Advanced Physical Fine Coal Cleaning Spherical Agglomeration U.S. DOE/PETC

Final Report

Appendices

Contract No. DE-AC22-87PC79867

Bechtel Job. No. 19307

September 1990

Bechtel National, Inc.

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SUMMARY POC TEST RESULTS - ILLINOIS NO. 6 COAL

Date:	11/3	11/8	11/20	11/21	11/26	11/30	12/1	12/8
Agglomeration Test No.:	30701	31201	32401	32501	32601	33401	33501	34201
Test Matrix Serial No.:	1	2		3	4			5
Grind Type:	Select	Select	1-Stage	1-Stage	1-Stage	Select	Select	Select
Spiral Use:	No	No	No	No	No	No	No	No
Feed Solids (%):	15.2	15.2	14.0	24.0	12.9	20.4	14.1	11.9
Feed Particle Size (d90,µm):	19.4	19.4	482.0	482.0	233.0	14.2	18.0	18.0
(d50,µm):	7.6	7.6	209.0	209.0	49.0	5.7	7.6	7.6
I. POC Feed Coal (1/4 in x 0):								
Ash, %	-	-	-	-	-	-	-	-
Total Sulfur, %	-	-	-	-	-	-	-	-
Pyritic Sulfur, %	-	-	-	-	-	-	-	-
Heating Value, Btu/lb	-	-	-	-	-	-	-	-
lbs Ash/MBtu	-	-	-	-	-	-	-	-
lbs SO2/MBtu	-	-	-	-	-	-	-	-
lbs Pyritic SO2/MBtu	-	-	-	-	-	-	-	-
II. Grinding Process								
Product:								
Ash, %	13.00	13.19	12.77	11.01	13.97	17.76	16.48	16.71
Total Sulfur, %	3.29	3.29	3.46	3.29	3.40	3.56	3.34	3.41
Pyritic Sulfur, %	0.93	1.05	1.37	1.22	1.39	1.28	1.32	1.19
Heating Value, Btu/lb	12407	12377	12444	12724	12253	11651	11854	11818
lbs Ash/MBtu	10.48	10.66	10.26	8.65	11.40	15.24	13.90	14.14
lbs SO2/MBtu	5.30	5.32	5.56	5.17	5.55	6.11	5.64	5.77
lbs Pyritic SO2/MBtu	1.50	1.70	2.20	1.92	2.27	2.20	2.23	2.01
Refuse:								
Ash, %	-	-	-	-	-	-	-	-
Total Sulfur, %	-	-	-	-	-	-	-	-
III. Agglomeration Process								
Product (Excluding Binder):								
Ash, %	3.81	4.42	15.08	6.98	9.76	7.72	5.63	4.01
Heating Value, Btu/lb	13868	13771	12077	13364	12923	13246	13579	13836
Agglomerates (With Asphalt):								
Ash, %	3.74	4.30	14.75	6.80	9.04	7.60	5.52	3.93
Total Sulfur, %	2.92	2.80	3.34	3.09	3.47	3.38	2.93	2.74
Pyritic Sulfur, %	0.51	0.44	1.31	0.89	1.25	1.07	0.69	0.36
Heating Value, %	13936	13875	12198	13471	13266	13314	13656	13909
lbs Ash/MBtu	2.68	3.10	12.09	5.05	6.81	5.71	4.04	2.83
lbs SO2/MBtu	4.19	4.04	5.48	4.59	5.23	5.08	4.29	3.94
lbs Pyritic SO2/MBtu	0.73	0.63	2.15	1.32	1.88	1.61	1.01	0.52
Moisture, %	34.7	65.8	63.6	38.0	31.6	41.6	31.5	27.0
Binder to Coal, %	1.84	2.73	2.20	2.53	7.35	1.55	1.93	1.94
Refuse:								
Ash, %	78.13	71.04	33.86	30.20	77.63	80.21	87.90	80.98
Total Sulfur, %	6.28	6.14	4.57	4.82	5.28	5.09	6.06	6.85
IV. Grinding Performance								
Yield, %	-	-	-	-	-	-	-	-
Energy Recovery, %	-	-	-	-	-	-	-	-
Ash Reduction, %	-	-	-	-	-	-	-	-
SO2 Reduction, %	-	-	-	-	-	-	-	-
Pyritic SO2 Reduction, %	-	-	-	-	-	-	-	-
V. Agglomeration Performance								
Yield, %	87.6	86.8	112.3	82.6	93.8	86.5	86.8	83.5
Energy Recovery, %	97.9	96.6	109.0	86.8	98.9	98.4	99.4	97.8
Ash Reduction, %	74.4	70.9	-17.8	41.7	40.2	62.6	70.9	80.0
SO2 Reduction, %	21.0	24.1	1.5	11.3	5.7	16.9	23.8	31.7
Pyritic SO2 Reduction, %	51.2	62.6	2.5	31.1	16.9	26.8	54.6	74.3
VI. Overall Performance								
Yield, %	87.6	86.8	112.3	82.6	93.8	86.5	86.8	83.5
Energy Recovery, %	97.9	96.6	109.0	86.8	98.9	98.4	99.4	97.8
Ash Reduction, %	74.4	70.9	-17.8	41.7	40.2	62.6	70.9	80.0
SO2 Reduction, %	21.0	24.1	1.5	11.3	5.7	16.9	23.8	31.7
Pyritic SO2 Reduction, %	51.2	62.6	2.5	31.1	16.9	26.8	54.6	74.3

SUMMARY POC TEST RESULTS - ILLINOIS NO. 6 COAL

Date:	12/12	12/13	12/14	12/14	12/15	12/19	12/20	1/3
Agglomeration Test No.:	34601	34701	34801	34802	34901	35301	35401	36801
Test Matrix Serial No.:	6	7		8	9	10	11	12
Grind Type:	Select	Select	Select	Select	Select	Select	Select	Select
Spiral Use:	No	No	No	No	No	Yes	Yes	Yes
Feed Solids (%):	10.2	10.2	14.6	14.6	14.5	14.0	15.2	15.2
Feed Particle Size (d90,µm):	19.3	19.3	18.7	18.7	18.9	16.3	18.2	18.2
(d50,µm):	7.6	7.6	8.7	8.7	7.2	6.2	7.4	7.4
I. POC Feed Coal (1/4 in x 0):								
Ash, %	-	-	-	-	-	18.43	17.40	17.40
Total Sulfur, %	-	-	-	-	-	4.31	4.03	4.03
Pyritic Sulfur, %	-	-	-	-	-	1.97	1.81	1.81
Heating Value, Btu/lb	-	-	-	-	-	11544	11708	11708
lbs Ash/MBtu	-	-	-	-	-	15.96	14.86	14.86
lbs SO2/MBtu	-	-	-	-	-	7.47	6.88	6.88
lbs Pyritic SO2/MBtu	-	-	-	-	-	3.41	3.09	3.09
II. Grinding Process								
Product:								
Ash, %	16.61	16.47	16.11	16.11	16.12	16.57	15.16	15.16
Total Sulfur, %	3.10	3.07	3.28	3.28	3.28	3.08	2.96	2.96
Pyritic Sulfur, %	0.96	0.99	1.09	1.09	1.13	0.78	0.73	0.73
Heating Value, Btu/lb	11834	11856	11913	11913	11912	11840	12064	12064
lbs Ash/MBtu	14.04	13.89	13.52	13.52	13.53	13.99	12.57	12.57
lbs SO2/MBtu	5.24	5.18	5.51	5.51	5.51	5.20	4.91	4.91
lbs Pyritic SO2/MBtu	1.62	1.67	1.83	1.83	1.90	1.32	1.21	1.21
Refuse:								
Ash, %	-	-	-	-	-	36.20	40.11	40.11
Total Sulfur, %	-	-	-	-	-	10.93	13.01	13.01
III. Agglomeration Process								
Product (Excluding Binder):								
Ash, %	3.97	3.95	4.89	4.29	4.07	3.99	3.71	3.66
Heating Value, Btu/lb	13842	13845	13696	13791	13827	13839	13883	13891
Agglomerates (With Asphalt):								
Ash, %	3.90	3.82	4.79	4.20	3.99	3.89	3.60	3.54
Total Sulfur, %	2.77	2.73	2.93	2.87	2.79	2.74	2.66	2.57
Pyritic Sulfur, %	0.38	0.37	0.56	0.50	0.43	0.35	0.25	0.21
Heating Value, %	13908	13971	13774	13874	13897	13951	13997	14013
lbs Ash/MBtu	2.80	2.73	3.48	3.03	2.87	2.79	2.57	2.53
lbs SO2/MBtu	3.98	3.91	4.25	4.14	4.02	3.93	3.80	3.67
lbs Pyritic SO2/MBtu	0.55	0.53	0.81	0.72	0.62	0.50	0.36	0.30
Moisture, %	41.2	42.5	54.5	49.0	33.9	34.7	34.7	33.0
Binder to Coal, %	1.74	3.36	2.00	2.18	1.87	2.99	3.08	3.27
Refuse:								
Ash, %	88.71	86.36	88.60	87.98	87.31	84.76	88.10	86.39
Total Sulfur, %	4.98	4.93	5.51	5.88	6.33	5.34	5.10	4.89
IV. Grinding Performance								
Yield, %	-	-	-	-	-	90.5	91.0	91.0
Energy Recovery, %	-	-	-	-	-	92.8	93.8	93.8
Ash Reduction, %	-	-	-	-	-	12.3	15.4	15.4
SO2 Reduction, %	-	-	-	-	-	30.3	28.7	28.7
Pyritic SO2 Reduction, %	-	-	-	-	-	61.4	60.9	60.9
V. Agglomeration Performance								
Yield, %	85.1	84.8	86.6	85.9	85.5	84.4	86.4	86.1
Energy Recovery, %	99.5	99.0	99.6	99.4	99.3	98.7	99.5	99.1
Ash Reduction, %	80.0	80.3	74.3	77.6	78.8	80.1	79.5	79.9
SO2 Reduction, %	24.0	24.5	22.7	24.9	27.1	24.5	22.5	25.2
Pyritic SO2 Reduction, %	66.3	68.3	55.6	60.6	67.4	61.9	70.5	75.2
VI. Overall Performance								
Yield, %	85.1	84.8	86.6	85.9	85.5	76.4	78.7	78.4
Energy Recovery, %	99.5	99.0	99.6	99.4	99.3	91.6	93.3	93.0
Ash Reduction, %	80.0	80.3	74.3	77.6	78.8	82.5	82.7	83.0
SO2 Reduction, %	24.0	24.5	22.7	24.9	27.1	47.4	44.8	46.7
Pyritic SO2 Reduction, %	66.3	68.3	55.6	60.6	67.4	85.3	88.4	90.3

SUMMARY POC TEST RESULTS - ILLINOIS NO. 6 COAL

Date:	1/3	1/3	1/4	1/4	1/4	1/5	1/5	1/5
Agglomeration Test No.:	36803	36804	36901	36902	36904	37001	37002	37003
Test Matrix Serial No.:	13			14	15	16		17
Grind Type:	Select	Select	Select	Select	Select	Select	Select	Select
Spiral Use:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Feed Solids (%):	15.2	18.2	18.2	18.2	18.2	14.4	14.4	14.4
Feed Particle Size (d90,µm):	20.3	20.3	20.3	20.3	20.3	-	-	-
(d50,µm):	7.7	7.7	7.7	7.7	7.7	-	-	-
I. POC Feed Coal (1/4 in x 0):								
Ash, %	18.82	18.82	18.82	18.82	18.82	16.16	16.16	16.16
Total Sulfur, %	4.34	4.34	4.34	4.34	4.34	3.84	3.84	3.84
Pyritic Sulfur, %	2.11	2.11	2.11	2.11	2.11	1.61	1.61	1.61
Heating Value, Btu/lb	11483	11483	11483	11483	11483	11905	11905	11905
lbs Ash/MBtu	16.39	16.39	16.39	16.39	16.39	13.57	13.57	13.57
lbs SO2/MBtu	7.56	7.56	7.56	7.56	7.56	6.45	6.45	6.45
lbs Pyritic SO2/MBtu	3.68	3.68	3.68	3.68	3.68	2.70	2.70	2.70
II. Grinding Process								
Product:								
Ash, %	16.85	16.85	16.85	16.85	16.85	14.35	14.35	14.35
Total Sulfur, %	3.56	3.56	3.56	3.56	3.56	3.01	3.01	3.01
Pyritic Sulfur, %	1.15	1.15	1.15	1.15	1.15	0.73	0.73	0.73
Heating Value, Btu/lb	11796	11796	11796	11796	11796	12193	12193	12193
lbs Ash/MBtu	14.29	14.29	14.29	14.29	14.29	11.77	11.77	11.77
lbs SO2/MBtu	6.04	6.04	6.04	6.04	6.04	4.94	4.94	4.94
lbs Pyritic SO2/MBtu	1.95	1.95	1.95	1.95	1.95	1.20	1.20	1.20
Refuse:								
Ash, %	36.99	36.99	36.99	36.99	36.99	44.14	44.14	44.14
Total Sulfur, %	11.25	11.25	11.25	11.25	11.25	14.52	14.52	14.52
III. Agglomeration Process								
Product (Excluding Binder):								
Ash, %	3.96	4.02	4.00	4.17	5.74	4.36	4.27	3.87
Heating Value, Btu/lb	13843	13834	13838	13810	13561	13780	13794	13858
Agglomerates (With Asphalt):								
Ash, %	3.87	3.93	3.93	4.10	5.60	4.22	4.13	3.74
Total Sulfur, %	2.84	2.89	2.87	2.80	2.80	2.99	3.03	2.74
Pyritic Sulfur, %	0.46	0.50	-	0.36	0.39	-	-	0.49
Heating Value, %	13931	13918	13899	13876	13657	13906	13920	13982
lbs Ash/MBtu	2.78	2.82	2.83	2.95	4.10	3.03	2.97	2.67
lbs SO2/MBtu	4.08	4.15	4.13	4.04	4.10	4.30	4.35	3.92
lbs Pyritic SO2/MBtu	0.66	0.72	-	0.52	0.57	-	-	0.70
Moisture, %	29.6	29.7	36.5	39.8	36.9	35.5	40.1	34.2
Binder to Coal, %	2.35	2.24	1.63	1.75	2.38	3.30	3.31	3.32
Refuse:								
Ash, %	88.22	87.02	89.31	88.21	88.52	89.10	88.23	89.13
Total Sulfur, %	5.95	5.31	5.45	6.02	5.99	3.53	4.23	5.16
IV. Grinding Performance								
Yield, %	90.2	90.2	90.2	90.2	90.2	93.9	93.9	93.9
Energy Recovery, %	92.7	92.7	92.7	92.7	92.7	96.2	96.2	96.2
Ash Reduction, %	12.8	12.8	12.8	12.8	12.8	13.3	13.3	13.3
SO2 Reduction, %	20.1	20.1	20.1	20.1	20.1	23.5	23.5	23.5
Pyritic SO2 Reduction, %	46.9	46.9	46.9	46.9	46.9	55.7	55.7	55.7
V. Agglomeration Performance								
Yield, %	84.7	84.5	84.9	84.9	86.6	88.2	88.0	87.7
Energy Recovery, %	99.4	99.2	99.6	99.4	99.5	99.7	99.6	99.7
Ash Reduction, %	80.6	80.2	80.2	79.3	71.3	74.2	74.8	77.3
SO2 Reduction, %	32.5	31.2	31.6	33.1	32.1	12.9	11.8	20.6
Pyritic SO2 Reduction, %	66.1	63.2	-	73.4	70.7	-	-	41.5
VI. Overall Performance								
Yield, %	76.4	76.3	76.6	76.6	78.1	82.9	82.6	82.4
Energy Recovery, %	92.1	91.9	92.3	92.1	92.2	95.9	95.8	95.9
Ash Reduction, %	83.1	82.8	82.7	82.0	75.0	77.6	78.1	80.3
SO2 Reduction, %	46.1	45.1	45.4	46.6	45.8	33.3	32.5	39.2
Pyritic SO2 Reduction, %	82.0	80.5	-	85.9	84.5	-	-	74.1

SUMMARY POC TEST RESULTS - ILLINOIS NO. 6 COAL

Date:	1/8	1/8	1/8	1/9	1/10	1/10	1/10	1/10
Agglomeration Test No.:	37301	37302	37303	37401	37501	37502	37503	37504
Test Matrix Serial No.:				18				
Grind Type:	Select	Select	Select	2-Stage	Select	Select	Select	Select
Spiral Use:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Feed Solids (%):	-	-	-	15.7	13.5	13.5	13.5	13.5
Feed Particle Size (d90,µm):	-	-	-	25.7	19.0	19.0	19.0	19.0
(d50,µm):	-	-	-	9.4	7.2	7.2	7.2	7.2
I. POC Feed Coal (1/4 in x 0):								
Ash, %	-	-	-	-	13.00	13.00	13.00	13.00
Total Sulfur, %	-	-	-	-	4.05	4.05	4.05	4.05
Pyritic Sulfur, %	-	-	-	-	1.71	1.71	1.71	1.71
Heating Value, Btu/lb	-	-	-	-	12407	12407	12407	12407
lbs Ash/MBtu	-	-	-	-	10.48	10.48	10.48	10.48
lbs SO2/MBtu	-	-	-	-	6.53	6.53	6.53	6.53
lbs Pyritic SO2/MBtu	-	-	-	-	2.76	2.76	2.76	2.76
II. Grinding Process								
Product:								
Ash, %	15.73	15.73	15.73	15.70	12.81	12.81	12.81	12.81
Total Sulfur, %	-	-	-	3.94	3.29	3.29	3.29	3.29
Pyritic Sulfur, %	-	-	-	1.56	1.04	1.04	1.04	1.04
Heating Value, Btu/lb	11974	11974	11974	11978	12437	12437	12437	12437
lbs Ash/MBtu	13.14	13.14	13.14	13.11	10.30	10.30	10.30	10.30
lbs SO2/MBtu	-	-	-	6.58	5.29	5.29	5.29	5.29
lbs Pyritic SO2/MBtu	-	-	-	2.60	1.67	1.67	1.67	1.67
Refuse:								
Ash, %	-	-	-	-	51.53	51.53	51.53	51.53
Total Sulfur, %	-	-	-	-	25.24	25.24	25.24	25.24
III. Agglomeration Process								
Product (Excluding Binder):								
Ash, %	4.17	4.10	3.95	5.06	4.34	3.96	3.97	4.02
Heating Value, Btu/lb	13811	13822	13845	13668	13783	13844	13842	13834
Agglomerates (With Asphalt):								
Ash, %	4.05	3.91	3.84	4.91	4.21	3.84	3.85	3.90
Total Sulfur, %	3.05	2.98	3.05	3.39	3.16	3.10	3.03	2.94
Pyritic Sulfur, %	0.65	-	-	0.93	-	-	0.87	-
Heating Value, %	13918	13993	13951	13788	13897	13957	13956	13948
lbs Ash/MBtu	2.91	2.79	2.75	3.56	3.03	2.75	2.76	2.80
lbs SO2/MBtu	4.38	4.26	4.37	4.92	4.55	4.44	4.34	4.22
lbs Pyritic SO2/MBtu	0.93	-	-	1.35	-	-	1.25	-
Moisture, %	24.9	28.6	29.0	21.7	31.8	36.9	24.3	31.7
Binder to Coal, %	2.83	4.52	2.83	3.05	2.98	3.00	3.04	3.02
Refuse:								
Ash, %	87.67	87.96	88.09	87.13	89.21	88.29	86.17	89.44
Total Sulfur, %	3.78	3.78	5.38	6.41	5.17	4.99	8.04	5.50
IV. Grinding Performance								
Yield, %	-	-	-	-	99.5	99.5	99.5	99.5
Energy Recovery, %	-	-	-	-	99.8	99.8	99.8	99.8
Ash Reduction, %	-	-	-	-	1.7	1.7	1.7	1.7
SO2 Reduction, %	-	-	-	-	19.0	19.0	19.0	19.0
Pyritic SO2 Reduction, %	-	-	-	-	39.3	39.3	39.3	39.3
V. Agglomeration Performance								
Yield, %	86.2	86.1	86.0	87.0	90.0	89.5	89.2	89.7
Energy Recovery, %	99.4	99.4	99.4	99.3	99.8	99.6	99.3	99.8
Ash Reduction, %	77.8	78.7	79.0	72.8	70.6	73.3	73.2	72.9
SO2 Reduction, %	-	-	-	25.3	14.0	16.0	17.9	20.3
Pyritic SO2 Reduction, %	-	-	-	48.2	-	-	25.4	-
VI. Overall Performance								
Yield, %	86.2	86.1	86.0	87.0	89.6	89.1	88.8	89.3
Energy Recovery, %	99.4	99.4	99.4	99.3	99.5	99.4	99.1	99.5
Ash Reduction, %	77.8	78.7	79.0	72.8	71.1	73.7	73.7	73.3
SO2 Reduction, %	-	-	-	25.3	30.3	32.0	33.5	35.4
Pyritic SO2 Reduction, %	-	-	-	48.2	-	-	54.8	-

SUMMARY POC TEST RESULTS - ILLINOIS NO. 6 COAL

Date:	1/11	1/11	1/11	1/12	1/12	1/15	1/15	1/19
Agglomeration Test No.:	37601	37602	37603	37701	37702	38001	38002	34801
Test Matrix Serial No.:								
Grind Type:	Select	Select	Select	Select	Select	Select	Select	Select
Spiral Use:	No	No	No	No	No	No	No	Yes
Feed Solids (%):	-	-	-	-	-	-	-	-
Feed Particle Size (d90, μ m):	-	-	-	-	-	-	-	-
(d50, μ m):	-	-	-	-	-	-	-	-
I. POC Feed Coal (1/4 in x 0):								
Ash, %	-	-	-	-	-	-	-	-
Total Sulfur, %	-	-	-	-	-	-	-	-
Pyritic Sulfur, %	-	-	-	-	-	-	-	-
Heating Value, Btu/lb	-	-	-	-	-	-	-	-
lbs Ash/MBtu	-	-	-	-	-	-	-	-
lbs SO2/MBtu	-	-	-	-	-	-	-	-
lbs Pyritic SO2/MBtu	-	-	-	-	-	-	-	-
II. Grinding Process								
Product:								
Ash, %	15.24	15.24	15.24	15.24	15.24	15.24	15.24	15.24
Total Sulfur, %	-	-	-	-	-	-	-	-
Pyritic Sulfur, %	-	-	-	-	-	-	-	-
Heating Value, Btu/lb	12051	12051	12051	12051	12051	12051	12051	12051
lbs Ash/MBtu	12.65	12.65	12.65	12.65	12.65	12.65	12.65	12.65
lbs SO2/MBtu	-	-	-	-	-	-	-	-
lbs Pyritic SO2/MBtu	-	-	-	-	-	-	-	-
Refuse:								
Ash, %	-	-	-	-	-	-	-	-
Total Sulfur, %	-	-	-	-	-	-	-	-
III. Agglomeration Process								
Product (Excluding Binder):								
Ash, %	-	-	-	3.78	3.64	3.95	3.91	4.14
Heating Value, Btu/lb	-	-	-	13872	13895	13846	13851	13816
Agglomerates (With Asphalt):								
Ash, %	4.45	4.13	4.13	3.68	3.54	3.82	3.79	4.02
Total Sulfur, %	3.37	3.12	3.12	2.92	2.87	2.87	2.86	2.69
Pyritic Sulfur, %	-	-	-	-	-	-	-	-
Heating Value, %	-	-	-	13973	13997	13966	13970	13921
lbs Ash/MBtu	-	-	-	2.63	2.53	2.74	2.71	2.89
lbs SO2/MBtu	-	-	-	4.18	4.10	4.11	4.09	3.86
lbs Pyritic SO2/MBtu	-	-	-	-	-	-	-	-
Moisture, %	41.3	22.2	36.7	32.5	27.2	25.9	25.9	32.7
Binder to Coal, %	-	-	-	2.71	2.76	3.19	3.19	2.79
Refuse:								
Ash, %	-	-	-	88.00	88.00	88.00	88.00	88.00
Total Sulfur, %	-	-	-	-	-	-	-	-
IV. Grinding Performance								
Yield, %	-	-	-	-	-	-	-	-
Energy Recovery, %	-	-	-	-	-	-	-	-
Ash Reduction, %	-	-	-	-	-	-	-	-
SO2 Reduction, %	-	-	-	-	-	-	-	-
Pyritic SO2 Reduction, %	-	-	-	-	-	-	-	-
V. Agglomeration Performance								
Yield, %	-	-	-	86.4	86.2	86.6	86.5	86.8
Energy Recovery, %	-	-	-	99.4	99.4	99.5	99.5	99.5
Ash Reduction, %	-	-	-	79.2	80.0	78.4	78.5	77.2
SO2 Reduction, %	-	-	-	-	-	-	-	-
Pyritic SO2 Reduction, %	-	-	-	-	-	-	-	-
VI. Overall Performance								
Yield, %	-	-	-	86.4	86.2	86.6	86.5	86.8
Energy Recovery, %	-	-	-	99.4	99.4	99.5	99.5	99.5
Ash Reduction, %	-	-	-	79.2	80.0	78.4	78.5	77.2
SO2 Reduction, %	-	-	-	-	-	-	-	-
Pyritic SO2 Reduction, %	-	-	-	-	-	-	-	-

SUMMARY POC TEST RESULTS - ILLINOIS NO. 6 COAL

Date:	1/22	1/22	1/23	1/23	1/23	1/24	1/24	1/24
Agglomeration Test No.:	38701	38702	38801	38802	38803	38901	38902	38903
Test Matrix Serial No.:								
Grind Type:	Select	Select	Select	Select	Select	Select	Select	Select
Spiral Use:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Feed Solids (%):	-	-	-	-	-	-	-	-
Feed Particle Size (d90,µm):	-	-	-	-	-	-	-	-
(d50,µm):	-	-	-	-	-	-	-	-
I. POC Feed Coal (1/4 in x 0):								
Ash, %	-	-	-	-	-	-	-	-
Total Sulfur, %	-	-	-	-	-	-	-	-
Pyritic Sulfur, %	-	-	-	-	-	-	-	-
Heating Value, Btu/lb	-	-	-	-	-	-	-	-
lbs Ash/MBtu	-	-	-	-	-	-	-	-
lbs SO2/MBtu	-	-	-	-	-	-	-	-
lbs Pyritic SO2/MBtu	-	-	-	-	-	-	-	-
II. Grinding Process								
Product:								
Ash, %	15.24	15.24	15.24	15.24	15.24	15.24	15.24	15.24
Total Sulfur, %	-	-	-	-	-	-	-	-
Pyritic Sulfur, %	-	-	-	-	-	-	-	-
Heating Value, Btu/lb	12051	12051	12051	12051	12051	12051	12051	12051
lbs Ash/MBtu	12.65	12.65	12.65	12.65	12.65	12.65	12.65	12.65
lbs SO2/MBtu	-	-	-	-	-	-	-	-
lbs Pyritic SO2/MBtu	-	-	-	-	-	-	-	-
Refuse:								
Ash, %	-	-	-	-	-	-	-	-
Total Sulfur, %	-	-	-	-	-	-	-	-
III. Agglomeration Process								
Product (Excluding Binder):								
Ash, %	5.43	4.55	4.30	4.16	3.98	3.73	3.56	3.57
Heating Value, Btu/lb	13610	13751	13790	13813	13840	13881	13907	13906
Agglomerates (With Asphalt):								
Ash, %	5.25	4.41	4.20	4.06	3.86	3.65	3.47	3.52
Total Sulfur, %	3.14	3.02	3.03	2.99	2.77	2.70	2.66	2.70
Pyritic Sulfur, %	-	-	-	-	-	-	-	-
Heating Value, %	13741	13866	13877	13899	13957	13958	14005	13956
lbs Ash/MBtu	3.82	3.18	3.03	2.92	2.77	2.62	2.48	2.52
lbs SO2/MBtu	4.57	4.36	4.37	4.30	3.97	3.87	3.80	3.87
lbs Pyritic SO2/MBtu	-	-	-	-	-	-	-	-
Moisture, %	46.9	32.5	26.1	26.3	50.0	31.7	30.4	34.5
Binder to Coal, %	3.28	2.99	2.28	2.29	3.12	2.07	2.66	1.35
Refuse:								
Ash, %	88.00	88.00	88.00	88.00	88.00	88.00	88.00	88.00
Total Sulfur, %	-	-	-	-	-	-	-	-
IV. Grinding Performance								
Yield, %	-	-	-	-	-	-	-	-
Energy Recovery, %	-	-	-	-	-	-	-	-
Ash Reduction, %	-	-	-	-	-	-	-	-
SO2 Reduction, %	-	-	-	-	-	-	-	-
Pyritic SO2 Reduction, %	-	-	-	-	-	-	-	-
V. Agglomeration Performance								
Yield, %	88.1	87.2	86.9	86.8	86.6	86.3	86.2	86.2
Energy Recovery, %	99.5	99.5	99.5	99.5	99.5	99.4	99.4	99.4
Ash Reduction, %	69.8	74.8	76.1	76.9	78.1	79.3	80.4	80.1
SO2 Reduction, %	-	-	-	-	-	-	-	-
Pyritic SO2 Reduction, %	-	-	-	-	-	-	-	-
VI. Overall Performance								
Yield, %	88.1	87.2	86.9	86.8	86.6	86.3	86.2	86.2
Energy Recovery, %	99.5	99.5	99.5	99.5	99.5	99.4	99.4	99.4
Ash Reduction, %	69.8	74.8	76.1	76.9	78.1	79.3	80.4	80.1
SO2 Reduction, %	-	-	-	-	-	-	-	-
Pyritic SO2 Reduction, %	-	-	-	-	-	-	-	-

RUN#: 30701
NUMBER: 1

DATE: 03-Nov-89

page1

1. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - W/O SPIRAL GRIND TEST# 30601

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	13.00%	3.74%
% ASH (ASPHALT FREE BASIS)			3.81%
% SULFUR	NA	3.29%	2.92%
% PYRITIC SULFUR	NA	0.93%	0.51%
BTU/LB - ASTM	NA	12226	13781
BTU/LB CORRELATED	NA	12407	13940
BTU/LB " LESS ASPHALT			13868
LBS ASH/MMBTU	NA	10.48	2.68
LBS SO2/MMBTU	NA	5.30	4.19
LBS PYRITIC SO2/MBTU	NA	1.50	0.73
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - UM		19.35	
PARTICLE D50 - UM		7.62	
MOISTURE			34.68%

B. PROCESS REFUSE

% ASH	78.13%
% SULFUR	6.28%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	87.63%
% TOTAL WT YIELD INCLUDING ASPHALT	89.28%
% ENERGY RECOVERY	97.95%
% ASH REDUCTION	74.39%
% SO2 REDUCTION	21.00%
% PYRITIC SO2 REDUCTION	51.19%
ASH SEPARATION FACTOR	1797
PYRITE SEPARATION FACTOR	1079

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	622 lbs
GROSS PRODUCT WT. RECOVERED	NA lbs
NET PRODUCT WT. RECOVERED (dry basis)	NA lbs
PRODUCT BINDER CONC.	1.84%
TOTAL BL. CONC. % OF FEED COAL	26.10%
STEAM / TON PRODUCT	NA lbs
HIGH SHEAR WORK/MTON PRODUCT	11.13 kWhr
LOW SHEAR WORK/MTON PRODUCT	28.61 kWhr

RUN#: 31201
NUMBER: 1

DATE: 08-Nov-89

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - W/O SPIRAL GRIND TEST# 30601

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	13.19%	4.30%
% ASH (ASPHALT FREE BASIS)			4.42%
% SULFUR	NA	3.29%	2.80%
% PYRITIC SULFUR	NA	1.05%	0.44%
BTU/LB - ASTM	NA	12197	13776
BTU/LB CORRELATED	NA	12377	13880
BTU/LB " LESS ASPHALT			13771
LBS ASH/MMBTU	NA	10.66	3.10
LBS SO2/MMBTU	NA	5.32	4.03
LBS PYRITIC SO2/MBTU	NA	1.70	0.63
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		19.35	
PARTICLE D50 - um		7.62	
MOISTURE			65.76%

B. PROCESS REFUSE

% ASH	71.04%
% SULFUR	6.14%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	86.84%
% TOTAL WT YIELD	89.28%
INCLUDING ASPHALT	
% ENERGY RECOVERY	96.61%
% ASH REDUCTION	70.93%
% SO2 REDUCTION	24.11%
% PYRITIC SO2 REDUCTION	62.63%
ASH SEPARATION FACTOR	1396
PYRITE SEPARATION FACTOR	1212

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	720 lbs
GROSS PRODUCT WT. RECOVERED	NA lbs
NET PRODUCT WT. RECOVERED (dry basis)	NA lbs
PRODUCT BINDER CONC.	2.73%
TOTAL BL. CONC. % OF FEED COAL	40.31%
STEAM / TON PRODUCT	5545.42 lbs
HIGH SHEAR WORK/MTON PRODUCT	27.24 kWhr
LOW SHEAR WORK/MTON PRODUCT	20.62 kWhr

DATE: 20-Nov-89
NUMBER: 1

RUN#: 32401

page1

I. MATERIAL SPECIFICATIONS:

FEED COAL

ID	ILLINIOS #6 BURNING STAR MINE PERRY CO. IL BALL MILL PRODUCT
ASH	12.77%
HEATING VALUE - EXP	12163 Btu/lb
HEATING VALUE - CORRELATED	12444 Btu/lb
TOTAL SULFUR	3.46%
PYRITIC SULFUR	1.37%
PYRITIC S02/MMBTU	2.20 lbs.
PARTICLE D90	482 um
PARTICLE D50	209 um

PHYSICAL DATA:

BRIDGING LIQUID SP.GV	0.695
BINDER SP.GV	1.050
COAL SP.GV (MF)	1.300
MINERAL SP.GV.	2.900
EST. FEED SOLIDS SP.GV.	1.399

FEED CONCENTRATIONS

SLURRY SOLIDS CONTENT	13.95%
BINDER SOLUTION CONC	30.00%
DT-D02 SP.GV.	1.050
EST. FEED SOLIDS	16.71%

CALCULATE BASED ON DT-D02? [YES/NO]
SOLIDS FOR CALCULATIONS
SP.GR. FOR CALCULATIONS

----> NO
13.95%
1.041

II. RUN SPECIFICATIONS:

C-6 IMPELLER MAX DIAM	8.8 in
C-8 IMPELLER DIAM	32.0 in
HIGH SHEAR RESIDENCE TIME	90.0 sec
FEED TIME	27.0 min
BINDER FEED TIME	10.0 min
GROWTH TIME	10.0 min
BINDER CONC TO HIGH SHEAR	0.39%
TOTAL BINDER	2.20%
TOTAL B.L. DOSE	32.50%
HIGH SHEAR TIP SPEED	21.0 m/sec
LOW SHEAR TIP SPEED (GROWTH PHASE)	5.0 m/sec

RUN#: 32501
NUMBER: 1

DATE: 21-Nov-89

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, FERRY CO. IL
BALL MILL ONLY GRIND TEST# 11/20

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	11.01%	6.80%
% ASH (ASPHALT FREE BASIS)			6.98%
% SULFUR	NA	3.29%	3.09%
% PYRITIC SULFUR	NA	1.22%	0.89%
BTU/LB - ASTM	NA	12720	13431
BTU/LB CORRELATED	NA	12724	13476
BTU/LB " LESS ASPHALT			13365
LBS ASH/MMBTU	NA	8.65	5.05
LBS SO2/MMBTU	NA	5.17	4.59
LBS PYRITIC SO2/MMBTU	NA	1.92	1.32
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		482	
PARTICLE D50 - μ M		209	
MOISTURE			38.00%

B. PROCESS REFUSE

% ASH	30.20%
% SULFUR	4.82%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	82.63%
% TOTAL WT YIELD INCLUDING ASPHALT	84.78%
% ENERGY RECOVERY	86.80%
% ASH REDUCTION	41.69%
% SO2 REDUCTION	11.32%
% PYRITIC SO2 REDUCTION	31.12%
ASH SEPARATION FACTOR	358
PYRITE SEPARATION FACTOR	448

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	595 lbs
GROSS PRODUCT WT. RECOVERED	695 lbs
NET PRODUCT WT. RECOVERED (dry basis)	431 lbs
PRODUCT BINDER CONC.	2.53%
TOTAL BL. CONC. % OF FEED COAL	32.67%
STEAM / TON PRODUCT	6174.75 lbs
HIGH SHEAR WORK/MTON PRODUCT	27.92 kWhr
LOW SHEAR WORK/MTON PRODUCT	17.49 kWhr

RUN#: 32601
NUMBER: 1

DATE: 22-Nov-89

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
BALL MILL ONLY GRIND TEST# 11/21

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	13.97%	9.04%
% ASH (ASPHALT FREE BASIS)			9.75%
% SULFUR	NA	3.40%	3.47%
% PYRITIC SULFUR	NA	1.39%	1.25%
BTU/LB - ASTM	NA	12423	12052
BTU/LB CORRELATED	NA	12253	13279
BTU/LB " LESS ASPHALT			12923
LBS ASH/MMBTU	NA	11.40	6.81
LBS SO2/MMBTU	NA	5.55	5.23
LBS PYRITIC SO2/MBTU	NA	2.27	1.88
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		233	
PARTICLE D50 - uM		49	
MOISTURE			31.61%

B. PROCESS REFUSE

% ASH	77.63%
% SULFUR	5.28%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	93.79%
% TOTAL WT YIELD INCLUDING ASPHALT	101.23%
% ENERGY RECOVERY	98.92%
% ASH REDUCTION	40.29%
% SO2 REDUCTION	5.83%
% PYRITIC SO2 REDUCTION	17.02%
ASH SEPARATION FACTOR	747
PYRITE SEPARATION FACTOR	396

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	627 lbs
GROSS PRODUCT WT. RECOVERED	NA lbs
NET PRODUCT WT. RECOVERED (dry basis)	NA lbs
PRODUCT BINDER CONC.	7.35%
TOTAL BL. CONC. % OF FEED COAL	48.67%
STEAM / TON PRODUCT	3033.51 lbs
HIGH SHEAR WORK/MTON PRODUCT	25.23 kWhr
LOW SHEAR WORK/MTON PRODUCT	26.26 kWhr

DATE: 30-Nov-89
NUMBER: 1

RUN#: 33401

page1

I. MATERIAL SPECIFICATIONS:
FEED COAL

ID

ILLINIOS #6
BURNING STAR MINE
PERRY CO. IL
SELECTIVE GRIND PRODUCT

ASH	15.95%
HEATING VALUE - EXP	NA Btu/lb
HEATING VALUE - CORRELATED	11939 Btu/lb
TOTAL SULFUR	3.26%
PYRITIC SULFUR	NA
PYRITIC S02/MMBTU	NA lbs.
PARTICLE SIZE (D90)	NA

PHYSICAL DATA:

BRIDGING LIQUID SP.GV	0.695
BINDER SP.GV	1.050
COAL SP.GV (MF)	1.300
MINERAL SP.GV.	2.900
EST. FEED SOLIDS SP.GV.	1.425

FEED CONCENTRATIONS

SLURRY SOLIDS CONTENT	12.85%
BINDER SOLUTION CONC	30.00%
DT-D02 SP.GV.	1.045
EST. FEED SOLIDS	14.43%

CALCULATE BASED ON DT-D02? [YES/NO]
SOLIDS FOR CALCULATIONS
SP.GR. FOR CALCULATIONS

---> YES
14.43%
1.045

II. RUN SPECIFICATIONS:

C-6 IMPELLER MAX DIAM	8.8 in
C-8 IMPELLER DIAM	32.0 in
HIGH SHEAR RESIDENCE TIME	90.0 sec
FEED TIME	10.0 min
BINDER FEED TIME	NA min
GROWTH TIME	NA min

BINDER CONC TO HIGH SHEAR	0.25%
TOTAL BINDER	0.25%
TOTAL B.L. DOSE	35.50%

HIGH SHEAR TIP SPEED	21.0 m/sec
LOW SHEAR TIP SPEED (GROWTH PHASE)	NA m/sec

RUN#: 33403
NUMBER: 3

DATE: 30-Nov-89

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 11/29

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	17.76%	7.60%
% ASH (ASPHALT FREE BASIS)			7.72%
% SULFUR	NA	3.56%	3.38%
% PYRITIC SULFUR	NA	1.32%	1.07%
BTU/LB - ASTM	NA	NA	13319
BTU/LB CORRELATED	NA	11651	13317
BTU/LB " LESS ASPHALT			13246
LBS ASH/MMBTU	NA	15.24	5.71
LBS SO2/MMBTU	NA	6.11	5.08
LBS PYRITIC SO2/MBTU	NA	2.27	1.61
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		18	
PARTICLE D50 - μ M		7.6	
MOISTURE			41.60%

B. PROCESS REFUSE

% ASH	82.21%
% SULFUR	5.09%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	86.52%
% TOTAL WT YIELD INCLUDING ASPHALT	87.89%
% ENERGY RECOVERY	98.37%
% ASH REDUCTION	62.56%
% SO2 REDUCTION	16.93%
% PYRITIC SO2 REDUCTION	29.08%
ASH SEPARATION FACTOR	921
PYRITE SEPARATION FACTOR	412

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	807 lbs
GROSS PRODUCT WT. RECOVERED	NA lbs
NET PRODUCT WT. RECOVERED (dry basis)	NA lbs
PRODUCT BINDER CONC.	1.55%
TOTAL BL. CONC. % OF FEED COAL	35.16%
STEAM / TON PRODUCT	2503.69 lbs
HIGH SHEAR WORK/MTON PRODUCT	16.74 kWhr
LOW SHEAR WORK/MTON PRODUCT	30.91 kWhr

RUN#: 33501
NUMBER: 1

DATE: 01-Dec-89

page 1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 12/01

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	16.48%	5.52%
% ASH (ASPHALT FREE BASIS)			5.63%
% SULFUR	NA	3.34%	2.93%
% PYRITIC SULFUR	NA	1.32%	0.69%
BTU/LB - ASTM	NA	11661	13592
BTU/LB CORRELATED	NA	11854	13660
BTU/LB " LESS ASPHALT			13579
LBS ASH/MMBTU	NA	13.90	4.04
LBS SO2/MMBTU	NA	5.64	4.29
LBS PYRITIC SO2/MBTU	NA	2.23	1.01
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		18	
PARTICLE D50 - μ M		7.6	
MOISTURE			31.49%

B. PROCESS REFUSE

% ASH	87.90%
% SULFUR	6.96%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	86.81%
% TOTAL WT YIELD INCLUDING ASPHALT	88.52%
% ENERGY RECOVERY	99.44%
% ASH REDUCTION	70.93%
% SO2 REDUCTION	23.87%
% PYRITIC SO2 REDUCTION	54.64%
ASH SEPARATION FACTOR	1356
PYRITE SEPARATION FACTOR	876

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	555 lbs
GROSS PRODUCT WT. RECOVERED	604 lbs
NET PRODUCT WT. RECOVERED (dry basis)	414 lbs
PRODUCT BINDER CONC.	1.93%
TOTAL BL. CONC. % OF FEED COAL	41.53%
STEAM / TON PRODUCT	2028.96 lbs
HIGH SHEAR WORK/MTON PRODUCT	20.29 kWhr
LOW SHEAR WORK/MTON PRODUCT	29.91 kWhr

RUN#: 34201
NUMBER: 1

DATE: 08-Dec-89

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 12/01

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	16.71%	3.93%
% ASH (ASPHALT FREE BASIS)			4.01%
% SULFUR	NA	3.41%	2.74%
% PYRITIC SULFUR	NA	1.19%	0.36%
BTU/LB - ASTM	NA	11425	13623
BTU/LB CORRELATED	NA	11818	13913
BTU/LB " LESS ASPHALT			13836
LBS ASH/MMBTU	NA	14.14	2.82
LBS SO2/MMBTU	NA	5.77	3.94
LBS PYRITIC SO2/MBTU	NA	2.01	0.52
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		18	
PARTICLE D50 - um		7.6	
MOISTURE			27.01%

B. PROCESS REFUSE

% ASH	80.98%
% SULFUR	6.85%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	83.50%
% TOTAL WT YIELD INCLUDING ASPHALT	85.15%
% ENERGY RECOVERY	97.76%
% ASH REDUCTION	80.02%
% SO2 REDUCTION	31.75%
% PYRITIC SO2 REDUCTION	74.30%
ASH SEPARATION FACTOR	1687
PYRITE SEPARATION FACTOR	1589

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	257 lbs
GROSS PRODUCT WT. RECOVERED	472 lbs
NET PRODUCT WT. RECOVERED (dry basis)	345 lbs
PRODUCT BINDER CONC.	1.94%
TOTAL BL. CONC. % OF FEED COAL	47.65%
STEAM / TON PRODUCT	6221.94 lbs
HIGH SHEAR WORK/MTON PRODUCT	60.61 kWhr
LOW SHEAR WORK/MTON PRODUCT	49.58 kWhr

RUN#: 34601
NUMBER: 1

DATE: 12-Dec-89

page 1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 12/11

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	16.61%	3.90%
% ASH (ASPHALT FREE BASIS)			3.97%
% SULFUR	NA	3.10%	2.77%
% PYRITIC SULFUR	NA	0.96%	0.38%
BTU/LB - ASTM	NA	11829	14037
BTU/LB CORRELATED	NA	11834	13911
BTU/LB " LESS ASPHALT			13842
LBS ASH/MMBTU	NA	14.04	2.80
LBS SO2/MMBTU	NA	5.24	3.98
LBS PYRITIC SO2/MBTU	NA	1.62	0.55
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		19.31	
PARTICLE D50 - μ M		7.59	
MOISTURE			41.21%

B. PROCESS REFUSE

% ASH	88.71%
% SULFUR	4.98%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	85.08%
% TOTAL WT YIELD	86.59%
INCLUDING ASPHALT	
% ENERGY RECOVERY	99.53%
% ASH REDUCTION	80.03%
% SO2 REDUCTION	23.99%
% PYRITIC SO2 REDUCTION	66.33%
ASH SEPARATION FACTOR	1902
PYRITE SEPARATION FACTOR	1115

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	493 lbs
GROSS PRODUCT WT. RECOVERED	725 lbs
NET PRODUCT WT. RECOVERED (dry basis)	426 lbs
PRODUCT BINDER CONC.	1.74%
TOTAL BL. CONC. % OF FEED COAL	41.73%
STEAM / TON PRODUCT	9267.86 lbs
HIGH SHEAR WORK/MTON PRODUCT	26.19 kWhr
LOW SHEAR WORK/MTON PRODUCT	34.61 kWhr

RUN#: 34701
NUMBER: 1

DATE: 13-Dec-89

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 12/11

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	16.47%	3.82%
% ASH (ASPHALT FREE BASIS)			3.95%
% SULFUR	NA	3.07%	2.73%
% PYRITIC SULFUR	NA	0.99%	0.37%
BTU/LB - ASTM	NA	11854	13942
BTU/LB CORRELATED	NA	11856	13977
BTU/LB " LESS ASPHALT			13845
LBS ASH/MMBTU	NA	13.89	2.73
LBS SO2/MMBTU	NA	5.18	3.91
LBS PYRITIC SO2/MBTU	NA	1.67	0.53
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		19.31	
PARTICLE D50 - μ M		7.59	
MOISTURE			42.47%

B. PROCESS REFUSE

% ASH	86.36%
% SULFUR	4.93%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	84.81%
% TOTAL WT YIELD INCLUDING ASPHALT	87.76%
% ENERGY RECOVERY	99.04%
% ASH REDUCTION	80.33%
% SO2 REDUCTION	24.57%
% PYRITIC SO2 REDUCTION	68.30%
ASH SEPARATION FACTOR	1854
PYRITE SEPARATION FACTOR	1130

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	485 lbs
GROSS PRODUCT WT. RECOVERED	761 lbs
NET PRODUCT WT. RECOVERED (dry basis)	438 lbs
PRODUCT BINDER CONC.	3.36%
TOTAL BL. CONC. % OF FEED COAL	33.09%
STEAM / TON PRODUCT	7424.85 lbs
HIGH SHEAR WORK/MTON PRODUCT	26.87 kWhr
LOW SHEAR WORK/MTON PRODUCT	28.67 kWhr

RUN#: 34801
NUMBER: 1

DATE: 14-Dec-89

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 12/13

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	16.11%	4.79%
% ASH (ASPHALT FREE BASIS)			4.89%
% SULFUR	NA	3.28%	2.93%
% PYRITIC SULFUR	NA	1.09%	0.56%
BTU/LB - ASTM	NA	11923	13970
BTU/LB CORRELATED	NA	11913	13778
BTU/LB " LESS ASPHALT			13696
LBS ASH/MMBTU	NA	13.52	3.48
LBS SO2/MMBTU	NA	5.51	4.25
LBS PYRITIC SO2/MBTU	NA	1.83	0.81
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		18.65	
PARTICLE D50 - uM		8.72	
MOISTURE			54.45%

B. PROCESS REFUSE

% ASH	88.60%
% SULFUR	5.51%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	86.59%
% TOTAL WT YIELD INCLUDING ASPHALT	88.36%
% ENERGY RECOVERY	99.56%
% ASH REDUCTION	74.29%
% SO2 REDUCTION	22.76%
% PYRITIC SO2 REDUCTION	55.58%
ASH SEPARATION FACTOR	1570
PYRITE SEPARATION FACTOR	852

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	591 lbs
GROSS PRODUCT WT. RECOVERED	853 lbs
NET PRODUCT WT. RECOVERED (dry basis)	389 lbs
PRODUCT BINDER CONC.	2.00%
TOTAL BL. CONC. % OF FEED COAL	40.16%
STEAM / TON PRODUCT	3684.87 lbs
HIGH SHEAR WORK/MTON PRODUCT	36.26 kWhr
LOW SHEAR WORK/MTON PRODUCT	19.18 kWhr

RUN#: 34802
NUMBER: 2

DATE: 14-Dec-89

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 12/13

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	16.11%	4.20%
% ASH (ASPHALT FREE BASIS)			4.29%
% SULFUR	NA	3.28%	2.87%
% PYRITIC SULFUR	NA	1.09%	0.50%
BTU/LB - ASTM	NA	11923	13856
BTU/LB CORRELATED	NA	11913	13878
BTU/LB " LESS ASPHALT			13791
LBS ASH/MMBTU	NA	13.52	3.03
LBS SO2/MMBTU	NA	5.51	4.14
LBS PYRITIC SO2/MBTU	NA	1.83	0.72
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		18.65	
PARTICLE D50 - uM		8.72	
MOISTURE			49.00%

B. PROCESS REFUSE

% ASH	87.98%
% SULFUR	5.88%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	85.88%
% TOTAL WT YIELD	87.79%
INCLUDING ASPHALT	
% ENERGY RECOVERY	99.42%
% ASH REDUCTION	77.62%
% SO2 REDUCTION	24.89%
% PYRITIC SO2 REDUCTION	60.62%
ASH SEPARATION FACTOR	1760
PYRITE SEPARATION FACTOR	1010

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	480 lbs
GROSS PRODUCT WT. RECOVERED	825 lbs
NET PRODUCT WT. RECOVERED (dry basis)	421 lbs
PRODUCT BINDER CONC.	2.18%
TOTAL BL. CONC. % OF FEED COAL	40.49%
STEAM / TON PRODUCT	4740.22 lbs
HIGH SHEAR WORK/MTON PRODUCT	37.25 kWhr
LOW SHEAR WORK/MTON PRODUCT	17.72 kWhr

RUN#: 34901
NUMBER: 1

DATE: 15-Dec-89

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 12/13

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH (EXP)	NA	16.12%	3.99%
% MINERAL MATTER (PARR EQ)		19.21%	5.84%
% ASH (ASPHALT FREE BASIS)			4.07%
% SULFUR	NA	3.28%	2.79%
% PYRITIC SULFUR	NA	1.13%	0.43%
BTU/LB - ASTM	NA	11732	13731
BTU/LB CORRELATED	NA	11912	13901
BTU/LB " LESS ASPHALT			13827
LBS ASH/MMBTU	NA	16.13	4.20
LBS SO2/MMBTU	NA	5.51	4.01
LBS PYRITIC SO2/MMBTU	NA	1.90	0.62
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		18.88	
PARTICLE D50 - μ M		7.22	
MOISTURE			33.85%

B. PROCESS REFUSE

% ASH (EXP)	87.31%
% MINERAL MATTER (PARR EQ)	97.78%
% SULFUR	6.33%

C. PROCESS PERFORMANCE

% YIELD FROM FEED	85.56%
% TOTAL WT YIELD INCLUDING ASPHALT	87.19%
% ENERGY RECOVERY	99.32%
% ASH REDUCTION	73.94%
% SO2 REDUCTION	27.11%
% PYRITIC SO2 REDUCTION	67.39%
ASH SEPARATION FACTOR	2058
PYRITE SEPARATION FACTOR	1260

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	591 lbs
GROSS PRODUCT WT. RECOVERED	720 lbs
NET PRODUCT WT. RECOVERED (dry basis)	476 lbs
PRODUCT BINDER CONC.	1.87%
TOTAL BL. CONC. % OF FEED COAL	41.43%
STEAM / TON PRODUCT	2638.28 lbs
HIGH SHEAR WORK/MTON PRODUCT	38.00 kWhr

RUN#: 35301
NUMBER: 1

DATE: 19-Dec-89

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 35001

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	18.43%	16.57%	3.89%
% ASH (ASPHALT FREE BASIS)			3.99%
% SULFUR	4.31%	3.08%	2.74%
% PYRITIC SULFUR	1.97%	0.78%	0.35%
BTU/LB - ASTM	11283	11602	13897
BTU/LB CORRELATED	11544	11840	13952
BTU/LB " LESS ASPHALT			13839
LBS ASH/MMBTU	15.96	13.99	2.79
LBS SO2/MMBTU	7.47	5.20	3.93
LBS PYRITIC SO2/MBTU	3.41	1.32	0.50
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		16.28	
PARTICLE D50 - uM		6.23	
MOISTURE			30.44%

B. PROCESS REFUSE

% ASH	36.20%	84.76%
% SULFUR	10.93%	5.34%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	90.52%	84.45%	76.44%
% TOTAL WT YIELD INCLUDING ASPHALT		87.05%	78.80%
% ENERGY RECOVERY	92.84%	98.71%	91.64%
% ASH REDUCTION	12.34%	80.08%	82.54%
% SO2 REDUCTION	30.32%	24.50%	47.40%
% PYRITIC SO2 REDUCTION	61.39%	61.92%	85.30%
ASH SEPARATION FACTOR	198	1795	
PYRITE SEPARATION FACTOR	1269	1288	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	555 lbs
GROSS PRODUCT WT. RECOVERED	741 lbs
NET PRODUCT WT. RECOVERED (dry basis)	515 lbs
PRODUCT BINDER CONC.	2.99%
TOTAL BL. CONC. % OF FEED COAL	41.66%
STEAM / TON PRODUCT	3270.13 lbs
HIGH SHEAR WORK/MTON PRODUCT	41.02 kWhr
LOW SHEAR WORK/MTON PRODUCT	22.81 kWhr

RUN#: 35401
NUMBER: 1

DATE: 20-Dec-89

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 35302

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	17.40%	15.16%	3.60%
% ASH (ASPHALT FREE BASIS)			3.71%
% SULFUR	4.03%	2.96%	2.66%
% PYRITIC SULFUR	1.81%	0.73%	0.25%
BTU/LB - ASTM	11480	11858	13878
BTU/LB CORRELATED	11708	12064	14003
BTU/LB " LESS ASPHALT			13883
LBS ASH/MMBTU	14.86	12.57	2.57
LBS SO2/MMBTU	6.88	4.91	3.80
LBS PYRITIC SO2/MBTU	3.09	1.21	0.36
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		18.17	
PARTICLE D50 - μ M		7.44	
MOISTURE			28.84%

B. PROCESS REFUSE

% ASH	40.11%	88.10%
% SULFUR	13.01%	5.10%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	91.02%	86.44%	78.68%
% TOTAL WT YIELD INCLUDING ASPHALT		89.19%	81.18%
% ENERGY RECOVERY	93.79%	99.47%	93.29%
% ASH REDUCTION	15.44%	79.54%	82.70%
% SO2 REDUCTION	28.72%	22.58%	44.81%
% PYRITIC SO2 REDUCTION	60.86%	70.49%	88.45%
ASH SEPARATION FACTOR	241	2051	
PYRITE SEPARATION FACTOR	1622	1763	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	538 lbs
GROSS PRODUCT WT. RECOVERED	538 lbs
NET PRODUCT WT. RECOVERED (dry basis)	383 lbs
PRODUCT BINDER CONC.	3.08%
TOTAL BL. CONC. % OF FEED COAL	43.22%
STEAM / TON PRODUCT	2426.96 lbs
HIGH SHEAR WORK/MTON PRODUCT	41.49 kWhr
LOW SHEAR WORK/MTON PRODUCT	22.64 kWhr

RUN#: 36801
NUMBER: 1

DATE: 03-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 35302

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	17.40%	15.16%	3.54%
% ASH (ASPHALT FREE BASIS)			3.66%
% SULFUR	4.03%	2.96%	2.57%
% PYRITIC SULFUR	1.81%	0.73%	0.21%
BTU/LB - ASTM	11480	11858	NA
BTU/LB CORRELATED	11708	12064	14018
BTU/LB " LESS ASPHALT			13892
LBS ASH/MMBTU	14.86	12.57	2.53
LBS SO2/MMBTU	6.88	4.91	3.67
LBS PYRITIC SO2/MBTU	3.09	1.21	0.30
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		18.17	
PARTICLE D50 - um		7.44	
MOISTURE			28.84%

B. PROCESS REFUSE

% ASH	40.11%	86.39%
% SULFUR	13.01%	4.89%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	91.02%	86.10%	78.37%
% TOTAL WT YIELD INCLUDING ASPHALT		89.01%	81.02%
% ENERGY RECOVERY	93.79%	99.14%	92.98%
% ASH REDUCTION	15.44%	79.90%	83.01%
% SO2 REDUCTION	28.72%	25.28%	46.74%
% PYRITIC SO2 REDUCTION	60.86%	75.24%	90.31%
ASH SEPARATION FACTOR	241	2033	
PYRITE SEPARATION FACTOR	1622	2005	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	525 lbs
GROSS PRODUCT WT. RECOVERED	924 lbs
NET PRODUCT WT. RECOVERED (dry basis)	658 lbs
PRODUCT BINDER CONC.	3.27%
TOTAL BL. CONC. % OF FEED COAL	45.09%
STEAM / TON PRODUCT	3502.22 lbs
HIGH SHEAR WORK/MTON PRODUCT	39.92 kWhr
LOW SHEAR WORK/MTON PRODUCT	14.66 kWhr

RUN#: 36803
NUMBER: 3

DATE: 03-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 36802

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	18.82%	16.85%	3.87%
% ASH (ASPHALT FREE BASIS)			3.96%
% SULFUR	4.34%	3.56%	2.84%
% PYRITIC SULFUR	2.11%	1.15%	0.46%
BTU/LB - ASTM	11283	11536	13739
BTU/LB CORRELATED	11483	11796	13936
BTU/LB " LESS ASPHALT			13843
LBS ASH/MMBTU	16.39	14.29	2.78
LBS SO2/MMBTU	7.56	6.04	4.08
LBS PYRITIC SO2/MBTU	3.68	1.95	0.66
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		20.3	
PARTICLE D50 - um		7.71	
MOISTURE			29.57%

B. PROCESS REFUSE

% ASH	36.99%	88.22%
% SULFUR	11.25%	5.95%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	90.22%	84.71%	76.42%
% TOTAL WT YIELD INCLUDING ASPHALT		86.75%	78.26%
% ENERGY RECOVERY	92.68%	99.41%	92.13%
% ASH REDUCTION	12.84%	80.56%	83.06%
% SO2 REDUCTION	20.15%	32.48%	46.08%
% PYRITIC SO2 REDUCTION	46.94%	66.14%	82.04%
ASH SEPARATION FACTOR	198	1886	
PYRITE SEPARATION FACTOR	883	1096	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	732 lbs
GROSS PRODUCT WT. RECOVERED	682 lbs
NET PRODUCT WT. RECOVERED (dry basis)	480 lbs
PRODUCT BINDER CONC.	2.35%
TOTAL BL. CONC. % OF FEED COAL	32.74%
STEAM / TON PRODUCT	1843.94 lbs
HIGH SHEAR WORK/MTON PRODUCT	29.30 kWhr
LOW SHEAR WORK/MTON PRODUCT	11.52 kWhr

RUN#: 36804
NUMBER: 4

DATE: 03-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 36802

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	18.82%	16.85%	3.93%
% ASH (ASPHALT FREE BASIS)			4.02%
% SULFUR	4.34%	3.56%	2.89%
% PYRITIC SULFUR	2.11%	1.15%	0.50%
BTU/LB - ASTM	11283	11536	13783
BTU/LB CORRELATED	11483	11796	13922
BTU/LB " LESS ASPHALT			13834
LBS ASH/MMBTU	16.39	14.29	2.82
LBS SO2/MMBTU	7.56	6.04	4.15
LBS PYRITIC SO2/MBTU	3.68	1.95	0.72
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		20.3	
PARTICLE D50 - μ M		7.71	
MOISTURE			29.72%

B. PROCESS REFUSE

% ASH	36.99%	87.02%
% SULFUR	11.25%	5.31%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	90.22%	84.54%	76.27%
% TOTAL WT YIELD INCLUDING ASPHALT		86.48%	78.02%
% ENERGY RECOVERY	92.68%	99.16%	91.89%
% ASH REDUCTION	12.84%	80.24%	82.78%
% SO2 REDUCTION	20.15%	31.22%	45.08%
% PYRITIC SO2 REDUCTION	46.94%	63.16%	80.46%
ASH SEPARATION FACTOR	198	1830	
PYRITE SEPARATION FACTOR	883	898	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	779 lbs
GROSS PRODUCT WT. RECOVERED	752 lbs
NET PRODUCT WT. RECOVERED (dry basis)	528 lbs
PRODUCT BINDER CONC.	2.24%
TOTAL BL. CONC. % OF FEED COAL	32.28%
STEAM / TON PRODUCT	3121.35 lbs
HIGH SHEAR WORK/MTON PRODUCT	29.39 kWhr
LOW SHEAR WORK/MTON PRODUCT	10.83 kWhr

RUN#: 36901
NUMBER: 1

DATE: 04-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 36802

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	18.82%	16.85%	3.93%
% ASH (ASPHALT FREE BASIS)			3.99%
% SULFUR	4.34%	3.56%	2.87%
% PYRITIC SULFUR	2.11%	1.15%	NA
BTU/LB - ASTM	11283	11536	NA
BTU/LB CORRELATED	11483	11796	13902
BTU/LB " LESS ASPHALT			13838
LBS ASH/MMBTU	16.39	14.29	2.83
LBS SO2/MMBTU	7.56	6.04	4.13
LBS PYRITIC SO2/MBTU	3.68	1.95	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		20.3	
PARTICLE D50 - um		7.71	
MOISTURE			36.54%

B. PROCESS REFUSE

% ASH	36.99%	89.31%
% SULFUR	11.25%	5.45%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	90.22%	84.93%	76.62%
% TOTAL WT YIELD INCLUDING ASPHALT		86.34%	77.90%
% ENERGY RECOVERY	92.68%	99.64%	92.35%
% ASH REDUCTION	12.84%	80.21%	82.75%
% SO2 REDUCTION	20.15%	31.60%	45.38%
% PYRITIC SO2 REDUCTION	46.94%	NA	NA
ASH SEPARATION FACTOR	198	1899	
PYRITE SEPARATION FACTOR	883	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	729 lbs
GROSS PRODUCT WT. RECOVERED	1028 lbs
NET PRODUCT WT. RECOVERED (dry basis)	652 lbs
PRODUCT BINDER CONC.	1.63%
TOTAL BL. CONC. % OF FEED COAL	30.85%
STEAM / TON PRODUCT	3874.47 lbs
HIGH SHEAR WORK/MTON PRODUCT	29.44 kWhr
LOW SHEAR WORK/MTON PRODUCT	5.03 kWhr

RUN#: 36902
NUMBER: 2

DATE: 04-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 36802

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	18.82%	16.85%	4.10%
% ASH (ASPHALT FREE BASIS)			4.17%
% SULFUR	4.34%	3.56%	2.80%
% PYRITIC SULFUR	2.11%	1.15%	0.36%
BTU/LB - ASTM	11283	11536	13870
BTU/LB CORRELATED	11483	11796	13879
BTU/LB " LESS ASPHALT			13810
LBS ASH/MMBTU	16.39	14.29	2.95
LBS SO2/MMBTU	7.56	6.04	4.03
LBS PYRITIC SO2/MBTU	3.68	1.95	0.52
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		20.3	
PARTICLE D50 - μ M		7.71	
MOISTURE			39.76%

B. PROCESS REFUSE

% ASH	36.99%	88.21%
% SULFUR	11.25%	6.02%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	90.22%	84.91%	76.61%
% TOTAL WT YIELD INCLUDING ASPHALT		86.43%	77.97%
% ENERGY RECOVERY	92.68%	99.42%	92.14%
% ASH REDUCTION	12.84%	79.32%	81.98%
% SO2 REDUCTION	20.15%	33.16%	46.62%
% PYRITIC SO2 REDUCTION	46.94%	73.40%	85.88%
ASH SEPARATION FACTOR	198	1795	
PYRITE SEPARATION FACTOR	883	1420	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	665 lbs
GROSS PRODUCT WT. RECOVERED	745 lbs
NET PRODUCT WT. RECOVERED (dry basis)	449 lbs
PRODUCT BINDER CONC.	1.75%
TOTAL BL. CONC. % OF FEED COAL	31.29%
STEAM / TON PRODUCT	7021.92 lbs
HIGH SHEAR WORK/MTON PRODUCT	29.41 kWhr
LOW SHEAR WORK/MTON PRODUCT	11.03 kWhr

RUN#: 36904
NUMBER: 4

DATE: 04-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 36802

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	18.82%	16.85%	5.60%
% ASH (ASPHALT FREE BASIS)			5.74%
% SULFUR	4.34%	3.56%	2.80%
% PYRITIC SULFUR	2.11%	1.15%	0.39%
BTU/LB - ASTM	11283	11536	13881
BTU/LB CORRELATED	11483	11796	13662
BTU/LB " LESS ASPHALT			13562
LBS ASH/MMBTU	16.39	14.29	4.10
LBS SO2/MMBTU	7.56	6.04	4.10
LBS PYRITIC SO2/MBTU	3.68	1.95	0.57
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		20.3	
PARTICLE D50 - uM		7.71	
MOISTURE			36.90%

B. PROCESS REFUSE

% ASH	36.99%	88.52%
% SULFUR	11.25%	5.99%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	90.22%	86.57%	78.11%
% TOTAL WT YIELD INCLUDING ASPHALT		88.68%	80.01%
% ENERGY RECOVERY	92.68%	99.54%	92.25%
% ASH REDUCTION	12.84%	71.31%	74.99%
% SO2 REDUCTION	20.15%	32.09%	45.77%
% PYRITIC SO2 REDUCTION	46.94%	70.72%	84.46%
ASH SEPARATION FACTOR	198	1336	
PYRITE SEPARATION FACTOR	883	1330	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	582 lbs
GROSS PRODUCT WT. RECOVERED	473 lbs
NET PRODUCT WT. RECOVERED (dry basis)	298 lbs
PRODUCT BINDER CONC.	2.38%
TOTAL BL. CONC. % OF FEED COAL	33.85%
STEAM / TON PRODUCT	NA lbs
HIGH SHEAR WORK/MTON PRODUCT	28.66 kWhr
LOW SHEAR WORK/MTON PRODUCT	11.34 kWhr

RUN#: 37001
NUMBER: 1

DATE: 05-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 36903

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	16.16%	14.35%	4.22%
% ASH (ASPHALT FREE BASIS)			4.36%
% SULFUR	3.84%	3.01%	2.99%
% PYRITIC SULFUR	1.61%	0.73%	NA
BTU/LB - ASTM	11629	12013	NA
BTU/LB CORRELATED	11905	12193	13911
BTU/LB " LESS ASPHALT			13780
LBS ASH/MMBTU	13.57	11.77	3.03
LBS SO2/MMBTU	6.45	4.94	4.30
LBS PYRITIC SO2/MBTU	2.70	1.20	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		NA	
PARTICLE D50 - uM		NA	
MOISTURE			35.54%

B. PROCESS REFUSE

% ASH	44.14%	89.10%
% SULFUR	14.52%	3.53%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	93.92%	88.22%	82.86%
% TOTAL WT YIELD INCLUDING ASPHALT		91.23%	85.68%
% ENERGY RECOVERY	96.19%	99.70%	95.90%
% ASH REDUCTION	13.30%	74.23%	77.65%
% SO2 REDUCTION	23.46%	12.94%	33.36%
% PYRITIC SO2 REDUCTION	55.73%	NA	NA
ASH SEPARATION FACTOR	289	1802	
PYRITE SEPARATION FACTOR	1868	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	540 lbs
GROSS PRODUCT WT. RECOVERED	888 lbs
NET PRODUCT WT. RECOVERED (dry basis)	572 lbs
PRODUCT BINDER CONC.	3.30%
TOTAL BL. CONC. % OF FEED COAL	46.88%
STEAM / TON PRODUCT	5554.47 lbs
HIGH SHEAR WORK/MTON PRODUCT	39.71 kWhr
LOW SHEAR WORK/MTON PRODUCT	6.79 kWhr

RUN#: 37002
NUMBER: 2

DATE: 05-Jan-90

page1

1. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 36903

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	16.16%	14.35%	4.13%
% ASH (ASPHALT FREE BASIS)			4.27%
% SULFUR	3.84%	3.01%	3.03%
% PYRITIC SULFUR	1.61%	0.73%	NA
BTU/LB - ASTM	11629	12013	NA
BTU/LB CORRELATED	11905	12193	13926
BTU/LB " LESS ASPHALT			13794
LBS ASH/MMBTU	13.57	11.77	2.97
LBS SO2/MMBTU	6.45	4.94	4.35
LBS PYRITIC SO2/MBTU	2.70	1.20	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		NA	
PARTICLE D50 - μ M		NA	
MOISTURE			40.14%

B. PROCESS REFUSE

% ASH	44.14%	88.23%
% SULFUR	14.52%	4.23%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	93.92%	88.00%	82.65%
% TOTAL WT YIELD INCLUDING ASPHALT		91.01%	85.48%
% ENERGY RECOVERY	96.19%	99.56%	95.77%
% ASH REDUCTION	13.30%	74.80%	78.15%
% SO2 REDUCTION	23.46%	11.86%	32.54%
% PYRITIC SO2 REDUCTION	55.73%	NA	NA
ASH SEPARATION FACTOR	289	1818	
PYRITE SEPARATION FACTOR	1868	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	539 lbs
GROSS PRODUCT WT. RECOVERED	921 lbs
NET PRODUCT WT. RECOVERED (dry basis)	551 lbs
PRODUCT BINDER CONC.	3.31%
TOTAL BL. CONC. % OF FEED COAL	46.88%
STEAM / TON PRODUCT	2276.64 lbs
HIGH SHEAR WORK/MTON PRODUCT	39.81 kWhr
LOW SHEAR WORK/MTON PRODUCT	13.61 kWhr

RUN#: 37003
NUMBER: 3

DATE: 05 Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 36903

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	16.16%	14.35%	3.74%
% ASH (ASPHALT FREE BASIS)			3.87%
% SULFUR	3.84%	3.01%	2.74%
% PYRITIC SULFUR	1.61%	0.73%	0.49%
BTU/LB - ASTM	11629	12013	14217
BTU/LB CORRELATED	11905	12193	13988
BTU/LB " LESS ASPHALT			13859
LBS ASH/MMBTU	13.57	11.77	2.67
LBS SO2/MMBTU	6.45	4.94	3.92
LBS PYRITIC SO2/MBTU	2.70	1.20	0.70
SIZE CONSIST	1/4" x 0		FELLETS
PARTICLE D90 - uM		NA	
PARTICLE D50 - uM		NA	
MOISTURE			34.17%

B. PROCESS REFUSE

% ASH	44.14%	89.13%
% SULFUR	14.52%	5.16%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	93.92%	87.71%	82.38%
% TOTAL WT YIELD INCLUDING ASPHALT		90.72%	85.21%
% ENERGY RECOVERY	96.19%	99.69%	95.89%
% ASH REDUCTION	13.30%	77.28%	80.30%
% SO2 REDUCTION	23.46%	20.65%	39.27%
% PYRITIC SO2 REDUCTION	55.73%	41.49%	74.10%
ASH SEPARATION FACTOR	289	2022	
PYRITE SEPARATION FACTOR	1868	924	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	537 lbs
GROSS PRODUCT WT. RECOVERED	850 lbs
NET PRODUCT WT. RECOVERED (dry basis)	560 lbs
PRODUCT BINDER CONC.	3.32%
TOTAL BL. CONC. % OF FEED COAL	46.88%
STEAM / TON PRODUCT	2606.62 lbs
HIGH SHEAR WORK/MTON PRODUCT	39.94 kWhr
LOW SHEAR WORK/MTON PRODUCT	13.65 kWhr

RUN#: 37301
NUMBER: 1

DATE: 08-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 01/05

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.73%	4.05%
% ASH (ASPHALT FREE BASIS)			4.17%
% SULFUR	NA	NA	3.05%
% PYRITIC SULFUR	NA	NA	0.65%
BTU/LB - ASTM	NA	NA	13923
BTU/LB CORRELATED	NA	11974	13923
BTU/LB " LESS ASPHALT			13811
LBS ASH/MMBTU	NA	13.14	2.91
LBS SO2/MMBTU	NA	NA	4.38
LBS PYRITIC SO2/MBTU	NA	NA	0.93
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			24.99%

B. PROCESS REFUSE

% ASH	NA	87.67%
% SULFUR	NA	3.78%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.15%	NA
% TOTAL WT YIELD		88.66%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	99.37%	NA
% ASH REDUCTION	NA	77.86%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1813	
PYRITE SEPARATION FACTOR	NA	501	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	630 lbs
GROSS PRODUCT WT. RECOVERED	864 lbs
NET PRODUCT WT. RECOVERED (dry basis)	648 lbs
PRODUCT BINDER CONC.	2.83%
TOTAL BL. CONC. % OF FEED COAL	39.69%
STEAM / TON PRODUCT	4284.10 lbs
HIGH SHEAR WORK/MTON PRODUCT	34.03 kWhr
LOW SHEAR WORK/MTON PRODUCT	11.64 kWhr

RUN#: 37302
NUMBER: 2

DATE: 08-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 01/05

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.73%	3.91%
% ASH (ASPHALT FREE BASIS)			4.09%
% SULFUR	NA	NA	2.98%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	11974	14001
BTU/LB " LESS ASPHALT			13823
LBS ASH/MMBTU	NA	13.14	2.79
LBS SO2/MMBTU	NA	NA	4.26
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			28.61%

B. PROCESS REFUSE

% ASH	NA	87.96%
% SULFUR	NA	4.46%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.13%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		90.20%	NA
% ENERGY RECOVERY	NA	99.43%	NA
% ASH REDUCTION	NA	78.74%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1851	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	769 lbs
GROSS PRODUCT WT. RECOVERED	1096 lbs
NET PRODUCT WT. RECOVERED (dry basis)	782 lbs
PRODUCT BINDER CONC.	4.52%
TOTAL BL. CONC. % OF FEED COAL	46.33%
STEAM / TON PRODUCT	1819.53 lbs
HIGH SHEAR WORK/MTON PRODUCT	33.45 kWhr
LOW SHEAR WORK/MTON PRODUCT	19.06 kWhr

RUN#: 37303
NUMBER: 3

DATE: 08-Jan-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND PRODUCT GRIND TEST# 01/05

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.73%	3.84%
% ASH (ASPHALT FREE BASIS)			3.95%
% SULFUR	NA	NA	2.88%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	11974	13956
BTU/LB " LESS ASPHALT			13845
LBS ASH/MMBTU	NA	13.14	2.75
LBS SO2/MMBTU	NA	NA	4.13
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		NA	
PARTICLE D50 - uM		NA	
MOISTURE			28.99%

B. PROCESS REFUSE

% ASH	NA	88.09%
% SULFUR	NA	5.38%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.00%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		88.51%	NA
% ENERGY RECOVERY	NA	99.45%	NA
% ASH REDUCTION	NA	79.06%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1918	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	629 lbs
GROSS PRODUCT WT. RECOVERED	755 lbs
NET PRODUCT WT. RECOVERED (dry basis)	536 lbs
PRODUCT BINDER CONC.	2.83%
TOTAL BL. CONC. % OF FEED COAL	39.69%
STEAM / TON PRODUCT	3337.80 lbs
HIGH SHEAR WORK/MTON PRODUCT	34.09 kWhr
LOW SHEAR WORK/MTON PRODUCT	19.81 kWhr

RUN#: 37401
NUMBER: 1

DATE: 09-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
CONSECUTIVE GRIND PRODUCT GRIND TEST# 37401

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.70%	4.91%
% ASH (ASPHALT FREE BASIS)			5.06%
% SULFUR	NA	3.94%	3.39%
% PYRITIC SULFUR	NA	1.56%	0.93%
BTU/LB - ASTM	NA	12057	13899
BTU/LB CORRELATED	NA	11978	13794
BTU/LB " LESS ASPHALT			13668
LBS ASH/MMBTU	NA	13.11	3.56
LBS SO2/MMBTU	NA	6.58	4.92
LBS PYRITIC SO2/MBTU	NA	2.60	1.35
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		25.66	
PARTICLE D50 - μ M		9.43	
MOISTURE			21.68%

B. PROCESS REFUSE

% ASH	NA	87.13%
% SULFUR	NA	6.41%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	87.04%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		89.78%	NA
% ENERGY RECOVERY	NA	99.32%	NA
% ASH REDUCTION	NA	72.84%	NA
% SO2 REDUCTION	NA	25.28%	NA
% PYRITIC SO2 REDUCTION	NA	48.23%	NA
ASH SEPARATION FACTOR	NA	1498	
PYRITE SEPARATION FACTOR	NA	600	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	681 lbs
GROSS PRODUCT WT. RECOVERED	787 lbs
NET PRODUCT WT. RECOVERED (dry basis)	616 lbs
PRODUCT BINDER CONC.	3.05%
TOTAL BL. CONC. % OF FEED COAL	37.48%
STEAM / TON PRODUCT	3049.19 lbs
HIGH SHEAR WORK/MTON PRODUCT	31.50 kWhr
LOW SHEAR WORK/MTON PRODUCT	25.30 kWhr

RUN#: 37501
NUMBER: 1

DATE: 10-Jan-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - modified GRIND TEST# 37403

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	13.00%	12.81%	4.21%
% ASH (ASPHALT FREE BASIS)			4.34%
% SULFUR	4.05%	3.29%	3.16%
% PYRITIC SULFUR	1.71%	1.04%	NA
BTU/LB - ASTM	12559	12553	NA
BTU/LB CORRELATED	12407	12437	13903
BTU/LB " LESS ASPHALT			13784
LBS ASH/MMBTU	10.48	10.30	3.03
LBS SO2/MMBTU	6.53	5.29	4.55
LBS PYRITIC SO2/MBTU	2.76	1.67	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		19.02	
PARTICLE D50 - μ M		7.23	
MOISTURE			31.77%

B. PROCESS REFUSE

% ASH	51.53%	89.21%
% SULFUR	25.24%	5.17%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	99.51%	90.02%	89.58%
% TOTAL WT YIELD INCLUDING ASPHALT		92.79%	92.33%
% ENERGY RECOVERY	99.75%	99.76%	99.51%
% ASH REDUCTION	1.70%	70.60%	71.10%
% SO2 REDUCTION	18.96%	14.07%	30.37%
% PYRITIC SO2 REDUCTION	39.33%	NA	NA
ASH SEPARATION FACTOR	400	1851	
PYRITE SEPARATION FACTOR	2415	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	569 lbs
GROSS PRODUCT WT. RECOVERED	915 lbs
NET PRODUCT WT. RECOVERED (dry basis)	624 lbs
PRODUCT BINDER CONC.	2.98%
TOTAL BL. CONC. % OF FEED COAL	39.80%
STEAM / TON PRODUCT	2516.98 lbs
HIGH SHEAR WORK/MTON PRODUCT	37.67 kWhr
LOW SHEAR WORK/MTON PRODUCT	16.10 kWhr

RUN#: 37502
NUMBER: 2

DATE: 10-Jan-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - modified GRIND TEST# 37403

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	13.00%	12.81%	3.84%
% ASH (ASPHALT FREE BASIS)			3.96%
% SULFUR	4.05%	3.29%	3.10%
% PYRITIC SULFUR	1.71%	1.04%	NA
BTU/LB - ASTM	12559	12553	NA
BTU/LB CORRELATED	12407	12437	13962
BTU/LB " LESS ASPHALT			13844
LBS ASH/MMBTU	10.48	10.30	2.75
LBS SO2/MMBTU	6.53	5.29	4.44
LBS PYRITIC SO2/MBTU	2.76	1.67	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		19.02	
PARTICLE D50 - μ M		7.23	
MOISTURE			36.88%

B. PROCESS REFUSE

% ASH	51.53%	88.29%
% SULFUR	25.24%	4.99%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	99.51%	89.50%	89.07%
% TOTAL WT YIELD INCLUDING ASPHALT		92.27%	91.82%
% ENERGY RECOVERY	99.75%	99.63%	99.38%
% ASH REDUCTION	1.70%	73.30%	73.75%
% SO2 REDUCTION	18.96%	16.06%	31.98%
% PYRITIC SO2 REDUCTION	39.33%	NA	NA
ASH SEPARATION FACTOR	400	1997	
PYRITE SEPARATION FACTOR	2415	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	566 lbs
GROSS PRODUCT WT. RECOVERED	566 lbs
NET PRODUCT WT. RECOVERED (dry basis)	357 lbs
PRODUCT BINDER CONC.	3.00%
TOTAL BL. CONC. % OF FEED COAL	39.80%
STEAM / TON PRODUCT	2554.57 lbs
HIGH SHEAR WORK/MTON PRODUCT	37.88 kWhr
LOW SHEAR WORK/MTON PRODUCT	17.48 kWhr

RUN#: 37503
NUMBER: 3

DATE: 10-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - modified GRIND TEST# 37403

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	13.00%	12.81%	3.85%
% ASH (ASPHALT FREE BASIS)			3.97%
% SULFUR	4.05%	3.29%	3.03%
% PYRITIC SULFUR	1.71%	1.04%	0.87%
BTU/LB - ASTM	12559	12553	14143
BTU/LB CORRELATED	12407	12437	13962
BTU/LB " LESS ASPHALT			13842
LBS ASH/MMBTU	10.48	10.30	2.76
LBS SO2/MMBTU	6.53	5.29	4.34
LBS PYRITIC SO2/MBTU	2.76	1.67	1.25
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		19.02	
PARTICLE D50 - um		7.23	
MOISTURE			24.29%

B. PROCESS REFUSE

% ASH	51.53%	86.17%
% SULFUR	25.24%	8.04%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	99.51%	89.25%	88.81%
% TOTAL WT YIELD INCLUDING ASPHALT		92.04%	91.59%
% ENERGY RECOVERY	99.75%	99.33%	99.08%
% ASH REDUCTION	1.70%	73.23%	73.68%
% SO2 REDUCTION	18.96%	17.96%	33.51%
% PYRITIC SO2 REDUCTION	39.33%	25.48%	54.79%
ASH SEPARATION FACTOR	400	1937	
PYRITE SEPARATION FACTOR	2415	825	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	565 lbs
GROSS PRODUCT WT. RECOVERED	817 lbs
NET PRODUCT WT. RECOVERED (dry basis)	619 lbs
PRODUCT BINDER CONC.	3.04%
TOTAL BL. CONC. % OF FEED COAL	46.93%
STEAM / TON PRODUCT	2655.35 lbs
HIGH SHEAR WORK/MTON PRODUCT	37.97 kWhr
LOW SHEAR WORK/MTON PRODUCT	19.47 kWhr

RUN#: 37504
NUMBER: 4

DATE: 10-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - modified GRIND TEST# 37403

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	13.00%	12.81%	3.90%
% ASH (ASPHALT FREE BASIS)			4.02%
% SULFUR	4.05%	3.29%	2.94%
% PYRITIC SULFUR	1.71%	1.04%	NA
BTU/LB - ASTM	12559	12553	NA
BTU/LB CORRELATED	12407	12437	13953
BTU/LB " LESS ASPHALT			13834
LBS ASH/MMBTU	10.48	10.30	2.80
LBS SO2/MMBTU	6.53	5.29	4.21
LBS PYRITIC SO2/MBTU	2.76	1.67	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		19.02	
PARTICLE D50 - μ M		7.23	
MOISTURE			31.67%

B. PROCESS REFUSE

% ASH	51.53%	89.44%
% SULFUR	25.24%	5.50%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	99.51%	89.71%	89.27%
% TOTAL WT YIELD INCLUDING ASPHALT		92.51%	92.05%
% ENERGY RECOVERY	99.75%	99.79%	99.54%
% ASH REDUCTION	1.70%	72.86%	73.32%
% SO2 REDUCTION	18.96%	20.34%	35.45%
% PYRITIC SO2 REDUCTION	39.33%	NA	NA
ASH SEPARATION FACTOR	400	1996	
PYRITE SEPARATION FACTOR	2415	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	568 lbs
GROSS PRODUCT WT. RECOVERED	671 lbs
NET PRODUCT WT. RECOVERED (dry basis)	458 lbs
PRODUCT BINDER CONC.	3.02%
TOTAL BL. CONC. % OF FEED COAL	46.93%
STEAM / TON PRODUCT	NA lbs
HIGH SHEAR WORK/MTON PRODUCT	37.78 kWhr
LOW SHEAR WORK/MTON PRODUCT	18.73 kWhr

RUN#: 37601
NUMBER: 1

DATE: 11-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 01/10

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	4.45%
% ASH (ASPHALT FREE BASIS)			NA
% SULFUR	NA	NA	3.37%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	NA
BTU/LB " LESS ASPHALT			NA
LBS ASH/MMBTU	NA	12.65	NA
LBS SO2/MMBTU	NA	NA	NA
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			41.25%

B. PROCESS REFUSE

% ASH	NA	NA
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	NA	NA
% TOTAL WT YIELD INCLUDING ASPHALT		NA	NA
% ENERGY RECOVERY	NA	NA	NA
% ASH REDUCTION	NA	NA	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	NA	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	NA lbs
GROSS PRODUCT WT. RECOVERED	1043 lbs
NET PRODUCT WT. RECOVERED (dry basis)	613 lbs
PRODUCT BINDER CONC.	NA
TOTAL BL. CONC. % OF FEED COAL	39.35%
STEAM / TON PRODUCT	NA lbs
HIGH SHEAR WORK/MTON PRODUCT	NA kwhr
LOW SHEAR WORK/MTON PRODUCT	NA kwhr

RUN#: 37602
NUMBER: 2

DATE: 11-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 01/10

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	4.02%
% ASH (ASPHALT FREE BASIS)			NA
% SULFUR	NA	NA	3.17%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	NA
BTU/LB " LESS ASPHALT			NA
LBS ASH/MMBTU	NA	12.65	NA
LBS SO2/MMBTU	NA	NA	NA
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			22.18%

B. PROCESS REFUSE

% ASH	NA	NA
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	NA	NA
% TOTAL WT YIELD		NA	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	NA	NA
% ASH REDUCTION	NA	NA	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	NA	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	NA lbs
GROSS PRODUCT WT. RECOVERED	751 lbs
NET PRODUCT WT. RECOVERED (dry basis)	585 lbs
PRODUCT BINDER CONC.	NA
TOTAL BL. CONC. % OF FEED COAL	39.35%
STEAM / TON PRODUCT	NA lbs
HIGH SHEAR WORK/MTON PRODUCT	NA kWhr
LOW SHEAR WORK/MTON PRODUCT	NA kWhr

RUN#: 37603
NUMBER: 3

DATE: 11-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# NA

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	4.13%
% ASH (ASPHALT FREE BASIS)			NA
% SULFUR	NA	NA	3.12%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	NA
BTU/LB " LESS ASPHALT			NA
LBS ASH/MMBTU	NA	12.65	NA
LBS SO2/MMBTU	NA	NA	NA
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		NA	
PARTICLE D50 - μ M		NA	
MOISTURE			36.70%

B. PROCESS REFUSE

% ASH	NA	NA
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	NA	NA
% TOTAL WT YIELD INCLUDING ASPHALT		NA	NA
% ENERGY RECOVERY	NA	NA	NA
% ASH REDUCTION	NA	NA	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	NA	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	NA lbs
GROSS PRODUCT WT. RECOVERED	838 lbs
NET PRODUCT WT. RECOVERED (dry basis)	530 lbs
PRODUCT BINDER CONC.	NA
TOTAL BL. CONC. % OF FEED COAL	39.35%
STEAM / TON PRODUCT	NA lbs
HIGH SHEAR WORK/MTON PRODUCT	NA kWhr
LOW SHEAR WORK/MTON PRODUCT	NA kWhr

RUN#: 37701
NUMBER: 1

DATE: 12-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL GRIND TEST# 01/11

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	3.68%
% ASH (ASPHALT FREE BASIS)			3.78%
% SULFUR	NA	NA	2.92%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	13978
BTU/LB " LESS ASPHALT			13872
LBS ASH/MMBTU	NA	12.65	2.63
LBS SO2/MMBTU	NA	NA	4.18
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		NA	
PARTICLE D50 - μ M		NA	
MOISTURE			32.52%

B. PROCESS REFUSE

% ASH **estimate to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.40%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		88.80%	NA
% ENERGY RECOVERY	NA	99.45%	NA
% ASH REDUCTION	NA	79.18%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	2011	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	669 lbs
GROSS PRODUCT WT. RECOVERED	842 lbs
NET PRODUCT WT. RECOVERED (dry basis)	568 lbs
PRODUCT BINDER CONC.	2.71%
TOTAL BL. CONC. % OF FEED COAL	39.87%
STEAM / TON PRODUCT	5184.68 lbs
HIGH SHEAR WORK/MTON PRODUCT	32.08 kWhr
LOW SHEAR WORK/MTON PRODUCT	17.00 kWhr

RUN#: 37702
NUMBER: 2

DATE: 12-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 01/11

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	3.54%
% ASH (ASPHALT FREE BASIS)			3.64%
% SULFUR	NA	NA	2.87%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	14002
BTU/LB " LESS ASPHALT			13895
LBS ASH/MMBTU	NA	12.65	2.53
LBS SO2/MMBTU	NA	NA	4.10
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		NA	
PARTICLE D50 - uM		NA	
MOISTURE			27.19%

B. PROCESS REFUSE

% ASH **estimate to allow yield calcs**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.25%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		88.70%	NA
% ENERGY RECOVERY	NA	99.44%	NA
% ASH REDUCTION	NA	80.01%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	2086	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	653 lbs
GROSS PRODUCT WT. RECOVERED	881 lbs
NET PRODUCT WT. RECOVERED (dry basis)	642 lbs
PRODUCT BINDER CONC.	2.76%
TOTAL BL. CONC. % OF FEED COAL	40.05%
STEAM / TON PRODUCT	NA lbs
HIGH SHEAR WORK/MTON PRODUCT	32.12 kWhr
LOW SHEAR WORK/MTON PRODUCT	48.29 kWhr

RUN#: 38001
NUMBER: 1

DATE: 15-Jan-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 01/12

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	3.82%
% ASH (ASPHALT FREE BASIS)			3.94%
% SULFUR	NA	NA	2.87%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	13971
BTU/LB " LESS ASPHALT			13846
LBS ASH/MMBTU	NA	12.65	2.73
LBS SO2/MMBTU	NA	NA	4.11
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		NA	
PARTICLE D50 - uM		NA	
MOISTURE			25.86%

B. PROCESS REFUSE

% ASH **estimated to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.56%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		89.41%	NA
% ENERGY RECOVERY	NA	99.46%	NA
% ASH REDUCTION	NA	78.38%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1931	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	830 lbs
GROSS PRODUCT WT. RECOVERED	1210 lbs
NET PRODUCT WT. RECOVERED (dry basis)	897 lbs
PRODUCT BINDER CONC.	3.19%
TOTAL BL. CONC. % OF FEED COAL	39.57%
STEAM / TON PRODUCT	2670.70 lbs
HIGH SHEAR WORK/MTON PRODUCT	34.46 kWhr
LOW SHEAR WORK/MTON PRODUCT	17.67 kWhr

RUN#: 38002
NUMBER: 2

DATE: 15-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL, GRIND TEST# 01/12

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	3.79%
% ASH (ASPHALT FREE BASIS)			3.94%
% SULFUR	NA	NA	2.86%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	14000
BTU/LB " LESS ASPHALT			13846
LBS ASH/MMBTU	NA	12.65	2.71
LBS SO2/MMBTU	NA	NA	4.09
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			34.54%

B. PROCESS REFUSE

% ASH **estimated to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.56%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		90.09%	NA
% ENERGY RECOVERY	NA	99.46%	NA
% ASH REDUCTION	NA	78.59%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1932	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	781 lbs
GROSS PRODUCT WT. RECOVERED	NA lbs
NET PRODUCT WT. RECOVERED (dry basis)	NA lbs
PRODUCT BINDER CONC.	3.92%
TOTAL BL. CONC. % OF FEED COAL	42.24%
STEAM / TON PRODUCT	1729.58 lbs
HIGH SHEAR WORK/MTON PRODUCT	34.20 kWhr
LOW SHEAR WORK/MTON PRODUCT	18.32 kWhr

RUN#: 38401
NUMBER: 1

DATE: 19-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND & SPIRAL GRIND TEST# 01/18

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	4.02%
% ASH (ASPHALT FREE BASIS)			4.13%
% SULFUR	NA	NA	2.69%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ABTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	13926
BTU/LB " LESS ASPHALT			13816
LBS ASH/MMBTU	NA	12.65	2.89
LBS SO2/MMBTU	NA	NA	3.86
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		NA	
PARTICLE D50 - uM		NA	
MOISTURE			32.68%

B. PROCESS REFUSE

% ASH **estimated to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.76%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		89.25%	NA
% ENERGY RECOVERY	NA	99.46%	NA
% ASH RECUTION	NA	77.17%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1847	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	937 lbs
GROSS PRODUCT WT. RECOVERED	1087 lbs
NET PRODUCT WT. RECOVERED (dry basis)	732 lbs
PRODUCT BINDER CONC.	2.79%
TOTAL BL. CONC. % OF FEED COAL	42.17%
STEAM / TON PRODUCT	2127.71 lbs
HIGH SHEAR WORK/MTON PRODUCT	20.35 kWhr
LOW SHEAR WORK/MTON PRODUCT	14.09 kWhr

RUN#: 38701
NUMBER: 1

DATE: 22-Jan-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND & SPIRAL GRIND TEST# 01/19

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	5.25%
% ASH (ASPHALT FREE BASIS)			5.43%
% SULFUR	NA	NA	3.14%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	13747
BTU/LB " LESS ASPHALT			13611
LBS ASH/MMBTU	NA	12.65	3.82
LBS SO2/MMBTU	NA	NA	4.57
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			46.88%

B. PROCESS REFUSE

% ASH **estimated to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	88.12%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		91.10%	NA
% ENERGY RECOVERY	NA	99.52%	NA
% ASH REDUCTION	NA	69.80%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1429	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	957 lbs
GROSS PRODUCT WT. RECOVERED	1517 lbs
NET PRODUCT WT. RECOVERED (dry basis)	806 lbs
PRODUCT BINDER CONC.	3.28%
TOTAL BL. CONC. % OF FEED COAL	39.84%
STEAM / TON PRODUCT	1713.72 lbs
HIGH SHEAR WORK/MTON PRODUCT	29.89 kWhr
LOW SHEAR WORK/MTON PRODUCT	10.46 kWhr

RUN#: 38702
NUMBER: 2

DATE: 22-Jan-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND & SPIRAL GRIND TEST# 01/19

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	4.41%
% ASH (ASPHALT FREE BASIS)			4.54%
% SULFUR	NA	NA	3.02%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	13871
BTU/LB " LESS ASPHALT			13751
LBS ASH/MMBTU	NA	12.65	3.18
LBS SO2/MMBTU	NA	NA	4.35
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			32.51%

B. PROCESS REFUSE

% ASH **estimated to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	87.19%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		89.87%	NA
% ENERGY RECOVERY	NA	99.48%	NA
% ASH REDUCTION	NA	74.86%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1688	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	944 lbs
GROSS PRODUCT WT. RECOVERED	1498 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1011 lbs
PRODUCT BINDER CONC.	2.99%
TOTAL BL. CONC. % OF FEED COAL	35.86%
STEAM / TON PRODUCT	2436.27 lbs
HIGH SHEAR WORK/MTON PRODUCT	30.29 kWhr
LOW SHEAR WORK/MTON PRODUCT	16.45 kWhr

RUN#: 38801
NUMBER: 1

DATE: 23-Jan-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND & SPIRAL GRIND TEST# 01/22

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	4.20%
% ASH (ASPHALT FREE BASIS)			4.30%
% SULFUR	NA	NA	3.03%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	13881
BTU/LB " LESS ASPHALT			13790
LBS ASH/MMBTU	NA	12.65	3.03
LBS SO2/MMBTU	NA	NA	4.37
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		NA	
PARTICLE D50 - uM		NA	
MOISTURE			26.11%

B. PROCESS REFUSE

% ASH **estimated to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.93%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		88.96%	NA
% ENERGY RECOVERY	NA	99.47%	NA
% ASH REDUCTION	NA	76.07%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1780	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	934 lbs
GROSS PRODUCT WT. RECOVERED	1255 lbs
NET PRODUCT WT. RECOVERED (dry basis)	927 lbs
PRODUCT BINDER CONC.	2.28%
TOTAL BL. CONC. % OF FEED COAL	30.54%
STEAM / TON PRODUCT	2222.28 lbs
HIGH SHEAR WORK/MTON PRODUCT	30.61 kWhr
LOW SHEAR WORK/MTON PRODUCT	24.33 kWhr

RUN#: 38802
NUMBER: 2

DATE: 23-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND & SPIRAL GRIND TEST# 01/22

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	4.06%
% ASH (ASPHALT FREE BASIS)			4.15%
% SULFUR	NA	NA	2.99%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	13903
BTU/LB " LESS ASPHALT			13813
LBS ASH/MMBTU	NA	12.65	2.92
LBS SO2/MMBTU	NA	NA	4.30
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			26.33%

B. PROCESS REFUSE

% ASH **estimated to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.78%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		88.81%	NA
% ENERGY RECOVERY	NA	99.46%	NA
% ASH REDUCTION	NA	76.91%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1838	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	933 lbs
GROSS PRODUCT WT. RECOVERED	1131 lbs
NET PRODUCT WT. RECOVERED (dry basis)	833 lbs
PRODUCT BINDER CONC.	2.29%
TOTAL BL. CONC. % OF FEED COAL	28.54%
STEAM / TON PRODUCT	2079.50 lbs
HIGH SHEAR WORK/MTON PRODUCT	30.66 kWhr
LOW SHEAR WORK/MTON PRODUCT	28.69 kWhr

RUN#: 38003
NUMBER: 3

DATE: 15-Jan-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND - NO SPIRAL; GRIND TEST# 01/12

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	3.86%
% ASH (ASPHALT FREE BASIS)			3.98%
% SULFUR	NA	NA	2.77%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	13963
BTU/LB " LESS ASPHALT			13840
LBS ASH/MMBTU	NA	12.65	2.76
LBS SO2/MMBTU	NA	NA	3.97
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			50.00%

B. PROCESS REFUSE

% ASH **estimated to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.60%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		89.40%	NA
% ENERGY RECOVERY	NA	99.46%	NA
% ASH REDUCTION	NA	78.14%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1913	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	830 lbs
GROSS PRODUCT WT. RECOVERED	698 lbs
NET PRODUCT WT. RECOVERED (dry basis)	349 lbs
PRODUCT BINDER CONC.	3.12%
TOTAL BL. CONC. % OF FEED COAL	39.34%
STEAM / TON PRODUCT	1671.05 lbs
HIGH SHEAR WORK/MTON PRODUCT	34.47 kWhr
LOW SHEAR WORK/MTON PRODUCT	8.84 kWhr

RUN#: 38901
NUMBER: 1

DATE: 24-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND & SPIRAL GRIND TEST# 01/23

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	3.65%
% ASH (ASPHALT FREE BASIS)			3.73%
% SULFUR	NA	NA	2.70%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	13961
BTU/LB " LESS ASPHALT			13881
LBS ASH/MMBTU	NA	12.65	2.61
LBS SO2/MMBTU	NA	NA	3.87
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			31.70%

B. PROCESS REFUSE

% ASH **estimated to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.34%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		88.16%	NA
% ENERGY RECOVERY	NA	99.45%	NA
% ASH RECUTION	NA	79.33%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	2039	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	948 lbs
GROSS PRODUCT WT. RECOVERED	1264 lbs
NET PRODUCT WT. RECOVERED (dry basis)	864 lbs
PRODUCT BINDER CONC.	2.07%
TOTAL BL. CONC. % OF FEED COAL	24.88%
STEAM / TON PRODUCT	1392.68 lbs
HIGH SHEAR WORK/MTON PRODUCT	30.17 kWhr
LOW SHEAR WORK/MTON PRODUCT	26.31 kWhr

RUN#: 38902
NUMBER: 2

DATE: 24-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND & SPIRAL GRIND TEST# 01/23

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	3.47%
% ASH (ASPHALT FREE BASIS)			3.54%
% SULFUR	NA	NA	2.66%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	13990
BTU/LB " LESS ASPHALT			13910
LBS ASH/MMBTU	NA	12.65	2.48
LBS SO2/MMBTU	NA	NA	3.80
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		NA	
PARTICLE D50 - uM		NA	
MOISTURE			30.39%

B. PROCESS REFUSE

% ASH **estimated to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.15%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		87.97%	NA
% ENERGY RECOVERY	NA	99.44%	NA
% ASH REDUCTION	NA	80.39%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	2140	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	946 lbs
GROSS PRODUCT WT. RECOVERED	1216 lbs
NET PRODUCT WT. RECOVERED (dry basis)	846 lbs
PRODUCT BINDER CONC.	2.07%
TOTAL BL. CONC. % OF FEED COAL	24.88%
STEAM / TON PRODUCT	1374.51 lbs
HIGH SHEAR WORK/MTON PRODUCT	17.64 kWhr
LOW SHEAR WORK/MTON PRODUCT	27.95 kWhr

RUN#: 38903
NUMBER: 3

DATE: 24-Jan-90

page1

I. CLEANING SUMMARY

FEED COAL ID: ILLINOIS #6, BURNING STAR MINE, PERRY CO. IL
SELECTIVE GRIND & SPIRAL GRIND TEST# 01/23

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.24%	3.52%
% ASH (ASPHALT FREE BASIS)			3.57%
% SULFUR	NA	NA	2.68%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	NA	12051	13958
BTU/LB " LESS ASPHALT			13906
LBS ASH/MMBTU	NA	12.65	2.52
LBS SO2/MMBTU	NA	NA	3.84
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			34.46%

B. PROCESS REFUSE

% ASH **estimated to allow yield calc**	NA	88.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.18%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		87.36%	NA
% ENERGY RECOVERY	NA	99.44%	NA
% ASH REDUCTION	NA	80.06%	NA
% SO2 REDUCTION	NA	NA	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	2126	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	939 lbs
GROSS PRODUCT WT. RECOVERED	NA lbs
NET PRODUCT WT. RECOVERED (dry basis)	NA lbs
PRODUCT BINDER CONC.	1.35%
TOTAL BL. CONC. % OF FEED COAL	19.73%
STEAM / TON PRODUCT	1268.88 lbs
HIGH SHEAR WORK/MTON PRODUCT	27.92 kWhr
LOW SHEAR WORK/MTON PRODUCT	24.01 kWhr

SUMMARY POC TEST RESULTS - UPPER FREEPORT COAL

Date:	2/6	2/8	2/9	2/9	2/12	2/12	2/13	2/15
Agglomeration Test No.:	40201	40401	40501	40502	40801	40802	40901	41101
Test Matrix Serial No.:	1	2			3	4		
Grind Type:	SELECT	SELECT	SELECT	SELECT	2-STAGE	2-STAGE	SELECT	SELECT
Spiral Use:	NO	NO	YES	YES			NO	NO
Feed Solids (%):	18.1	18.1	16.7	16.7	17.8	17.8	18.2	17.8
Feed Particle Size (d90,µm):	16.3	16.3	15.8	15.8	24.6	24.6	15.5	15.5
(d50,µm):	5.6	5.6	5.5	5.5	7.9	7.9	5.3	5.3
I. POC Feed Coal (1/4 in x 0):								
Ash, %	-	-	23.23	23.23	-	-	-	-
Total Sulfur, %	-	-	3.63	3.63	-	-	-	-
Pyritic Sulfur, %	-	-	3.16	3.16	-	-	-	-
Heating Value, Btu/lb	-	-	11558	11558	-	-	-	-
lbs Ash/MBtu	-	-	20.10	20.10	-	-	-	-
lbs SO2/MBtu	-	-	6.28	6.28	-	-	-	-
lbs Pyritic SO2/MBtu	-	-	5.47	5.47	-	-	-	-
II. Grinding Process								
Product:								
Ash, %	21.01	21.01	20.90	20.90	24.02	24.02	20.67	20.67
Total Sulfur, %	2.92	2.92	2.74	2.74	3.75	3.75	2.80	2.80
Pyritic Sulfur, %	1.94	1.94	2.15	2.15	2.72	2.72	1.83	1.83
Heating Value, Btu/lb	11963	11963	11983	11983	11414	11414	12025	12025
lbs Ash/MBtu	17.56	17.56	17.44	17.44	21.04	21.04	17.19	17.19
lbs SO2/MBtu	4.88	4.88	4.57	4.57	6.57	6.57	4.66	4.66
lbs Pyritic SO2/MBtu	3.24	3.24	3.59	3.59	4.77	4.77	3.04	3.04
Refuse:								
Ash, %	-	-	65.10	65.10	-	-	-	-
Total Sulfur, %	-	-	15.47	15.47	-	-	-	-
III. Agglomeration Process								
Product (Excluding Binder):								
Ash, %	6.77	7.20	7.09	7.19	10.74	10.57	9.50	7.60
Heating Value, Btu/lb	14562	14483	14503	14485	13837	13868	14064	14410
Agglomerates (With Asphalt):								
Ash, %	6.61	6.95	6.98	7.07	10.45	10.29	9.23	7.39
Total Sulfur, %	1.77	1.77	1.77	1.79	2.97	2.81	2.07	1.80
Pyritic Sulfur, %	0.82	0.93	0.96	1.07	2.14	1.95	1.27	0.97
Heating Value, %	14632	14591	14551	14537	13939	13967	14163	14498
lbs Ash/MBtu	4.52	4.76	4.80	4.86	7.50	7.37	6.52	5.10
lbs SO2/MBtu	2.42	2.43	2.43	2.46	4.26	4.02	2.92	2.48
lbs Pyritic SO2/MBtu	1.12	1.27	1.32	1.47	3.07	2.79	1.79	1.34
Moisture, %	26.6	23.1	22.2	19.8	16.5	21.1	15.3	21.5
Binder to Coal, %	2.31	3.45	1.55	1.69	2.73	2.64	2.82	2.78
Refuse:								
Ash, %	86.00	80.93	85.11	86.14	86.10	80.79	85.45	85.71
Total Sulfur, %	8.94	8.22	7.80	7.49	7.01	7.80	7.50	7.76
IV. Grinding Performance								
Yield, %	-	-	94.7	94.7	-	-	-	-
Energy Recovery, %	-	-	98.2	98.2	-	-	-	-
Ash Reduction, %	-	-	13.2	13.2	-	-	-	-
SO2 Reduction, %	-	-	27.2	27.2	-	-	-	-
Pyritic SO2 Reduction, %	-	-	34.4	34.4	-	-	-	-
V. Agglomeration Performance								
Yield, %	82.0	81.3	82.3	82.6	82.4	80.8	85.3	83.3
Energy Recovery, %	99.8	98.4	99.6	99.9	99.9	98.2	99.7	99.8
Ash Reduction, %	74.3	72.9	72.5	72.1	64.4	65.0	62.1	70.3
SO2 Reduction, %	50.4	50.3	46.8	46.1	35.1	38.8	37.2	46.7
Pyritic SO2 Reduction, %	65.4	60.7	63.2	59.0	35.6	41.4	41.1	56.0
VI. Overall Performance								
Yield, %	82.0	81.3	78.0	78.3	82.4	80.8	85.3	83.3
Energy Recovery, %	99.8	98.4	97.8	98.1	99.9	98.2	99.7	99.8
Ash Reduction, %	74.3	72.9	76.1	75.8	64.4	65.0	62.1	70.3
SO2 Reduction, %	50.4	50.3	61.3	60.8	35.1	38.8	37.2	46.7
Pyritic SO2 Reduction, %	65.4	60.7	75.9	73.1	35.6	41.4	41.1	56.0

SUMMARY POC TEST RESULTS - UPPER FREEPORT COAL

Date:	2/6	2/8	2/9	2/9	2/12	2/12	2/13	2/15
Agglomeration Test No.:	40201	40401	40501	40502	40801	40802	40901	41101
Test Matrix Serial No.:	1	2			3	4		
Grind Type:	SELECT	SELECT	SELECT	SELECT	2-STAGE	2-STAGE	SELECT	SELECT
Spiral Use:	NO	NO	YES	YES			NO	NO
Feed Solids (%):	18.1	18.1	16.7	16.7	17.8	17.8	18.2	17.8
Feed Particle Size (d90,µm):	16.3	16.3	15.8	15.8	24.6	24.6	15.5	15.5
(d50,µm):	5.6	5.6	5.5	5.5	7.9	7.9	5.3	5.3
I. POC Feed Coal (1/4 in x 0):								
Ash, %	-	-	23.23	23.23	-	-	-	-
Total Sulfur, %	-	-	3.63	3.63	-	-	-	-
Pyritic Sulfur, %	-	-	3.16	3.16	-	-	-	-
Heating Value, Btu/lb	-	-	11558	11558	-	-	-	-
lbs Ash/MBtu	-	-	20.10	20.10	-	-	-	-
lbs SO2/MBtu	-	-	6.28	6.28	-	-	-	-
lbs Pyritic SO2/MBtu	-	-	5.47	5.47	-	-	-	-
II. Grinding Process								
Product:								
Ash, %	21.01	21.01	20.90	20.90	24.02	24.02	20.67	20.67
Total Sulfur, %	2.92	2.92	2.74	2.74	3.75	3.75	2.80	2.80
Pyritic Sulfur, %	1.94	1.94	2.15	2.15	2.72	2.72	1.83	1.83
Heating Value, Btu/lb	11963	11963	11983	11983	11414	11414	12025	12025
lbs Ash/MBtu	17.56	17.56	17.44	17.44	21.04	21.04	17.19	17.19
lbs SO2/MBtu	4.88	4.88	4.57	4.57	6.57	6.57	4.66	4.66
lbs Pyritic SO2/MBtu	3.24	3.24	3.59	3.59	4.77	4.77	3.04	3.04
Refuse:								
Ash, %	-	-	65.10	65.10	-	-	-	-
Total Sulfur, %	-	-	15.47	15.47	-	-	-	-
III. Agglomeration Process								
Product (Excluding Binder):								
Ash, %	6.77	7.20	7.09	7.19	10.74	10.57	9.50	7.60
Heating Value, Btu/lb	14562	14483	14503	14485	13837	13868	14064	14410
Agglomerates (With Asphalt):								
Ash, %	6.61	6.95	6.98	7.07	10.45	10.29	9.23	7.39
Total Sulfur, %	1.77	1.77	1.77	1.79	2.97	2.81	2.07	1.80
Pyritic Sulfur, %	0.82	0.93	0.96	1.07	2.14	1.95	1.27	0.97
Heating Value, %	14632	14591	14551	14537	13939	13967	14163	14498
lbs Ash/MBtu	4.52	4.76	4.80	4.86	7.50	7.37	6.52	5.10
lbs SO2/MBtu	2.42	2.43	2.43	2.46	4.26	4.02	2.92	2.48
lbs Pyritic SO2/MBtu	1.12	1.27	1.32	1.47	3.07	2.79	1.79	1.34
Moisture, %	26.6	23.1	22.2	19.8	16.5	21.1	15.3	21.5
Binder to Coal, %	2.31	3.45	1.55	1.69	2.73	2.64	2.82	2.78
Refuse:								
Ash, %	86.00	80.93	85.11	86.14	86.10	80.79	85.45	85.71
Total Sulfur, %	8.94	8.22	7.80	7.49	7.01	7.80	7.50	7.76
IV. Grinding Performance								
Yield, %	-	-	94.7	94.7	-	-	-	-
Energy Recovery, %	-	-	98.2	98.2	-	-	-	-
Ash Reduction, %	-	-	13.2	13.2	-	-	-	-
SO2 Reduction, %	-	-	27.2	27.2	-	-	-	-
Pyritic SO2 Reduction, %	-	-	34.4	34.4	-	-	-	-
V. Agglomeration Performance								
Yield, %	82.0	81.3	82.3	82.6	82.4	80.8	85.3	83.3
Energy Recovery, %	99.8	98.4	99.6	99.9	99.9	98.2	99.7	99.8
Ash Reduction, %	74.3	72.9	72.5	72.1	64.4	65.0	62.1	70.3
SO2 Reduction, %	50.4	50.3	46.8	46.1	35.1	38.8	37.2	46.7
Pyritic SO2 Reduction, %	65.4	60.7	63.2	59.0	35.6	41.4	41.1	56.0
VI. Overall Performance								
Yield, %	82.0	81.3	78.0	78.3	82.4	80.8	85.3	83.3
Energy Recovery, %	99.8	98.4	97.8	98.1	99.9	98.2	99.7	99.8
Ash Reduction, %	74.3	72.9	76.1	75.8	64.4	65.0	62.1	70.3
SO2 Reduction, %	50.4	50.3	61.3	60.8	35.1	38.8	37.2	46.7
Pyritic SO2 Reduction, %	65.4	60.7	75.9	73.1	35.6	41.4	41.1	56.0

SUMMARY POC TEST RESULTS - UPPER FREEPORT COAL

Date:	2/15	2/16	2/24	2/26	2/26	2/26	2/27	2/27
Agglomeration Test No.:	41102	41201	42002	42201	42202	42203	42301	42303
Test Matrix Serial No.:	5	6			7	8		
Grind Type:	1-STAGE	1-STAGE	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT
Spiral Use:			YES	YES	YES	YES	YES	YES
Feed Solids (%):	16.1	14.3	16.2	16.2	12.6	12.6	12.6	13.3
Feed Particle Size (d90,µm):	102.8	102.8	11.6	11.6	-	-	-	13.8
(d50,µm):	25.9	25.9	3.7	3.7	-	-	-	4.8
I. POC Feed Coal (1/4 in x 0):								
Ash, %	-	-	23.27	23.27	23.27	23.27	23.27	23.71
Total Sulfur, %	-	-	3.74	3.74	3.74	3.74	3.74	3.97
Pyritic Sulfur, %	-	-	2.87	2.87	2.87	2.87	2.87	-
Heating Value, Btu/lb	-	-	11551	11551	11551	11551	11551	11471
lbs Ash/MBtu	-	-	20.15	20.15	20.15	20.15	20.15	20.67
lbs SO2/MBtu	-	-	6.48	6.48	6.48	6.48	6.48	6.92
lbs Pyritic SO2/MBtu	-	-	4.97	4.97	4.97	4.97	4.97	-
II. Grinding Process								
Product:								
Ash, %	22.27	22.27	18.71	18.71	17.81	17.81	17.81	16.18
Total Sulfur, %	3.36	3.36	2.29	2.29	2.16	2.16	2.16	1.89
Pyritic Sulfur, %	2.63	2.63	-	-	1.39	1.39	1.39	1.23
Heating Value, Btu/lb	11733	11733	12383	12383	12547	12547	12547	12845
lbs Ash/MBtu	18.98	18.98	15.11	15.11	14.19	14.19	14.19	12.60
lbs SO2/MBtu	5.73	5.73	3.70	3.70	3.44	3.44	3.44	2.94
lbs Pyritic SO2/MBtu	4.48	4.48	-	-	2.22	2.22	2.22	1.92
Refuse:								
Ash, %	-	-	60.72	60.72	60.72	60.72	60.72	51.85
Total Sulfur, %	-	-	14.28	14.28	14.28	14.28	14.28	11.14
III. Agglomeration Process								
Product (Excluding Binder):								
Ash, %	12.79	12.70	8.15	7.19	6.19	5.66	7.51	6.55
Heating Value, Btu/lb	13462	13480	14310	14485	14667	14764	14427	14601
Agglomerates (With Asphalt):								
Ash, %	12.53	12.36	7.95	7.06	6.00	5.48	7.31	6.22
Total Sulfur, %	3.15	3.14	1.85	1.65	1.49	1.35	1.40	1.28
Pyritic Sulfur, %	2.40	2.38	1.00	-	0.68	0.52	-	0.56
Heating Value, %	13548	13589	14391	14541	14758	14855	14510	14753
lbs Ash/MBtu	9.25	9.10	5.52	4.86	4.07	3.69	5.04	4.22
lbs SO2/MBtu	4.65	4.62	2.57	2.27	2.02	1.82	1.93	1.74
lbs Pyritic SO2/MBtu	3.54	3.50	1.39	-	0.92	0.70	-	0.76
Moisture, %	19.5	21.4	27.4	19.8	24.4	22.2	32.4	26.1
Binder to Coal, %	2.07	2.66	2.46	1.79	3.09	3.22	2.62	5.08
Refuse:								
Ash, %	77.21	77.10	80.00	84.40	84.40	84.40	84.40	85.71
Total Sulfur, %	4.58	4.60	-	-	-	6.34	6.20	4.96
IV. Grinding Performance								
Yield, %	-	-	89.1	89.1	87.3	87.3	87.3	78.9
Energy Recovery, %	-	-	95.6	95.6	94.8	94.8	94.8	88.3
Ash Reduction, %	-	-	25.0	25.0	29.5	29.5	29.5	39.1
SO2 Reduction, %	-	-	42.9	42.9	46.8	46.8	46.8	57.5
Pyritic SO2 Reduction, %	-	-	-	-	55.4	55.4	55.4	-
V. Agglomeration Performance								
Yield, %	85.3	85.1	85.3	85.1	85.1	84.6	86.6	87.8
Energy Recovery, %	97.9	97.8	98.6	99.5	99.5	99.5	99.6	99.9
Ash Reduction, %	51.3	52.1	63.4	67.9	71.4	74.0	64.5	66.5
SO2 Reduction, %	18.8	19.3	30.5	38.6	41.4	47.2	44.0	41.0
Pyritic SO2 Reduction, %	21.0	21.9	-	-	58.4	68.4	-	60.4
VI. Overall Performance								
Yield, %	85.3	85.1	76.0	75.8	74.3	73.8	75.6	69.3
Energy Recovery, %	97.9	97.8	94.2	95.1	94.4	94.3	94.4	88.2
Ash Reduction, %	51.3	52.1	72.6	75.9	79.8	81.7	75.0	79.6
SO2 Reduction, %	18.8	19.3	60.3	65.0	68.8	71.9	70.2	74.9
Pyritic SO2 Reduction, %	21.0	21.9	72.0	-	81.5	85.9	-	-

SUMMARY POC TEST RESULTS - UPPER FREEPORT COAL

Date:	2/27	2/27	2/28	2/28	2/28	3/1	3/1	3/1
Agglomeration Test No.:	42304	42305	42401	42402	42403	42501	42502	42504
Test Matrix Serial No.:	9	10	11	12	13	14	14	14
Grind Type:	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT
Spiral Use:	YES	YES	YES	YES	YES	YES	YES	YES
Feed Solids (%):	13.3	13.3	13.3	13.3	13.3	13.8	13.8	18.7
Feed Particle Size (d90,µm):	13.8	13.8	14.8	14.8	14.8	14.8	14.8	-
(d50,µm):	4.8	4.8	5.1	5.1	5.1	5.1	5.1	-
I. POC Feed Coal (1/4 in x 0):								
Ash, %	23.71	23.71	22.79	22.79	22.79	22.79	23.62	-
Total Sulfur, %	3.97	3.97	3.73	3.73	3.73	3.73	3.85	-
Pyritic Sulfur, %	-	-	-	-	-	-	-	-
Heating Value, Btu/lb	11471	11471	11638	11638	11638	11638	11487	-
lbs Ash/MBtu	20.67	20.67	19.58	19.58	19.58	19.58	20.56	-
lbs SO2/MBtu	6.92	6.92	6.41	6.41	6.41	6.41	6.70	-
lbs Pyritic SO2/MBtu	-	-	-	-	-	-	-	-
II. Grinding Process								
Product:								
Ash, %	16.18	16.18	15.35	15.35	15.35	16.78	16.78	16.86
Total Sulfur, %	1.89	1.89	1.80	1.80	1.80	2.04	2.04	2.02
Pyritic Sulfur, %	1.23	1.23	1.12	1.12	1.12	1.19	1.19	1.02
Heating Value, Btu/lb	12845	12845	12996	12996	12996	12735	12735	12720
lbs Ash/MBtu	12.60	12.60	11.81	11.81	11.81	13.18	13.18	13.25
lbs SO2/MBtu	2.94	2.94	2.77	2.77	2.77	3.20	3.20	3.18
lbs Pyritic SO2/MBtu	1.92	1.92	1.72	1.72	1.72	1.87	1.87	1.60
Refuse:								
Ash, %	51.85	51.85	51.41	51.41	51.41	51.41	51.41	-
Total Sulfur, %	11.14	11.14	10.94	10.94	10.94	10.94	10.94	-
III. Agglomeration Process								
Product (Excluding Binder):								
Ash, %	5.75	5.93	6.08	6.12	5.90	6.70	6.03	6.53
Heating Value, Btu/lb	14748	14715	14687	14680	14721	14574	14697	14605
Agglomerates (With Asphalt):								
Ash, %	5.61	5.76	5.89	5.89	5.70	6.58	5.88	6.39
Total Sulfur, %	1.24	1.23	1.23	1.32	1.29	1.47	1.38	1.43
Pyritic Sulfur, %	0.50	0.48	0.46	-	0.49	0.63	-	0.57
Heating Value, %	14816	14797	14780	14789	14817	14628	14768	14670
lbs Ash/MBtu	3.79	3.89	3.99	3.98	3.85	4.50	3.98	4.36
lbs SO2/MBtu	1.67	1.66	1.66	1.79	1.74	2.01	1.87	1.95
lbs Pyritic SO2/MBtu	0.67	0.65	0.62	-	0.66	0.86	-	0.78
Moisture, %	33.0	27.5	20.9	33.5	28.5	39.7	23.4	25.7
Binder to Coal, %	2.40	2.86	3.19	3.73	3.32	1.78	2.45	2.18
Refuse:								
Ash, %	86.10	85.20	84.40	86.00	84.11	77.70	85.60	85.95
Total Sulfur, %	6.63	6.41	-	7.24	7.00	6.53	7.70	7.20
IV. Grinding Performance								
Yield, %	78.9	78.9	79.4	79.4	79.4	82.6	80.2	-
Energy Recovery, %	88.3	88.3	88.6	88.6	88.6	90.4	89.0	-
Ash Reduction, %	39.1	39.1	39.7	39.7	39.7	32.7	35.9	-
SO2 Reduction, %	57.5	57.5	56.8	56.8	56.8	50.0	52.2	-
Pyritic SO2 Reduction, %	-	-	-	-	-	-	-	-
V. Agglomeration Performance								
Yield, %	87.0	87.1	88.2	88.4	87.9	85.8	86.5	87.0
Energy Recovery, %	99.9	99.7	99.6	99.9	99.6	98.2	99.8	99.9
Ash Reduction, %	69.9	69.1	66.3	66.3	67.4	65.9	69.8	67.1
SO2 Reduction, %	43.1	43.5	39.9	35.6	37.1	37.3	41.7	38.6
Pyritic SO2 Reduction, %	64.8	66.1	63.9	-	61.6	53.9	-	51.5
VI. Overall Performance								
Yield, %	68.6	68.7	70.0	70.2	69.8	70.9	69.4	87.0
Energy Recovery, %	88.3	88.1	88.3	88.5	88.3	88.8	88.8	99.9
Ash Reduction, %	81.7	81.2	79.6	79.7	80.4	77.0	80.6	67.1
SO2 Reduction, %	75.8	76.0	74.0	72.2	72.8	68.6	72.1	38.6
Pyritic SO2 Reduction, %	-	-	-	-	-	-	-	-

SUMMARY POC TEST RESULTS - UPPER FREEPORT COAL

Date:	3/2	3/2	3/2	3/3	3/3	3/7	3/8	3/8
Agglomeration Test No.:	42601	42602	42603	42701	42702	43101	43201	43202
Test Matrix Serial No.:								
Grind Type:	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT
Spiral Use:	YES	YES	YES	YES	YES	YES	YES	YES
Feed Solids (%):	18.7	18.7	17.5	17.5	18.5	17.4	17.4	17.4
Feed Particle Size (d90,µm):	-	-	14.9	16.0	16.0	15.7	15.7	15.7
(d50,µm):	-	-	5.4	5.3	5.3	5.3	5.3	5.3
I. POC Feed Coal (1/4 in x 0):								
Ash, %	-	-	22.27	22.27	22.27	23.15	23.15	23.15
Total Sulfur, %	-	-	3.74	3.74	3.74	3.80	3.80	3.80
Pyritic Sulfur, %	-	-	3.15	3.15	3.15	3.14	3.14	3.14
Heating Value, Btu/lb	-	-	11733	11733	11733	11573	11573	11573
lbs Ash/MBtu	-	-	18.98	18.98	18.98	20.00	20.00	20.00
lbs SO2/MBtu	-	-	6.38	6.38	6.38	6.57	6.57	6.57
lbs Pyritic SO2/MBtu	-	-	5.37	5.37	5.37	5.43	5.43	5.43
II. Grinding Process								
Product:								
Ash, %	16.86	16.86	16.11	16.31	16.31	15.93	15.93	15.93
Total Sulfur, %	2.02	2.02	1.87	1.92	1.92	1.82	1.82	1.82
Pyritic Sulfur, %	1.02	1.02	1.12	1.12	1.13	0.97	0.97	0.97
Heating Value, Btu/lb	12720	12720	12857	12821	12821	12890	12890	12890
lbs Ash/MBtu	13.25	13.25	12.53	12.72	12.72	12.36	12.36	12.36
lbs SO2/MBtu	3.18	3.18	2.91	3.00	3.00	2.82	2.82	2.82
lbs Pyritic SO2/MBtu	1.60	1.60	1.74	1.75	1.76	1.51	1.51	1.51
Refuse:								
Ash, %	56.21	56.21	61.56	61.56	61.56	59.65	59.65	59.65
Total Sulfur, %	12.59	12.59	14.56	14.56	14.56	14.47	14.47	14.47
III. Agglomeration Process								
Product (Excluding Binder):								
Ash, %	6.52	6.60	6.50	6.67	8.43	7.11	6.83	6.71
Heating Value, Btu/lb	14608	14592	14611	14581	14259	14499	14550	14572
Agglomerates (With Asphalt):								
Ash, %	6.37	6.42	6.32	6.48	8.08	6.99	6.70	6.56
Total Sulfur, %	1.39	1.34	1.33	1.46	1.41	1.33	1.30	1.30
Pyritic Sulfur, %	0.56	0.53	0.52	0.62	0.61	-	-	-
Heating Value, %	14675	14675	14694	14665	14397	14553	14609	14640
lbs Ash/MBtu	4.34	4.37	4.30	4.42	5.61	4.80	4.59	4.48
lbs SO2/MBtu	1.89	1.83	1.81	1.99	1.96	1.83	1.78	1.78
lbs Pyritic SO2/MBtu	0.76	0.72	0.71	0.85	0.85	-	-	-
Moisture, %	31.0	20.5	21.8	23.9	21.1	34.9	22.7	29.8
Binder to Coal, %	2.24	2.76	2.79	2.79	4.14	1.75	1.93	2.25
Refuse:								
Ash, %	83.37	86.00	77.78	78.94	86.55	84.00	84.40	84.40
Total Sulfur, %	6.93	7.60	6.19	5.73	6.53	-	-	-
IV. Grinding Performance								
Yield, %	-	-	86.4	86.8	86.8	83.5	83.5	83.5
Energy Recovery, %	-	-	94.7	94.9	94.9	93.0	93.0	93.0
Ash Reduction, %	-	-	34.0	33.0	33.0	38.2	38.2	38.2
SO2 Reduction, %	-	-	54.4	53.0	53.0	57.0	57.0	57.0
Pyritic SO2 Reduction, %	-	-	67.6	67.5	67.2	72.3	72.3	72.3
V. Agglomeration Performance								
Yield, %	86.5	87.1	86.5	86.7	89.9	88.5	88.3	88.1
Energy Recovery, %	99.4	99.9	98.3	98.6	100.0	99.6	99.6	99.6
Ash Reduction, %	67.3	67.0	65.7	65.3	55.9	61.1	62.9	63.7
SO2 Reduction, %	40.4	42.5	37.8	33.5	34.6	35.3	37.0	37.1
Pyritic SO2 Reduction, %	52.4	55.0	59.4	51.6	51.9	-	-	-
VI. Overall Performance								
Yield, %	-	-	74.8	75.2	78.1	73.9	73.7	73.6
Energy Recovery, %	-	-	93.1	93.5	94.9	92.6	92.7	92.7
Ash Reduction, %	-	-	77.3	76.7	70.4	76.0	77.1	77.6
SO2 Reduction, %	-	-	71.6	68.8	69.3	72.2	72.9	73.0
Pyritic SO2 Reduction, %	-	-	86.8	84.3	84.2	-	-	-

SUMMARY POC TEST RESULTS - UPPER FREEPORT COAL

Date:	3/8	3/9	3/9	3/9
Agglomeration Test No.:	43203	43301	43302	43303
Test Matrix Serial No.:	15	16	17	18
Grind Type:	SELECT	SELECT	SELECT	SELECT
Spiral Use:	YES	YES	YES	YES
Feed Solids (%):	17.4	17.9	17.9	17.9
Feed Particle Size (d90,µm):	15.7	-	-	-
(d50,µm):	5.3	-	-	-
I. POC Feed Coal (1/4 in x 0):				
Ash, %	23.15	21.73	21.73	21.73
Total Sulfur, %	3.80	3.53	3.53	3.53
Pyritic Sulfur, %	3.14	-	-	-
Heating Value, Btu/lb	11573	11832	11832	11832
lbs Ash/MBtu	20.00	18.37	18.37	18.37
lbs SO2/MBtu	6.57	5.97	5.97	5.97
lbs Pyritic SO2/MBtu	5.43	-	-	-
II. Grinding Process				
Product:				
Ash, %	15.93	14.40	14.40	14.40
Total Sulfur, %	1.82	1.60	1.60	1.60
Pyritic Sulfur, %	0.97	-	-	-
Heating Value, Btu/lb	12890	13169	13169	13169
lbs Ash/MBtu	12.36	10.93	10.93	10.93
lbs SO2/MBtu	2.82	2.43	2.43	2.43
lbs Pyritic SO2/MBtu	1.51	-	-	-
Refuse:				
Ash, %	59.65	45.35	45.35	45.35
Total Sulfur, %	14.47	9.15	9.15	9.15
III. Agglomeration Process				
Product (Excluding Binder):				
Ash, %	6.07	6.07	6.71	6.11
Heating Value, Btu/lb	14688	14689	14572	14682
Agglomerates (With Asphalt):				
Ash, %	5.99	5.93	6.69	5.98
Total Sulfur, %	1.31	1.33	1.35	1.30
Pyritic Sulfur, %	-	-	-	-
Heating Value, %	14729	14756	14583	14744
lbs Ash/MBtu	4.07	4.02	4.59	4.06
lbs SO2/MBtu	1.78	1.80	1.85	1.76
lbs Pyritic SO2/MBtu	-	-	-	-
Moisture, %	28.1	29.8	38.9	21.9
Binder to Coal, %	1.39	2.29	0.36	2.11
Refuse:				
Ash, %	84.41	84.41	84.41	84.41
Total Sulfur, %	-	-	-	-
IV. Grinding Performance				
Yield, %	83.5	76.3	76.3	76.3
Energy Recovery, %	93.0	84.9	84.9	84.9
Ash Reduction, %	38.2	40.5	40.5	40.5
SO2 Reduction, %	57.0	59.3	59.3	59.3
Pyritic SO2 Reduction, %	72.3	-	-	-
V. Agglomeration Performance				
Yield, %	87.4	89.4	90.1	89.4
Energy Recovery, %	99.6	99.7	99.7	99.7
Ash Reduction, %	67.1	63.2	58.0	62.9
SO2 Reduction, %	37.0	25.8	23.8	27.4
Pyritic SO2 Reduction, %	-	-	-	-
VI. Overall Performance				
Yield, %	73.0	68.2	68.8	68.2
Energy Recovery, %	92.6	84.7	84.7	84.7
Ash Reduction, %	79.7	78.1	75.0	77.9
SO2 Reduction, %	72.9	69.8	69.0	70.4
Pyritic SO2 Reduction, %	-	-	-	-

RUN#: 40201
NUMBER: 1

DATE: 06-Feb-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

SELECTIVE GRIND - no spiral;

GRIND TEST# 40101

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	21.01%	6.61%
% ASH (ASPHALT FREE BASIS)			6.77%
% SULFUR	NA	2.92%	1.77%
% PYRITIC SULFUR	NA	1.94%	0.82%
BTU/LB - ASTM	NA	11922	14674
BTU/LB CORRELATED	NA	11963	14636
BTU/LB " LESS ASPHALT			14562
LBS ASH/MMBTU	NA	17.56	4.52
LBS SO2/MMBTU	NA	4.88	2.42
LBS PYRITIC SO2/MBTU	NA	3.24	1.12
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		16.28	
PARTICLE D50 - uM		5.62	
MOISTURE			26.60%

B. PROCESS REFUSE

% ASH	NA	86.00%
% SULFUR	NA	8.94%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	82.02%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		83.96%	NA
% ENERGY RECOVERY	NA	99.84%	NA
% ASH REDUCTION	NA	74.28%	NA
% SO2 REDUCTION	NA	50.45%	NA
% PYRITIC SO2 REDUCTION	NA	65.45%	NA
ASH SEPARATION FACTOR	NA	1043	
PYRITE SEPARATION FACTOR	NA	894	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	949 lbs
GROSS PRODUCT WT. RECOVERED	1278 lbs
NET PRODUCT WT. RECOVERED (dry basis)	938 lbs
PRODUCT BINDER CONC.	2.31%
TOTAL BL. CONC. % OF FEED COAL	36.30%
STEAM / TON PRODUCT	1939.81 lbs
HIGH SHEAR WORK/MTON PRODUCT	9.58 kWhr
LOW SHEAR WORK/MTON PRODUCT	8.15 kWhr

RUN#: 40401
NUMBER: 1

DATE: 08-Feb-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

SELECTIVE GRIND - NO SPIRAL;

GRIND TEST# 40101

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	21.01%	6.95%
% ASH (ASPHALT FREE BASIS)			7.20%
% SULFUR	NA	2.92%	1.77%
% PYRITIC SULFUR	NA	1.94%	0.93%
BTU/LB - ASTM	NA	11922	14431
BTU/LB CORRELATED	NA	11963	14597
BTU/LB " LESS ASPHALT			14484
LBS ASH/MMBTU	NA	17.56	4.76
LBS SO2/MMBTU	NA	4.88	2.43
LBS PYRITIC SO2/MBTU	NA	3.24	1.27
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		16.28	
PARTICLE D50 - uM		5.62	
MOISTURE			23.12%

B. PROCESS REFUSE

% ASH	NA	80.93%
% SULFUR	NA	8.22%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	81.27%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		84.17%	NA
% ENERGY RECOVERY	NA	98.39%	NA
% ASH REDUCTION	NA	72.89%	NA
% SO2 REDUCTION	NA	50.32%	NA
% PYRITIC SO2 REDUCTION	NA	60.71%	NA
ASH SEPARATION FACTOR	NA	914	
PYRITE SEPARATION FACTOR	NA	718	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	951 lbs
GROSS PRODUCT WT. RECOVERED	1004 lbs
NET PRODUCT WT. RECOVERED (dry basis)	772 lbs
PRODUCT BINDER CONC.	3.45%
TOTAL BL. CONC. % OF FEED COAL	35.52%
STEAM / TON PRODUCT	1241.13 lbs
HIGH SHEAR WORK/MTON PRODUCT	9.56 kWhr
LOW SHEAR WORK/MTON PRODUCT	17.82 kWhr

RUN#: 40501
NUMBER: 1

DATE: 09-Feb-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

SELECTIVE GRIND & SPIRAL;

GRIND TEST#

40402

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.23%	20.90%	6.98%
% ASH (ASPHALT FREE BASIS)			7.09%
% SULFUR	3.63%	2.74%	1.77%
% PYRITIC SULFUR	3.16%	2.15%	0.96%
BTU/LB - ASTM	11666	11925	14452
BTU/LB CORRELATED	11558	11983	14554
BTU/LB " LESS ASPHALT			14503
LBS ASH/MMBTU	20.10	17.44	4.80
LBS SO2/MMBTU	6.28	4.57	2.43
LBS PYRITIC SO2/MBTU	5.47	3.59	1.32
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		15.84	
PARTICLE D50 - um		5.48	
MOISTURE			22.22%

B. PROCESS REFUSE

% ASH	65.10%	85.11%
% SULFUR	15.47%	7.80%

C. PROCESS PERFORMANCE	GRINDING	AGGLOM'	TOTAL
% YIELD FROM FEED	94.73%	82.30%	77.96%
% TOTAL WT YIELD INCLUDING ASPHALT		83.59%	79.19%
% ENERGY RECOVERY	98.21%	99.61%	97.83%
% ASH REDUCTION	13.22%	72.50%	76.14%
% SO2 REDUCTION	27.20%	46.81%	61.28%
% PYRITIC SO2 REDUCTION	34.38%	63.24%	75.87%
ASH SEPARATION FACTOR	295	988	
PYRITE SEPARATION FACTOR	682	669	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	865 lbs
GROSS PRODUCT WT. RECOVERED	1126 lbs
NET PRODUCT WT. RECOVERED (dry basis)	876 lbs
PRODUCT BINDER CONC.	1.55%
TOTAL BL. CONC. % OF FEED COAL	31.69%
STEAM / TON PRODUCT	1502.34 lbs
HIGH SHEAR WORK/MTON PRODUCT	10.40 kWhr
LOW SHEAR WORK/MTON PRODUCT	12.46 kWhr

RUN#: 40502
NUMBER: 2

DATE: 09-Feb-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM - HELEN MINE
SELECTIVE GRIND & SPIRAL;

GRIND TEST# 40402

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.23%	20.90%	7.07%
% ASH (ASPHALT FREE BASIS)			7.19%
% SULFUR	3.63%	2.74%	1.79%
% PYRITIC SULFUR	3.16%	2.15%	1.07%
BTU/LB - ASTM	11666	11925	14298
BTU/LB CORRELATED	11558	11983	14540
BTU/LB " LESS ASPHALT			14485
LBS ASH/MMBTU	20.10	17.44	4.86
LBS SO2/MMBTU	6.28	4.57	2.46
LBS PYRITIC SO2/MBTU	5.47	3.59	1.47
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		15.84	
PARTICLE D50 - uM		5.49	
MOISTURE			19.78%

B. PROCESS REFUSE

% ASH	65.10%	86.14%
% SULFUR	15.47%	7.49%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	94.73%	82.64%	78.28%
% TOTAL WT YIELD INCLUDING ASPHALT		84.06%	79.63%
% ENERGY RECOVERY	98.21%	99.89%	98.10%
% ASH REDUCTION	13.22%	72.12%	75.81%
% SO2 REDUCTION	27.20%	46.16%	60.80%
% PYRITIC SO2 REDUCTION	34.38%	58.98%	73.08%
ASH SEPARATION FACTOR	295	990	
PYRITE SEPARATION FACTOR	682	578	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	870 lbs
GROSS PRODUCT WT. RECOVERED	909 lbs
NET PRODUCT WT. RECOVERED (dry basis)	729 lbs
PRODUCT BINDER CONC.	1.69%
TOTAL BL. CONC. % OF FEED COAL	32.32%
STEAM / TON PRODUCT	1643.39 lbs
HIGH SHEAR WORK/MTON PRODUCT	10.96 kWhr
LOW SHEAR WORK/MTON PRODUCT	10.96 kWhr

RUN#: 40801
NUMBER: 1

DATE: 12-Feb-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT - HELEN MINE
CONSECUTIVE GRIND:

GRIND TEST# 40503

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	24.02%	10.45%
% ASH (ASPHALT FREE BASIS)			10.74%
% SULFUR	NA	3.75%	2.97%
% PYRITIC SULFUR	NA	2.72%	2.14%
BTU/LB - ASTM	NA	11507	13887
BTU/LB CORRELATED	NA	11414	13944
BTU/LB " LESS ASPHALT			13837
LBS ASH/MMBTU	NA	21.04	7.49
LBS SO2/MMBTU	NA	6.57	4.26
LBS PYRITIC SO2/MMBTU	NA	4.77	3.07
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		24.61	
PARTICLE D50 - μ M		7.91	
MOISTURE			16.48%

B. PROCESS REFUSE

% ASH	NA	87.81%
% SULFUR	NA	7.01%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	82.77%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		85.09%	NA
% ENERGY RECOVERY	NA	100.34%	NA
% ASH REDUCTION	NA	64.39%	NA
% SO2 REDUCTION	NA	35.17%	NA
% PYRITIC SO2 REDUCTION	NA	35.60%	NA
ASH SEPARATION FACTOR	NA	677	
PYRITE SEPARATION FACTOR	NA	271	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	938 lbs
GROSS PRODUCT WT. RECOVERED	960 lbs
NET PRODUCT WT. RECOVERED (dry basis)	802 lbs
PRODUCT BINDER CONC.	2.73%
TOTAL BL. CONC. % OF FEED COAL	32.64%
STEAM / TON PRODUCT	1386.39 lbs
HIGH SHEAR WORK/MTON PRODUCT	10.17 kWhr
LOW SHEAR WORK/MTON PRODUCT	21.51 kWhr

RUN#: 40802
NUMBER: 2

DATE: 12-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT - HELEN MINE
CONSECUTIVE GRIND;

GRIND TEST# 40503

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	24.02%	10.29%
% ASH (ASPHALT FREE BASIS)			10.57%
% SULFUR	NA	3.75%	2.81%
% PYRITIC SULFUR	NA	2.72%	1.95%
BTU/LB - ASTM	NA	11507	13690
BTU/LB CORRELATED	NA	11414	13971
BTU/LB " LESS ASPHALT			13869
LBS ASH/MMBTU	NA	21.04	7.37
LBS SO2/MMBTU	NA	6.57	4.02
LBS PYRITIC SO2/MBTU	NA	4.77	2.79
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		24.61	
PARTICLE D50 - um		7.91	
MOISTURE			21.13%

B. PROCESS REFUSE

% ASH	NA	80.79%
% SULFUR	NA	7.80%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	80.84%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		83.03%	NA
% ENERGY RECOVERY	NA	98.23%	NA
% ASH REDUCTION	NA	65.00%	NA
% SO2 REDUCTION	NA	38.78%	NA
% PYRITIC SO2 REDUCTION	NA	41.43%	NA
ASH SEPARATION FACTOR	NA	618	
PYRITE SEPARATION FACTOR	NA	323	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	915 lbs
GROSS PRODUCT WT. RECOVERED	1010 lbs
NET PRODUCT WT. RECOVERED (dry basis)	797 lbs
PRODUCT BINDER CONC.	2.64%
TOTAL BL. CONC. % OF FEED COAL	30.79%
STEAM / TON PRODUCT	1823.37 lbs
HIGH SHEAR WORK/MTON PRODUCT	10.42 kWhr
LOW SHEAR WORK/MTON PRODUCT	15.63 kWhr

RUN#: 40901
NUMBER: 1

DATE: 13-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM - HELEN MINE

SELECTIVE GRIND - NO SPIRAL;

GRIND TEST#

40803

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.27%	20.67%	9.23%
% ASH (ASPHALT FREE BASIS)			9.50%
% SULFUR	3.67%	2.80%	2.07%
% PYRITIC SULFUR	2.93%	1.83%	1.27%
BTU/LB - ASTM	11704	12086	13993
BTU/LB CORRELATED	11551	12025	14168
BTU/LB " LESS ASPHALT			14064
LBS ASH/MMBTU	20.15	17.19	6.51
LBS SO2/MMBTU	6.35	4.66	2.92
LBS PYRITIC SO2/MBTU	5.07	3.04	1.79
SIZE CONSIST	1/4" x 0		FELLETS
PARTICLE D90 - μ M		15.46	
PARTICLE D50 - μ M		5.34	
MOISTURE			15.31%

B. PROCESS REFUSE

% ASH	NA	85.45%
% SULFUR	NA	7.50%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	85.29%	NA
% TOTAL WT YIELD		87.76%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	99.75%	NA
% ASH REDUCTION	14.68%	62.10%	67.66%
% SO2 REDUCTION	26.72%	37.25%	54.02%
% PYRITIC SO2 REDUCTION	40.01%	41.10%	64.66%
ASH SEPARATION FACTOR	NA	767	
PYRITE SEPARATION FACTOR	NA	504	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	893 lbs
GROSS PRODUCT WT. RECOVERED	887 lbs
NET PRODUCT WT. RECOVERED (dry basis)	751 lbs
PRODUCT BINDER CONC.	2.82%
TOTAL BL. CONC. % OF FEED COAL	31.15%
STEAM / TON PRODUCT	1576.23 lbs
HIGH SHEAR WORK/MTON PRODUCT	10.67 kWhr
LOW SHEAR WORK/MTON PRODUCT	16.21 kWhr

RUN#: 41101
NUMBER: 1

DATE: 15-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

SELECTIVE GRIND - NO SPIRAL;

GRIND TEST#

40803

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.27%	20.67%	7.39%
% ASH (ASPHALT FREE BASIS)			7.60%
% SULFUR	3.67%	2.80%	1.80%
% PYRITIC SULFUR	2.93%	1.83%	0.97%
BTU/LB - ASTM	11704	12086	14232
BTU/LB CORRELATED	11551	12025	14503
BTU/LB " LESS ASPHALT			14410
LBS ASH/MMBTU	20.15	17.19	5.10
LBS SO2/MMBTU	6.35	4.66	2.48
LBS PYRITIC SO2/MBTU	5.07	3.04	1.34
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		15.46	
PARTICLE D50 - um		5.34	
MOISTURE			21.52%

B. PROCESS REFUSE

% ASH	NA	85.71%
% SULFUR	NA	7.76%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	83.27%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		85.65%	NA
% ENERGY RECOVERY	NA	99.78%	NA
% ASH REDUCTION	14.68%	70.36%	74.71%
% SO2 REDUCTION	26.72%	46.70%	60.94%
% PYRITIC SO2 REDUCTION	40.01%	56.05%	73.63%
ASH SEPARATION FACTOR	NA	939	
PYRITE SEPARATION FACTOR	NA	666	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	867 lbs
GROSS PRODUCT WT. RECOVERED	1231 lbs
NET PRODUCT WT. RECOVERED (dry basis)	966 lbs
PRODUCT BINDER CONC.	2.78%
TOTAL BL. CONC. % OF FEED COAL	32.00%
STEAM / TON PRODUCT	1149.61 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.00 kWhr
LOW SHEAR WORK/MTON PRODUCT	22.63 kWhr

RUN#: 41102
NUMBER: 2

DATE: 15-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM - HELEN MINE
Ball Mill Grind

GRIND TEST# 41102

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	22.27%	12.53%
% ASH (ASPHALT FREE BASIS)			12.79%
% SULFUR	NA	3.36%	3.15%
% PYRITIC SULFUR	NA	2.63%	2.40%
BTU/LB - ASTM	NA	11902	13649
BTU/LB CORRELATED	NA	11733	13551
BTU/LB " LESS ASPHALT			13462
LBS ASH/MMBTU	NA	18.98	9.25
LBS SO2/MMBTU	NA	5.73	4.65
LBS PYRITIC SO2/MBTU	NA	4.48	3.54
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		102.79	
PARTICLE D50 - uM		25.93	
MOISTURE			19.53%

B. PROCESS REFUSE

% ASH	NA	77.21%
% SULFUR	NA	4.58%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	85.29%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		87.09%	NA
% ENERGY RECOVERY	NA	97.86%	NA
% ASH REDUCTION	NA	51.28%	NA
% SO2 REDUCTION	NA	18.83%	NA
% PYRITIC SO2 REDUCTION	NA	20.99%	NA
ASH SEPARATION FACTOR	NA	515	
PYRITE SEPARATION FACTOR	NA	163	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1298 lbs
GROSS PRODUCT WT. RECOVERED	775 lbs
NET PRODUCT WT. RECOVERED (dry basis)	624 lbs
PRODUCT BINDER CONC.	2.07%
TOTAL BL. CONC. % OF FEED COAL	18.72%
STEAM / TON PRODUCT	751.43 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.02 kWhr
LOW SHEAR WORK/MTON PRODUCT	NA kWhr

RUN#: 41201
NUMBER: 1

DATE: 16-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM
Ball Mill Product Grind

GRIND TEST# 41103

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	22.27%	12.36%
% ASH (ASPHALT FREE BASIS)			12.70%
% SULFUR	NA	3.36%	3.14%
% PYRITIC SULFUR	NA	2.63%	2.38%
BTU/LB - ASTM	NA	11902	13732
BTU/LB CORRELATED	NA	11733	13594
BTU/LB " LESS ASPHALT			13480
LBS ASH/MMBTU	NA	18.98	9.09
LBS SO2/MMBTU	NA	5.73	4.62
LBS PYRITIC SO2/MBTU	NA	4.48	3.50
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		102.79	
PARTICLE D50 - uM		25.93	
MOISTURE			21.40%

B. PROCESS REFUSE

% ASH **est from 41103 for yld calc**	NA	77.21%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	85.16%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		87.49%	NA
% ENERGY RECOVERY	NA	97.84%	NA
% ASH REDUCTION	NA	52.10%	NA
% SO2 REDUCTION	NA	19.34%	NA
% PYRITIC SO2 REDUCTION	NA	21.89%	NA
ASH SEPARATION FACTOR	NA	518	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	765 lbs
GROSS PRODUCT WT. RECOVERED	1053 lbs
NET PRODUCT WT. RECOVERED (dry basis)	828 lbs
PRODUCT BINDER CONC.	2.66%
TOTAL BL. CONC. % OF FEED COAL	18.96%
STEAM / TON PRODUCT	NA lbs
HIGH SHEAR WORK/MTON PRODUCT	NA kWhr
LOW SHEAR WORK/MTON PRODUCT	NA kWhr

RUN#: 42002
NUMBER: 2

DATE: 24-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM - HELEN MINE

Selective Grnd w/ Spiral;
Centrifuge to 2000rpm

GRIND TEST# 42001

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.27%	18.71%	7.95%
% ASH (ASPHALT FREE BASIS)			8.15%
% SULFUR	3.74%	2.29%	1.85%
% PYRITIC SULFUR	2.87%	NA	1.00%
BTU/LB - ASTM	11818	NA	14173
BTU/LB CORRELATED	11551	12383	14395
BTU/LB " LESS ASPHALT			14310
LBS ASH/MMBTU	20.15	15.11	5.52
LBS SO2/MMBTU	6.48	3.70	2.57
LBS PYRITIC SO2/MBTU	4.97	NA	1.39
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		11.6	
PARTICLE D50 - μ M		3.74	
MOISTURE			27.42%

B. PROCESS REFUSE

% ASH	60.72%	80.00%
% SULFUR	14.28%	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	89.15%	85.30%	76.04%
% TOTAL WT YIELD INCLUDING ASPHALT		87.45%	77.96%
% ENERGY RECOVERY	95.57%	98.58%	94.21%
% ASH REDUCTION	25.00%	63.45%	72.59%
% SO2 REDUCTION	42.88%	30.51%	60.31%
% PYRITIC SO2 REDUCTION	NA	NA	72.04%
ASH SEPARATION FACTOR	289	837	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	870 lbs
GROSS PRODUCT WT. RECOVERED	1533 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1113 lbs
PRODUCT BINDER CONC.	2.46%
TOTAL BL. CONC. % OF FEED COAL	26.45%
STEAM / TON PRODUCT	1678.54 lbs
HIGH SHEAR WORK/MTON PRODUCT	10.96 kWhr
LOW SHEAR WORK/MTON PRODUCT	41.10 kWhr

RUN#: 42201
NUMBER: 1

DATE: 26-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST#

42001

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.27%	18.71%	7.06%
% ASH (ASPHALT FREE BASIS)			7.19%
% SULFUR	3.74%	2.29%	1.65%
% PYRITIC SULFUR	2.87%	NA	NA
BTU/LB - ASTM	11818	NA	NA
BTU/LB CORRELATED	11551	12383	14544
BTU/LB " LESS ASPHALT			14485
LBS ASH/MMBTU	20.15	15.11	4.85
LBS SO2/MMBTU	6.48	3.70	2.27
LBS PYRITIC SO2/MBTU	4.97	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		11.6	
PARTICLE D50 - uM		3.74	
MOISTURE			19.75%

B. PROCESS REFUSE

% ASH ** estimate - ave of 20 **	60.72%	84.40%
% SULFUR	14.28%	NA

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	89.15%	85.08%	75.84%
% TOTAL WT YIELD INCLUDING ASPHALT		86.63%	77.23%
% ENERGY RECOVERY	95.57%	99.52%	95.11%
% ASH REDUCTION	25.00%	67.87%	75.90%
% SO2 REDUCTION	42.88%	38.65%	64.96%
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	289	999	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	862 lbs
GROSS PRODUCT WT. RECOVERED	889 lbs
NET PRODUCT WT. RECOVERED (dry basis)	713 lbs.
PRODUCT BINDER CONC.	1.79%
TOTAL BL. CONC. % OF FEED COAL	25.49%
STEAM / TON PRODUCT	2187.66 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.06 kwhr
LOW SHEAR WORK/MTON PRODUCT	14.00 kwhr

RUN#: 42202
NUMBER: 2

DATE: 26-Feb-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 42001/
42203

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	17.81%	6.00%
% ASH (ASPHALT FREE BASIS)			6.19%
% SULFUR	NA	2.16%	1.49%
% PYRITIC SULFUR	NA	1.39%	0.68%
BTU/LB - ASTM	NA	12655	14740
BTU/LB CORRELATED	NA	12547	14763
BTU/LB " LESS ASPHALT			14667
LBS ASH/MMBTU	NA	14.19	4.06
LBS SO2/MMBTU	NA	3.44	2.02
LBS PYRITIC SO2/MBTU	NA	2.22	0.92
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			24.43%

B. PROCESS REFUSE

% ASH ** estimate - ave of 20 **	NA	84.40%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	85.14%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		87.86%	NA
% ENERGY RECOVERY	NA	99.53%	NA
% ASH REDUCTION	NA	71.37%	NA
% SO2 REDUCTION	NA	41.37%	NA
% PYRITIC SO2 REDUCTION	NA	58.42%	NA
ASH SEPARATION FACTOR	NA	1161	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	671 lbs
GROSS PRODUCT WT. RECOVERED	806 lbs
NET PRODUCT WT. RECOVERED (dry basis)	609 lbs
PRODUCT BINDER CONC.	3.09%
TOTAL BL. CONC. % OF FEED COAL	42.69%
STEAM / TON PRODUCT	2099.23 lbs
HIGH SHEAR WORK/MTON PRODUCT	14.21 kWhr
LOW SHEAR WORK/MTON PRODUCT	15.63 kWhr

RUN#: 42203
NUMBER: 3

DATE: 26-Feb-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST#

42203

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	17.81%	5.48%
% ASH (ASPHALT FREE BASIS)			5.66%
% SULFUR	NA	2.16%	1.35%
% PYRITIC SULFUR	NA	1.39%	0.52%
BTU/LB - ASTM	NA	12655	14872
BTU/LB CORRELATED	NA	12547	14861
BTU/LB " LESS ASPHALT			14764
LBS ASH/MMBTU	NA	14.19	3.69
LBS SO2/MMBTU	NA	3.44	1.82
LBS PYRITIC SO2/MBTU	NA	2.22	0.70
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			22.18%

B. PROCESS REFUSE

% ASH	NA	86.49%
% SULFUR	NA	6.34%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	84.97%	NA
% TOTAL WT YIELD		87.80%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	99.98%	NA
% ASH REDUCTION	NA	74.02%	NA
% SO2 REDUCTION	NA	47.23%	NA
% PYRITIC SO2 REDUCTION	NA	68.41%	NA
ASH SEPARATION FACTOR	NA	1298	
PYRITE SEPARATION FACTOR	NA	1036	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	670 lbs
GROSS PRODUCT WT. RECOVERED	684 lbs
NET PRODUCT WT. RECOVERED (dry basis)	532 lbs.
PRODUCT BINDER CONC.	3.22%
TOTAL BL. CONC. % OF FEED COAL	37.80%
STEAM / TON PRODUCT	NA lbs
HIGH SHEAR WORK/MTON PRODUCT	14.22 kWhr
LOW SHEAR WORK/MTON PRODUCT	17.72 kWhr

RUN#: 42301
NUMBER: 1

DATE: 27-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM
Selective Grind w/Spiral

GRIND TEST# 42203

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	17.81%	7.31%
% ASH (ASPHALT FREE BASIS)			7.51%
% SULFUR	NA	2.16%	1.40%
% PYRITIC SULFUR	NA	1.39%	NA
BTU/LB - ASTM	NA	12655	NA
BTU/LB CORRELATED	NA	12547	14515
BTU/LB " LESS ASPHALT			14427
LBS ASH/MMBTU	NA	14.19	5.04
LBS SO2/MMBTU	NA	3.44	1.93
LBS PYRITIC SO2/MBTU	NA	2.22	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			32.41%

B. PROCESS REFUSE

% ASH ** estimate - ave of 20 **	NA	84.40%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.60%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		88.93%	NA
% ENERGY RECOVERY	NA	99.58%	NA
% ASH REDUCTION	NA	64.52%	NA
% SO2 REDUCTION	NA	43.97%	NA
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	974	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	679 lbs
GROSS PRODUCT WT. RECOVERED	681 lbs
NET PRODUCT WT. RECOVERED (dry basis)	460 lbs
PRODUCT BINDER CONC.	2.62%
TOTAL BL. CONC. % OF FEED COAL	38.53%
STEAM / TON PRODUCT	2393.01 lbs
HIGH SHEAR WORK/MTON PRODUCT	14.04 kWhr
LOW SHEAR WORK/MTON PRODUCT	31.59 kWhr

RUN#: 42303
NUMBER: 3

DATE: 27-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST#

42302

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.71%	16.18%	6.22%
% ASH (ASPHALT FREE BASIS)			6.55%
% SULFUR	3.97%	1.89%	1.28%
% PYRITIC SULFUR	NA	1.23%	0.56%
BTU/LB - ASTM	NA	13048	14731
BTU/LB CORRELATED	11471	12845	14762
BTU/LB " LESS ASPHALT			14602
LBS ASH/MMBTU	20.67	12.60	4.21
LBS SO2/MMBTU	6.92	2.94	1.73
LBS PYRITIC SO2/MBTU	NA	1.92	0.76
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		13.76	
PARTICLE D50 - um		4.84	
MOISTURE			26.09%

B. PROCESS REFUSE

% ASH	51.85%	68.15%
% SULFUR	11.14%	4.96%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	78.89%	84.37%	66.56%
% TOTAL WT YIELD INCLUDING ASPHALT		88.89%	70.12%
% ENERGY RECOVERY	88.34%	95.91%	84.73%
% ASH REDUCTION	39.06%	66.55%	79.62%
% SO2 REDUCTION	57.49%	41.07%	74.95%
% PYRITIC SO2 REDUCTION	NA	60.39%	NA
ASH SEPARATION FACTOR	253	878	
PYRITE SEPARATION FACTOR	714	747	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	789 lbs
GROSS PRODUCT WT. RECOVERED	989 lbs
NET PRODUCT WT. RECOVERED (dry basis)	731 lbs.
PRODUCT BINDER CONC.	5.08%
TOTAL BL. CONC. % OF FEED COAL	48.85%
STEAM / TON PRODUCT	2278.89 lbs
HIGH SHEAR WORK/MTON PRODUCT	13.29 kWhr
LOW SHEAR WORK/MTON PRODUCT	41.68 kWhr

RUN#: 42304
NUMBER: 4

DATE: 27-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 42302

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.71%	16.18%	5.61%
% ASH (ASPHALT FREE BASIS)			5.75%
% SULFUR	3.97%	1.89%	1.24%
% PYRITIC SULFUR	NA	1.23%	0.50%
BTU/LB - ASTM	NA	13048	14862
BTU/LB CORRELATED	11471	12845	14821
BTU/LB " LESS ASPHALT			14748
LBS ASH/MMBTU	20.67	12.60	3.79
LBS SO2/MMBTU	6.92	2.94	1.67
LBS PYRITIC SO2/MBTU	NA	1.92	0.67
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		13.76	
PARTICLE D50 - um		4.84	
MOISTURE			33.01%

B. PROCESS REFUSE

% ASH	51.85%	86.74%
% SULFUR	11.14%	6.63%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	78.89%	87.12%	68.73%
% TOTAL WT YIELD INCLUDING ASPHALT		89.26%	70.42%
% ENERGY RECOVERY	88.34%	100.03%	88.37%
% ASH REDUCTION	39.06%	69.95%	81.69%
% SO2 REDUCTION	57.49%	43.14%	75.83%
% PYRITIC SO2 REDUCTION	NA	64.77%	NA
ASH SEPARATION FACTOR	253	1315	
PYRITE SEPARATION FACTOR	714	1155	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	718 lbs
GROSS PRODUCT WT. RECOVERED	934 lbs
NET PRODUCT WT. RECOVERED (dry basis)	626 lbs
PRODUCT BINDER CONC.	2.40%
TOTAL BL. CONC. % OF FEED COAL	44.39%
STEAM / TON PRODUCT	1659.45 lbs
HIGH SHEAR WORK/MTON PRODUCT	13.28 kWhr
LOW SHEAR WORK/MTON PRODUCT	20.32 kWhr

RUN#: 42305
NUMBER: 5

DATE: 27-Feb-90

page1

1. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST#

42302

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.71%	16.18%	5.76%
% ASH (ASPHALT FREE BASIS)			5.93%
% SULFUR	3.97%	1.89%	1.23%
% PYRITIC SULFUR	NA	1.23%	0.48%
BTU/LB - ASTM	NA	13048	14847
BTU/LB CORRELATED	11471	12845	14802
BTU/LB " LESS ASPHALT			14715
LBS ASH/MMBTU	20.67	12.60	3.89
LBS SO2/MMBTU	6.92	2.94	1.66
LBS PYRITIC SO2/MBTU	NA	1.92	0.65
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		13.76	
PARTICLE D50 - um		4.84	
MOISTURE			27.47%

B. PROCESS REFUSE

% ASH	51.85%	85.20%
% SULFUR	11.14%	6.41%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	78.89%	87.07%	68.69%
% TOTAL WT YIELD INCLUDING ASPHALT		89.64%	70.71%
% ENERGY RECOVERY	88.34%	99.75%	88.12%
% ASH REDUCTION	39.06%	69.11%	81.17%
% SO2 REDUCTION	57.49%	43.53%	75.99%
% PYRITIC SO2 REDUCTION	NA	66.14%	NA
ASH SEPARATION FACTOR	253	1251	
PYRITE SEPARATION FACTOR	714	1163	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	721 lbs
GROSS PRODUCT WT. RECOVERED	909 lbs
NET PRODUCT WT. RECOVERED (dry basis)	659 lbs
PRODUCT BINDER CONC.	2.86%
TOTAL BL. CONC. % OF FEED COAL	41.93%
STEAM / TON PRODUCT	2530.68 lbs
HIGH SHEAR WORK/MTON PRODUCT	13.22 kWhr
LOW SHEAR WORK/MTON PRODUCT	23.39 kWhr

RUN#: 42401
NUMBER: 1

DATE: 28-Feb-90

page1

1. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 42401

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	22.79%	15.35%	5.89%
% ASH (ASPHALT FREE BASIS)			6.08%
% SULFUR	3.73%	1.80%	1.23%
% PYRITIC SULFUR	NA	1.12%	0.46%
BTU/LB - ASTM	NA	13115	14806
BTU/LB CORRELATED	11638	12996	14785
BTU/LB " LESS ASPHALT			14687
LBS ASH/MMBTU	19.58	11.81	3.98
LBS SO2/MMBTU	6.41	2.77	1.66
LBS PYRITIC SO2/MBTU	NA	1.72	0.62
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		14.77	
PARTICLE D50 - um		5.14	
MOISTURE			20.87%

B. PROCESS REFUSE

% ASH **estimate - ave of 20 **	51.41%	84.40%
% SULFUR	10.94%	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	79.37%	88.17%	69.98%
% TOTAL WT YIELD INCLUDING ASPHALT		91.08%	72.28%
% ENERGY RECOVERY	88.63%	99.64%	88.31%
% ASH REDUCTION	39.68%	66.27%	79.66%
% SO2 REDUCTION	56.78%	39.94%	74.04%
% PYRITIC SO2 REDUCTION	NA	63.90%	NA
ASH SEPARATION FACTOR	266	1223	
PYRITE SEPARATION FACTOR	775	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	769 lbs
GROSS PRODUCT WT. RECOVERED	1100 lbs
NET PRODUCT WT. RECOVERED (dry basis)	870 lbs
PRODUCT BINDER CONC.	3.19%
TOTAL BL. CONC. % OF FEED COAL	37.44%
STEAM / TON PRODUCT	2275.71 lbs
HIGH SHEAR WORK/MTON PRODUCT	13.02 kWhr
LOW SHEAR WORK/MTON PRODUCT	19.84 kWhr

RUN#: 42402
NUMBER: 2

DATE: 28-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 42401

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	22.79%	15.35%	5.89%
% ASH (ASPHALT FREE BASIS)			6.12%
% SULFUR	3.73%	1.80%	1.32%
% PYRITIC SULFUR	NA	1.12%	NA
BTU/LB - ASTM	NA	13115	NA
BTU/LB CORRELATED	11638	12996	14796
BTU/LB " LESS ASPHALT			14681
LBS ASH/MMBTU	19.58	11.81	3.98
LBS SO2/MMBTU	6.41	2.77	1.78
LBS PYRITIC SO2/MBTU	NA	1.72	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		14.77	
PARTICLE D50 - uM		5.14	
MOISTURE			33.47%

B. PROCESS REFUSE

% ASH	51.41%	86.86%
% SULFUR	10.94%	7.24%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	79.37%	88.57%	70.29%
% TOTAL WT YIELD INCLUDING ASPHALT		92.00%	73.02%
% ENERGY RECOVERY	88.63%	100.05%	88.67%
% ASH REDUCTION	39.68%	66.30%	79.67%
% SO2 REDUCTION	56.78%	35.59%	72.16%
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	266	1258	
PYRITE SEPARATION FACTOR	775	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	740 lbs
GROSS PRODUCT WT. RECOVERED	1198 lbs
NET PRODUCT WT. RECOVERED (dry basis)	797 lbs
PRODUCT BINDER CONC.	3.73%
TOTAL BL. CONC. % OF FEED COAL	40.83%
STEAM / TON PRODUCT	1757.23 lbs
HIGH SHEAR WORK/MTON PRODUCT	12.39 kWhr
LOW SHEAR WORK/MTON PRODUCT	16.11 kWhr

RUN#: 42403
NUMBER: 3

DATE: 28-Feb-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 42401

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	22.79%	15.35%	5.70%
% ASH (ASPHALT FREE BASIS)			5.89%
% SULFUR	3.73%	1.80%	1.29%
% PYRITIC SULFUR	NA	1.12%	0.49%
BTU/LB - ASTM	NA	13115	14838
BTU/LB CORRELATED	11638	12996	14823
BTU/LB " LESS ASPHALT			14721
LBS ASH/MMBTU	19.58	11.81	3.85
LBS SO2/MMBTU	6.41	2.77	1.74
LBS PYRITIC SO2/MBTU	NA	1.72	0.66
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		14.77	
PARTICLE D50 - uM		5.14	
MOISTURE			28.54%

B. PROCESS REFUSE

% ASH	51.41%	84.11%
% SULFUR	10.94%	7.00%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	79.37%	87.91%	69.77%
% TOTAL WT YIELD INCLUDING ASPHALT		90.93%	72.17%
% ENERGY RECOVERY	88.63%	99.58%	88.26%
% ASH REDUCTION	39.68%	67.44%	80.36%
% SO2 REDUCTION	56.78%	37.16%	72.84%
% PYRITIC SO2 REDUCTION	NA	61.64%	NA
ASH SEPARATION FACTOR	266	1254	
PYRITE SEPARATION FACTOR	775	1256	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	731 lbs
GROSS PRODUCT WT. RECOVERED	1068 lbs
NET PRODUCT WT. RECOVERED (dry basis)	763 lbs
PRODUCT BINDER CONC.	3.32%
TOTAL BL. CONC. % OF FEED COAL	37.74%
STEAM / TON PRODUCT	1750.46 lbs
HIGH SHEAR WORK/MTON PRODUCT	12.54 kWhr
LOW SHEAR WORK/MTON PRODUCT	16.30 kWhr

RUN#: 42501
NUMBER: 1

DATE: 01-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 42401

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	22.79%	16.78%	6.58%
% ASH (ASPHALT FREE BASIS)			6.70%
% SULFUR	3.73%	2.04%	1.47%
% PYRITIC SULFUR	NA	1.19%	0.63%
BTU/LB - ASTM	NA	12878	14685
BTU/LB CORRELATED	11638	12735	14631
BTU/LB " LESS ASPHALT			14575
LBS ASH/MMBTU	19.58	13.18	4.50
LBS SO2/MMBTU	6.41	3.20	2.01
LBS PYRITIC SO2/MBTU	NA	1.87	0.86
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		NA	
PARTICLE D50 - μ M		NA	
MOISTURE			39.69%

B. PROCESS REFUSE

% ASH	NA	77.70%
% SULFUR	NA	6.53%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	85.80%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		87.36%	NA
% ENERGY RECOVERY	NA	98.20%	NA
% ASH REDUCTION	32.71%	65.87%	77.03%
% SO2 REDUCTION	50.02%	37.28%	68.65%
% PYRITIC SO2 REDUCTION	NA	53.92%	NA
ASH SEPARATION FACTOR	NA	995	
PYRITE SEPARATION FACTOR	NA	889	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	898 lbs
GROSS PRODUCT WT. RECOVERED	1066 lbs
NET PRODUCT WT. RECOVERED (dry basis)	643 lbs
PRODUCT BINDER CONC.	1.78%
TOTAL BL. CONC. % OF FEED COAL	23.06%
STEAM / TON PRODUCT	3247.49 lbs
HIGH SHEAR WORK/MTON PRODUCT	10.12 kWhr
LOW SHEAR WORK/MTON PRODUCT	13.27 kWhr

RUN#: 42502
NUMBER: 2

DATE: 01-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM
Selective Grind w/Spiral

GRIND TEST# 42401

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	22.79%	16.78%	5.88%
% ASH (ASPHALT FREE BASIS)			6.03%
% SULFUR	3.73%	2.04%	1.38%
% PYRITIC SULFUR	NA	1.19%	NA
BTU/LB - ASTM	NA	12878	NA
BTU/LB CORRELATED	11638	12735	14772
BTU/LB " LESS ASPHALT			14697
LBS ASH/MMBTU	19.58	13.18	3.98
LBS SO2/MMBTU	6.41	3.20	1.87
LBS PYRITIC SO2/MBTU	NA	1.87	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			23.43%

B. PROCESS REFUSE

% ASH	NA	87.05%
% SULFUR	NA	7.70%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.73%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		88.91%	NA
% ENERGY RECOVERY	NA	100.09%	NA
% ASH REDUCTION	32.71%	69.79%	79.67%
% SO2 REDUCTION	50.02%	41.68%	70.85%
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	NA	1253	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield) 914 lbs
GROSS PRODUCT WT. RECOVERED 1006 lbs
NET PRODUCT WT. RECOVERED (dry basis) 770 lbs

PRODUCT BINDER CONC. 2.45%
TOTAL BL. CONC. % OF FEED COAL 32.46%
STEAM / TON PRODUCT 510.55 lbs
HIGH SHEAR WORK/MTON PRODUCT 10.03 kWhr
LOW SHEAR WORK/MTON PRODUCT 13.04 kWhr

RUN#: 42504
NUMBER: 4

DATE: 01-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST#

42503

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	16.86%	6.39%
% ASH (ASPHALT FREE BASIS)			6.53%
% SULFUR	NA	2.02%	1.43%
% PYRITIC SULFUR	NA	1.02%	0.57%
BTU/LB - ASTM	NA	12743	14819
BTU/LB CORRELATED	NA	12720	14674
BTU/LB " LESS ASPHALT			14605
LBS ASH/MMBTU	NA	13.25	4.35
LBS SO2/MMBTU	NA	3.18	1.95
LBS PYRITIC SO2/MBTU	NA	1.60	0.78
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		NA	
PARTICLE D50 - μ M		NA	
MOISTURE			25.74%

B. PROCESS REFUSE

% ASH	NA	85.95%
% SULFUR	NA	7.20%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	87.00%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		88.94%	NA
% ENERGY RECOVERY	NA	99.88%	NA
% ASH REDUCTION	NA	67.15%	NA
% SO2 REDUCTION	NA	38.63%	NA
% PYRITIC SO2 REDUCTION	NA	51.56%	NA
ASH SEPARATION FACTOR	NA	1145	
PYRITE SEPARATION FACTOR	NA	1099	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1026 lbs
GROSS PRODUCT WT. RECOVERED	1341 lbs
NET PRODUCT WT. RECOVERED (dry basis)	996 lbs
PRODUCT BINDER CONC.	2.18%
TOTAL BL. CONC. % OF FEED COAL	26.37%
STEAM / TON PRODUCT	935.55 lbs
HIGH SHEAR WORK/MTON PRODUCT	6.70 kWhr
LOW SHEAR WORK/MTON PRODUCT	11.79 kWhr

RUN#: 42601
NUMBER: 1

DATE: 02-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM
Selective Grind w/Spiral

GRIND TEST# 42503

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	16.86%	6.37%
% ASH (ASPHALT FREE BASIS)			6.52%
% SULFUR	NA	2.02%	1.39%
% PYRITIC SULFUR	NA	1.02%	0.56%
BTU/LB - ASTM	NA	12743	NA
BTU/LB CORRELATED	NA	12720	14679
BTU/LB " LESS ASPHALT			14608
LBS ASH/MMBTU	NA	13.25	4.34
LBS SO2/MMBTU	NA	3.18	1.89
LBS PYRITIC SO2/MBTU	NA	1.60	0.76
SIZE CONSIST	1/4" x 0		FELLETS
PARTICLE D90 - μM		NA	
PARTICLE D50 - μM		NA	
MOISTURE			31.01%

B. PROCESS REFUSE

% ASH	NA	83.37%
% SULFUR	NA	6.93%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.54%	NA
% TOTAL WT YIELD		88.53%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	99.38%	NA
% ASH REDUCTION	NA	67.26%	NA
% SO2 REDUCTION	NA	40.37%	NA
% PYRITIC SO2 REDUCTION	NA	52.42%	NA
ASH SEPARATION FACTOR	NA	1107	
PYRITE SEPARATION FACTOR	NA	1071	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1111 lbs
GROSS PRODUCT WT. RECOVERED	1404 lbs
NET PRODUCT WT. RECOVERED (dry basis)	969 lbs
PRODUCT BINDER CONC.	2.24%
TOTAL BL. CONC. % OF FEED COAL	24.97%
STEAM / TON PRODUCT	1112.67 lbs
HIGH SHEAR WORK/MTON PRODUCT	9.22 kWhr
LOW SHEAR WORK/MTON PRODUCT	4.29 kWhr

RUN#: 42602
NUMBER: 2

DATE: 02-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 42503

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	16.86%	6.42%
% ASH (ASPHALT FREE BASIS)			6.60%
% SULFUR	NA	2.02%	1.34%
% PYRITIC SULFUR	NA	1.02%	0.53%
BTU/LB - ASTM	NA	12743	NA
BTU/LB CORRELATED	NA	12720	14680
BTU/LB " LESS ASPHALT			14592
LBS ASH/MMBTU	NA	13.25	4.37
LBS SO2/MMBTU	NA	3.18	1.83
LBS PYRITIC SO2/MBTU	NA	1.60	0.72
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			20.53%

B. PROCESS REFUSE

% ASH	NA	87.14%
% SULFUR	NA	7.60%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	87.26%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		89.74%	NA
% ENERGY RECOVERY	NA	100.10%	NA
% ASH REDUCTION	NA	67.00%	NA
% SO2 REDUCTION	NA	42.52%	NA
% PYRITIC SO2 REDUCTION	NA	54.98%	NA
ASH SEPARATION FACTOR	NA	1152	
PYRITE SEPARATION FACTOR	NA	1251	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1024 lbs
GROSS PRODUCT WT. RECOVERED	1366 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1086 lbs
PRODUCT BINDER CONC.	2.76%
TOTAL BL. CONC. % OF FEED COAL	24.88%
STEAM / TON PRODUCT	1275.75 lbs
HIGH SHEAR WORK/MTON PRODUCT	9.09 kWhr
LOW SHEAR WORK/MTON PRODUCT	6.98 kWhr

RUN#: 42603
NUMBER: 3

DATE: 02-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM
Selective Grind w/Spiral

GRIND TEST# 42603

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	22.27%	16.11%	6.32%
% ASH (ASPHALT FREE BASIS)			6.50%
% SULFUR	3.74%	1.87%	1.33%
% PYRITIC SULFUR	3.15%	1.12%	0.52%
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	11733	12857	14699
BTU/LB " LESS ASPHALT			14611
LBS ASH/MMBTU	18.98	12.53	4.30
LBS SO2/MMBTU	6.38	2.91	1.81
LBS PYRITIC SO2/MBTU	5.37	1.74	0.71
SIZE CONSIST	1/4" x 0		FELLETS
PARTICLE D90 - μ M		14.94	
PARTICLE D50 - μ M		5.35	
MOISTURE			21.83%

B. PROCESS REFUSE

% ASH	61.56%	77.78%
% SULFUR	14.56%	6.19%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	86.45%	86.52%	74.79%
% TOTAL WT YIELD INCLUDING ASPHALT		89.01%	76.94%
% ENERGY RECOVERY	94.73%	98.32%	93.14%
% ASH REDUCTION	33.98%	65.68%	77.35%
% SO2 REDUCTION	54.37%	37.79%	71.61%
% PYRITIC SO2 REDUCTION	67.55%	59.39%	86.82%
ASH SEPARATION FACTOR	330	1035	
PYRITE SEPARATION FACTOR	1124	1030	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	1015 lbs
GROSS PRODUCT WT. RECOVERED	1156 lbs
NET PRODUCT WT. RECOVERED (dry basis)	904 lbs
PRODUCT BINDER CONC.	2.79%
TOTAL BL. CONC. % OF FEED COAL	26.86%
STEAM / TON PRODUCT	2643.07 lbs
HIGH SHEAR WORK/MTON PRODUCT	9.17 kWhr
LOW SHEAR WORK/MTON PRODUCT	10.80 kWhr

RUN#: 42701
NUMBER: 1

DATE: 03-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 42603

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	22.27%	16.31%	6.48%
% ASH (ASPHALT FREE BASIS)			6.66%
% SULFUR	3.74%	1.92%	1.46%
% PYRITIC SULFUR	3.15%	1.13%	0.62%
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	11733	12821	14670
BTU/LB " LESS ASPHALT			14581
LBS ASH/MMBTU	18.98	12.72	4.42
LBS SO2/MMBTU	6.38	3.00	1.99
LBS PYRITIC SO2/MBTU	5.37	1.76	0.85
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		16.03	
PARTICLE D50 - μ M		5.33	
MOISTURE			23.90%

B. PROCESS REFUSE

% ASH	61.56%	78.94%
% SULFUR	14.56%	5.73%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	86.83%	86.66%	75.24%
% TOTAL WT YIELD INCLUDING ASPHALT		89.14%	77.40%
% ENERGY RECOVERY	94.88%	98.55%	93.50%
% ASH REDUCTION	32.97%	65.28%	76.73%
% SO2 REDUCTION	53.02%	33.54%	68.78%
% PYRITIC SO2 REDUCTION	67.17%	52.05%	84.26%
ASH SEPARATION FACTOR	328	1026	
PYRITE SEPARATION FACTOR	1119	801	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1017 lbs
GROSS PRODUCT WT. RECOVERED	2164 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1647 lbs
PRODUCT BINDER CONC.	2.79%
TOTAL BL. CONC. % OF FEED COAL	33.81%
STEAM / TON PRODUCT	1674.94 lbs
HIGH SHEAR WORK/MTON PRODUCT	9.37 kWhr
LOW SHEAR WORK/MTON PRODUCT	9.37 kWhr

RUN#: 42702
NUMBER: 2

DATE: 03-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 42603

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	22.27%	16.31%	8.08%
% ASH (ASPHALT FREE BASIS)			8.43%
% SULFUR	3.74%	1.92%	1.41%
% PYRITIC SULFUR	3.15%	1.13%	0.61%
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	11733	12821	14404
BTU/LB " LESS ASPHALT			14259
LBS ASH/MMBTU	18.98	12.72	5.61
LBS SO2/MMBTU	6.38	3.00	1.96
LBS PYRITIC SO2/MBTU	5.37	1.76	0.85
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		16.03	
PARTICLE D50 - um		5.33	
MOISTURE			21.13%

B. PROCESS REFUSE

% ASH	61.56%	86.55%
% SULFUR	14.56%	6.53%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	86.83%	89.91%	78.07%
% TOTAL WT YIELD		93.80%	81.44%
INCLUDING ASPHALT			
% ENERGY RECOVERY	94.88%	100.00%	94.88%
% ASH REDUCTION	32.97%	55.91%	70.45%
% SO2 REDUCTION	53.02%	34.64%	69.29%
% PYRITIC SO2 REDUCTION	67.17%	51.95%	84.23%
ASH SEPARATION FACTOR	328	923	
PYRITE SEPARATION FACTOR	1119	963	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1069 lbs
GROSS PRODUCT WT. RECOVERED	881 lbs
NET PRODUCT WT. RECOVERED (dry basis)	695 lbs
PRODUCT BINDER CONC.	4.14%
TOTAL BL. CONC. % OF FEED COAL	39.61%
STEAM / TON PRODUCT	764.28 lbs
HIGH SHEAR WORK/MTON PRODUCT	9.81 kWhr
LOW SHEAR WORK/MTON PRODUCT	63.10 kWhr

RUN#: 43101
NUMBER: 1

DATE: 07-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM/KINETICS TESTS

Selective Grind w/Spiral

GRIND TEST#

42703

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.15%	15.93%	6.99%
% ASH (ASPHALT FREE BASIS)			7.11%
% SULFUR	3.80%	1.82%	1.33%
% PYRITIC SULFUR	3.14%	0.97%	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	11573	12890	14556
BTU/LB " LESS ASPHALT			14499
LBS ASH/MMBTU	20.00	12.36	4.80
LBS SO2/MMBTU	6.57	2.82	1.83
LBS PYRITIC SO2/MBTU	5.43	1.51	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		15.68	
PARTICLE D50 - um		5.32	
MOISTURE			34.92%

B. PROCESS REFUSE

% ASH **estimate - avg of 20**	59.65%	84.00%
% SULFUR	14.47%	NA

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	83.49%	88.53%	73.91%
% TOTAL WT YIELD INCLUDING ASPHALT		90.11%	75.23%
% ENERGY RECOVERY	92.99%	99.58%	92.60%
% ASH REDUCTION	38.22%	61.14%	75.99%
% SO2 REDUCTION	57.00%	35.25%	72.17%
% PYRITIC SO2 REDUCTION	72.27%	NA	NA
ASH SEPARATION FACTOR	313	1045	
PYRITE SEPARATION FACTOR	1245	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1238 lbs
GROSS PRODUCT WT. RECOVERED	1721 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1120 lbs
PRODUCT BINDER CONC.	1.75%
TOTAL BL. CONC. % OF FEED COAL	33.65%
STEAM / TON PRODUCT	1225.22 lbs
HIGH SHEAR WORK/MTON PRODUCT	5.94 kWhr
LOW SHEAR WORK/MTON PRODUCT	3.85 kWhr

RUN#: 43201
NUMBER: 1

DATE: 08-Mar-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT BEAM: KINETIC TESTS

Selective Grind w/Spiral

GRIND TEST#

43102

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.15%	15.93%	6.70%
% ASH (ASPHALT FREE BASIS)			6.83%
% SULFUR	3.80%	1.82%	1.30%
% PYRITIC SULFUR	3.14%	0.97%	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	11573	12890	14612
BTU/LB " LESS ASPHALT			14550
LBS ASH/MMBTU	20.00	12.36	4.59
LBS SO2/MMBTU	6.57	2.82	1.78
LBS PYRITIC SO2/MBTU	5.43	1.51	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		15.68	
PARTICLE D50 - uM		5.32	
MOISTURE			22.73%

B. PROCESS REFUSE

% ASH **estimated - avg of 20**	59.65%	84.40%
% SULFUR	14.47%	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	83.49%	88.27%	73.69%
% TOTAL WT YIELD INCLUDING ASPHALT		90.01%	75.14%
% ENERGY RECOVERY	92.99%	99.64%	92.66%
% ASH REDUCTION	38.22%	62.90%	77.08%
% SO2 REDUCTION	57.00%	36.99%	72.91%
% PYRITIC SO2 REDUCTION	72.27%	NA	NA
ASH SEPARATION FACTOR	313	1091	
PYRITE SEPARATION FACTOR	1245	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	925 lbs
GROSS PRODUCT WT. RECOVERED	1224 lbs
NET PRODUCT WT. RECOVERED (dry basis)	946 lbs
PRODUCT BINDER CONC.	1.93%
TOTAL BL. CONC. % OF FEED COAL	33.38%
STEAM / TON PRODUCT	1241.33 lbs
HIGH SHEAR WORK/MTON PRODUCT	3.17 kWhr
LOW SHEAR WORK/MTON PRODUCT	5.41 kWhr

RUN#: 43202
NUMBER: 2

DATE: 08-Mar-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT BEAM: KINETIC TESTS

Selective Grind w/Spiral

GRIND TEST#

43102

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.15%	15.93%	6.56%
% ASH (ASPHALT FREE BASIS)			6.71%
% SULFUR	3.80%	1.82%	1.30%
% PYRITIC SULFUR	3.14%	0.97%	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	11573	12890	14644
BTU/LB " LESS ASPHALT			14573
LBS ASH/MMBTU	20.00	12.36	4.48
LBS SO2/MMBTU	6.57	2.82	1.78
LBS PYRITIC SO2/MBTU	5.43	1.51	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		15.68	
PARTICLE D50 - um		5.32	
MOISTURE			29.84%

B. PROCESS REFUSE

% ASH	59.65%	84.40%
% SULFUR	14.47%	NA

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	83.49%	88.13%	73.58%
% TOTAL WT YIELD INCLUDING ASPHALT		90.16%	75.27%
% ENERGY RECOVERY	92.99%	99.64%	92.65%
% ASH REDUCTION	38.22%	63.75%	77.61%
% SO2 REDUCTION	57.00%	37.13%	72.96%
% PYRITIC SO2 REDUCTION	72.27%	NA	NA
ASH SEPARATION FACTOR	313	1109	
PYRITE SEPARATION FACTOR	1245	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1016 lbs
GROSS PRODUCT WT. RECOVERED	1769 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1241 lbs
PRODUCT BINDER CONC.	2.25%
TOTAL BL. CONC. % OF FEED COAL	33.01%
STEAM / TON PRODUCT	1044.60 lbs
HIGH SHEAR WORK/MTON PRODUCT	5.46 kWhr
LOW SHEAR WORK/MTON PRODUCT	11.40 kWhr

RUN#: 43203
NUMBER: 3

DATE: 08-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 43102

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	23.15%	15.93%	5.99%
% ASH (ASPHALT FREE BASIS)			6.07%
% SULFUR	3.80%	1.82%	1.31%
% PYRITIC SULFUR	3.14%	0.97%	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	11573	12890	14731
BTU/LB " LESS ASPHALT			14689
LBS ASH/MMBTU	20.00	12.36	4.07
LBS SO2/MMBTU	6.57	2.82	1.78
LBS PYRITIC SO2/MBTU	5.43	1.51	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		15.68	
PARTICLE D50 - uM		5.32	
MOISTURE			28.07%

B. PROCESS REFUSE

% ASH ** ESTIMATE AVE OF 20 **	59.65%	84.41%
% SULFUR	14.47%	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLOM'	TOTAL
% YIELD FROM FEED	83.49%	87.42%	72.98%
% TOTAL WT YIELD INCLUDING ASPHALT		88.65%	74.01%
% ENERGY RECOVERY	92.99%	99.62%	92.63%
% ASH REDUCTION	38.22%	67.10%	79.67%
% SO2 REDUCTION	57.00%	37.02%	72.92%
% PYRITIC SO2 REDUCTION	72.27%	NA	NA
ASH SEPARATION FACTOR	313	1215	
PYRITE SEPARATION FACTOR	1245	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1510 lbs
GROSS PRODUCT WT. RECOVERED	1026 lbs
NET PRODUCT WT. RECOVERED (dry basis)	738 lbs
PRODUCT BINDER CONC.	1.39%
TOTAL BL. CONC. % OF FEED COAL	18.55%
STEAM / TON PRODUCT	927.45 lbs
HIGH SHEAR WORK/MTON PRODUCT	2.19 kWhr
LOW SHEAR WORK/MTON PRODUCT	6.95 kWhr

RUN#: 43301
NUMBER: 1

DATE: 09-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 3/8/90

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	21.73%	14.40%	5.93%
% ASH (ASPHALT FREE BASIS)			6.07%
% SULFUR	3.53%	1.60%	1.33%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	11832	13169	14760
BTU/LB " LESS ASPHALT			14690
LBS ASH/MMBTU	18.37	10.93	4.02
LBS SO2/MMBTU	5.97	2.43	1.80
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			29.81%

B. PROCESS REFUSE

% ASH ** estimate ave of 20 **	45.35%	84.41%
% SULFUR	9.15%	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	76.32%	89.37%	68.20%
% TOTAL WT YIELD INCLUDING ASPHALT		91.46%	69.80%
% ENERGY RECOVERY	84.94%	99.68%	84.67%
% ASH REDUCTION	40.46%	63.26%	78.12%
% SO2 REDUCTION	59.28%	25.83%	69.80%
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	240	1243	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	936 lbs
GROSS PRODUCT WT. RECOVERED	1870 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1313 lbs
PRODUCT BINDER CONC.	2.29%
TOTAL BL. CONC. % OF FEED COAL	33.33%
STEAM / TON PRODUCT	1495.26 lbs
HIGH SHEAR WORK/MTON PRODUCT	2.35 kWhr
LOW SHEAR WORK/MTON PRODUCT	6.85 kWhr

RUN#: 43302
NUMBER: 2

DATE: 09-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 43204

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	21.73%	14.40%	6.69%
% ASH (ASPHALT FREE BASIS)			6.71%
% SULFUR	3.53%	1.60%	1.35%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	11832	13169	14583
BTU/LB " LESS ASPHALT			14572
LBS ASH/MMBTU	18.37	10.93	4.59
LBS SO2/MMBTU	5.97	2.43	1.85
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		NA	
PARTICLE D50 - uM		NA	
MOISTURE			38.89%

B. PROCESS REFUSE

% ASH **est ave of 20 **	45.35%	84.41%
% SULFUR	9.15%	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	76.32%	90.11%	68.77%
% TOTAL WT YIELD INCLUDING ASPHALT		90.44%	69.02%
% ENERGY RECOVERY	84.94%	99.70%	84.69%
% ASH REDUCTION	40.46%	58.05%	75.02%
% SO2 REDUCTION	59.28%	23.81%	68.97%
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	240	1133	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	926 lbs
GROSS PRODUCT WT. RECOVERED	1422 lbs
NET PRODUCT WT. RECOVERED (dry basis)	869 lbs
PRODUCT BINDER CONC.	0.36%
TOTAL BL. CONC. % OF FEED COAL	22.53%
STEAM / TON PRODUCT	151.22 lbs
HIGH SHEAR WORK/MTON PRODUCT	4.52 kWhr
LOW SHEAR WORK/MTON PRODUCT	9.78 kWhr

RUN#: 43303
NUMBER: 3

DATE: 09-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: UPPER FREEPORT SEAM

Selective Grind w/Spiral

GRIND TEST# 43204

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	21.73%	14.40%	5.98%
% ASH (ASPHALT FREE BASIS)			6.11%
% SULFUR	3.53%	1.60%	1.30%
% PYRITIC SULFUR	NA	NA	NA
BTU/LB - ASTM	NA	NA	NA
BTU/LB CORRELATED	11832	13169	14747
BTU/LB " LESS ASPHALT			14682
LBS ASH/MMBTU	18.37	10.93	4.05
LBS SO2/MMBTU	5.97	2.43	1.76
LBS PYRITIC SO2/MBTU	NA	NA	NA
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		NA	
PARTICLE D50 - μ M		NA	
MOISTURE			21.87%

B. PROCESS REFUSE

% ASH ** est ave of 20 **	45.35%	84.41%
% SULFUR	9.15%	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	76.32%	89.41%	68.24%
% TOTAL WT YIELD INCLUDING ASPHALT		91.34%	69.71%
% ENERGY RECOVERY	84.94%	99.68%	84.67%
% ASH REDUCTION	40.46%	62.92%	72.92%
% SO2 REDUCTION	59.28%	27.04%	72.45%
% PYRITIC SO2 REDUCTION	NA	NA	NA
ASH SEPARATION FACTOR	240	1234	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	701 lbs
GROSS PRODUCT WT. RECOVERED	945 lbs
NET PRODUCT WT. RECOVERED (dry basis)	738 lbs
PRODUCT BINDER CONC.	2.11%
TOTAL BL. CONC. % OF FEED COAL	29.57%
STEAM / TON PRODUCT	2162.71 lbs
HIGH SHEAR WORK/MTON PRODUCT	5.49 kWhr
LOW SHEAR WORK/MTON PRODUCT	12.91 kWhr

SUMMARY POC TEST RESULTS - PITTSBURGH COAL

Date:	3/15	3/15	3/16	3/16	3/19	3/19	3/19	3/21
Agglomeration Test No.:	43901	43902	44001	44002	44301	44302	44303	44501
Test Matrix Serial No.:	1	2	3	4	5	6	7	
Grind Type:	SELECT	SELECT	SELECT	2-STAGE	2-STAGE	1-STAGE	1-STAGE	SELECT
Spiral Use:	YES	YES	YES	NO	NO	NO	NO	NO
Feed Solids (%):	13.1	13.1	13.1	15.1	15.1	18.6	18.6	19.3
Feed Particle Size (d90,µm):	15.6	15.6	15.6	28.5	28.5	135.0	135.0	18.6
(d50,µm):	5.7	5.7	5.7	10.0	10.0	26.4	26.4	6.7
I. POC Feed Coal (1/4 in x 0)								
Ash, %	9.43	9.43	9.43	-	-	-	-	-
Total Sulfur, %	2.42	2.42	2.42	-	-	-	-	-
Pyritic Sulfur, %	1.25	1.25	1.25	-	-	-	-	-
Heating Value, Btu/lb	13662	13662	13662	-	-	-	-	-
lbs Ash/MBtu	6.90	6.90	6.90	-	-	-	-	-
lbs SO2/MBtu	3.54	3.54	3.54	-	-	-	-	-
lbs Pyritic SO2/MBtu	1.83	1.83	1.83	-	-	-	-	-
II. Grinding Process								
Ash, %	9.05	9.05	9.05	15.09	15.09	8.79	8.79	8.05
Total Sulfur, %	1.87	1.87	1.87	2.76	2.76	2.34	2.34	2.05
Pyritic Sulfur, %	0.47	0.47	0.47	1.43	1.43	1.38	1.38	0.66
Heating Value, Btu/lb	13731	13731	13731	12636	12636	13778	13778	13913
lbs Ash/MBtu	6.59	6.59	6.59	11.94	11.94	6.38	6.38	5.79
lbs SO2/MBtu	2.72	2.72	2.72	4.37	4.37	3.40	3.40	2.95
lbs Pyritic SO2/MBtu	0.68	0.68	0.68	2.26	2.26	2.00	2.00	0.95
Refuse:								
Ash, %	12.52	12.52	12.52	-	-	-	-	-
Total Sulfur, %	2.95	2.95	2.95	-	-	-	-	-
III. Agglomeration Process								
Product (Excluding Asphalt):								
Ash, %	3.40	3.70	3.46	6.47	5.98	6.41	6.60	4.14
Heating Value, Btu/lb	14755	14702	14745	14199	14288	14210	14176	14621
Agglomerates (With Asphalt):								
Ash, %	3.32	3.61	3.40	6.32	5.84	6.27	6.46	4.03
Total Sulfur, %	1.63	1.66	1.59	2.51	2.53	2.31	2.34	1.96
Pyritic Sulfur, %	0.31	0.34	0.34	1.10	1.11	0.90	0.76	0.53
Heating Value, Btu/lb	14770	14718	14756	14226	14313	14235	14201	14641
lbs Ash/MBtu	2.25	2.45	2.30	4.44	4.08	4.40	4.55	2.75
lbs SO2/MBtu	2.21	2.26	2.16	3.53	3.54	3.25	3.30	2.68
lbs Pyritic SO2/MBtu	0.42	0.46	0.46	1.55	1.55	1.26	1.07	0.72
Moisture, %	31.4	23.3	25.2	22.0	33.2	21.3	26.3	26.7
Binder to Coal, %	2.37	2.35	1.71	2.35	2.34	2.18	2.10	2.72
Refuse:								
Ash, %	82.28	84.00	84.00	84.00	84.00	23.65	83.00	84.00
Total Sulfur, %	5.37	5.72	5.20	5.45	6.71	2.61	-	5.96
IV. Grinding Performance								
Yield, %	89.0	89.0	89.0	-	-	-	-	-
Energy Recovery, %	89.5	89.5	89.5	-	-	-	-	-
Ash Reduction, %	4.5	4.5	4.5	-	-	-	-	-
SO2 Reduction, %	23.1	23.1	23.1	-	-	-	-	-
Pyritic SO2 Reduction, %	62.6	62.6	62.6	-	-	-	-	-
V. Agglomeration Performance								
Yield, %	92.8	93.3	93.1	88.9	88.3	86.2	97.1	95.1
Energy Recovery, %	99.8	99.9	99.9	99.9	99.9	88.9	99.9	99.9
Ash Reduction, %	65.9	62.8	65.0	62.8	65.8	31.0	28.7	52.4
SO2 Reduction, %	19.0	17.2	20.9	19.2	19.1	4.5	3.0	9.1
Pyritic SO2 Reduction, %	38.7	32.5	32.7	31.7	31.5	36.9	46.6	23.7
VI. Overall Performance								
Yield, %	82.7	83.1	82.9	88.9	88.3	86.2	97.1	95.1
Energy Recovery, %	89.3	89.4	89.4	99.9	99.9	88.9	99.9	99.9
Ash Reduction, %	67.4	64.5	66.6	62.8	65.8	31.0	28.7	52.4
SO2 Reduction, %	37.7	36.3	39.2	19.2	19.1	4.5	3.0	9.1
Pyritic SO2 Reduction, %	77.1	74.8	74.8	31.7	31.5	36.9	46.6	23.7

SUMMARY POC TEST RESULTS - PITTSBURGH COAL

Date:	3/21	3/22	3/22	3/22	3/23	3/23	3/23	3/24
Agglomeration Test No.:	44502	44601	44602	44603	44701	44702	44703	44801
Test Matrix Serial No.:		8	9	10			11	
Grind Type:	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT
Spiral Use:	NO	NO	NO	NO	NO	NO	NO	NO
Feed Solids (%):	19.3	17.7	17.7	17.7	19.1	19.1	19.1	19.0
Feed Particle Size (d90,µm):	18.6	17.1	17.1	17.1	17.9	17.9	17.9	17.6
(d50,µm):	6.7	6.2	6.2	6.2	6.4	6.4	6.4	6.4
I. POC Feed Coal (1/4 in x 0)								
Ash, %	-	-	-	-	-	-	-	-
Total Sulfur, %	-	-	-	-	-	-	-	-
Pyritic Sulfur, %	-	-	-	-	-	-	-	-
Heating Value, Btu/lb	-	-	-	-	-	-	-	-
lbs Ash/MBtu	-	-	-	-	-	-	-	-
lbs SO2/MBtu	-	-	-	-	-	-	-	-
lbs Pyritic SO2/MBtu	-	-	-	-	-	-	-	-
II. Grinding Process								
Ash, %	8.05	8.36	8.36	8.36	8.58	8.58	8.58	8.38
Total Sulfur, %	2.05	2.17	2.17	2.17	2.17	2.17	2.17	2.20
Pyritic Sulfur, %	0.66	0.72	0.72	0.72	0.62	0.62	0.62	0.65
Heating Value, Btu/lb	13913	13856	13856	13856	13816	13816	13816	13853
lbs Ash/MBtu	5.79	6.03	6.03	6.03	6.21	6.21	6.21	6.05
lbs SO2/MBtu	2.95	3.13	3.13	3.13	3.14	3.14	3.14	3.18
lbs Pyritic SO2/MBtu	0.95	1.04	1.04	1.04	0.90	0.90	0.90	0.94
Refuse:								
Ash, %	-	-	-	-	-	-	-	-
Total Sulfur, %	-	-	-	-	-	-	-	-
III. Agglomeration Process								
Product (Excluding Asphalt)								
Ash, %	3.90	3.70	3.76	3.84	4.42	4.09	3.81	4.06
Heating Value, Btu/lb	14664	14702	14690	14676	14570	14630	14682	14635
Agglomerates (With Asphalt)								
Ash, %	3.82	3.59	3.67	3.75	4.31	3.99	3.71	3.96
Total Sulfur, %	1.89	1.87	1.86	1.84	1.96	1.86	1.84	1.93
Pyritic Sulfur, %	0.49	0.43	0.37	0.34	0.45	0.39	0.35	0.34
Heating Value, Btu/lb	14679	14721	14707	14692	14591	14649	14699	14654
lbs Ash/MBtu	2.60	2.44	2.50	2.55	2.95	2.72	2.52	2.70
lbs SO2/MBtu	2.58	2.54	2.53	2.50	2.69	2.54	2.50	2.63
lbs Pyritic SO2/MBtu	0.67	0.58	0.50	0.46	0.62	0.53	0.48	0.46
Moisture, %	28.0	35.7	28.3	26.3	23.6	35.1	24.1	24.0
Binder to Coal, %	2.16	2.92	2.39	2.32	2.54	2.48	2.56	2.57
Refuse:								
Ash, %	84.00	81.91	71.28	84.00	84.00	84.00	84.00	78.24
Total Sulfur, %	6.44	7.35	6.63	7.90	6.24	7.82	7.94	6.81
IV. Grinding Performance								
Yield, %	-	-	-	-	-	-	-	-
Energy Recovery, %	-	-	-	-	-	-	-	-
Ash Reduction, %	-	-	-	-	-	-	-	-
SO2 Reduction, %	-	-	-	-	-	-	-	-
Pyritic SO2 Reduction, %	-	-	-	-	-	-	-	-
V. Agglomeration Performance								
Yield, %	94.8	94.0	93.2	94.4	94.8	94.4	94.0	94.2
Energy Recovery, %	99.9	99.8	98.8	99.9	99.9	99.9	99.9	99.5
Ash Reduction, %	55.0	59.6	58.6	57.7	52.4	56.1	59.4	55.3
SO2 Reduction, %	12.6	18.9	19.2	20.0	14.5	19.2	20.3	17.1
Pyritic SO2 Reduction, %	29.6	43.8	51.6	55.5	31.3	40.7	46.9	50.6
VI. Overall Performance								
Yield, %	94.8	94.0	93.2	94.4	94.8	94.4	94.0	94.2
Energy Recovery, %	99.9	99.8	98.8	99.9	99.9	99.9	99.9	99.5
Ash Reduction, %	55.0	59.6	58.6	57.7	52.4	56.1	59.4	55.3
SO2 Reduction, %	12.6	18.9	19.2	20.0	14.5	19.2	20.3	17.1
Pyritic SO2 Reduction, %	29.6	43.8	51.6	55.5	31.3	40.7	46.9	50.6

SUMMARY POC TEST RESULTS - PITTSBURGH COAL

Date:	3/24	3/24	3/26	3/26	3/26	3/27	3/27	3/27
Agglomeration Test No.:	44802	44803	45001	45002	45003	45101	45102	45103
Test Matrix Serial No.:	12	13	14			15	16	
Grind Type:	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT
Spiral Use:	NO	NO	NO	NO	NO	NO	NO	NO
Feed Solids (%):	19.0	19.0	18.9	18.9	18.9	17.3	17.3	17.3
Feed Particle Size (d90, μm):	17.6	17.6	-	-	-	-	-	-
(d50, μm):	6.4	6.4	-	-	-	-	-	-
I. POC Feed Coal (1/4 in x 0)								
Ash, %	-	-	-	-	-	-	-	-
Total Sulfur, %	-	-	-	-	-	-	-	-
Pyritic Sulfur, %	-	-	-	-	-	-	-	-
Heating Value, Btu/lb	-	-	-	-	-	-	-	-
lbs Ash/MBtu	-	-	-	-	-	-	-	-
lbs SO2/MBtu	-	-	-	-	-	-	-	-
lbs Pyritic SO2/MBtu	-	-	-	-	-	-	-	-
II. Grinding Process								
Ash, %	8.38	8.38	8.48	8.48	8.48	7.89	7.89	7.89
Total Sulfur, %	2.20	2.20	2.12	2.12	2.12	2.08	2.08	2.08
Pyritic Sulfur, %	0.65	0.65	0.86	0.86	0.86	0.72	0.72	0.72
Heating Value, Btu/lb	13853	13853	13835	13835	13835	13942	13942	13942
lbs Ash/MBtu	6.05	6.05	6.13	6.13	6.13	5.66	5.66	5.66
lbs SO2/MBtu	3.18	3.18	3.06	3.06	3.06	2.98	2.98	2.98
lbs Pyritic SO2/MBtu	0.94	0.94	1.24	1.24	1.24	1.03	1.03	1.03
Refuse:								
Ash, %	-	-	-	-	-	-	-	-
Total Sulfur, %	-	-	-	-	-	-	-	-
III. Agglomeration Process								
Product (Excluding Asphalt)								
Ash, %	3.83	3.72	3.72	3.92	4.01	3.78	3.88	4.09
Heating Value, Btu/lb	14678	14698	14697	14662	14645	14686	14669	14630
Agglomerates (With Asphalt)								
Ash, %	3.73	3.64	3.63	3.82	3.93	3.68	3.78	3.99
Total Sulfur, %	1.91	1.90	1.81	1.83	1.85	1.81	1.81	1.84
Pyritic Sulfur, %	0.39	0.35	0.35	0.41	0.41	0.35	0.38	0.36
Heating Value, Btu/lb	14696	14712	14714	14679	14659	14705	14687	14649
lbs Ash/MBtu	2.54	2.47	2.47	2.60	2.68	2.50	2.57	2.72
lbs SO2/MBtu	2.60	2.58	2.46	2.49	2.52	2.46	2.46	2.51
lbs Pyritic SO2/MBtu	0.53	0.48	0.48	0.56	0.56	0.48	0.52	0.49
Moisture, %	18.5	16.1	38.6	19.9	22.8	22.7	22.8	24.9
Binder to Coal, %	2.50	2.08	2.51	2.51	2.04	2.73	2.56	2.55
Refuse:								
Ash, %	84.00	84.00	83.64	84.00	84.00	84.00	77.94	78.49
Total Sulfur, %	8.28	8.24	7.91	9.15	9.01	8.47	7.96	8.12
IV. Grinding Performance								
Yield, %	-	-	-	-	-	-	-	-
Energy Recovery, %	-	-	-	-	-	-	-	-
Ash Reduction, %	-	-	-	-	-	-	-	-
SO2 Reduction, %	-	-	-	-	-	-	-	-
Pyritic SO2 Reduction, %	-	-	-	-	-	-	-	-
V. Agglomeration Performance								
Yield, %	94.3	94.2	94.0	94.3	94.4	94.9	94.6	94.9
Energy Recovery, %	99.9	99.9	99.9	99.9	99.9	99.9	99.5	99.6
Ash Reduction, %	58.0	59.1	59.8	57.5	56.3	55.8	54.5	51.9
SO2 Reduction, %	18.2	18.7	19.7	18.6	17.6	17.5	17.4	15.8
Pyritic SO2 Reduction, %	43.4	49.3	61.7	55.1	55.0	53.9	49.9	52.4
VI. Overall Performance								
Yield, %	94.3	94.2	94.0	94.3	94.4	94.9	94.6	94.9
Energy Recovery, %	99.9	99.9	99.9	99.9	99.9	99.9	99.5	99.6
Ash Reduction, %	58.0	59.1	59.8	57.5	56.3	55.8	54.5	51.9
SO2 Reduction, %	18.2	18.7	19.7	18.6	17.6	17.5	17.4	15.8
Pyritic SO2 Reduction, %	43.4	49.3	61.7	55.1	55.0	53.9	49.9	52.4

SUMMARY POC TEST RESULTS - PITTSBURGH COAL

Date:	3/28	3/30	3/30
Agglomeration Test No.:	45201	45401	45402
Test Matrix Serial No.:	17	18	18
Grind Type:	SELECT	SELECT	SELECT
Spiral Use:	NO	NO	NO
Feed Solids (%):	17.3	19.1	19.1
Feed Particle Size (d90,µm):	-	18.2	18.2
(d50,µm):	-	6.7	6.7
I. POC Feed Coal (1/4 in x 0)			
Ash, %	-	-	-
Total Sulfur, %	-	-	-
Pyritic Sulfur, %	-	-	-
Heating Value, Btu/lb	-	-	-
lbs Ash/MBtu	-	-	-
lbs SO2/MBtu	-	-	-
lbs Pyritic SO2/MBtu	-	-	-
II. Grinding Process			
Ash, %	7.89	7.76	7.76
Total Sulfur, %	2.08	2.09	2.09
Pyritic Sulfur, %	0.72	0.68	0.68
Heating Value, Btu/lb	13942	13965	13965
lbs Ash/MBtu	5.66	5.56	5.56
lbs SO2/MBtu	2.98	2.99	2.99
lbs Pyritic SO2/MBtu	1.03	0.97	0.97
Refuse:			
Ash, %	-	-	-
Total Sulfur, %	-	-	-
III. Agglomeration Process			
Product (Excluding Asphalt)			
Ash, %	3.62	3.97	3.86
Heating Value, Btu/lb	14716	14652	14672
Agglomerates (With Asphalt)			
Ash, %	3.48	3.97	3.74
Total Sulfur, %	1.74	1.84	1.89
Pyritic Sulfur, %	0.30	0.37	0.37
Heating Value, Btu/lb	14741	14652	14694
lbs Ash/MBtu	2.36	2.71	2.55
lbs SO2/MBtu	2.36	2.51	2.57
lbs Pyritic SO2/MBtu	0.41	0.51	0.50
Moisture, %	29.6	52.4	19.4
Binder to Coal, %	3.87	0.00	3.13
Refuse:			
Ash, %	81.01	78.49	82.72
Total Sulfur, %	7.63	7.45	8.16
IV. Grinding Performance			
Yield, %	-	-	-
Energy Recovery, %	-	-	-
Ash Reduction, %	-	-	-
SO2 Reduction, %	-	-	-
Pyritic SO2 Reduction, %	-	-	-
V. Agglomeration Performance			
Yield, %	94.5	94.9	95.1
Energy Recovery, %	99.7	99.6	99.9
Ash Reduction, %	58.3	51.2	54.2
SO2 Reduction, %	20.9	16.1	14.1
Pyritic SO2 Reduction, %	60.6	48.1	48.3
VI. Overall Performance			
Yield, %	94.5	94.9	95.1
Energy Recovery, %	99.7	99.6	99.9
Ash Reduction, %	58.3	51.2	54.2
SO2 Reduction, %	20.9	16.1	14.1
Pyritic SO2 Reduction, %	60.6	48.1	48.3

RUN#: 43901
NUMBER: 1

DATE: 15-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind with Spiral

GRIND TEST#

43802

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	9.43%	9.05%	3.32%
% ASH (ASPHALT FREE BASIS)			3.40%
% SULFUR	2.42%	1.87%	1.63%
% PYRITIC SULFUR	1.25%	0.47%	0.31%
BTU/LB - ASTM	13690	13580	14915
BTU/LB CORRELATED	13745	13814	14904
BTU/LB " LESS ASPHALT			14834
LBS ASH/MMBTU	6.86	6.55	2.23
LBS SO2/MMBTU	3.52	2.71	2.19
LBS PYRITIC SO2/MBTU	1.82	0.68	0.42
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		15.6	
PARTICLE D50 - μ M		5.73	
MOISTURE			31.44%

B. PROCESS REFUSE

% ASH	12.52%	82.28%
% SULFUR	2.95%	5.37%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	89.05%	92.84%	82.67%
% TOTAL WT YIELD INCLUDING ASPHALT		95.09%	84.68%
% ENERGY RECOVERY	89.49%	99.70%	89.22%
% ASH REDUCTION	4.51%	66.00%	67.53%
% SO2 REDUCTION	23.11%	19.21%	37.88%
% PYRITIC SO2 REDUCTION	62.59%	38.87%	77.13%
ASH SEPARATION FACTOR	123	2247	
PYRITE SEPARATION FACTOR	559	1608	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	758 lbs
GROSS PRODUCT WT. RECOVERED	1254 lbs
NET PRODUCT WT. RECOVERED (dry basis)	860 lbs
PRODUCT BINDER CONC.	2.37%
TOTAL BL. CONC. % OF FEED COAL	31.76%
STEAM / TON PRODUCT	2615.48 lbs
HIGH SHEAR WORK/MTON PRODUCT	24.18 kWhr
LOW SHEAR WORK/MTON PRODUCT	8.63 kWhr

RUN#: 43902
NUMBER: 2

DATE: 15-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind with Spiral

GRIND TEST#

43802

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	9.43%	9.05%	3.61%
% ASH (ASPHALT FREE BASIS)			3.70%
% SULFUR	2.42%	1.87%	1.66%
% PYRITIC SULFUR	1.25%	0.47%	0.34%
BTU/LB - ASTM	13690	13580	14939
BTU/LB CORRELATED	13745	13814	14851
BTU/LB " LESS ASPHALT			14780
LBS ASH/MMBTU	6.86	6.55	2.43
LBS SO2/MMBTU	3.52	2.71	2.24
LBS PYRITIC SO2/MBTU	1.82	0.68	0.46
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		15.6	
PARTICLE D50 - um		5.73	
MOISTURE			23.28%

B. PROCESS REFUSE

% ASH	12.52%	87.69%
% SULFUR	2.95%	5.72%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	89.05%	93.63%	83.37%
% TOTAL WT YIELD INCLUDING ASPHALT		95.88%	85.38%
% ENERGY RECOVERY	89.49%	100.18%	89.66%
% ASH REDUCTION	4.51%	62.90%	64.57%
% SO2 REDUCTION	23.11%	17.43%	36.51%
% PYRITIC SO2 REDUCTION	62.59%	32.71%	74.83%
ASH SEPARATION FACTOR	123	2221	
PYRITE SEPARATION FACTOR	559	1575	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	765 lbs
GROSS PRODUCT WT. RECOVERED	927 lbs
NET PRODUCT WT. RECOVERED (dry basis)	711 lbs
PRODUCT BINDER CONC.	2.35%
TOTAL BL. CONC. % OF FEED COAL	28.64%
STEAM / TON PRODUCT	1785.26 lbs
HIGH SHEAR WORK/MTON PRODUCT	23.98 kWhr
LOW SHEAR WORK/MTON PRODUCT	10.45 kWhr

RUN#: 44001
NUMBER: 1

DATE: 16-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind with Spiral

GRIND TEST#

43802

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	9.43%	9.05%	3.40%
% ASH (ASPHALT FREE BASIS)			3.46%
% SULFUR	2.42%	1.87%	1.59%
% PYRITIC SULFUR	1.25%	0.47%	0.34%
BTU/LB - ASTM	13690	13580	14699
BTU/LB CORRELATED	13745	13814	14874
BTU/LB " LESS ASPHALT			14823
LBS ASH/MMBTU	6.86	6.55	2.29
LBS SO2/MMBTU	3.52	2.71	2.14
LBS PYRITIC SO2/MBTU	1.82	0.68	0.46
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		15.6	
PARTICLE D50 - uM		5.73	
MOISTURE			25.17%

B. PROCESS REFUSE

% ASH	12.52%	87.78%
% SULFUR	2.95%	5.20%

C. PROCESS PERFORMANCE

	GRINDING	AGGLOM'	TOTAL
% YIELD FROM FEED	89.05%	93.37%	83.14%
% TOTAL WT YIELD INCLUDING ASPHALT		94.99%	84.59%
% ENERGY RECOVERY	89.49%	100.20%	89.67%
% ASH REDUCTION	4.51%	65.11%	66.68%
% SO2 REDUCTION	23.11%	21.03%	39.28%
% PYRITIC SO2 REDUCTION	62.59%	32.82%	74.86%
ASH SEPARATION FACTOR	123	2370	
PYRITE SEPARATION FACTOR	559	1428	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	568 lbs
GROSS PRODUCT WT. RECOVERED	628 lbs
NET PRODUCT WT. RECOVERED (dry basis)	470 lbs
PRODUCT BINDER CONC. ** estimated **	1.71%
TOTAL BL. CONC. % OF FEED COAL	35.73%
STEAM / TON PRODUCT	2710.65 lbs
HIGH SHEAR WORK/MTON PRODUCT	24.20 kWhr
LOW SHEAR WORK/MTON PRODUCT	20.33 kWhr

RUN#: 44002
NUMBER: 2

DATE: 16-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Consecutive Grind, No Cent:

GRIND TEST#

44001

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.09%	6.32%
% ASH (ASPHALT FREE BASIS)			6.47%
% SULFUR	NA	2.76%	2.51%
% PYRITIC SULFUR	NA	1.43%	1.10%
BTU/LB - ASTM	NA	13425	14280
BTU/LB CORRELATED	NA	12723	14361
BTU/LB " LESS ASPHALT			14279
LBS ASH/MMBTU	NA	11.86	4.40
LBS SO2/MMBTU	NA	4.34	3.50
LBS PYRITIC SO2/MBTU	NA	2.25	1.53
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		28.53	
PARTICLE D50 - μ M		10	
MOISTURE			21.97%

B. PROCESS REFUSE

% ASH	NA	84.71%
% SULFUR	NA	5.45%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	98.98%	NA
% TOTAL WT YIELD		91.12%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	99.87%	NA
% ASH REDUCTION	NA	62.90%	NA
% SO2 REDUCTION	NA	19.43%	NA
% PYRITIC SO2 REDUCTION	NA	31.85%	NA
ASH SEPARATION FACTOR	NA	1165	
PYRITE SEPARATION FACTOR	NA	441	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1023 lbs
GROSS PRODUCT WT. RECOVERED	1082 lbs
NET PRODUCT WT. RECOVERED (dry basis)	844 lbs

PRODUCT BINDER CONC.** estimated **	2.35%
TOTAL BL. CONC. % OF FEED COAL	31.96%
STEAM / TON PRODUCT	1368.17 lbs
HIGH SHEAR WORK/MTON PRODUCT	18.81 kWhr
LOW SHEAR WORK/MTON PRODUCT	7.02 kWhr

RUN#: 44301
NUMBER: 1

DATE: 19-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Consecutive Grind, no Cent;

GRIND TEST#

44001

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	15.09%	5.84%
% ASH (ASPHALT FREE BASIS)			5.98%
% SULFUR	NA	2.76%	2.53%
% PYRITIC SULFUR	NA	1.43%	1.11%
BTU/LB - ASTM	NA	13425	14413
BTU/LB CORRELATED	NA	12723	14448
BTU/LB " LESS ASPHALT			14368
LBS ASH/MMBTU	NA	11.86	4.04
LBS SO2/MMBTU	NA	4.34	3.50
LBS PYRITIC SO2/MBTU	NA	2.25	1.54
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		28.53	
PARTICLE D50 - μ M		10	
MOISTURE			33.19%

B. PROCESS REFUSE

% ASH	NA	87.19%
% SULFUR	NA	6.71%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	88.78%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		90.90%	NA
% ENERGY RECOVERY	NA	100.26%	NA
% ASH REDUCTION	NA	65.92%	NA
% SO2 REDUCTION	NA	19.28%	NA
% PYRITIC SO2 REDUCTION	NA	31.64%	NA
ASH SEPARATION FACTOR	NA	1295	
PYRITE SEPARATION FACTOR	NA	537	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	972 lbs
GROSS PRODUCT WT. RECOVERED	1812 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1211 lbs
PRODUCT BINDER CONC.	2.34%
TOTAL BL. CONC. % OF FEED COAL	36.00%
STEAM / TON PRODUCT	1440.06 lbs
HIGH SHEAR WORK/MTON PRODUCT	18.86 kWhr
LOW SHEAR WORK/MTON PRODUCT	28.97 kWhr

RUN#: 44302
NUMBER: 2

DATE: 19-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Ball Mill Grind

GRIND TEST# 44301

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.79%	6.27%
% ASH (ASPHALT FREE BASIS)			6.41%
% SULFUR	NA	2.34%	2.31%
% PYRITIC SULFUR	NA	1.38%	0.90%
BTU/LB - ASTM	NA	13830	14302
BTU/LB CORRELATED	NA	13861	14366
BTU/LB " LESS ASPHALT			14291
LBS ASH/MMBTU	NA	6.34	4.36
LBS SO2/MMBTU	NA	3.38	3.22
LBS PYRITIC SO2/MBTU	NA	1.99	1.25
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		135.04	
PARTICLE D50 - μ M		26.4	
MOISTURE			21.30%

B. PROCESS REFUSE

% ASH	NA	23.56%
% SULFUR	NA	2.61%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	86.12%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		88.04%	NA
% ENERGY RECOVERY	NA	88.79%	NA
% ASH REDUCTION	NA	31.18%	NA
% SO2 REDUCTION	NA	4.76%	NA
% PYRITIC SO2 REDUCTION	NA	37.08%	NA
ASH SEPARATION FACTOR	NA	317	
PYRITE SEPARATION FACTOR	NA	250	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	858 lbs
GROSS PRODUCT WT. RECOVERED	818 lbs
NET PRODUCT WT. RECOVERED (dry basis)	644 lbs
PRODUCT BINDER CONC.	2.18%
TOTAL BL. CONC. % OF FEED COAL	24.31%
STEAM / TON PRODUCT	2175.13 lbs
HIGH SHEAR WORK/MTON PRODUCT	21.36 kWhr
LOW SHEAR WORK/MTON PRODUCT	4.36 kWhr

RUN#: 44303
NUMBER: 3

DATE: 19-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Ball Mill Product

GRIND TEST# 44301

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.79%	6.46%
% ASH (ASPHALT FREE BASIS)			6.60%
% SULFUR	NA	2.34%	2.34%
% PYRITIC SULFUR	NA	1.38%	0.76%
BTU/LB - ASTM	NA	13830	NA
BTU/LB CORRELATED	NA	13861	14330
BTU/LB " LESS ASPHALT			14256
LBS ASH/MMBTU	NA	6.34	4.51
LBS SO2/MMBTU	NA	3.38	3.27
LBS PYRITIC SO2/MBTU	NA	1.99	1.06
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		135.04	
PARTICLE D50 - um		26.4	
MOISTURE			26.30%

B. PROCESS REFUSE

% ASH *** estimate ***	NA	85.00%
% SULFUR	NA	NA

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	97.20%	NA
% TOTAL WT YIELD		99.29%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	99.98%	NA
% ASH REDUCTION	NA	28.92%	NA
% SO2 REDUCTION	NA	3.28%	NA
% PYRITIC SO2 REDUCTION	NA	46.73%	NA
ASH SEPARATION FACTOR	NA	1252	
PYRITE SEPARATION FACTOR	NA	NA	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1089 lbs
GROSS PRODUCT WT. RECOVERED	1400 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1032 lbs
PRODUCT BINDER CONC.	2.10%
TOTAL BL. CONC. % OF FEED COAL	14.75%
STEAM / TON PRODUCT	1285.79 lbs
HIGH SHEAR WORK/MTON PRODUCT	18.94 kwhr
LOW SHEAR WORK/MTON PRODUCT	8.08 kwhr

RUN#: 44501
NUMBER: 1

DATE: 21-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spirals: GRIND TEST# 20-Mar

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.05%	4.03%
% ASH (ASPHALT FREE BASIS)			4.14%
% SULFUR	NA	2.05%	1.96%
% PYRITIC SULFUR	NA	0.66%	0.53%
BTU/LB - ASTM	NA	13985	14704
BTU/LB CORRELATED	NA	13994	14783
BTU/LB " LESS ASPHALT			14700
LBS ASH/MMBTU	NA	5.75	2.73
LBS SO2/MMBTU	NA	2.93	2.65
LBS PYRITIC SO2/MBTU	NA	0.94	0.72
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			26.65%

B. PROCESS REFUSE

% ASH	NA	86.08%
% SULFUR	NA	5.96%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	95.23%	NA
% TOTAL WT YIELD		97.89%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	100.03%	NA
% ASH RECUTION	NA	52.61%	NA
% SO2 REDUCTION	NA	9.49%	NA
% PYRITIC SO2 REDUCTION	NA	23.98%	NA
ASH SEPARATION FACTOR	NA	1979	
PYRITE SEPARATION FACTOR	NA	1071	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1017 lbs
GROSS PRODUCT WT. RECOVERED	1268 lbs
NET PRODUCT WT. RECOVERED (dry basis)	930 lbs
PRODUCT BINDER CONC.	2.72%
TOTAL BL. CONC. % OF FEED COAL	31.68%
STEAM / TON PRODUCT	1768.30 lbs
HIGH SHEAR WORK/MTON PRODUCT	15.77 kWhr
LOW SHEAR WORK/MTON PRODUCT	4.12 kWhr

RUN#: 44502
NUMBER: 2

DATE: 21-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral:

GRIND TEST# 20-Mar

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.05%	3.82%
% ASH (ASPHALT FREE BASIS)			3.90%
% SULFUR	NA	2.05%	1.89%
% PYRITIC SULFUR	NA	0.66%	0.49%
BTU/LB - ASTM	NA	13985	14807
BTU/LB CORRELATED	NA	13994	14808
BTU/LB " LESS ASPHALT			14743
LBS ASH/MMBTU	NA	5.75	2.58
LBS SO2/MMBTU	NA	2.93	2.55
LBS PYRITIC SO2/MBTU	NA	0.94	0.66
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		NA	
PARTICLE D50 - μ M		NA	
MOISTURE			28.00%

B. PROCESS REFUSE

% ASH	NA	84.70%
% SULFUR	NA	6.44%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.87%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		96.96%	NA
% ENERGY RECOVERY	NA	99.95%	NA
% ASH REDUCTION	NA	55.16%	NA
% SO2 REDUCTION	NA	12.87%	NA
% PYRITIC SO2 REDUCTION	NA	29.84%	NA
ASH SEPARATION FACTOR	NA	2059	
PYRITE SEPARATION FACTOR	NA	1247	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1131 lbs
GROSS PRODUCT WT. RECOVERED	1534 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1104 lbs
PRODUCT BINDER CONC.	2.16%
TOTAL BL. CONC. % OF FEED COAL	30.79%
STEAM / TON PRODUCT	1773.47 lbs
HIGH SHEAR WORK/MTON PRODUCT	9.32 kWhr
LOW SHEAR WORK/MTON PRODUCT	8.90 kWhr

RUN#: 44601
NUMBER: 1

DATE: 22-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral;

GRIND TEST#

44504

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.36%	3.59%
% ASH (ASPHALT FREE BASIS)			3.70%
% SULFUR	NA	2.17%	1.87%
% PYRITIC SULFUR	NA	0.72%	0.43%
BTU/LB - ASTM	NA	13964	14748
BTU/LB CORRELATED	NA	13938	14868
BTU/LB " LESS ASPHALT			14780
LBS ASH/MMBTU	NA	6.00	2.41
LBS SO2/MMBTU	NA	3.11	2.52
LBS PYRITIC SO2/MMBTU	NA	1.03	0.58
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		17.14	
PARTICLE D50 - um		6.2	
MOISTURE			35.65%

B. PROCESS REFUSE

% ASH	NA	81.91%
% SULFUR	NA	7.53%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.04%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		96.87%	NA
% ENERGY RECOVERY	NA	99.72%	NA
% ASH REDUCTION	NA	59.74%	NA
% SO2 REDUCTION	NA	19.21%	NA
% PYRITIC SO2 REDUCTION	NA	44.01%	NA
ASH SEPARATION FACTOR	NA	2084	
PYRITE SEPARATION FACTOR	NA	1647	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1055 lbs
GROSS PRODUCT WT. RECOVERED	1706 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1098 lbs
PRODUCT BINDER CONC.	2.92%
TOTAL BL. CONC. % OF FEED COAL	33.68%
STEAM / TON PRODUCT	1484.31 lbs
HIGH SHEAR WORK/MTON PRODUCT	10.38 kWhr
LOW SHEAR WORK/MTON PRODUCT	6.43 kWhr

RUN#: 44602
NUMBER: 2

DATE: 22-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral: GRIND TEST# 44504

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.36%	3.67%
% ASH (ASPHALT FREE BASIS)			3.76%
% SULFUR	NA	2.17%	1.86%
% PYRITIC SULFUR	NA	0.72%	0.37%
BTU/LB - ASTM	NA	13964	14710
BTU/LB CORRELATED	NA	13938	14841
BTU/LB " LESS ASPHALT			14769
LBS ASH/MMBTU	NA	6.00	2.47
LBS SO2/MMBTU	NA	3.11	2.51
LBS PYRITIC SO2/MBTU	NA	1.03	0.50
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		17.14	
PARTICLE D50 - um		6.2	
MOISTURE			28.27%

B. PROCESS REFUSE

% ASH	NA	71.28%
% SULFUR	NA	6.63%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	93.19%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		95.47%	NA
% ENERGY RECOVERY	NA	98.74%	NA
% ASH REDUCTION	NA	58.77%	NA
% SO2 REDUCTION	NA	19.50%	NA
% PYRITIC SO2 REDUCTION	NA	51.74%	NA
ASH SEPARATION FACTOR	NA	1767	
PYRITE SEPARATION FACTOR	NA	1670	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1040 lbs
GROSS PRODUCT WT. RECOVERED	1547 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1110 lbs
PRODUCT BINDER CONC.	2.39%
TOTAL BL. CONC. % OF FEED COAL	29.55%
STEAM / TON PRODUCT	1458.08 lbs
HIGH SHEAR WORK/MTON PRODUCT	12.63 kWhr
LOW SHEAR WORK/MTON PRODUCT	3.56 kWhr

RUN#: 44603
NUMBER: 3

DATE: 22-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral: GRIND TEST# 44504

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.36%	3.75%
% ASH (ASPHALT FREE BASIS)			3.84%
% SULFUR	NA	2.17%	1.84%
% PYRITIC SULFUR	NA	0.72%	0.34%
BTU/LB - ASTM	NA	13964	14829
BTU/LB CORRELATED	NA	13938	14825
BTU/LB " LESS ASPHALT			14755
LBS ASH/MMBTU	NA	6.00	2.53
LBS SO2/MMBTU	NA	3.11	2.48
LBS PYRITIC SO2/MBTU	NA	1.03	0.46
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		17.14	
PARTICLE D50 - um		6.2	
MOISTURE			26.25%

B. PROCESS REFUSE

% ASH	NA	89.01%
% SULFUR	NA	7.90%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.69%	NA
% TOTAL WT YIELD		96.94%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	100.24%	NA
% ASH REDUCTION	NA	57.83%	NA
% SO2 REDUCTION	NA	20.28%	NA
% PYRITIC SO2 REDUCTION	NA	55.60%	NA
ASH SEPARATION FACTOR	NA	2196	
PYRITE SEPARATION FACTOR	NA	2200	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	1056 lbs
GROSS PRODUCT WT. RECOVERED	1486 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1096 lbs
PRODUCT BINDER CONC. *estimate*	2.32%
TOTAL BL. CONC. % OF FEED COAL *estimate*	28.45%
STEAM / TON PRODUCT	1656.85 lbs
HIGH SHEAR WORK/MTON PRODUCT	12.25 kWhr
LOW SHEAR WORK/MTON PRODUCT	7.60 kWhr

RUN#: 44701
NUMBER: 1

DATE: 23-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral: GRIND TEST# 44701

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.58%	4.31%
% ASH (ASPHALT FREE BASIS)			4.42%
% SULFUR	NA	2.17%	1.96%
% PYRITIC SULFUR	NA	0.62%	0.45%
BTU/LB - ASTM	NA	13867	NA
BTU/LB CORRELATED	NA	13898	14729
BTU/LB " LESS ASPHALT			14650
LBS ASH/MMBTU	NA	6.17	2.93
LBS SO2/MMBTU	NA	3.12	2.66
LBS PYRITIC SO2/MBTU	NA	0.89	0.61
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		17.85	
PARTICLE D50 - um		6.41	
MOISTURE			23.64%

B. PROCESS REFUSE

% ASH	NA	86.56%
% SULFUR	NA	6.24%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.94%	NA
% TOTAL WT YIELD		97.41%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	100.07%	NA
% ASH REDUCTION	NA	52.60%	NA
% SO2 REDUCTION	NA	14.77%	NA
% PYRITIC SO2 REDUCTION	NA	31.51%	NA
ASH SEPARATION FACTOR	NA	1859	
PYRITE SEPARATION FACTOR	NA	1316	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1143 lbs
GROSS PRODUCT WT. RECOVERED	1348 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1029 lbs
PRODUCT BINDER CONC. ** estimate **	2.54%
TOTAL BL. CONC. % OF FEED COAL	27.04%
STEAM / TON PRODUCT	1428.72 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.41 kWhr
LOW SHEAR WORK/MTON PRODUCT	4.20 kWhr

RUN#: 44702
NUMBER: 2

DATE: 23-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral: GRIND TEST# 44701

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.58%	3.99%
% ASH (ASPHALT FREE BASIS)			4.09%
% SULFUR	NA	2.17%	1.86%
% PYRITIC SULFUR	NA	0.62%	0.39%
BTU/LB - ASTM	NA	13867	NA
BTU/LB CORRELATED	NA	13898	14785
BTU/LB " LESS ASPHALT			14709
LBS ASH/MMBTU	NA	6.17	2.70
LBS SO2/MMBTU	NA	3.12	2.52
LBS PYRITIC SO2/MBTU	NA	0.89	0.53
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		17.85	
PARTICLE D50 - um		6.41	
MOISTURE			35.10%

B. PROCESS REFUSE

% ASH	NA	87.02%
% SULFUR	NA	7.82%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.59%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		97.00%	NA
% ENERGY RECOVERY	NA	100.11%	NA
% ASH REDUCTION	NA	56.29%	NA
% SO2 REDUCTION	NA	19.43%	NA
% PYRITIC SO2 REDUCTION	NA	40.87%	NA
ASH SEPARATION FACTOR	NA	2012	
PYRITE SEPARATION FACTOR	NA	1897	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1138 lbs
GROSS PRODUCT WT. RECOVERED	1501 lbs
NET PRODUCT WT. RECOVERED (dry basis)	974 lbs
PRODUCT BINDER CONC.	2.48%
TOTAL BL. CONC. % OF FEED COAL	36.12%
STEAM / TON PRODUCT	1434.83 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.45 kWhr
LOW SHEAR WORK/MTON PRODUCT	7.09 kWhr

RUN#: 44703
NUMBER: 3

DATE: 23-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral:

GRIND TEST#

44701

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.58%	3.71%
% ASH (ASPHALT FREE BASIS)			3.81%
% SULFUR	NA	2.17%	1.84%
% PYRITIC SULFUR	NA	0.62%	0.35%
BTU/LB - ASTM	NA	13867	NA
BTU/LB CORRELATED	NA	13898	14837
BTU/LB " LESS ASPHALT			14761
LBS ASH/MMBTU	NA	6.17	2.50
LBS SO2/MMBTU	NA	3.12	2.48
LBS PYRITIC SO2/MBTU	NA	0.89	0.47
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		17.85	
PARTICLE D50 - um		6.41	
MOISTURE			24.07%

B. PROCESS REFUSE

% ASH	NA	85.51%
% SULFUR	NA	7.94%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.16%	NA
% TOTAL WT YIELD		96.63%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	100.00%	NA
% ASH RECUCTION	NA	59.50%	NA
% SO2 REDUCTION	NA	20.57%	NA
% PYRITIC SO2 REDUCTION	NA	47.12%	NA
ASH SEPARATION FACTOR	NA	2115	
PYRITE SEPARATION FACTOR	NA	2136	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	1134 lbs
GROSS PRODUCT WT. RECOVERED	1110 lbs
NET PRODUCT WT. RECOVERED (dry basis)	843 lbs
PRODUCT BINDER CONC. * estimated	2.56%
TOTAL BL. CONC. % OF FEED COAL *estimate	34.41%
STEAM / TON PRODUCT	1234.50 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.50 kWhr
LOW SHEAR WORK/MTON PRODUCT	4.07 kWhr

RUN#: 44801
NUMBER: 1

DATE: 24-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral: GRIND TEST# 44801

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.38%	3.96%
% ASH (ASPHALT FREE BASIS)			4.06%
% SULFUR	NA	2.20%	1.93%
% PYRITIC SULFUR	NA	0.65%	0.38%
BTU/LB - ASTM	NA	13867	NA
BTU/LB CORRELATED	NA	13935	14793
BTU/LB " LESS ASPHALT			14714
LBS ASH/MMBTU	NA	6.01	2.68
LBS SO2/MMBTU	NA	3.16	2.61
LBS PYRITIC SO2/MBTU	NA	0.93	0.51
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		17.61	
PARTICLE D50 - μ M		6.36	
MOISTURE			23.98%

B. PROCESS REFUSE

% ASH	NA	78.24%
% SULFUR	NA	6.81%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.18%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		96.66%	NA
% ENERGY RECOVERY	NA	99.45%	NA
% ASH REDUCTION	NA	55.49%	NA
% SO2 REDUCTION	NA	17.36%	NA
% PYRITIC SO2 REDUCTION	NA	44.93%	NA
ASH SEPARATION FACTOR	NA	1814	
PYRITE SEPARATION FACTOR	NA	1688	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1130 lbs
GROSS PRODUCT WT. RECOVERED	1254 lbs
NET PRODUCT WT. RECOVERED (dry basis)	953 lbs
PRODUCT BINDER CONC.	2.57%
TOTAL BL. CONC. % OF FEED COAL	34.00%
STEAM / TON PRODUCT	1362.97 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.45 kWhr
LOW SHEAR WORK/MTON PRODUCT	12.98 kWhr

RUN#: 44802
NUMBER: 2

DATE: 24-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2
Selective Grind - NO Spiral: GRIND TEST# 44801

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.38%	3.73%
% ASH (ASPHALT FREE BASIS)			3.82%
% SULFUR	NA	2.20%	1.91%
% PYRITIC SULFUR	NA	0.65%	0.39%
BTU/LB - ASTM	NA	13867	NA
BTU/LB CORRELATED	NA	13935	14832
BTU/LB " LESS ASPHALT			14757
LBS ASH/MMBTU	NA	6.01	2.51
LBS SO2/MMBTU	NA	3.16	2.58
LBS PYRITIC SO2/MBTU	NA	0.93	0.53
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		17.61	
PARTICLE D50 - μ M		6.36	
MOISTURE			18.48%

B. PROCESS REFUSE

% ASH	NA	86.07%
% SULFUR	NA	8.28%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.46%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		96.88%	NA
% ENERGY RECOVERY	NA	100.04%	NA
% ASH REDUCTION	NA	58.18%	NA
% SO2 REDUCTION	NA	18.44%	NA
% PYRITIC SO2 REDUCTION	NA	43.63%	NA
ASH SEPARATION FACTOR	NA	2126	
PYRITE SEPARATION FACTOR	NA	2006	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1132 lbs
GROSS PRODUCT WT. RECOVERED	1558 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1270 lbs
PRODUCT BINDER CONC.	2.50%
TOTAL BL. CONC. % OF FEED COAL	33.39%
STEAM / TON PRODUCT	1339.33 lbs
HIGH SHEAR WORK/MTON PRODUCT	9.87 kWhr
LOW SHEAR WORK/MTON PRODUCT	12.14 kWhr

RUN#: 44803
NUMBER: 3

DATE: 24-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral: GRIND TEST#, 44801

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.38%	3.64%
% ASH (ASPHALT FREE BASIS)			3.72%
% SULFUR	NA	2.20%	1.90%
% PYRITIC SULFUR	NA	0.65%	0.35%
BTU/LB - ASTM	NA	13867	NA
BTU/LB CORRELATED	NA	13935	14839
BTU/LB " LESS ASPHALT			14777
LBS ASH/MMBTU	NA	6.01	2.45
LBS SO2/MMBTU	NA	3.16	2.56
LBS PYRITIC SO2/MBTU	NA	0.93	0.47
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		17.61	
PARTICLE D50 - um		6.36	
MOISTURE			16.07%

B. PROCESS REFUSE

% ASH	NA	84.85%
% SULFUR	NA	8.28%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.25%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		96.25%	NA
% ENERGY RECOVERY	NA	99.95%	NA
% ASH REDUCTION	NA	59.21%	NA
% SO2 REDUCTION	NA	18.90%	NA
% PYRITIC SO2 REDUCTION	NA	49.44%	NA
ASH SEPARATION FACTOR	NA	2152	
PYRITE SEPARATION FACTOR	NA	2230	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	892 lbs
GROSS PRODUCT WT. RECOVERED	965 lbs
NET PRODUCT WT. RECOVERED (dry basis)	810 lbs
PRODUCT BINDER CONC.	2.08%
TOTAL BL. CONC. % OF FEED COAL	31.16%
STEAM / TON PRODUCT	1961.78 lbs
HIGH SHEAR WORK/MTON PRODUCT	12.01 kWhr
LOW SHEAR WORK/MTON PRODUCT	13.56 kWhr

RUN#: 45001
NUMBER: 1

DATE: 26-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral:

GRIND TEST# 45001

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.48%	3.63%
% ASH (ASPHALT FREE BASIS)			3.72%
% SULFUR	NA	2.12%	1.81%
% PYRITIC SULFUR	NA	0.86%	0.35%
BTU/LB - ASTM	NA	13715	NA
BTU/LB CORRELATED	NA	13917	14851
BTU/LB " LESS ASPHALT			14776
LBS ASH/MMBTU	NA	6.09	2.44
LBS SO2/MMBTU	NA	3.05	2.44
LBS PYRITIC SO2/MBTU	NA	1.24	0.47
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			38.64%

B. PROCESS REFUSE

% ASH	NA	83.64%
% SULFUR	NA	7.91%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.05%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		96.47%	NA
% ENERGY RECOVERY	NA	99.85%	NA
% ASH REDUCTION	NA	59.89%	NA
% SO2 REDUCTION	NA	19.99%	NA
% PYRITIC SO2 REDUCTION	NA	61.86%	NA
ASH SEPARATION FACTOR	NA	2113	
PYRITE SEPARATION FACTOR	NA	2125	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1121 lbs
GROSS PRODUCT WT. RECOVERED	1704 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1046 lbs
PRODUCT BINDER CONC.	2.51%
TOTAL BL. CONC. % OF FEED COAL	30.53%
STEAM / TON PRODUCT	1561.33 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.63 kWhr
LOW SHEAR WORK/MTON PRODUCT	15.70 kWhr

RUN#: 45002
NUMBER: 2

DATE: 26-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral: GRIND TEST# 45001

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.48%	3.82%
% ASH (ASPHALT FREE BASIS)			3.92%
% SULFUR	NA	2.12%	1.83%
% PYRITIC SULFUR	NA	0.86%	0.41%
BTU/LB - ASTM	NA	13715	NA
BTU/LB CORRELATED	NA	13917	14817
BTU/LB " LESS ASPHALT			14741
LBS ASH/MMBTU	NA	6.09	2.58
LBS SO2/MMBTU	NA	3.05	2.47
LBS PYRITIC SO2/MBTU	NA	1.24	0.55
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			19.89%

B. PROCESS REFUSE

% ASH	NA	87.40%
% SULFUR	NA	9.15%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.54%	NA
% TOTAL WT YIELD		96.97%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	100.13%	NA
% ASH REDUCTION	NA	57.69%	NA
% SO2 REDUCTION	NA	18.92%	NA
% PYRITIC SO2 REDUCTION	NA	55.22%	NA
ASH SEPARATION FACTOR	NA	2109	
PYRITE SEPARATION FACTOR	NA	2110	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield	1127 lbs
GROSS PRODUCT WT. RECOVERED	1365 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1094 lbs
PRODUCT BINDER CONC.	2.51%
TOTAL BL. CONC. % OF FEED COAL	30.55%
STEAM / TON PRODUCT	1242.56 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.57 kWhr
LOW SHEAR WORK/MTON PRODUCT	13.18 kWhr

RUN#: 45003
NUMBER: 3

DATE: 26-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral: GRIND TEST# 45001

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	8.48%	3.93%
% ASH (ASPHALT FREE BASIS)			4.01%
% SULFUR	NA	2.12%	1.85%
% PYRITIC SULFUR	NA	0.86%	0.41%
BTU/LB - ASTM	NA	13715	NA
BTU/LB CORRELATED	NA	13917	14786
BTU/LB " LESS ASPHALT			14724
LBS ASH/MMBTU	NA	6.09	2.66
LBS SO2/MMBTU	NA	3.05	2.50
LBS PYRITIC SO2/MBTU	NA	1.24	0.55
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		NA	
PARTICLE D50 - uM		NA	
MOISTURE			22.81%

B. PROCESS REFUSE

% ASH	NA	84.24%
% SULFUR	NA	9.01%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.43%	NA
% TOTAL WT YIELD		96.39%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	99.91%	NA
% ASH REDUCTION	NA	56.38%	NA
% SO2 REDUCTION	NA	17.87%	NA
% PYRITIC SO2 REDUCTION	NA	55.13%	NA
ASH SEPARATION FACTOR	NA	1983	
PYRITE SEPARATION FACTOR	NA	2075	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1080 lbs
GROSS PRODUCT WT. RECOVERED	1418 lbs
NET PRODUCT WT. RECOVERED (dry basis)	1095 lbs
PRODUCT BINDER CONC.	2.04%
TOTAL BL. CONC. % OF FEED COAL	23.92%
STEAM / TON PRODUCT	1598.84 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.64 kWhr
LOW SHEAR WORK/MTON PRODUCT	11.00 kWhr

RUN#: 45101
NUMBER: 1

DATE: 27-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral: GRIND TEST# 45101

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	7.89%	3.68%
% ASH (ASPHALT FREE BASIS)			3.78%
% SULFUR	NA	2.08%	1.81%
% PYRITIC SULFUR	NA	0.72%	0.35%
BTU/LB - ASTM	NA	13895	NA
BTU/LB CORRELATED	NA	14023	14847
BTU/LB " LESS ASPHALT			14765
LBS ASH/MMBTU	NA	5.63	2.48
LBS SO2/MMBTU	NA	2.97	2.44
LBS PYRITIC SO2/MBTU	NA	1.03	0.47
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		NA	
PARTICLE D50 - μ M		NA	
MOISTURE			22.65%

B. PROCESS REFUSE

% ASH	NA	85.31%
% SULFUR	NA	8.47%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.96%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		97.63%	NA
% ENERGY RECOVERY	NA	99.99%	NA
% ASH REDUCTION	NA	55.95%	NA
% SO2 REDUCTION	NA	17.81%	NA
% PYRITIC SO2 REDUCTION	NA	54.09%	NA
ASH SEPARATION FACTOR	NA	2142	
PYRITE SEPARATION FACTOR	NA	2298	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1031 lbs
GROSS PRODUCT WT. RECOVERED	1243 lbs
NET PRODUCT WT. RECOVERED (dry basis)	961 lbs
PRODUCT BINDER CONC.	2.73%
TOTAL BL. CONC. % OF FEED COAL	27.97%
STEAM / TON PRODUCT	1357.38 lbs
HIGH SHEAR WORK/MTON PRODUCT	12.64 kWhr
LOW SHEAR WORK/MTON PRODUCT	3.20 kWhr

RUN#: 45102
NUMBER: 2

DATE: 27-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral: GRIND TEST# 45101

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	7.89%	3.78%
% ASH (ASPHALT FREE BASIS)			3.88%
% SULFUR	NA	2.08%	1.81%
% PYRITIC SULFUR	NA	0.72%	0.38%
BTU/LB - ASTM	NA	13895	NA
BTU/LB CORRELATED	NA	14023	14825
BTU/LB " LESS ASPHALT			14748
LBS ASH/MMBTU	NA	5.63	2.55
LBS SO2/MMBTU	NA	2.97	2.44
LBS PYRITIC SO2/MBTU	NA	1.03	0.51
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - uM		NA	
PARTICLE D50 - uM		NA	
MOISTURE			22.76%

B. PROCESS REFUSE

% ASH	NA	77.94%
% SULFUR	NA	7.96%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.58%	NA
% TOTAL WT YIELD		97.07%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	99.47%	NA
% ASH REDUCTION	NA	54.68%	NA
% SO2 REDUCTION	NA	17.69%	NA
% PYRITIC SO2 REDUCTION	NA	50.08%	NA
ASH SEPARATION FACTOR	NA	1901	
PYRITE SEPARATION FACTOR	NA	1981	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1025 lbs
GROSS PRODUCT WT. RECOVERED	1179 lbs
NET PRODUCT WT. RECOVERED (dry basis)	911 lbs
PRODUCT BINDER CONC.	2.56%
TOTAL BL. CONC. % OF FEED COAL	25.87%
STEAM / TON PRODUCT	1479.01 lbs
HIGH SHEAR WORK/MTON PRODUCT	12.71 kWhr
LOW SHEAR WORK/MTON PRODUCT	7.94 kWhr

RUN#: 45103
NUMBER: 3

DATE: 27-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2
Selective Grind - NO Spiral: GRIND TEST# 45101

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	7.89%	3.99%
% ASH (ASPHALT FREE BASIS)			4.09%
% SULFUR	NA	2.08%	1.84%
% PYRITIC SULFUR	NA	0.72%	0.36%
BTU/LB - ASTM	NA	13895	NA
BTU/LB CORRELATED	NA	14023	14787
BTU/LB " LESS ASPHALT			14709
LBS ASH/MMBTU	NA	5.63	2.70
LBS SO2/MMBTU	NA	2.97	2.49
LBS PYRITIC SO2/MBTU	NA	1.03	0.49
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			24.87%

B. PROCESS REFUSE

% ASH	NA	78.49%
% SULFUR	NA	8.12%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.90%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		97.38%	NA
% ENERGY RECOVERY	NA	99.54%	NA
% ASH REDUCTION	NA	52.04%	NA
% SO2 REDUCTION	NA	16.11%	NA
% PYRITIC SO2 REDUCTION	NA	52.58%	NA
ASH SEPARATION FACTOR	NA	1820	
PYRITE SEPARATION FACTOR	NA	2140	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1029 lbs
GROSS PRODUCT WT. RECOVERED	1276 lbs
NET PRODUCT WT. RECOVERED (dry basis)	959 lbs
PRODUCT BINDER CONC. (est-may have run out)	2.55%
TOTAL BL. CONC. % OF FEED COAL	25.87%
STEAM / TON PRODUCT	1474.24 lbs
HIGH SHEAR WORK/MTON PRODUCT	12.67 kWhr
LOW SHEAR WORK/MTON PRODUCT	8.55 kWhr

RUN#: 45201
NUMBER: 1

DATE: 28-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral;

GRIND TEST#

45201

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	7.89%	3.48%
% ASH (ASPHALT FREE BASIS)			3.62%
% SULFUR	NA	2.08%	1.74%
% PYRITIC SULFUR	NA	0.72%	0.30%
BTU/LB - ASTM	NA	13895	NA
BTU/LB CORRELATED	NA	14023	14910
BTU/LB " LESS ASPHALT			14794
LBS ASH/MMBTU	NA	5.63	2.33
LBS SO2/MMBTU	NA	2.97	2.33
LBS PYRITIC SO2/MBTU	NA	1.03	0.40
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		NA	
PARTICLE D50 - um		NA	
MOISTURE			29.60%

B. PROCESS REFUSE

% ASH	NA	81.01%
% SULFUR	NA	7.63%

C. PROCESS PERFORMANCE

	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.48%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		98.29%	NA
% ENERGY RECOVERY	NA	99.68%	NA
% ASH REDUCTION	NA	58.52%	NA
% SO2 REDUCTION	NA	21.32%	NA
% PYRITIC SO2 REDUCTION	NA	60.81%	NA
ASH SEPARATION FACTOR	NA	2115	
PYRITE SEPARATION FACTOR	NA	2403	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1038 lbs
GROSS PRODUCT WT. RECOVERED	1362 lbs
NET PRODUCT WT. RECOVERED (dry basis)	959 lbs
PRODUCT BINDER CONC. * estimate *	3.87%
TOTAL BL. CONC. % OF FEED COAL * estimate*	38.57%
STEAM / TON PRODUCT	1572.97 lbs
HIGH SHEAR WORK/MTON PRODUCT	12.56 kWhr
LOW SHEAR WORK/MTON PRODUCT	5.65 kWhr

RUN#: 45401
NUMBER: 1

DATE: 30-Mar-90

page1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral:

GRIND TEST# 45401

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	7.76%	3.97%
% ASH (ASPHALT FREE BASIS)			3.97%
% SULFUR	NA	2.09%	1.84%
% PYRITIC SULFUR	NA	0.68%	0.37%
BTU/LB - ASTM	NA	14002	NA
BTU/LB CORRELATED	NA	14047	14731
BTU/LB " LESS ASPHALT			14731
LBS ASH/MMBTU	NA	5.52	2.69
LBS SO2/MMBTU	NA	2.98	2.50
LBS PYRITIC SO2/MBTU	NA	0.97	0.50
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - um		18.22	
PARTICLE D50 - um		6.74	
MOISTURE			52.37%

B. PROCESS REFUSE

% ASH	NA	78.49%
% SULFUR	NA	7.45%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	94.91%	NA
% TOTAL WT YIELD INCLUDING ASPHALT		94.91%	NA
% ENERGY RECOVERY	NA	99.54%	NA
% ASH REDUCTION	NA	51.22%	NA
% SO2 REDUCTION	NA	16.05%	NA
% PYRITIC SO2 REDUCTION	NA	48.12%	NA
ASH SEPARATION FACTOR	NA	1877	
PYRITE SEPARATION FACTOR	NA	1911	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1111 lbs
GROSS PRODUCT WT. RECOVERED	1419 lbs
NET PRODUCT WT. RECOVERED (dry basis)	676 lbs
PRODUCT BINDER CONC.	0.0 %
TOTAL BL. CONC. % OF FEED COAL	22.35%
STEAM / TON PRODUCT	1323.50 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.74 kWhr
LOW SHEAR WORK/MTON PRODUCT	3.57 kWhr

RUN#: 45402
NUMBER: 2

DATE: 30-Mar-90

page 1

I. CLEANING SUMMARY

FEED COAL ID: PITTSBURGH SEAM - BLACKSVILLE NO. 2

Selective Grind - NO Spiral:

GRIND TEST#

45404

A. MATERIAL PROPERTIES	RUN OF MINE	GRINDING PRODUCT	AGGLOM' PRODUCT
% ASH	NA	7.76%	3.74%
% ASH (ASPHALT FREE BASIS)			3.91%
% SULFUR	NA	2.09%	1.89%
% PYRITIC SULFUR	NA	0.68%	0.37%
BTU/LB - ASTM	NA	14002	14476
BTU/LB CORRELATED	NA	14047	14875
BTU/LB " LESS ASPHALT			14742
LBS ASH/MMBTU	NA	5.52	2.51
LBS SO2/MMBTU	NA	2.98	2.54
LBS PYRITIC SO2/MMBTU	NA	0.97	0.50
SIZE CONSIST	1/4" x 0		PELLETS
PARTICLE D90 - μ M		18.22	
PARTICLE D50 - μ M		6.74	
MOISTURE			19.38%

B. PROCESS REFUSE

% ASH	NA	82.72%
% SULFUR	NA	8.16%

C. PROCESS PERFORMANCE	GRINDING	AGGLM'	TOTAL
% YIELD FROM FEED	NA	95.12%	NA
% TOTAL WT YIELD		99.49%	NA
INCLUDING ASPHALT			
% ENERGY RECOVERY	NA	99.83%	NA
% ASH REDUCTION	NA	54.49%	NA
% SO2 REDUCTION	NA	14.60%	NA
% PYRITIC SO2 REDUCTION	NA	48.62%	NA
ASH SEPARATION FACTOR	NA	2012	
PYRITE SEPARATION FACTOR	NA	2098	

D. AGGLOMERATION PROCESS MATERIAL AND ENERGY TOTALS

TOTAL PRODUCT WT. (dry basis via wt. yield)	1164 lbs
GROSS PRODUCT WT. RECOVERED	1166 lbs
NET PRODUCT WT. RECOVERED (dry basis)	940 lbs
PRODUCT BINDER CONC.	4.39%
TOTAL BL. CONC. % OF FEED COAL	35.22%
STEAM / TON PRODUCT	1488.88 lbs
HIGH SHEAR WORK/MTON PRODUCT	11.20 kWhr
LOW SHEAR WORK/MTON PRODUCT	10.99 kWhr

LABORATORY ANALYSIS INDEX

RUN No.	BM FEED	BM PRODUCT	CENT. FEED	FGM FEED	FGM PRODUCT	SPIRAL TAILS	FINAL PRODUCT	AGG FEED	AGG	PRIM TAILS	SEC TAILS	BINDER SOLN
26401		BCDM	BCDM		BCDM		BCDM					
26501		BCDM	BCDM		BCDM		BCDM					
27102		BCDM	BCDM		BCDM		BCDM					
27103		BCDM	BCDM		BCDM		BCDM					
27201		BCDM	BCDM		BCDM		BCDM					
28601	Tests ACDEFGHIJMNUVW on ROM Illinois No. 6, Burning Star No. 4, Perry County, Illinois											
29801		BCDM	BCDM		BCDM		BCDM					
29803	ACD	CDM	BCDM		BCDM		BCDM					
30601	ACD						CD					
30701								BCDEFM	ACDEFL	BCD	BCD	BCDE
31201								BCDEF	ACDEF	BCD	BCD	BCDF
32401								BCD	ACD	BCD		BCD
32501								BCDEFM	ACDEF	BCD	BCD	
32601								BCDEFM	ACDEF	BCD	BCD	BCDEF
33101		BRS			BRS		BRS					
33102		BRS			BRS		BRS					
33103		BRS			BRS		BRS					
33104		BCDEFLMRS	BCDEFMRS		BCDEFLMRS		BCDEFLMRS					
33105					BCDMRS		BCDMRS					
33106	Rheology Testing Of Illinois No. 6 Slurries with d90 < 20 μ m (See Appendix D)											
33401								BCDERS				BCD
33403								ACDEF		BCD		
33501								BCDEFRS	ACDEFRS	BCDRS	BCDRS	
34201								BCDEFRS	ACDEFRS	BCDRS	BCD	
34601								BCDEFMRS	ACDEFRS	BCDRS	BCD	
34602	Test M on Blender Feed											
34701								BCDEFRS	ACDEFRS	BCDRS	BCD	
34801								BCDEFMRS	ACDEFRS	BCDRS	BCD	
34802									ACDEFRS	BCDRS	BCD	
34901								BCDEFMRS	ACDEFRS	BCDRS	BCD	

LABORATORY ANALYSIS INDEX

RUN No.	BM FEED	BM PRODUCT	CENT. FEED	FGM FEED	FGM PRODUCT	SPIRAL TAILS	FINAL PRODUCT	AGG FEED	AGG	PRIM TAILS	SEC TAILS	BINDER SOLN
35001	ACDEFRS					BCDRS	BCDEFMRS	BCDEFMRS				
35301									ACDEF	BCD	BCD	
35302	ACDEF					BCD	BCDEFM					
35401								ACDEFGHIKLPUVW	BCDEFIKLQ	BCD		
36801								ACDEF	BCDE	BCD		BCDEF
36802	ACDEF					BC D	BCDEFM					
36803								ACDEF	BCD	BCD		
36804								ACDEF	BCD	BCD		
36901								ACD	BCD	BCD		
36902								ACDEF	BCD	BCD		
36903	ACDEF					BCD	BCDEF					
36904								ACDEF	BCD	BCD		
37001								ACD	BCD	BCD		
37002								ACD	BCD	BCD		
37003								ACDEF	BCD	BCD		
37301								ACDEF	BCD	BCD		
37302								ACD	BCD	BCD		
37303								ACD	BCD	BCD		
37401								BCDEFM	ACDEF	BCD	BCD	
37403	ACDEF					BCD	BCDEFM					
37404	Rheology Testing of Illinois No. 6 2-Stage Grind Slurries (Refer to Appendix D)											
37501								ACD	BCD	BCD		
37502								ACD	BCD	BCD		
37503								ACDEF	BCD	BCD		
37504								ACD	BCD	BCD		
37601								ACD				
37602								ACD				
37603								ACD				
37701								ACD				
37702								ACD				

LABORATORY ANALYSIS INDEX

RUN No.	BM FEED	BM PRODUCT	CENT. FEED	FGM FEED	FGM PRODUCT	SPIRAL TAILS	FINAL PRODUCT	AGG FEED	AGG	PRIM TAILS	SEC TAILS	BINDER SOLN
38001									ACD			
38002									ACD			
38003									ACD			
38301									ACD			
38401									ACD			
38701									ACD			
38702									ACD			
38801									ACD			
38802									ACD			
38803									ACD			
38901									ACD			
38902									ACD			
38903									ACD			
39001								BCDEFMO	ACDEFP	BCDQ		
39002									ACDEFP	BCDQ		
39003								BCDEFMO	ACDEFP	BCDQ		
39101									ACD			
39401	Tests ACDEFGHIJMNUVW - ROM Upper Freeport, Helen Mine, Indiana County, PA											
39501								BCD	ACD			
39502									ACD			
39601									ACD			
39602									ACDP			
39701								BCD	ACD			
39702									ACDP			
39703									ACD			
39801								BCD	ACDP			
40101					CDM							
40201								BCDEFMO	ACDEF	BCD		
40202	(Lab Grind - M)											
40401									ACDEF	BCD		

LABORATORY ANALYSIS INDEX

RUN No.	BM FEED	BM PRODUCT	CENT. FEED	FGM FEED	FGM PRODUCT	SPIRAL TAILS	FINAL PRODUCT	AGG FEED	AGG	PRIM TAILS	SEC TAILS	BINDER SOLN
40402A	ACD	BCDM		BCDEFM	BCDM	BCDM	BCDM					
40402B	ACD	BCDEFM		BCDEFM	BCDEFIM	BCDEFM	BCDEFM					
40402C	ACD	BCDEFM		BCDEFM	BCDEFIM	BCDEFM	BCDEFM					
40501								BCDEFM	PCDEFIL	BCD		
40502									ACDEF	BCD		
40503A	ACD	BCDM			BCDM							
40503B	ACD	BCDM			BCDM							
40503C	ACD	BCDM			BCDM							
40801								BCDEFMO	ACDEF	BCD		
40802									ACDEF	BCD		
40803A	BCD	BCDEFM		BCDEFM	BCDEFM		BCDEFM					
40803B	BCD	BCDEFM		BCDEFM	BCDEFM		BCDEFM					
40803C	BCD	BCDEFM		BCDEFM	BCDEFM		BCDEFM					
40901								BCDEFM	ACDEF	BCD		
41101									ACDEF	BCD		
41102	ACD	BCDEFMO						BCD	ACDEF	BCD		
41103								BCD	ACDEF	BCD		
41201									ACDEF			
42001	ACD	BCD		BCD	BCD	BCD	BCD					
42001	ACD	BCD		BCD	BCD	BCD	BCD					
42001	ACD	BCDEF		BCDM	BCDM	BCDM	BCDEFM					
42002									BCDEF			
42201									BCDEF			
42202								BCDEF	BCDEF			
42203									ACDEF	BCD		
42301									ACD			
42302	ACDE					BCD	BCDEFM					
42303								BCDE	ACDEF	BCD		
42304									ACDEF	BCD		
42305									ACDEF	BCD		

LABORATORY ANALYSIS INDEX

RUN No.	BM FEED	BM PRODUCT	CENT. FEED	FGM FEED	FGM PRODUCT	SPIRAL TAILS	FINAL PRODUCT	AGG FEED	AGG	PRIM TAILS	SEC TAILS	BINDER SOLN
42401	ACDE					BCD	BCDEFM		ACDEF			
42402									ACD	BCD		
42403									ACDEF	BCD		
42501								BCDEF	ACDEF	BCD		
42502									ACD	BCD		
42504								BCDEF	ACDEF	BCD		
42601									ACDE	BCD		
42602									ACDE	BCD		
42603	ACDE					BCD	BCDE	BCDEM	ACDE	BCD		
42701								BCDEFM	ACDE	BCD		
42702	ACDE								ACDE			
42703	ACDE					BCD	BCDEM					
43101									ACD			
43201									ACD			
43202									ACD			
43203									ACD			
43204	ACD					BCD	BCD		ACD			
43301									ACD			
43302									ACD			
43303									ACD			
43601	ACDEF	BCD		BCD	BCD		BCD					
43701								BCDEFM	ACDEF	BCD		
43702									ACDEF1	BCD		
43801									ACDEF	BCD		
43802	ACDEF					BCD	BCD					
43901								BCDEFB	ACDEF	BCD		
43902									ACDEF	BCD		
44001									ACDEF	BCD		
44002								BCDEFM	ACDEF	BCD		
44003	Tests ACDEFGHIJMNUVW - Pittsburgh Seam Coal, Blacksville No. 2 Mine, Monongalia County, West Virginia											

LABORATORY ANALYSIS INDEX

RUN No.	BM FEED	BM PRODUCT	CENT. FEED	FGM FEED	FGM PRODUCT	SPIRAL TAILS	FINAL PRODUCT	AGG FEED	AGG	PRIM TAILS	SEC TAILS	BINDER SOLN
44301								BCDEFM	ACDEF	BCD		
44302									ACDEF	BCD		
44303									ACDE			
44501								BCDEFM	ACDEF	BCD		
44502									ACDEF	BCD		
44601								BCDEFM	ACDEFP	BCDQ		
44602									ACDEF	NCD		
44603									ACDEFP	BCDQ		
44700	Tests CEF - Pittsburgh Coal											
44701								BCDEFM	ACDE	BCD		
44702									ACDE	BCD		
44703									ACDE	BCD		
44801								BCDEFM	ACDE	BCD		
44802									ACDE	BCD		
44803									ACDE	BCD		
45001								BCDEF	ACDE	BCD		
45002									ACDE	BCD		
45003									ACDE	BCD		
45101								BCDEF	ACDE	BCD		
45102									ACDE	BCD		
45103									ACDE	BCD		
45201									ACDE	BCD		
45401									ACDE	BCD		
45402								BCDEFILMOUW	ACDEFLPUW	BCDQ		

LABORATORY ANALYSIS INDEX

RUN	BM	BM	CENT.	FGM	FGM	SPIRAL	FINAL	AGG	AGG	PRIM	SEC	BINDER
No.	FEED	PRODUCT	FEED	FEED	PRODUCT	TAILS	PRODUCT	FEED		TAILS	TAILS	SOLN

KEY

A - Total Moisture
 B - Percent Solids
 C - Ash
 D - Total Sulfur
 E - Sulfur Forms
 F - Heating Value
 G - Proximate Analysis (minus U & V)
 H - Ultimate Analysis
 I - Mineral Ash Analysis
 J - Water Analysis
 K - Trace Elements
 L - Petrography

M - Size Analysis (Microtrac)
 N - Coarse Coal Washability
 O - Centrifugal Washability
 P - Heptane in Agglomerates
 Q - Heptane in Talings
 R - 'Quick' Ash
 S - 'Quick' Sulfur
 T - Coarse Coal Screening
 U - Free Swelling Index
 V - Hardgrove Grindability Index
 W - Ash Fusion Characteristics
 X - Vapor Analysis

EXPORTech Company, Inc.
A RESEARCH AND DEVELOPMENT COMPANY

January 17, 1990

RE: Petrographic Analysis:
Bechtel Run 30701, ETCi Sample 311302
Bechtel Run 33104, ETCi Samples 311201, 312203, and 312204

Note regarding Run 33104: Sample 311201 (run 30601) was requested by Bechtel.

Each coal sample was mixed with a plastic mounting media, pressed into a cylindrical pellet, ground and polished for microscopic observation. A total of 500 pyrite particles per sample were measured and assigned to a free, semi-locked or locked category. The results of the petrographic analyses are listed in Table I and typical photomicrographs of the coal samples are shown in Figures 1 through 6.

ETCi sample 311302 has the least pyrite and also the least non-pyritic mineral matter of the current group of coal samples, Table I and Figures 1, 3, and 5. The pyrite are all less than 10 microns in size and occur most frequently in the semi-locked and locked categories.

ETCi sample 311201 is the coarsest of the subject samples and is intermediate in the content of pyrite and other minerals, Table I and Figures 1, 3, and 5. A large proportion of the pyrite is free or semi-locked. Some of the pyrite is relatively coarse and is up to 57 microns in greatest dimension.

ETCi sample 312203 is relatively coarse but less coarse than 311201. The pyrite content in sample 312203 is about twice that of other samples. The sample also contains the most mineral matter. The bulk of the pyrite is 21 microns or less and occurs mostly in the semi-locked and free categories, Table I and Figures 2, 4, and 6. This coal sample is very high in minerals and is probably a refuse or reject fraction.

ETCi sample 312204 is the finest size coal sample in the group. Most of the pyrite is 7 microns or less, Table I and Figures 2, 4, and 6. Most of the pyrite is semi-locked or locked. The particles of coal in this sample are frequently irregular in shape and there is a relatively large amount of very fine clay in the sample.

The data in this study is on a frequency basis so you will probably wish to convert these data to a weight percent.

The photomicrographs in Figures 3 and 4 were taken without a blue filter. The filter was used in taking the photomicrographs in Figures 5 and 6.

FREQUENCY DISTRIBUTION BY SIZE AND ASSOCIATION OF PYRITE FOR
ETC_i SAMPLES 311302, 311201, 312203, 312204
BECHTEL RUNS 30701 AND 33104

[illegible]

EXPORTech Company, Inc.
A RESEARCH AND DEVELOPMENT COMPANY

March 9, 1990

RE: Petrographic Analysis
Bechtel Run 33104, ETCi sample 312201
Bechtel Run 35401, ETCi samples 313801, 313802

Note: ETCi Sample 312201 was analyzed to replace 311201,
incorrectly requested by Bechtel on December 7, 1989.

Each of the samples was mounted in plastic and ground and polished for microscopic analysis. From 700 to 1000 pyrite particles were measured per sample and the association in terms of Free, Semi-Locked, and Locked was determined for each pyrite particle measured. The results of the analyses are shown in Table I. Photomicrographs of typical areas from each of the samples are shown in Figures 1 through 8.

ETCi sample 312201 is the coarsest of the samples and apparently is the "feed" sample. The coal is relatively high in ash and pyritic sulfur. The ash forming minerals are mostly clay with calcite, quartz, and pyrite. Most of the pyrite occurs as free and semi-locked, Table I, and Figures 1, 3, 5, and 7. Some of the pyrite is relatively coarse and gets up to 150 microns in longest dimension while the coarsest coal is about 200 microns. The coarsest pyrite particle encountered in the analysis was 47 microns.

ETCi sample 313801 is fine and uniform in size, Figures 1, 3, 5, and 7. The sample is probably a beneficiated product. The bulk of the coal is less than 10 microns but some of the coarser pyrites are about 30 microns in greatest dimension. Most of the pyrite is less than 2 microns and it is mostly semi-locked, Table I.

ETCi sample 313802 consists of an abundance of very fine clay with some other minerals of which pyrite is the most conspicuous, Figures 2, 4, 6, and 8. This sample is obviously a refuse product. The pyrite is free and is mostly about one micron or less in size, Table I, Figure 8.

All pyrite size data in this work is reported on a frequency basis.

Table I

FREQUENCY DISTRIBUTION BY SIZE AND ASSOCIATION OF PYRITE FOR
ETC1 SAMPLES 312201, 313801, AND 313802

Mean Size Microns	<u>Pyrite Association</u>			<u>Pyrite Association</u>			<u>Pyrite Association</u>		
	<u>Free</u>	<u>Semi-Locked</u>	<u>Locked</u>	<u>Free</u>	<u>Semi-Locked</u>	<u>Locked</u>	<u>Free</u>	<u>Semi-Locked</u>	<u>Locked</u>
1	26.2	21.5	6.8	15.3	45.9	10.5	90.0	---	---
3	10.5	9.7	3.3	6.6	15.5	2.1	8.9	---	---
5	4.4	4.7	1.6	0.8	2.9	0.2	1.1	---	---
7	2.8	1.7	0.8	---	0.2	---	---	---	---
9	0.8	0.7	0.5						
11	0.4	0.7	0.1						
13	0.2	0.7	---						
15	0.3	0.4	---						
17	0.1	0.2	0.2						
19	0.2	---	---						
21	---	---	0.1						
23	0.1	---	---						
25	---	---	---						
27	---	---	---						
29	---	---	---						
31	0.1	---	---						
33	---	---	---						
35	---	---	---						
7	---	---	---						
3	0.1	---	0.1						
41	---	---	---						
43	---	---	---						
45	---	---	---						
47	---	0.1	---

EXPORTech Company, Inc.
A RESEARCH AND DEVELOPMENT COMPANY

July 16, 1990

RE: Petrographic Analysis
Bechtel Run 35302
ETCi Sample 313702

The sample was mounted, ground, and polished for microscopic analysis. A total of 650 pyrite particles were measured and allocated to categories of Free, Semi-Locked, and Locked. Results of the petrographic analysis are listed in Table I. Photomicrographs of typical microscopic fields are shown in Figures 1 through 4.

The coal is high volatile A or B rank bituminous. It is a bright coal rich in vitrinite. Most of the coal is 15 microns or less with occasional particles up to 80 microns. There is a small amount of higher rank coal contamination.

The pyrite in the coal is mostly euhedral and consists of single, coarse crystals. Most of the other pyrite forms have probably been broken down and/or removed. The bulk of the pyrites is less than 3 microns on a frequency basis, Table I and Figures 2, 3 and 4. Most of the pyrite is semi-locked or locked with only minor amounts of free pyrite. Apparently nearly all of the free pyrite has been removed.

The sample has some quartz and very fine size clay in addition to the pyrite.

Table I

FREQUENCY DISTRIBUTION BY SIZE AND ASSOCIATION OF PYRITE FOR
ETC1 SAMPLE 313702

Mean Size, Microns	Free	Semi-Locked	Locked
1	10.3	53.5	19.6
3	1.6	3.5	1.9
5	0.5	2.1	0.3
7		0.5	0.2
9

EXPORTech Company, Inc.
A RESEARCH AND DEVELOPMENT COMPANY

March 9, 1990

Petrographic Analysis

Bechtel Run 40402, Run #3

ETCi Samples 330802 (Ball Mill Product), 330804 (FGM Product), and 330806 (Final Product)

The samples were prepared for microscopic analysis and 700 to 800 pyrite particles were measured per sample and assigned to categories of Free, Semi-Locked and Locked. The results of the analyses are shown in Table I and Figures 1 through 10.

The coal appears to be medium volatile bituminous and is high in ash forming minerals and pyrite. Most of the minerals are clay with some pyrite, quartz, and calcite.

ETCi sample 330802 is the Ball Mill Product. It is the coarsest sample and contains mostly free pyrite and semi-locked pyrite, Table I and Figures 1, 3, 5, 7, 9 and 10. Some coal particles are up to 650 microns in longest dimension with some pyrite as coarse as 240 microns. A large amount of the pyrite is 20-50 microns. The coal sample contains bone coal, carbonaceous shale, shale, clay shale, quartz, pyrite and calcite. There is some coal brecciation and a small amount of contamination with Illinois coal.

ETCi sample 330804 is the FGM Product. The coal size is intermediate with a few very coarse particles up to 540 microns but most of the coal is less than 20 microns. The sample has an abundance of pyrite and clay minerals and some quartz and calcite. Most of the pyrite is less than 10 microns. Much of the pyrite is free with intermediate amounts of semi-locked and a small amount of locked pyrite, Table I and Figures 1, 3, 5, and 7.

ETCi sample 330806 is the Final Product. The coal is very fine size with coal particles up to 30 microns and occasionally coarser. Much of the coal is less than 5 microns. The pyrite is mostly semi-locked, Table I and Figures 2, 4, 6, and 8. The pyrite is commonly about 1 micron or less.

The subject coal samples contain a wide variety of pyrite including framboidal, euhedral and massive (dense-irregular). The photomicrographs in Figures 9 and 10 show some of the variety of pyrite forms in the Ball Mill Product.

Table I

FREQUENCY DISTRIBUTION BY SIZE AND ASSOCIATION OF PYRITE FOR
ETCi SAMPLES 330802, 330804, 330806

Mean Size Microns	<u>Pyrite Association</u>			<u>Pyrite Association</u>			<u>Pyrite Association</u>		
	<u>Free</u>	<u>Semi-Locked</u>	<u>Locked</u>	<u>Free</u>	<u>Semi-Locked</u>	<u>Locked</u>	<u>Free</u>	<u>Semi-Locked</u>	<u>Locked</u>
1	40.0	20.4	11.5	29.3	14.4	2.6	32.7	41.8	8.3
3	8.9	5.2	3.8	24.0	6.7	0.9	6.9	6.6	0.8
5	4.3	3.0	1.6	12.4	2.2	0.1	1.5	1.2	0.2
7	2.0	2.0	0.8	5.1	0.5				
9	0.7	0.5	0.4	0.8	0.1				
11	0.2	0.5	0.2	0.3					
13	0.3	0.3	0.2	0.3					
15	0.1	0.2	---	0.1					
17	0.1	---	---	0.1					
19	0.1	0.1	---	---					
21	0.3	0.3	0.1	---					
23	---	---	---	---					
25	0.1	---	---	---					
27	---	0.1	---	---					
29	0.1	0.1	0.1	---					
31	---	---	---	---					
33	0.1	---	---	---					
5	0.1	0.1	---	---					
)	---	---	---	0.1					
41	---	---	---	---					
43	---	---	---	---					
45	---	0.1	---	---					
47	---	---	---	---					
49	---	---	---	---					
51	---	---	---	---

EXPORTech Company, Inc.
A RESEARCH AND DEVELOPMENT COMPANY

June 22, 1990

Petrographic Analysis
Bechtel Run 40501
ETCi Sample 331002

The coal sample was mounted in an epoxy plastic and ground and polished for microscopic analysis. A total of 500 pyrite particles were measured and allocated to categories of Free, Semi-Locked, and Locked. The results of the petrographic analysis are listed in Table I. Typical photomicrographs illustrating the microscopic appearance of the coal and pyrite are shown in Figures 1 through 5.

The coal appears to be medium volatile bituminous. It consists mostly of vitrinite with some (5 to 10%) of semifusinite and fusinite. The coal is sufficiently mature so that the liptinite or exinite is losing its optical distinction. Most of the coal is 10 microns or less with particles up to about 35 microns and occasionally coarser, Figures 1 and 2. There is some lower rank coal contamination.

The pyrite in the coal is mostly euhedral with some dense irregular forms. Quartz and quartz with pyrite inclusions are relatively common mineral forms in the coal. Much of the quartz is free. There is some disseminated clay.

The pyrite in coal sample 331002 is mostly 3 microns or less and mostly semi-locked or locked with very little free pyrite, Table I and Figures 3, 4, and 5.

The coal sample contains some aggregates that we were unable to break up in our preparation. The aggregates frequently contain quartz and pyrite. They appear to be held together by extremely fine material that is less than 0.5 microns, Figures 2 and 3.

Table I

FREQUENCY DISTRIBUTION BY SIZE AND ASSOCIATION OF PYRITE FOR
ETC1 SAMPLE 331002

Mean Size, Microns	Free	Semi-Locked	Locked
1	8.8	44.1	24.2
3	1.1	12.1	3.5
5	0.2	4.0	0.9
7		0.7	0.2
9			0.2

EXPORTech Company, Inc.
A RESEARCH AND DEVELOPMENT COMPANY

April 26, 1990

Petrographic Analysis

Bechtel Run 45402

ETCi Samples 339001 (Agglomeration Feed) and 339002 (Agglomerates)

The samples were prepared for microscopic analysis and 600 pyrite particles were measured per sample and categorized as Free, Semi-Locked and Locked. The results of the analyses are listed in Table I and photomicrographs illustrating the microscopic appearance of the coals are shown in Figures 1 through 4.

The coal in samples 339001 and 339002 looks very similar. The coal is high volatile "A-rank" bituminous. It has a relative abundance of vitrinite. Most of the pyrite is euhedral or what appears to be fragments of framboids. Both samples consist of a coal that is mostly less than 10 microns with a relative abundance of fines that are mostly less than 5 microns. Some coal particles in both samples get up to 600 microns in longest dimension but seldom exceed 40 microns. Most of the pyrite is in the size range of 0.5 to 1 micron and generally symmetrical in shape. The largest pyrite particles in the subject samples are about 9 microns.

Sample 339001 has more pyrite and other ash forming minerals (clay and quartz) than the other sample. It also has more Free pyrite, Table I, and Figures 1 through 4.

Sample 339002 has less pyrite and other minerals than 339001 and most of the pyrite is Semi-locked or Locked, Table I and Figures 1 through 4.

Table I

FREQUENCY DISTRIBUTION BY SIZE AND ASSOCIATION OF PYRITE FOR
ETC_i SAMPLES 339001 and 339002

Mean Size Microns	Sample 339001 <u>Pyrite Association</u>			Sample 339002 <u>Pyrite Association</u>		
	<u>Free</u>	<u>Semi-Locked</u>	<u>Locked</u>	<u>Free</u>	<u>Semi-Locked</u>	<u>Locked</u>
1	32.3	35.8	11.7	13.5	42.5	19.8
3	5.7	10.0	1.1	3.8	12.2	4.0
5	1.3	1.5	0.2	0.7	2.1	0.3
7	0.2	0.2	0.0	0.2	0.7	0.2

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract 19307-F-31

RUN #: 30601
SAMPLE DATE: 11-2-89

BECHTEL REFERENCE:	ETC#	MOISTURE WT. %	ASH WT. %	TOTAL SULFUR WT. %
BALL MILL FEED	311201	9.52	13.73	3.88
FINAL PRODUCT	311202	-----	12.73	3.27

```

: ch-top %pass %ch      : summary data
: 704.00 100.0 0.0      : dv: 0.0302
: 150.00 100.0 0.0      : %10: 2.28
: 75.00 100.0 0.0       : %50: 6.09
MICROTRAC DATA: DATA BASE UPDATE : 59.69 100.0 0.0 : %90: 14.39
measurment/present'n0: 1932 - 1: 42.21 100.0 0.1 : mv: 7.16
1997 0.69-704. SRA res: NORMAL : 29.85 99.9 1.2 : cs: 1.338
chan select bounds: 0.69- 704.00 : 21.10 98.7 7.2 :
progression: geom/sqrt2 8 chans:20 : 14.92 91.5 13.7 : sd: 4.82
sample date/time: 10/30/89 12:11 : 10.55 77.8 17.5 : ma: 4.48
sample ident: 310805 : 7.46 60.3 16.4 :
sample ID : F.P. : 5.28 44.0 12.2 : parameters
lot code: : 3.73 31.8 16.0 : name value
account 0: printer: OFF: 2.64 15.8 12.6 :smpl amt 0.000
run time: 30 sec. run 0: 100/ 2 : 1.69 3.2 2.8 :disprnt
sample preparation code: 0 : 1.01 0.4 0.4 :disp amt 0.000
notes: :disp med
:dmmed amt 0.000
:agitat'n
:agit tim 0
:circul'n
:circ tim 0
:param #1 0.000
:param #2 0.000
:param #3 0.000
Esc-exit f2-commands :

```

310805
F.P.
Record Number: 1932

13-Nov-89

EXPORTech Company, Inc.

Page 1

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract 19307-F-31

RUN #: 30701
SAMPLE DATE: 11-7-89

BECHTEL REFERENCE:	ETCI #	MOISTURE WT. %	SOLIDS WT. %	ASH WT. %	TOTAL SULFUR WT. %	BTU	<---- FORMS OF SULFUR ---->			
							%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	311301	-----	15.23	13.00	3.29	12226	0.93	0.21	2.15	
AGGLOMERATES	311302	34.68	-----	3.74	2.92	13781	0.51	0.08	2.33	-----
PRIMARY TAILS	311303	-----	7.84	78.13	6.28	-----	-----	-----	-----	-----
SECONDARY TAILS	311304	-----	10.02	14.83	2.87	-----	-----	-----	-----	-----
BINDER SOLUTION	311305	-----	5.52	0.52	3.98	17283	-----	-----	-----	-----

	: ch-top	%pass	%-ch	: summary data
	: 704.00	100.0	0.0	: dv: 0.0768
	: 150.00	100.0	0.0	: %10: 2.41
MM9	: 75.00	100.0	0.0	: %50: 7.62
MICROTRAC DATA: DATA BASE UPDATE	: 59.69	100.0	0.0	: %90: 19.35
measurment/présent'n#: 2245 -	1:	42.21	100.0 0.7	: mv: 9.17
7997 0.69-704. SRA res: NORMAL	: 29.85	99.3	6.0	: cs: 1.160
chan select bounds: 0.69- 704.00	: 21.10	93.3	12.7	:
progression: geom/sqrt2 # chans:20	: 14.92	80.6	15.6	: sd: 6.67
sample date/time: 11/09/89 17:02	: 10.55	65.0	16.0	: ma: 5.17
sample ident: 311301	: 7.46	49.0	13.1	LMNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
sample ID : 30701 A.A.G. FEED	: 5.28	35.9	9.6	: parameters
lot code:	: 3.73	26.3	13.2	: name value
account #:	printer: OFF:	2.64	13.1 10.5	:smpl amt 0.000
run time: 30 sec. run #: 100/ 2	: 1.69	2.5	2.3	:disprnt
sample preparation code: 0	: 1.01	0.2	0.2	:disp amt 0.000
notes:	:	:	:	:disp med
:	:	:	:	:dmed amt 0.000
:	:	:	:	:agitat'n
:	:	:	:	:agit tim 0
:	:	:	:	:circul'n
:	:	:	:	:circ tim 0
:	:	:	:	:param #1 0.000
MM9	:	:	:	:param #2 0.000
Esc-exit	F2-commands	:	:	:param #3 0.000

311301
30701 A.A.G. FEED
Record Number: 2245

P.O. No. 19307-F-46H

TEST RUN 26401

SAMPLE DATE: 9-21-89

BECHTEL REFERENCE:	ETC#	SOLIDS	ASH	TOTAL	MICROTRAC
		WT. %	WT. %	SULFUR WT. %	
BALL MILL PRODUCT	310101	23.27	28.52	4.21	
CENTRIFUGE FEED	310102	22.08	25.84	3.71	
FG MILL PRODUCT	310103	25.80	23.00	3.28	
FINAL PRODUCT	310104	4.58	34.75	2.06	

TEST RUN 26501

SAMPLE DATE: 9-22-89

BECHTEL REFERENCE:	ETC#	SOLIDS	ASH	TOTAL	MICROTRAC
		WT. %	WT. %	SULFUR WT. %	
BALL MILL PRODUCT	310201	38.97	26.19	4.60	
CENTRIFUGE FEED	310202	26.25	29.63	4.26	
FG MILL PRODUCT	310203	31.97	26.84	4.17	
FINAL PRODUCT	310204	7.54	36.01	2.37	

	ch-top	%pass	%-ch	summary data
NORMAL or HIGH resolution	: 704.00	100.0	0.0	: dv: 0.1011
	: 497.80	100.0	1.0	: %10: 3.62
MM9	: 352.00	99.0	2.1	: %50: 36.55
MICROTRAC DATA: MANUAL MODE	: 248.90	96.8	3.7	: %90: 151.39
measurment/present'n#: 1127 - 1	: 176.00	93.1	6.6	: mv: 61.70
7997 0.69-704. SRA res: NORMAL	: 124.45	86.6	11.1	: cs: 0.479
chan select bounds: 0.69- 704.00	: 88.00	75.5	10.7	:
progression: geom/sqrt2 # chans:20	: 62.23	64.8	9.3	: sd: 54.61
sample date/time: 09/26/89 07:46	: 44.00	55.5	9.6	: ma: 12.52
sample ident: 310101	: 31.11	46.0	8.8	LL
sample ID : BECHTEL BMP 9/21/89	: 22.00	37.1	7.4	: parameters
lot code:	: 15.56	29.7	6.2	: name value
account #: printer: OFF:	: 11.00	23.6	5.6	: smpl amt
run time: 30 sec. run #: 100/ 2	: 7.78	18.0	4.3	: disprnt
sample preparation code:	: 5.50	13.6	2.2	: disp amt
notes:	: 3.89	11.4	6.0	: disp med
	: 2.75	5.4	4.9	: dmed amt
	: 1.94	0.5	0.5	: aqitat'n
	: 1.38	0.0	0.0	: aqit tim
	: 0.97	0.0	0.0	: circul'n
	:			: circ tim
	:			: param #1
MM9				: param #2
Esc-exit F2-commands :				: param #3

```

:      Parameters
:  name      value
:smpl amt
:disprsnt
:disp amt
:disp med
:dmed amt
:aqitat'n
:aqit tim
:circul'n
:circ tim
:param #1
:param #2
:param #3

```

310101
BECHTEL BMP 9/21/89
Record Number: 1127

MAL	: ch-top %pass %ch	: summary data
NORMAL or HIGH resolution	: 704.00 100.0 0.0	: dv: 0.0737
	: 497.80 100.0 0.0	: %10: 2.71
MM9	: 352.00 100.0 0.0	: %50: 14.65
MICROTRAC DATA: MANUAL MODE	: 248.90 100.0 1.4	: %90: 92.36
measurment/present'n: 1130 - 1:	: 176.00 98.6 3.8	: mv: 31.56
7997 0.69-704. SRA res: NORMAL	: 124.45 94.8 5.5	: cs: 0.799
chan select bounds: 0.69- 704.00	: 88.00 89.3 5.4	:
progression: geom/sort2 # chans:20	: 62.23 84.0 5.9	: sd: 29.50
sample date/time: 09/26/89 07:52	: 44.00 78.0 6.6	: ma: 7.51
sample ident: 310102	: 31.11 71.4 9.3	LL
sample ID : BECHTEL CF 9/21/89	: 22.00 62.0 10.0	: parameters
lot code:	: 15.56 52.0 9.9	: name value
account #: printer: OFF:	: 11.00 42.0 10.1	:smpl amt
run time: 30 sec. run #: 100/ 2	: 7.78 31.9 7.6	:disprsnt
sample preparation code:	: 5.50 24.3 4.2	:disp amt
notes:	: 3.89 20.1 9.7	:disp med
	: 2.75 10.4 8.2	:dmed amt
	: 1.94 2.2 1.5	:aqitat'n
	: 1.38 0.7 0.7	:aqit tim
	: 0.97 0.0 0.0	:circul'n
	:	:circ tim
	:	:param #1
MM9		:param #2
Esc-exit F2-commands :		:param #3

310102
BECHTEL CF 9/21/89
Record Number: 1130

#####9

310103
BECHTEL FGMP 9/21/89
Record Number: 1133

7HAL	: ch-top 3pass 3-ch	: summary data
NORMAL or HIGH resolution	: 704.00 100.0 0.0	: dv: 0.1372
	: 497.80 100.0 0.0	: 310: 3.49
XXXXXXXXXXXXXXXXXXXXXXXXXXXX	352.00 100.0 0.0	: 350: 21.38
MICROTRAC DATA: MANUAL MODE	: 248.90 100.0 1.8	: 390: 109.65
measurment/present'n8: 1139 - 1:	176.00 98.2 5.4	: mv: 39.47
7997 0.69-704. SRA res: NORMAL	: 124.45 92.8 6.9	: cs: 0.560
chan select bounds: 0.69- 704.00	: 88.00 85.9 7.2	:
progression: geom/sqrt2 8 chans:20	: 62.23 78.7 7.0	: sd: 37.46
sample date/time: 09/26/89 08:21	: 44.00 71.7 8.6	: ma: 10.71
sample ident: 310201	: 31.11 63.1 12.0	XXXXXXXXXXXXXXXXXXXX
sample ID : BECHTEL BMP 9/22/89	: 22.00 51.1 11.8	: parameters
lot code:	: 15.56 39.3 10.9	: name value
account #:	printer: OFF: 11.00 28.4 9.1	:smpl amt
run time: 30 sec. run #: 100/ 2	: 7.78 19.2 5.1	:disprnt
sample preparation code:	: 5.50 14.1 2.0	:diso amt
notes:	: 3.89 12.2 6.3	:diso med
	: 2.75 5.9 5.2	:dmed amt
	: 1.94 0.8 0.7	:aqitat'n
	: 1.38 0.1 0.1	:aqit tim
	: 0.97 0.0 0.0	:circul'n
	:	:circ tim
	:	:paran 01
XXXXXXXXXXXXXXXXXXXXXXXXXXXX		:paran 02
Esc-exit F2-commands :		:paran 03

310201
 BECHTEL BMP 9/22/89
 Record Number: 1139

```

: ch-top 3pass 3-ch      : summary data
NORMAL or HIGH resolution : 704.00 100.0 0.0      : dv: 0.1067
                          : 497.80 100.0 0.0      : 310: 2.72
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9 352.00 100.0 0.0 : 350: 15.39
MICROTRAC DATA: MANUAL MODE : 248.90 100.0 2.1 : 390: 107.49
measure't/present'n0: 1142 - 1: 176.00 97.9 5.3 : mv: 35.27
7997 0.69-704. SRA res: NORMAL : 124.45 92.6 5.7 : cs: 0.772
chan select bounds: 0.69- 704.00 : 88.00 87.0 5.8 :
progression: geom/sqrt2 8 chans:20 : 62.23 81.1 5.5 : sd: 35.75
sample date/time: 09/26/89 08:27 : 44.00 75.6 6.3 : na: 7.77
sample ident: 310202 : 31.11 69.4 9.1 LMMMMMMMMMMMMMMMMMMMMMMMM
sample ID : BECHTEL CF 9/22/89 : 22.00 60.2 9.9 : parameters
lot code: : 15.56 50.4 10.3 : name value
account #: printer: OFF: 11.00 40.0 10.4 :smol ant
run time: 30 sec. run #: 100/ 2 : 7.78 29.7 6.7 :disprnt
sample preparation code: : 5.50 22.9 2.8 :disp ant
notes: : 3.89 20.1 9.8 :disp med
: 2.75 10.3 8.3 :dmed ant
: 1.94 2.0 1.4 :agitat'n
: 1.38 0.6 0.6 :aqit tim
: 0.97 0.0 0.0 :circul'n
: :circ tim
: :param 01
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9 :param 02
Esc-exit F2-commands : :param 03

```

310202
BECHTEL CF 9/22/89
Record Number: 1142

```

L                                     : ch-top &pass &-ch      : summary data
NORMAL or HIGH resolution           : 704.00 100.0 0.0      : dv: 0.0448
                                     : 497.80 100.0 0.0      : $10: 2.59
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9 352.00 100.0 0.0      : $50: 10.27
MICROTRAC DATA: MANUAL MODE        : 248.90 100.0 0.0      : $90: 29.90
measurment/present'n0: 1157 -      1: 176.00 100.0 0.0      : mv: 13.58
7997 0.69-704. SRA res: NORMAL      : 124.45 100.0 0.0      : cs: 0.963
chan select bounds: 0.69- 704.00    : 88.00 100.0 0.0      :
progression: geom/sort2 8 chans:20   : 62.23 100.0 3.1      : sd: 10.73
sample date/time: 09/26/89 08:54    : 44.00 96.9 5.5       : na: 6.23
sample ident: 310203                : 31.11 91.4 10.3      LMMMMMMMMMMMMMMMMMMMM
sample ID : BECHTEL FGMP 9/22/89    : 22.00 81.1 14.2      : parameters
lot code:                           : 15.56 66.9 14.2      : name value
account #: printer: OFF: 11.00 52.7 11.9 :sapl amt
run time: 30 sec. run #: 100/ 2     : 7.78 40.8 10.6      :disprnt
sample preparation code:              : 5.50 30.2 6.0       :diso amt
notes:                               : 3.89 24.2 12.2      :disp med
                                     : 2.75 12.0 10.2      :dmed amt
                                     : 1.94 1.8 1.3        :agitat'n
                                     : 1.38 0.5 0.5        :agit tin
                                     : 0.97 0.0 0.0        :circul'n
                                     :                    :circ tin
                                     :                    :paran #1
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9 :                    :paran #2
Esc-exit F2-commands :                    :paran #3

```

310203
BECHTEL FGMP 9/22/89
Record Number: 1157

#####9

Esc-exit

F2-commands

310204
BECHTEL FP 9/22/89
Record Number: 1151

06-Oct-89

EXPORTech Company, Inc.

Page

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

P.O. No. 19307-F-46H

RUN #:	27102				
SAMPLE DATE:	09-28-89				
		SOLIDS	ASH	TOTAL	
		WT. %	WT. %	SULFUR	
BECHTEL REFERENCE:	ETC#			WT. %	MICROTRAC
=====					
BALL MILL PRODUCT	310301	26.02	31.05	4.50	
CENTRIFUGE FEED	310302	37.06	42.60	10.64	
FG MILL PRODUCT	310303	48.76	46.93	12.95	
FINAL PRODUCT	310304	14.45	28.97	4.04	

NORMAL	: ch-top	%pass	%-ch	: summary data
NORMAL or HIGH resolution	: 704.00	100.0	0.0	: dv: 0.0768
	: 497.80	100.0	3.3	: %10: 3.72
#####	352.00	96.7	2.3	: %50: 43.57
MICROTRAC DATA: MANUAL MODE	: 248.90	94.4	6.5	: %90: 199.84
measurment/present'n0: 1247 -	1: 176.00	87.9	7.9	: mv: 76.55
7997 0.69-704. SRA res: NORMAL	: 124.45	80.0	8.3	: cs: 0.441
chan select bounds: 0.69- 704.00	: 88.00	71.6	10.1	:
progression: geom/sqrt2 0 chans:20	: 62.23	61.5	11.2	: sd: 71.25
sample date/time: 09/29/89 14:01	: 44.00	50.3	8.6	: ma: 13.59
sample ident: 310301	: 31.11	41.7	7.7	L#####
sample ID : BECHTEL BMP 27102	: 22.00	34.0	7.6	: parameters
lot code:	: 15.56	26.4	5.1	: name value
account 0: printer: OFF:	11.00	21.3	6.2	:smpl amt
run time: 30 sec. run 0: 100/ 2	: 7.78	15.1	3.9	:disprsnt
sample preparation code:	: 5.50	11.2	0.3	:disp amt
notes:	: 3.89	10.8	5.4	:disp med
	: 2.75	5.4	4.6	:dmed amt
	: 1.94	0.8	0.7	:aqit'at'n
	: 1.38	0.1	0.1	:agit tim
	: 0.97	0.0	0.0	:circul'n
	:			:circ tim
	:			:param 01
#####	:			:param 02
Esc-exit F2-commands :	:			:param 03

310301
BECHTEL BMP 27102
Record Number: 1247

```

      : ch-top &pass %ch          : summary data
      : 704.00 100.0 16.1         : dv:   0.0768
      : 150.00 83.9 17.4         : %10:   3.72
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9 75.00 66.5 15.6 : %50:  43.57
MICROTRAC DATA: MANUAL MODE       : 45.00 50.9 3.3    : %90: 199.84
measurment/present'n#: 1247 -     1: 40.00 47.6 3.3    : mv:   76.55
7997 0.69-704. SRA res: NORMAL    : 35.00 44.3 3.5    : cs:   0.441
chan select bounds:                : 30.00 40.8 4.3    :
progression:           # chans:    : 25.00 36.5 4.9    : sd:   71.25
sample date/time: 09/29/89 14:01   : 20.00 31.6 5.8    : ma:   13.59
sample ident: 310301               : 15.00 25.8 6.4    LMMMMMMMMMMMMMMMMMMMMMM
sample ID : BECHTEL BMP 27102      : 10.00 19.4 1.9    : parameters
lot code:                        : 9.00 17.4 1.9     : name value
account #: printer: OFF:           : 8.00 15.5 1.8     :smpl amt
run time: 30 sec. run #: 100/ 2    : 7.00 13.7 1.7     :disprnt
sample preparation code:            : 6.00 12.0 1.0     :disp amt
notes:                             : 5.00 11.0 0.2     :disp med
                                   : 4.00 10.8 4.3     :dmed amt
                                   : 3.00 6.6 5.5      :agitat'n
                                   : 2.00 1.1 1.1      :agit tim
                                   : 1.00 0.0 0.0      :circul'n
                                   :                  :cirtim
                                   :                  :param #1
                                   :                  :param #2
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9 :                  :param #3
Esc-exit             f2-commands :

```

#####9

Esc-exit

F2-commands

310302
BECHTEL CF 27102
Record Number: 1250

	: ch-top %pass %ch	: summary data
	: 704.00 100.0 3.4	: dv: 0.0619
	: 150.00 96.6 4.2	: %10: 3.24
MM9	: 75.00 92.4 7.5	: %50: 15.56
MICROTRAC DATA: MANUAL MODE	: 45.00 84.9 2.5	: %90: 59.49
measurment/present'n#: 1250 - 1:	: 40.00 82.4 2.6	: mv: 27.87
7997 0.69-704. SRA res: NORMAL	: 35.00 79.8 3.7	: cs: 0.666
chan select bounds:	: 30.00 76.1 7.3	:
progression: # chans:	: 25.00 68.8 8.9	: sd: 18.54
sample date/time: 09/29/89 14:07	: 20.00 60.0 11.6	: ma: 9.00
sample ident: 310302	: 15.00 48.4 16.1	LL
sample ID : BECHTEL CF 27102	: 10.00 32.2 4.6	: parameters
lot code:	: 9.00 27.6 4.6	: name value
account #: printer: OFF:	: 8.00 23.0 3.6	:smpl ant
run time: 30 sec. run #: 100/ 2	: 7.00 19.4 3.3	:disprnt
sample preparation code:	: 6.00 16.1 1.9	:disp ant
notes:	: 5.00 14.1 0.5	:disp med
	: 4.00 13.6 4.9	:dmed ant
	: 3.00 8.7 6.6	:agitat'n
	: 2.00 2.1 2.0	:agit tim
	: 1.00 0.0 0.0	:circul'n
	:	:circ tim
	:	:param #1
MM9		:param #2
Esc-exit F2-commands :		:param #3

MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9

BECHTEL FGMP 27102
Record Number: 1262

```

                                : ch-top $pass %-ch          : summary data
                                : 704.00 100.0 0.0           : dv:    0.0544
                                : 150.00 100.0 0.0           : %10:   2.65
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9 75.00 100.0 4.2         : %50:  10.15
MICROTRAC DATA: MANUAL MODE      : 45.00 95.8 1.3       : %90:  29.53
measurment/present'n#: 1262 - 1: 40.00 94.5 1.4         : mv:   13.84
7997 0.69-704. SRA res: NORMAL    : 35.00 93.2 2.5       : cs:   0.940
chan select bounds:                : 30.00 90.6 6.7       :
progression:                        # chans:              : sd:   10.94
sample date/time: 09/29/89 14:31  : 20.00 75.6 11.1     : ma:    6.38
sample ident: 310303               : 15.00 64.5 15.1     LMMMMMMMMMMMMMMMMMMMMMMM
sample ID : BECTEL FGHP 27102      : 10.00 49.4 4.4       : parameters
lot code:                          : 9.00 45.0 4.4        : name value
account #: printer: OFF:            8.00 40.7 4.7         : smpl amt
run time: 30 sec. run #: 100/ 2    : 7.00 36.0 4.8        : disprnt
sample preparation code:             : 6.00 31.2 3.5        : disp amt
notes:                              : 5.00 27.7 2.3        : disp med
                                : 4.00 25.4 11.0      : dmed amt
                                : 3.00 14.3 12.6     : agitat'n
                                : 2.00 1.8 1.7       : agit tim
                                : 1.00 0.0 0.0       : circul'n
                                :                   : circ tim
                                :                   : param #1
                                :                   : param #2
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMM9   :                   : param #3
Esc-exit      F2-commands :

```

NORMAL	ch-top	%pass	%-ch	summary data
NORMAL or HIGH resolution	: 704.00	100.0	0.0	: dv: 0.0421
	: 497.80	100.0	0.0	: %10: 2.39
MMM9	: 352.00	100.0	0.0	: %50: 6.64
MICROTRAC DATA: MANUAL MODE	: 248.90	100.0	0.0	: %90: 20.40
measurment/present'n0: 1265 - 1:	: 176.00	100.0	0.0	: mv: 9.33
7997 0.69-704. SRA res: NORMAL	: 124.45	100.0	0.0	: cs: 1.220
chan select bounds: 0.69- 704.00	: 88.00	100.0	0.0	:
progression: geom/sqrt2 # chans:20	: 62.23	100.0	0.8	: sd: 7.39
sample date/time: 09/29/89 14:56	: 44.00	99.2	0.3	: na: 4.92
sample ident: 310304	: 31.11	98.9	5.6	LL
sample ID : BECHTEL FP 27102	: 22.00	93.3	13.3	: parameters
lot code:	: 15.56	80.0	13.1	: name value
account #: printer: OFF:	: 11.00	66.9	11.3	:smpl ant
run time: 30 sec. run #: 100/ 2	: 7.78	55.6	11.2	:disprnt
sample preparation code:	: 5.50	44.4	7.5	:disp ant
notes: .	: 3.89	37.0	20.3	:disp med
	: 2.75	16.6	14.9	:dmed ant
	: 1.94	1.7	1.2	:agitat'n
	: 1.38	0.5	0.5	:agit tim
	: 0.97	0.0	0.0	:circul'n
	:			:circ tim
	:			:param #1
MMM9				:param #2
Esc-exit F2-commands :				:param #3

310304
BECHTEL FP 27102
Record Number: 1265

	:	ch-top \$pass	\$-ch	: summary data
	:	704.00	100.0 0.0	: dv: 0.0421
	:	150.00	100.0 0.0	: %10: 2.39
MMH9	:	75.00	100.0 0.8	: %50: 6.64
MICROTRAC DATA: MANUAL MODE	:	45.00	99.2 0.1	: %90: 20.40
measurment/present'n#: 1265 - 1:	:	40.00	99.1 0.1	: mv: 9.33
7997 0.69-704. SRA res: NORMAL	:	35.00	99.0 0.8	: cs: 1.220
chan select bounds:	:	30.00	98.2 3.1	:
progression: # chans:	:	25.00	95.1 6.0	: sd: 7.39
sample date/time: 09/29/89 14:56	:	20.00	89.2 10.8	: ma: 4.92
sample ident: 310304	:	15.00	78.4 15.0	LMMMMMMMMMMMMMMMMMMMMMMMMMHH
sample ID : BECHTEL FP 27102	:	10.00	63.4 3.5	: parameters
lot code:	:	9.00	59.9 3.5	: name value
account #: printer: OFF:	:	8.00	56.4 4.6	:smpl amt
run time: 3D sec. run #: 100/ 2 :	:	7.00	51.8 4.9	:disprnt
sample preparation code:	:	6.00	46.9 4.8	:disp amt
notes:	:	5.00	42.1 4.6	:disp med
.	:	4.00	37.5 16.4	:dmed amt
.	:	3.00	21.1 18.3	:agitat'n
.	:	2.00	2.8 2.8	:agit tim
.	:	1.00	0.0 0.0	:circul'n
.	:			:cirtim
.	:			:param #1
MMMH9	:			:param #2
Esc-exit F2-commands :	:			:param #3

06-Oct-89

EXPORTech Company, Inc.

Page 1

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

P.O. No. 19307-F-46H

RUN #: 27103

SAMPLE DATE: 09-28-89

		SOLIDS	ASH	TOTAL	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	SULFUR	MICROTRAC
				WT. %	
BALL MILL PRODUCT	310401	27.32	30.32	4.63	
CENTRIFUGE FEED	310402	32.65	36.40	7.51	
FG MILL PRODUCT	310403	41.92	38.26	8.95	
FINAL PRODUCT	310404	9.45	32.98	3.18	

#####

:Param #3

310401
BECHTEL BMP 27103
Record Number: 1260

```

: ch-top %pass %ch
: 704.00 100.0 13.8
: 150.00 86.2 19.6
MICROTRAC DATA: MANUAL MODE : 75.00 66.5 14.8
measurment/present'n0: 1268 - 1: 45.00 51.7 4.2
7277 0.69-704. SRA res: NORMAL : 40.00 47.5 4.5
chan select bounds: : 35.00 43.0 4.4
progression: 8 chans: : 30.00 38.6 4.0
sample date/time: 09/29/89 15:25 : 25.00 34.6 4.5
sample id: 310401 : 20.00 30.1 5.4
sample ID : BECHTEL BNP 27103 : 15.00 24.7 7.7
lot code: : 10.00 17.0 2.0
account #: printer: OFF: 9.00 15.0 2.0
run time: 30 sec. run #: 100/ 2 : 8.00 13.0 1.6
sample preparation code: : 7.00 11.4 1.5
notes: : 6.00 9.8 0.8
: 5.00 9.0 0.2
: 4.00 8.8 3.2
: 3.00 5.6 4.5
: 2.00 1.1 1.1
: 1.00 0.0 0.0
:
:
:
Esc-exit F2-commands :

```

```

: summary data
: dv: 0.0775
: %10: 6.11
: %50: 42.74
: %90: 179.64
: mv: 75.23
: cs: 0.403
:
: sd: 62.42
: na: 14.87
LMMMMMMMMMMMMMMMMMMMM
: parameters
: name value
:smpl ant
:disprnt
:disp ant
:disp mod
:dmed ant
:agitat'n
:agit tim
:circul'n
:circ tim
:param #1
:param #2
:param #3

```

NORMAL				: ch-top \$pass \$-ch				: summary data			
NORMAL or HIGH resolution				704.00	100.0	0.0		:	dv:	0.0569	
				497.80	100.0	0.0		:	\$10:	5.93	
#####9				352.00	100.0	0.0		:	\$50:	18.31	
MICROTRAC DATA: MANUAL MODE				248.90	100.0	0.0		:	\$90:	102.12	
measurment/present'n0: 1271 -				176.00	100.0	3.9		:	mv:	33.60	
7997 0.69-704. SRA res: NORMAL				124.45	96.1	10.0		:	cs:	0.555	
chan select bounds: 0.69- 704.00				88.00	86.1	2.3		:			
progression: geom/sqrt2 8 chans:20				62.23	83.8	5.5		:	sd:	28.14	
sample date/time: 09/29/89 15:30				44.00	78.4	10.4		:	ma:	10.81	
sample ident: 310402				31.11	67.9	10.2		#####			
sample ID : BECHTEL CF 27103				22.00	57.8	13.5		:	parameters		
lot code:				15.56	44.2	13.5		:	name	value	
account 8: printer: OFF:				11.00	30.7	14.4		:	snpl ant		
run time: 30 sec. run 8: 100/ 2				7.78	16.3	7.8		:	disprent		
sample preparation code:				5.50	8.5	0.7		:	disp ant		
notes: .				3.89	7.9	2.3		:	disp ned		
				2.75	5.5	3.4		:	dned ant		
				1.94	2.1	1.4		:	agitat'n		
				1.38	0.7	0.7		:	agit tim		
				0.97	0.0	0.0		:	circul'n		
								:	circ tim		
								:	param #1		
#####9								:	param #2		
Esc-exit f2-commands :								:	param #3		

310402
BECHTEL CF 27103
Record Number: 1271

	: ch-top tpass t-ch	: summary data
	: 704.00 100.0 1.9	: dv: 0.0569
	: 150.00 98.1 13.1	: t10: 5.93
#####	: 75.00 85.0 6.3	: t50: 18.31
MICROTRAC DATA: MANUAL MODE	: 45.00 78.7 3.5	: t90: 102.12
measurment/present'n0: 1271 - 1:	: 40.00 75.1 4.0	: mv: 33.60
7977 0.69-704. SRA res: NORMAL	: 35.00 71.1 4.4	: cs: 0.555
chan select bounds:	: 30.00 66.7 5.6	:
progrussion: 8 chans:	: 25.00 61.1 7.6	: sd: 28.14
sample date/time: 09/29/89 15:30	: 20.00 53.6 11.0	: na: 10.81
sample ident: 310402	: 15.00 42.6 16.3	#####
sample ID: DECHTEL CF 27103	: 10.00 26.2 4.5	: parameters
lot code:	: 9.00 21.8 4.5	: name value
account 0: printer: OFF:	: 8.00 17.3 3.6	: snol ant
run time: 30 sec. run 0: 100/ 2	: 7.00 13.7 3.4	: disprnt
sample preparation code:	: 6.00 10.2 1.9	: disp ant
notes:	: 5.00 8.3 0.4	: disp med
	: 4.00 7.9 1.9	: dmed ant
	: 3.00 6.1 3.7	: agitat'n
	: 2.00 2.4 2.3	: agit tim
	: 1.00 0.1 0.1	: circul'n
	:	: circ tim
	:	: param 01
#####	:	: param 02
Esc-exit F2-commands :	:	: param 03

	: ch-top %pass %ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0479
	: 150.00 100.0 0.0	: %10: 5.77
MM9	: 75.00 100.0 2.2	: %50: 13.75
MICROTRAC DATA: MANUAL MODE	: 45.00 97.8 2.8	: %90: 32.65
measurment/present'n: 1274 -	1: 40.00 95.0 3.4	: mv: 16.37
7997 0.69-704. SRA res: NORMAL	: 35.00 91.6 4.2	: cs: 0.674
chan select bounds:	: 30.00 87.4 6.9	:
progression: # chans:	: 25.00 80.6 10.1	: sd: 10.23
sample date/time: 09/29/89 15:35	: 20.00 70.5 15.5	: na: 8.90
sample ident: 310403	: 15.00 54.9 21.9	LL
sample ID : BECHTEL FGMP 27103	: 10.00 33.0 6.1	: parameters
lot code:	: 9.00 26.9 6.1	: name value
account #: printer: OFF:	: 8.00 20.8 5.0	:smpl amt
run time: 30 sec. run #: 100/ 2	: 7.00 15.8 4.7	:disprnt
sample preparation code:	: 6.00 11.1 2.6	:disp amt
notes:	: 5.00 8.5 0.4	:disp med
	: 4.00 8.1 1.5	:dmed amt
	: 3.00 6.6 3.3	:agitat'n
	: 2.00 3.2 3.0	:agit tim
	: 1.00 0.2 0.2	:circul'n
	:	:circ tim
	:	:param #1
MM9	:	:param #2
Esc-exit F2-commands :	:	:param #3

310404
BECHTEL FP 27103
Record Number: 1277

	: ch-top %pass %ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0204
	: 150.00 100.0 0.0	: %10: 1.69
MM9	: 75.00 100.0 0.0	: %50: 8.25
MICROTRAC DATA: MANUAL MODE	: 45.00 100.0 0.0	: %90: 15.06
measurment/present'n#: 1277 -	1: 40.00 100.0 0.0	: mv: 8.01
7997 0.69-704. SRA res: NORMAL	: 35.00 100.0 0.0	: cs: 1.453
chan select bounds:	: 30.00 100.0 0.0	:
progression: 8 chans:	: 25.00 100.0 2.6	: sd: 5.52
sample date/time: 09/29/89 15:40	: 20.00 97.4 7.6	: ma: 4.13
sample ident: 310404	: 15.00 89.8 22.7	LMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
sample ID : BECHTEL FP 27103	: 10.00 67.1 9.8	: parameters
lot code:	: 9.00 57.3 9.8	: name value
account #: printer: OFF:	: 8.00 47.5 7.3	:smpl amt
run time: 30 sec. run #: 100/ 2	: 7.00 40.2 6.6	:disprnt
sample preparation code:	: 6.00 33.7 3.3	:disp amt
notes:	: 5.00 30.4 0.0	:disp med
	: 4.00 30.4 4.8	:dmed amt
	: 3.00 25.6 12.0	:agitat'n
	: 2.00 13.6 11.4	:agit tin
	: 1.00 2.2 2.2	:circul'n
	:	:circ tin
	:	:param #1
MM9		:param #2
Esc-exit F2-commands :		:param #3

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

P.O. No. 19307-F-46H

RUN #: 27201
SAMPLE DATE: 09-27-89

BECHTEL REFERENCE:	ETC#	SOLIDS WT. %	ASH WT. %	TOTAL SULFUR WT. %	MICROTRAC
BALL MILL PRODUCT CENTRIFUGE FEED	310501	33.48	32.75	6.58	
CENTRIFUGE FEED FG MILL FEED	310502	40.69	35.33	7.63	
FG MILL PRODUCT	310503	40.47	34.96	7.40	
FINAL PRODUCT	310504	15.66	23.92	3.24	

	: ch-ton %pass %ch	: summary data
Sample prep (0 to 999)	: 704.00 100.0 0.0	: dv: 0.0796
	: 497.80 100.0 0.0	: %10: 3.77
#####	352.00 100.0 0.0	: %50: 20.38
MICROTRAC DATA: MANUAL MODE	: 248.90 100.0 1.4	: %90: 102.29
Measure't/present'n# 1413 -	1: 176.00 98.6 5.3	: mv: 37.26
7777 0.69-704. SRA res: NORMAL	: 124.45 93.3 5.3	: cs: 0.563
chan select bounds: 0.69- 704.00	: 88.00 87.9 6.7	:
regression: geom/sqrt2 # chans:20	: 62.23 81.2 8.5	: sd: 33.71
sample date/time: 10/05/89 15:00	: 44.00 72.6 8.5	: ma: 10.65
sample ident: 310501	: 31.11 64.1 11.1	#####
sample ID : BECHTEL CF 27201	: 22.00 52.9 11.7	: parameters
Int code:	: 15.56 41.3 10.1	: name value
account #: printer: OFF:	11.00 31.1 8.5	:smpl amt
run time: 30 sec. run #: 100/ 2	: 7.78 22.7 7.2	:disprnt
sample preparation code:	: 5.50 15.4 4.8	:disp amt
notes:	: 3.89 10.7 5.9	:disp med
	: 2.75 4.7 4.3	:dmed amt
	: 1.94 0.4 0.4	:agitat'n
	: 1.38 0.0 0.0	:agit tim
	: 0.97 0.0 0.0	:circul'n
	:	:circ tim
	:	:param #1
#####		:param #2
Esc-exit F2-commands :		:param #3

310501
BECHTEL CF 27201
Record Number: 1413

```

      : ch-top %pass %-ch       : summary data
      : 704.00 100.0 4.1        : dv:    0.0796
      : 150.00 95.9 11.4        : %10:   3.77
***** 75.00 84.5 11.4          : %50:  20.38
MICROTRAC DATA: MANUAL MODE   : 45.00 73.1 3.1         : %90: 102.29
measurem't/present'n# 1413 - 1: 40.00 70.0 3.3           : mv:   37.26
7-77 0.69-704. SRA res: NORMAL : 35.00 66.6 3.9         : cs:   0.563
chan select bounds:            : 30.00 62.7 6.1        :
progression: # chans:          : 25.00 56.6 7.3        : sd:  33.71
sample date/time: 10/05/89 15:00 : 20.00 49.3 9.3       : na:  10.65
sample ident: 310501             : 15.00 40.0 11.5      LMMMMMMMMMMMMMMMMMM
sample ID : BECHTEL CF 27201     : 10.00 28.5 2.6       : parameters
lot code:                        : 9.00 25.9 2.6        : name value
account #: printer: OFF:         : 8.00 23.2 3.1        :smpl amt
run time: 30 sec. run #: 100/ 2 : 7.00 20.2 3.2         :disprnt
sample preparation code:          : 6.00 17.0 3.1        :disp amt
notes:                            : 5.00 13.9 3.0        :disp ned
                                : 4.00 11.0 5.0        :dmed amt
                                : 3.00 6.0 5.3         :agitat'n
                                : 2.00 0.7 0.7         :agit tim
                                : 1.00 0.0 0.0        :circul'n
                                :                     :circ tim
                                :                     :param #1
*****                               :param #2
Esc-exit F2-commands :                     :param #3

```

	: ch-top %pass %ch	: summary data
up to 10 chars	: 704.00 100.0 0.0	: dv: 0.0602
	: 497.80 100.0 0.0	: %10: 2.90
MM9	352.00 100.0 0.0	: %50: 12.77
MICROTRAC DATA: DATA BASE UPDATE	: 248.90 100.0 0.0	: %90: 64.04
measurment/present'n: 1409 -	1: 176.00 100.0 3.2	: mv: 24.55
7927 0.69-704. SRA res: NORMAL	: 124.45 96.8 3.5	: cs: 0.803
chan select bounds: 0.69- 704.00	: 88.00 93.5 3.8	:
progression: geom/sqrt2 # chans:20	: 62.23 89.7 5.3	: sd: 19.65
sample date/time: 10/05/89 14:55	: 44.00 84.5 5.6	: ma: 7.47
sample ident: 310502	: 31.11 78.9 9.7	LMNNNNNNNNNNNNNNNNNNNNNN
sample ID : BECHTEL FGMF 27201	: 22.00 69.2 11.9	: parameters
lot code:	: 15.56 57.3 11.9	: name value
account #: printer: OFF:	11.00 45.4 11.1	:smpl amt 0.000
run time: 30 sec. run #: 100/ 2	: 7.78 34.2 9.6	:disprnt
sample preparation code: 0	: 5.50 24.7 6.2	:disp amt 0.000
notes:	: 3.89 18.5 9.7	:disp med
	: 2.75 8.7 7.4	:dmed amt 0.000
	: 1.94 1.4 1.0	:agitat'n
	: 1.38 0.3 0.3	:agit tim 0
	: 0.97 0.0 0.0	:circul'n
	:	:circ tim 0
	:	:param #1 0.000
MM9		:param #2 0.000
Esc-exit F2-commands :		:param #3 0.000

310502 *CONTINUED* *FGMF*

BECHTEL FGMF 27201

Record Number: 1409

	: ch-top %pass %ch	: summary data
	: 704.00 100.0 1.6	: dv: 0.0602
	: 150.00 98.4 6.8	: %10: 2.90
MM	: 75.00 91.6 6.8	: %50: 12.77
MICROTRAC DATA: DATA BASE UPDATE	: 45.00 84.8 2.0	: %90: 64.04
measured't/present'n# 1409 - 1:	: 40.00 82.7 2.2	: mv: 24.55
7077 0.69-704. SRA res: NORMAL	: 35.00 80.6 2.9	: cs: 0.803
chan select bounds: 0.69- 704.00	: 30.00 77.7 5.3	:
progression: geom/sqrt2 # chans:20	: 25.00 72.4 6.9	: sd: 19.65
sample date/time: 10/05/89 14:55	: 20.00 65.5 9.7	: na: 7.47
sample ident: 310502	: 15.00 55.8 13.9	LMNMMMMMMMMMMMMMMMMMMMM
sample ID : BECHTEL FGMF 27201	: 10.00 41.9 3.5	: parameters
lot code:	: 9.00 38.5 3.5	: name value
acount #:	printer: OFF: 8.00 35.0 4.0	:smpl amt 0.000
run time: 30 sec. run #: 100/ 2	: 7.00 31.0 4.2	:disprsnt
sample preparation code: 0	: 6.00 26.8 4.0	:disp amt 0.000
notes:	: 5.00 22.7 3.9	:disp med
	: 4.00 18.9 8.0	:dmed amt 0.000
	: 3.00 10.9 8.9	:aqitat'n
	: 2.00 1.9 1.9	:agit tim 0
	: 1.00 0.0 0.0	:circul'n
	:	:circ tim 0
	:	:param #1 0.000
MM		:param #2 0.000
Esc-exit F2-commands :		:param #3 0.000

NORMAL				ch-ion %pass %ch				summary data			
NORMAL or HIGH resolution				704.00	100.0	0.0		dv:	0.0479		
				497.80	100.0	0.0		%10:	2.77		
#####				352.00	100.0	0.0		%50:	10.27		
MICROTRAC DATA: MANUAL MODE				248.90	100.0	0.0		%90:	30.80		
measurment/present'n0: 1416 - 1:				176.00	100.0	0.0		mv:	14.83		
0.69-704. SRA res: NORMAL				124.45	100.0	0.9		cs:	0.916		
chan select bounds: 0.69- 704.00				88.00	99.1	1.6					
progression: geom/sqrt2 # chans:20				62.23	97.5	2.4		sd:	10.69		
sample date/time: 10/05/89 15:19				44.00	95.2	4.9		ma:	6.55		
sample ident: 310503				31.11	90.3	9.1		#####			
sample 10 : BECHTEL FGMP 27201				22.00	81.2	13.6		parameters			
lot code:				15.56	67.6	14.5		name value			
account #: printer: OFF:				11.00	53.1	13.5		:smpl amt			
run time: 30 sec. run #: 100/ 2				7.78	39.6	11.4		:disprsent			
sample preparation code:				5.50	28.2	7.7		:disp amt			
notes:				3.89	20.4	10.6		:disp med			
				2.75	9.9	7.9		:dmed amt			
				1.94	1.9	1.4		:agitat'n			
				1.38	0.6	0.6		:agit tim			
				0.97	0.0	0.0		:circul'n			
								:circ tim			
								:param #1			
#####								:param #2			
Esc-exit F2-commands :								:param #3			

310503 FROM SAIGON
BECHTEL FGMP 27201
Record Number: 1416

	: ch-top %pass %ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0479
	: 150.00 100.0 1.7	: %10: 2.77
*****	: 75.00 98.3 3.0	: %50: 10.27
MICROTRAC DATA: MANUAL MODE	: 45.00 95.3 1.6	: %90: 30.80
measured/present no: 1416 -	: 40.00 93.7 1.9	: mv: 14.83
7227 0.69-704. SRA res: NORMAL	: 35.00 91.8 2.6	: cs: 0.916
chan select bounds:	: 30.00 89.2 5.0	:
progression: # chans:	: 25.00 84.2 7.2	: sd: 10.69
sample date/time: 10/05/89 15:19	: 20.00 77.0 11.2	: ma: 6.55
sample ident: 310503	: 15.00 65.8 16.9	L*****
sample ID: BECHTEL FGMP 27201	: 10.00 48.9 4.2	: parameters
lot code:	: 9.00 44.7 4.2	: name value
account #: printer: OFF:	: 8.00 40.5 4.8	: smpl amt
run time: 30 sec. run #: 100/ 2	: 7.00 35.7 5.0	: disprnt
sample preparation code:	: 6.00 30.7 4.9	: disp amt
notes: .	: 5.00 25.8 4.8	: disp med
	: 4.00 21.0 8.8	: dmed amt
	: 3.00 12.2 9.7	: agit'at'n
	: 2.00 2.5 2.5	: agit tim
	: 1.00 0.0 0.0	: circul'n
	:	: circ tim
	:	: param #1
*****	:	: param #2
Esc-exit F2-commands :	:	: param #3

NORMAL	: ch-top	%pass	%-ch	: summary data
NORMAL or HIGH resolution	: 704.00	100.0	0.0	: dv: 0.0379
	: 497.80	100.0	0.0	: %10: 2.27
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX9	352.00	100.0	0.0	: %50: 6.56
MICROTRAC DATA: MANUAL MODE	: 248.90	100.0	0.0	: %90: 17.85
measurment/present'n: 1419 -	1: 176.00	100.0	0.0	: mv: 8.24
7277 0.69-704. SRA res: NORMAL	: 124.45	100.0	0.0	: cs: 1.300
chan select bounds: 0.69- 704.00	: 88.00	100.0	0.0	:
progression: geom/sqrt2 8 chans:20	: 62.23	100.0	0.0	: sd: 6.06
sample date/time: 10/05/89 15:34	: 44.00	100.0	0.0	: na: 4.62
sample ident: 310504	: 31.11	100.0	3.7	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
sample ID : BECHTEL FP 27201	: 22.00	96.3	9.8	: parameters
lot code:	: 15.56	86.5	13.9	: name value
account #: printer: OFF:	11.00	72.6	15.2	:smpl amt
run time: 30 sec. run #: 100/ 2	: 7.78	57.5	14.0	:disprnt
sample preparation code:	: 5.50	43.5	8.9	:disp amt
notes:	: 3.89	34.5	16.5	:diso med
	: 2.75	18.1	13.5	:dmed amt
	: 1.94	4.6	2.8	:agitat'n
	: 1.38	1.8	1.5	:agit tim
	: 0.97	0.3	0.3	:circul'n
	:			:circ tim
	:			:param #1
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX9				:param #2
Esc-exit F2-commands :				:param #3

310504 BECHTEL FP 27201

Record Number: 1419

	: ch-top 3pass 3-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0379
	: 150.00 100.0 0.0	: %10: 2.27
#####	: 75.00 100.0 0.0	: %50: 6.56
MICROTRAC DATA: MANUAL MODE.	: 45.00 100.0 0.0	: %90: 17.85
measurment/present'nd: 1419 - 1:	: 40.00 100.0 0.0	: mv: 8.24
7777 0.69-704. SRA res: NORMAL	: 35.00 100.0 0.4	: cs: 1.300
chan select bounds:	: 30.00 99.6 2.0	:
cregression: 8 chans:	: 25.00 97.5 4.3	: sd: 6.06
sample date/time: 10/05/89 15:34	: 20.00 93.3 8.5	: na: 4.62
sample ident: 310504	: 15.00 84.8 16.9	#####
sample ID: BECHTEL FP 27201	: 10.00 67.9 4.7	: parameters
lot code:	: 9.00 63.2 4.7	: name value
account #: printer: OFF:	: 8.00 58.5 5.8	:smpl amt
run time: 30 sec. run #: 100/ 2	: 7.00 52.7 6.1	:disprsnt
sample preparation code:	: 6.00 46.5 5.8	:disp amt
notes:	: 5.00 40.7 5.6	:disp med
	: 4.00 35.1 13.5	:dmed amt
	: 3.00 21.7 16.1	:agitat'n
	: 2.00 5.6 5.2	:agit tim
	: 1.00 0.4 0.4	:circul'n
	:	:circ tim
	:	:param #1
#####	:	:param #2
Esc-exit F2-commands :	:	:param #3

EXPORTech Company, Inc.

P.O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract 19307-F-31

RUN #: 28601

DESCRIPTION: ROM ILLINOIS NO. 6, BURNING STAR NO. 4, PERRY COUNTY ILLINOIS

SAMPLE #: 311001

FULL PROXIMATE:

.....

TOTAL MOISTURE	8.33 %
ASH	15.14 %
VOLATILE MATTER	38.33 %
FIXED CARBON	47.56 %
TOTAL SULFUR	3.65 %
ORGANIC SULFUR	1.98 %
PYRITIC SULFUR	1.57 %
SULFATE SULFUR	0.10 %
PYRITIC SULFUR/TOTAL SULFUR	43.01 %
HEATING VALUE	12222
GRINDABILITY INDEX	54
FREE SWELLING INDEX	3.5

ULTIMATE:

.....

CARBON	67.87 %
HYDROGEN	4.82 %
NITROGEN	1.29 %
CHLORINE	0.07 %
SULFUR	3.65 %
ASH	15.14 %
OXYGEN (DIF)	7.16 %

MINERAL ASH ANALYSIS:

.....

SILICA SiO2	50.62 %
ALLUMINA Al2O3	19.69 %
TITANIA TiO2	1.00 %
FERRIC OXIDE Fe2O3	16.35 %
LIME CaO	4.08 %
MAGNESIA MgO	0.94 %
POTASSIUM OXIDE K2O	2.09 %
SODIUM OXIDE Na2O	0.75 %
SULFUR TRIOXIDE SO3	2.67 %
PHOSPHOROUS PENTOXIDE P2O5	0.18 %
STRONTIUM OXIDE SrO	0.03 %
BARIUM OXIDE BaO	0.01 %
MANGANESE OXIDE Mn3O4	0.01 %
TOTAL:	98.42 %

TRACE ELEMENTS: CONCENTRATION IN PPM

.....

ARSENIC (As)	36	BARIUM (Ba)	84
BORON (B)	130	BROMINE (Br)	8
CADMIUM (Cd)	0.4	CHLORINE (Cl)	60
MERCURY (Hg)	0.04	COBALT (Co)	22
MOLYBDENUM (Mo)	9	GERMANIUM (Ge)	7
LEAD (Pb)	31	LITHIUM (Li)	910
SULFUR (S) *	1.06	SODIUM (Na) *	0.55
SELENIUM (Se)	6	MANGANESE (Mn)	81
CHROMIUM (Cr)	30	STRONTIUM (Sr)	180
COPPER (Cu)	44		
FLUORINE (F)	107		
NICKEL (Ni)	39		
VANADIUM (V)	64		
ZINC (Zn)	190		

* RESULTS IN WEIGHT

ASH FUSION: (F)

.....

REDUCING:	
INITIAL DEFORMATION:	2086
SOFTENING	2287
HEMISPHERICAL	2388
FLUID	2510

OXIDIZING:	
INITIAL DEFORMATION:	2315
SOFTENING	2473
HEMISPHERICAL	2525
FLUID	2640

EXPORTEch Company, Inc.

P.O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract 19307-F-31

RUN #: 28601

DESCRIPTION: ROM ILLINOIS NO. 6, BURNING STAR NO. 4, PERRY COUNTY ILLINOIS

SAMPLE #: 311001

SIZING ANALYSIS

SAMPLE#	SIZE	WT.%	% ASH	% SUL	BTU	<----- CUMULATIVE ----->			
						WT.%	% ASH	% SUL	BTU
311002	6.3x.600	74.52	14.18	4.18	12308	74.52	14.18	4.18	12308
311004	.600x.250	10.44	15.50	3.36	12135	84.96	14.34	4.08	12287
311005	.250x.150	4.59	17.56	3.27	11854	89.55	14.50	4.03	12265
311006	.150x.075	4.98	19.81	3.46	11455	94.53	14.78	4.00	12222
311007	.075x.045	1.70	22.39	3.71	11086	96.23	14.92	4.00	12202
311008	.045	3.77	27.49	3.33	10299	100.00	15.39	3.97	12130

FLOAT SINK ANALYSIS

+28 MESH

							<----- CUMULATIVE ----->				
SAMPLE#	SPECIFIC GRAVITY	WEIGHT PERCENT	PERCENT ASH	PERCENT SULFUR	BTU	% PYRITIC SULFUR	WEIGHT PERCENT	PERCENT ASH	PERCENT SULFUR	BTU	% PYRITIC SULFUR
=====											
311009	F @1.20	0.35	1.98	2.25	13812	0.25	0.35	1.98	2.25	13812	0.25
311010	F @1.25	6.08	2.03	2.44	14053	0.31	6.43	2.02	2.43	14040	0.31
311011	F @1.30	33.15	3.82	2.76	13803	0.47	39.58	3.53	2.71	13841	0.44
311012	F @1.35	18.01	6.67	2.88	13333	0.67	57.59	4.51	2.76	13682	0.51
311013	F @1.40	19.51	10.99	3.03	12574	0.92	77.10	6.15	2.83	13402	0.62
311014	F @1.50	9.26	18.06	3.56	11496	1.64	86.35	7.43	2.91	13198	0.73
311015	F @1.60	2.43	25.71	4.67	10316	2.84	88.79	7.93	2.96	13119	0.78
311016	F @1.80	2.17	33.61	6.10	8852	4.61	90.96	8.54	3.03	13017	0.88
311017	F @2.00	1.32	44.68	8.79	7333	7.58	92.27	9.06	3.11	12936	0.97
311018	S @2.00	7.73	72.45	16.64	2684	14.67	100.00	13.96	4.16	12144	2.03

-28 MESH

							<----- CUMULATIVE ----->				
SAMPLE#	SPECIFIC GRAVITY	WEIGHT PERCENT	PERCENT ASH	PERCENT SULFUR	BTU	% PYRITIC SULFUR	WEIGHT PERCENT	PERCENT ASH	PERCENT SULFUR	BTU	% PYRITIC SULFUR
=====											
311019	F @1.20	1.37	1.08	2.16	14035	0.07	1.37	1.08	2.16	14035	0.07
311020	F @1.25	4.99	1.66	2.36	14058	0.13	6.37	1.53	2.32	14053	0.12
311021	F @1.30	17.53	2.53	2.14	14291	0.24	23.90	2.26	2.18	14228	0.21
311022	F @1.35	9.49	4.57	2.15	14038	0.31	33.39	2.92	2.17	14174	0.24
311023	F @1.40	21.53	4.99	2.48	13503	0.39	54.92	3.73	2.30	13911	0.30
311024	F @1.50	17.16	10.75	2.67	12626	0.72	72.08	5.40	2.39	13605	0.40
311025	F @1.60	6.67	18.82	2.65	11437	1.01	78.75	6.54	2.41	13421	0.45
311026	F @1.80	4.54	29.78	3.05	9714	1.65	83.28	7.81	2.44	13219	0.51
311027	F @2.00	2.23	42.05	3.35	7738	2.28	85.52	8.70	2.47	13076	0.56
311028	S @2.00	14.48	74.92	8.05	1873	7.67	100.00	18.29	3.28	11454	1.59

01-Nov-89

EXPORTech Company, Inc.

Page 1

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract 19307-F-31

RUN #: 29801
SAMPLE DATE: 10-25-89

BECHTEL REFERENCE:	ETC# #	SOLIDS WT. %	ASH WT. %	TOTAL SULFUR WT. %	MICROTRAC
BALL MILL PRODUCT	310701	-----	14.83	4.00	
CENTRIFUGE FEED	310702	21.60	17.03	4.94	
FG MILL PRODUCT	310703	30.40	18.53	5.46	
FINAL PRODUCT	310704	7.32	14.53	3.41	

```

*****
Esc-exit      F2-commands  :

```

310701
BM PRODUCT
Record Number: 1824

	: ch-top %pass %ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0420
	: 150.00 100.0 1.2	: %10: 2.74
#####	75.00 98.8 0.6	: %50: 9.67
MICROTRAC DATA: DATA BASE UPDATE	: 59.69 98.2 2.4	: %90: 28.71
measurment/present'n: 1833 -	1: 42.21 95.7 4.7	: mv: 13.65
777 0.69-704. SRA res: NORMAL	: 29.85 91.0 8.8	: cs: 0.944
chan select bounds: 0.69- 704.00	: 21.10 82.2 13.2	:
progression: geom/sqrt2 0 chans:20	: 14.92 69.0 14.9	: sd: 9.31
sample date/time: 10/26/89 14:03	: 10.55 54.1 14.6	: ma: 6.36
sample ident: 310702	: 7.46 39.5 11.6	L#####
sample ID : CENT. FEED	: 5.28 28.0 8.3	: parameters
lot code:	: 3.73 19.7 10.7	: name value
account #:	printer: OFF: 2.64 9.0 7.7	:smpl amt 0.000
run time: 30 sec. run #: 100/ 2	: 1.69 1.2 1.2	:disprsnt
sample preparation code: 0	: 1.01 0.1 0.1	:disp amt 0.000
notes:	:	:disd med
	:	:dmed amt 0.000
	:	:agitat'n
	:	:agit tim 0
	:	:circul'n
	:	:circ tim 0
	:	:param #1 0.000
#####	:	:param #2 0.000
Esc-exit F2-commands :	:	:param #3 0.000

310702
CENT. FEED
Record Number: 1833

	: ch-top %pass %ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0460
	: 150.00 100.0 0.0	: %10: 2.62
MM	: 75.00 100.0 0.0	: %50: 8.56
MICROTRAC DATA: DATA BASE UPDATE	: 59.69 100.0 0.2	: %90: 21.25
measurment/present'n: 1836 - 1:	: 42.21 99.7 2.4	: mv: 10.38
7777 0.69-704. SRA res: NORMAL	: 29.85 97.3 7.6	: cs: 1.036
chan select bounds: 0.69- 704.00	: 21.10 89.7 13.5	:
progression: geom/sqrt2 # chans:20	: 14.92 76.2 16.1	: sd: 7.56
sample date/time: 10/26/89 14:10	: 10.55 60.1 16.1	: ma: 5.79
sample ident: 310703	: 7.46 44.1 13.1	LMNNNNNNNNNNNNNNNNNNNNNN
sample ID : FGM PRODUCT	: 5.28 31.0 9.2	: parameters
lot code:	: 3.73 21.8 11.6	: name value
account #: printer: OFF:	: 2.64 10.2 8.6	:smp ant 0.000
run time: 30 sec. run #: 100/ 2	: 1.69 1.7 1.6	:disprnt
sample preparation code: 0	: 1.01 0.1 0.1	:disp ant 0.000
notes:	:	:disp med
	:	:dmed ant 0.000
	:	:agitat'n
	:	:agit tim 0
	:	:circul'n
	:	:circ tim 0
	:	:param #1 0.000
MM	:	:param #2 0.000
Esc-exit F2-commands :	:	:param #3 0.000

310703
FGM PRODUCT
Record Number: 1836

	: ch-top %pass %ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0330
	: 150.00 100.0 0.0	: %10: 2.24
MM9	: 75.00 100.0 0.0	: %50: 5.65
MICROTRAC DATA: DATA BASE UPDATE	: 59.69 100.0 0.0	: %90: 13.79
measurem't/present'n0: 1839 - 1:	: 42.21 100.0 0.0	: mv: 6.76
7997 0.69-704. SRA res: NORMAL	: 29.85 100.0 0.9	: cs: 1.405
chan select bounds: 0.69- 704.00	: 21.10 99.0 6.3	:
progression: geom/sqrt2 # chans:20	: 14.92 92.8 12.0	: sd: 4.39
sample date/time: 10/26/89 14:22	: 10.55 80.8 17.0	: ma: 4.27
sample ident: 310704	: 7.46 63.8 16.5	LMNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
sample ID : FINAL PRODUCT	: 5.28 47.2 12.6	: parameters
lot code:	: 3.73 34.7 17.6	: name value
account #:	printer: OFF: 2.64 17.0 13.5	:smpl amt 0.000
run time: 30 sec. run #: 100/ 2	: 1.69 3.5 3.0	:disprnt
sample preparation code: 0	: 1.01 0.5 0.5	:disp amt 0.000
notes:	:	:disp med
:	:	:dmed amt 0.000
:	:	:agitat'n
:	:	:agit tim 0
:	:	:circul'n
:	:	:circ tim 0
:	:	:param #1 0.000
MM9	:	:param #2 0.000
Esc-exit F2-commands :	:	:param #3 0.000

310704
FINAL PRODUCT
Record Number: 1839

01-Nov-89

EXPORTech Company, Inc.

Page

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract 19307-F-31

RUN #: 29803

SAMPLE DATE: 10-25-89

BECHTEL REFERENCE:	ETC#	MOISTURE WT. %	SOLIDS WT. %	ASH WT. %	TOTAL SULFUR WT. %	MICROTRAC
BALL MILL FEED	310801	9.77	-----	15.06	4.05	-----
BALL MILL PRODUCT	310802	-----	-----	14.78	4.07	
CENTRIFUGE FEED	310803	-----	23.72	19.41	5.78	
FG MILL PRODUCT	310804	-----	35.95	21.43	6.55	
FINAL PRODUCT	310805	-----	9.76	14.47	3.61	

	: ch-top &pass &-ch	: summary data
	: 704.00 100.0 0.1	: dv: 0.0439
	: 150.00 99.9 1.0	: &10: 2.71
MM	: 75.00 98.9 0.4	: &50: 9.57
MICROTRAC DATA: DATA BASE UPDATE	: 59.69 98.5 1.9	: &90: 27.71
measurment/present no: 1926 - 1:	: 42.21 96.6 4.6	: mv: 13.32
7797 0.69-704. SRA res: NORMAL	: 29.85 91.9 8.8	: cs: 0.953
chan select bounds: 0.69- 704.00	: 21.10 83.1 13.3	:
progression: geom/sqrt2 8 chans:20	: 14.92 69.8 15.3	: sd: 9.11
sample date/time: 10/30/89 11:58	: 10.55 54.5 14.6	: na: 6.30
sample ident: 310803	: 7.46 40.0 12.0	LMNNNNNNNNNNNNNNNNNNNNNN
sample ID : C.F.	: 5.28 28.0 8.3	: parameters
lot code:	: 3.73 19.8 10.5	: name value
account #: printer: OFF:	: 2.64 9.3 7.9	:smpl amt 0.000
run time: 30 sec. run #: 100/ 2	: 1.69 1.3 1.3	:disprnt
sample preparation code: 0	: 1.01 0.1 0.1	:disp amt 0.000
notes:	:	:disp med
	:	:dmed amt 0.000
	:	:agitat'n
	:	:agit tim 0
	:	:circul'n
	:	:circ tim 0
	:	:param #1 0.000
MM	:	:param #2 0.000
Esc-exit F2-commands :	:	:param #3 0.000

310803
C.F.
Record Number: 1926

#####9

310804
F.G.M.P.
Record Number: 1929

	: ch-top %pass %ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0302
	: 150.00 100.0 0.0	: %10: 2.28
#####	: 75.00 100.0 0.0	: %50: 6.09
MICROTRAC DATA: DATA BASE UPDATE	: 59.69 100.0 0.0	: %90: 14.39
measurment/present'nd: 1932 - 1:	: 42.21 100.0 0.1	: mv: 7.16
7997 0.69-704. SRA res: NORMAL	: 29.85 99.9 1.2	: cs: 1.330
chan select bounds: 0.69- 704.00	: 21.10 98.7 7.2	:
progression: geom/sqrt2 8 chans:20	: 14.92 91.5 13.7	: sd: 4.82
sample date/time: 10/30/89 12:11	: 10.55 77.8 17.5	: ma: 4.48
sample ident: 310805	: 7.46 60.3 16.4	L#####
sample ID : F.P.	: 5.28 44.0 12.2	: parameters
lot code:	: 3.73 31.8 16.0	: name value
account #:	printer: OFF: 2.64 15.8 12.6	:smpl amt 0.000
run time: 30 sec. run #: 100/ 2	: 1.69 3.2 2.8	:disprnt
sample preparation code: 0	: 1.01 0.4 0.4	:disp amt 0.000
notes:	:	:disp med
	:	:dmed amt 0.000
	:	:agitat'n
	:	:agit tim 0
	:	:circul'n
	:	:circ tim 0
	:	:param #1 0.000
#####	:	:param #2 0.000
Esc-exit F2-commands :	:	:param #3 0.000

310805
F.P.
Record Number: 1932

20-Nov-89

EXPORTech Company, Inc.

Page 1

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract 19307-F-31

RUN #: 31201

SAMPLE DATE: 11-08-89

BECHTEL REFERENCE:	ETC#	MOISTURE		SOLIDS		ASH		TOTAL		<---- FORMS OF SULFUR ---->			
		WT. %		WT. %		WT. %		WT. %		BTU	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATION FEED	311401	-----		14.61		13.19		3.29		12197	1.05	0.11	2.13
AGGLOMERATES	311402	65.76	-----			4.30		2.80		13776	0.44	0.06	2.30
PRIMARY TAILS	311403	-----		2.14		71.04		6.14		-----	-----	-----	-----
SECONDARY TAILS	311404	-----		3.95		6.49		2.95		-----	-----	-----	-----
BINDER SOLUTION	311405	-----		6.17		4.25		3.95		16208	-----	-----	-----

01-Dec-89

EXPORTech Company, Inc.

Page

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract 19307-F-31

RUN #: 32401

SAMPLE DATE: 11-20-89

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATION FEED	311501	-----	13.95	12.77	3.46	12163	1.37	0.03	2.06
AGGLOMERATES	311502	63.59	-----	14.75	3.34	12066	1.31	0.02	2.01
PRIMARY TAILS	311503	-----	3.10	33.86	4.57	-----	-----	-----	-----
BINDER SOLUTION	311504	-----	3.99	0.52	3.67	17324	-----	-----	-----

Note: Percent solids for Binder Solution was measured as requested and not as percent of asphalt to total.

01-Dec-89

EXPORTech Company, Inc.

Page 1

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract 19307-F-31

RUN #: 32501

SAMPLE DATE: 11-21-89

BECHTEL REFERENCE:	ETC#	MOISTURE	SOLIDS	ASH	TOTAL	BTU	<---- FORMS OF SULFUR ---->			
		WT. %	WT. %	WT. %	SULFUR		WT. %	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	311601	-----	24.04	11.01	3.29	12720	1.22	0.03	2.04	
AGGLOMERATES	311602	38.00	-----	6.80	3.09	13431	0.89	0.03	2.17	-----
PRIMARY TAILS	311603	-----	3.87	30.2	4.82	-----	-----	-----	-----	-----
SECONDARY TAILS	311604	-----	26.45	9.10	3.39	-----	-----	-----	-----	-----

	: ch-top %pass %ch	: summary data
	: 704.00 100.0 61.4	: dv: 0.3291
	: 150.00 38.6 16.0	: %10: 24.79
#####	75.00 22.7 3.5	: %50: 208.76
MICROTRAC DATA: MANUAL MODE	: 59.69 19.2 4.3	: %90: 481.58
pressure't/present'n#: 2359 - 1:	42.21 14.8 3.3	: mv: 233.03
7337 0.69-704. SRA res: NORMAL	: 29.85 11.5 2.7	: cs: 0.131
chan select bounds: 0.69- 704.00	: 21.10 8.8 2.3	:
progression: geom/sqrt2 # chans:20	: 14.92 6.5 2.9	: sd: 192.69
sample date/time: 11/22/89 16:06	: 7.46 3.7 1.4	: wa: 45.73
sample ident: 311601	: 3.73 2.2 1.3	#####
sample ID : A.G.G.	: 2.64 0.9 0.9	: parameters
int code:	: 1.69 0.0 0.0	: name value
account #:	printer: OFF: 1.01 0.0 0.0	:smpl amt
run time: 30 sec. run #: 100/ 2	:	:disprnt
sample preparation code:	:	:disp amt
notes:	:	:disp med
	:	:dmed amt
	:	:agitat'n
	:	:agit tim
	:	:circul'n
	:	:circ tim
	:	:param #1
#####	:	:param #2
Esc-exit F2-commands :	:	:param #3

311601
A.G.G.
Record Number: 2359

01-Dec-89

EXPORTech Company, Inc.

Page 1

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract 19307-F-31

RUN #: 32601

SAMPLE DATE: 11-22-89

BECHTEL REFERENCE:	ETC#	MOISTURE	SOLIDS	ASH	TOTAL	<---- FORMS OF SULFUR ---->				
		WT. %	WT. %	WT. %	SULFUR	BTU	%PYRITIC	%SULFATE	%ORGANIC MICROTRAC	
					WT. %					
AGGLOMERATION FEED	311801	-----	12.85	13.97	3.40	12423	1.39	0.06	1.95	
AGGLOMERATES	311802	31.61	-----	9.04	3.47	12052	1.25	0.04	2.18	-----
PRIMARY TAILS	311803	-----	0.89	77.63	5.28	-----	-----	-----	-----	-----
SECONDARY TAILS	311804	-----	41.76	9.06	2.92	-----	-----	-----	-----	-----
BINDER SOLUTION	311805		4.37	0.75	3.74	17596	0.06	0.01	3.67	-----

Note: Percent solids for Binder Solution was measured as requested and not as percent of asphalt to total.

```

: ch-top tpass 1-ch      : summary data
: 704.00 100.0 18.8      : dv: 0.1210
: 150.00 81.2 18.9       : 110: 6.26
***** 75.00 62.4 6.2     : 150: 48.74
MICROTRAC DATA: DATA BASE UPDATE : 59.69 56.1 10.1 : 190: 232.97
resources/1/present/n0: 2371 - 1: 42.21 46.1 9.2 : av: 86.77
1000 62-704. SFA res: NORMAL : 29.85 36.9 8.3 : cs: 0.353
chan select brnds: 0.69- 704.00 : 21.10 28.6 7.1 :
p. progression: geom/sqrt2 0 chans:20 : 14.92 21.5 5.5 : sd: 78.11
sample date/time: 11/28/89 11:58 : 10.55 16.0 4.2 : 03: 17.00
sample ident: 311P01 : 7.46 11.8 3.2 *****
sample ID : A.G.G. FEED : 5.28 8.6 7.0 : parameters
lot code: : 3.73 6.6 3.8 : name value
amount 0: printer: OFF: 2.64 2.7 2.7 : [amp] aut 0.000
run time: 10 sec. run 0: 100/ 2 : 1.69 0.0 0.0 : [disp] aut
sample preparation code: 0 : 1.01 0.0 0.0 : [disp] aut 0.000
notes: : [disp] med
: [dosed] aut 0.000
: [sagit] n
: [sagit] tim 0
: [circul] n
: [circu] tim 0
: [param] 01 0.000
***** [param] 02 0.000
[esc]-exit F2-commands : [param] 03 0.000

```

```
rec-exit      f2-commands      :
```

311001
A.G.G. FEED
Record Number: 2371

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 33101
SAMPLE DATE: 11-29-89

BECHTEL REFERENCE:	ETCI #	SOLIDS WT. %	QUICK ASH WT. %	QUICK SULFUR WT. %
BALL MILL PRODUCT	311901	25.13	17.11	3.83
FG MILL PRODUCT	311902	44.69	24.71	7.54
FINAL PRODUCT	311903	16.98	14.23	3.11

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 33102
SAMPLE DATE: 11-29-89

BECHTEL REFERENCE:	ETCi #	SOLIDS WT. %	QUICK ASH WT. %	QUICK SULFUR WT. %
BALL MILL PRODUCT	312001	33.64	17.64	3.66
FG MILL PRODUCT	312002	44.50	21.30	6.22
FINAL PRODUCT	312003	15.34	16.52	3.37

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P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 33103
SAMPLE DATE: 11-29-89

BECHTEL REFERENCE:	ETCi #	SOLIDS WT. %	QUICK ASH WT. %	QUICK SULFUR WT. %
BALL MILL PRODUCT	312101	32.30	17.97	3.64
FG MILL PRODUCT	312102	41.23	24.78	7.72
FINAL PRODUCT	312103	13.10	15.95	3.33

04-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #:	33104									
SAMPLE DATE:	11-29-89		QUICK	QUICK		TOTAL				
			ASH	SULFUR	SOLIDS	ASH	SULFUR	<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	WT. %	BTU	%PYRITIC	%SULFATE	%ORGANIC MICROTRAC
BALL MILL PRODUCT	312201	16.47	3.72	28.42	17.72	3.95	11581	1.97	0.06	1.92
CENTRIFUGE FEED	312202	21.60	6.30	30.23	22.14	6.53	11044	4.14	0.15	2.24
FG MILL PRODUCT	312203	24.35	7.34	40.97	24.06	7.46	10570	5.03	0.31	2.12
FINAL PRODUCT	312204	17.89	3.32	11.61	17.91	3.37	11499	1.03	0.24	2.10

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 7.7	: dv: 0.0895
	: 150.00 90.1 20.3	: \$10: 4.87
*****	: 75.00 67.8 6.8	: \$50: 40.16
NICOPTRAC DATA: MANUAL MODE	: 59.69 63.0 11.3	: \$90: 149.69
pressure 1/present no: 2416 - 1:	: 42.21 51.6 10.1	: mv: 60.30
1987 0 49-704. SPA res: NORMAL	: 27.85 41.5 9.0	: cs: 0.410
chan select bounds: 0.69- 704.00	: 21.10 32.5 7.7	:
progression: geom/sqrt2 8 chans:20	: 14.92 24.8 6.2	: sd: 55.10
sample date/time: 12/01/89 14:49	: 10.55 18.7 4.6	: wa: 14.65
sample ident: 312201	: 7.46 14.0 3.5	*****
sample ID : B.M.P.	: 5.28 10.6 2.6	: parameters
1-4 codes:	: 3.73 8.0 4.6	: name value
account 0:	printer: OFF: 2.64 5.4 3.7	: compl ant
run time: 30 sec. run 0: 100/ 2	: 1.67 0.1 0.1	: dispersnt
sample preparation code:	: 1.01 0.0 0.0	: disp ant
notes:	:	: disp oed
:	:	: doed ant
:	:	: agitat'n
:	:	: agit tim
:	:	: circul'n
:	:	: circ tim
:	:	: para 01
*****	:	: para 02
Esc=exit F2=commands	:	: para 03

312201
B.M.P.
Record Number: 2416

```

: ch-top lpass 1 ch      : summary data
: 704.00 100.0 0.0      : dv: 0.0386
: 150.00 100.0 0.0      : s10: 2.36
: 75.00 100.0 0.0       : s50: 7.17
: 59.67 100.0 0.0       : s90: 18.18
: 42.21 100.0 0.5       : mv: 8.60
: 27.85 99.5 4.6        : cs: 1.270
: 21.10 94.9 11.3
: 14.92 83.5 15.3
: 10.55 68.2 16.1
: 7.46 52.1 13.3
: 5.28 38.8 10.0
: 3.73 28.8 14.6
: 2.64 14.2 11.5
: 1.69 2.7 2.4
: 1.01 0.3 0.3
: printer: OFF
: run time: 30 sec. run 0: 100/ 2
: sample preparation code:
: notes:

```

MIRAPAC DATA: MANUAL MODE
pressure t/present'nd: 2425 - 1: 42.21 100.0 0.0
: 27.85 99.5 4.6
chan colort brnds: 0.69- 704.00 : 21.10 94.9 11.3
: 14.92 83.5 15.3
sample date/time: 17/01/89 15:04 : 10.55 68.2 16.1
sample ident: 312204
sample 10 : f.p.
lrl code:
: printer: OFF
run time: 30 sec. run 0: 100/ 2
sample preparation code:
: notes:

fsc-evil f2-commands :
: fsc-evil f2-commands :
: fsc-evil f2-commands :

312204
F.P.
Record Number: 2425

04-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #:	33105						
SAMPLE DATE:	11-29-89	QUICK	QUICK			TOTAL	
		ASH	SULFUR	SOLIDS	ASH	SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	WT. %	MICROTRAC
=====							
FG MILL PRODUCT	312301	34.47	10.15	25.48	36.73	11.36	
FINAL PRODUCT	312302	17.68	4.64	12.68	17.69	4.57	

```

: ch-top &pass &ch : summary data
: 704.00 100.0 0.0 : dv: 0.0389
: 150.00 100.0 0.0 : %10: 2.37
***** 75.00 100.0 0.0 : %50: 6.55
MICROTRAC DATA: MANUAL MODE : 59.69 100.0 0.0 : %70: 17.15
measure'/present'n0: 2428 - 1: 42.21 100.0 0.4 : av: 8.12
0.69-704. SPA res: NORMAL : 29.85 97.6 4.1 : cs: 1.253
chan select bounds: 0.69- 704.00 : 21.10 95.5 9.6 :
progression: geom/sqrt2 8 chans:20 : 14.92 85.9 13.7 : sd: 5.74
sample date/time: 12/01/89 15:09 : 10.55 72.2 16.1 : na: 4.79
sample ident: 312301 : 7.46 56.1 14.7 *****
sample 10 : F.G.M.P. : 5.28 41.4 11.8 : parameters
lot code: : 3.73 27.6 15.6 : name value
amount 0: printer: OFF: 2.64 14.0 11.4 :sopl ant
run time: 30 sec. run 0: 100/ 2 : 1.69 2.6 2.4 :disprnt
sample preparation code: : 1.01 0.2 0.2 :disp ant
notes: : :disp ned
: : :doed ant
: : :agitat'n
: : :agit tie
: : :circul'n
: : :circ tie
: : :para 01
***** :para 02
Esc-exit F2-commands : :para 03

```

312301
F.G.M.P.
Record Number: 2428

```

: ch-top fpass 8-ch          : suanary data
: 704.00 100.0 0.0          : dv: 0.0271
: 150.00 100.0 0.0          : f10: 2.23
: 75.00 100.0 0.0           : f50: 5.70
: 59.69 100.0 0.0           : f90: 14.22
: 42.21 100.0 0.0           : dv: 6.90
: 27.85 100.0 0.0           : cs: 1.378
: 2431 - 1: 42.21 100.0 0.0
: res: NORMAL : 27.85 100.0 0.0
: 0.67-704.00 : 21.10 99.1 7.2
: 14.92 91.9 12.9
: 10.55 79.0 16.5
: 7.46 62.5 15.5
: 5.28 47.0 12.5
: 3.73 34.5 17.5
: printer: Off: 2.64 17.1 13.4
: 1.69 3.6 3.1
: 1.01 0.5 0.5
: 12-seconds :

```

312302
F.P.
Record Number: 2431

14-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #:	33401					
SAMPLE DATE:	11-29-89	QUICK	QUICK			TOTAL
		ASH	SULFUR	SOLIDS	ASH	SULFUR
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	WT. %
=====						
AGGLOMERATION FEED	312401	16.60	3.44	20.39	17.76	3.56
BINDER SOLUTION	312402	-----	-----	30.59	0.63	2.99

		<----- SULFUR FORMS ----->		
		PYRITIC SULFATE ORGANIC		
		=====		
AGGLOMERATION FEED	312401	1.28	0.28	2.00

07-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 33403
SAMPLE DATE: 11-30-89

BECHTEL REFERENCE:	ETC#	MOISTURE	SOLIDS	ASH	TOTAL	BTU	<----- SULFUR FORMS ----->		
		WT. %	WT. %	WT. %	SULFUR		WT. %	PYRITIC	SULFATE	ORGANIC
AGGLOMERATES	312501	41.60	-----	7.60	3.38	13319	1.07	0.12	2.19
PRIMARY TAILS	312502	-----	2.10	82.21	5.09	-----	-----	-----	-----

06-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #:	33501								
SAMPLE DATE:	12-01-89	QUICK	QUICK					TOTAL	
		ASH	SULFUR	MOISTURE	SOLIDS	ASH	SULFUR		
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	WT. %	WT. %	BTU	
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
AGGLOMERATION FEED	312601	15.95	3.26	-----	14.07	16.48	3.34	11661	
AGGLOMERATES	312602	5.69	2.90	31.49	-----	5.52	2.93	13592	
PRIMARY TAILS	312603	88.12	6.86	-----	2.45	87.90	6.96	-----	
SECONDARY TAILS	312604	6.94	3.11	-----	0.82	7.17	3.19	-----	

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
=====	=====	=====	=====	=====
AGGLOMERATION FEED	312601	1.32	0.11	1.91
AGGLOMERATES	312602	0.69	0.05	2.19
PRIMARY TAILS	312603	-----	-----	-----
SECONDARY TAILS	312604	-----	-----	-----

15-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 34201

SAMPLE DATE: 12-08-89

		QUICK ASH	QUICK SULFUR	MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	312701	15.78	3.30	-----	11.90	16.71	3.41	11425
AGGLOMERATES	312702	3.86	2.69	27.01	-----	3.93	2.74	13623
PRIMARY TAILS	312703	80.33	6.76	-----	1.42	80.98	6.85	-----
SECONDARY TAILS	312704	-----	-----	-----	6.40	9.65	2.99	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATION FEED	312701	1.19	0.19	2.03
AGGLOMERATES	312702	0.36	0.07	2.31
PRIMARY TAILS	312703	-----	-----	-----
SECONDARY TAILS	312704	-----	-----	-----

22-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #:	34601							
SAMPLE DATE:	12-12-89	QUICK	QUICK				TOTAL	
		ASH	SULFUR	MOISTURE	SOLIDS	ASH	SULFUR	
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	312901	16.22	3.14	-----	10.19	16.61	3.10	11829
AGGLOMERATES	312902	4.18	2.78	41.21	-----	3.90	2.77	14037
PRIMARY TAILS	312903	87.23	4.99	-----	2.03	88.71	4.98	-----
SECONDARY TAILS	312904	-----	-----	-----	0.01	* INSUFFICIENT MATERIAL TO ANALYZE *		

		<---- FORMS OF SULFUR ---->			
BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	312901	0.96	0.19	1.95	
AGGLOMERATES	312902	0.38	0.08	2.31	-----
PRIMARY TAILS	312903	-----	-----	-----	-----
SECONDARY TAILS	312904				-----

[illegible]

312901
NGG. FEED
Record Number: 2740

22-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 34602
SAMPLE DATE: 12-12-89

BECHTEL REFERENCE: ETC1 # MICROTRAC

BLENDER FEED 313001

```

: ch-top 8pass 8-ch : summary data
: 704.00 100.0 0.0 : dv: 0.0330
: 150.00 100.0 0.0 : 810: 2.00
##### 75.00 100.0 0.0 : 850: 3.79
MICROTRAC DATA: MANUAL MODE : 59.69 100.0 0.0 : 890: 14.34
Measure 1/present no: 2743 - 1: 42.71 100.0 0.2 : av: 6.22
977 0.69-704. SRA res: NORMAL : 29.85 99.8 2.1 : cs: 1.694
has select bounds: 0.69- 704.00 : 21.10 97.7 6.7 :
regression: geom/sqrt2 8 chans:20 : 14.92 91.0 0.4 : sd: 4.34
sample date/time: 12/10/89 15:26 : 10.55 82.6 12.0 : na: 3.54
sample ident: 313001 : 7.46 70.6 12.4 #####
sample 10 : BLENDER FEED : 5.28 58.2 9.4 : parameters
of code: : 3.73 48.9 22.3 : name value
count 0: printer: OFF: 2.64 26.5 20.2 : repl ant
run time: 30 sec. run 0: 100/ 2 : 1.69 6.3 5.1 : disprnt
sample preparation code: : 1.01 1.2 1.2 : disp ant
ntext: : : disp ned
: : : ded ant
: : : agitat'n
: : : agit lin
: : : circuli'n
: : : circ lin
: : : para 01
##### : para 02
.:exit f2-commands : : para 03

```

313001
BLENDER FEED
Record Number: 2743

22-Dec-89 .. EXPORTech Company, Inc.

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #:	34701								
SAMPLE DATE:	12-13-89		QUICK	QUICK				TOTAL	
			ASH	SULFUR	MOISTURE	SOLIDS	ASH	SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	313101	16.01	3.03	.....	12.58	16.47	3.07	11854	
AGGLOMERATES	313102	3.84	2.65	42.47	.....	3.82	2.73	13942	
PRIMARY TAILS	313103	86.16	4.82	.....	2.13	86.36	4.93	.....	
SECONDARY TAILS	313104	.....	.....	.....	12.27	5.52	2.74	.....	

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATION FEED	313101	0.99	0.14	1.94
AGGLOMERATES	313102	0.37	0.06	2.30
PRIMARY TAILS	313103	.....	.....	.....
SECONDARY TAILS	313104	.....	.....	.....

22-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 34801

SAMPLE DATE: 12-12-89

		QUICK ASH	QUICK SULFUR	MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	313201	15.37	3.13	.....	14.62	16.11	3.28	11923
AGGLOMERATES	313202	3.97	2.69	54.45	.....	4.79	2.93	13970
PRIMARY TAILS	313203	87.42	5.52	.....	2.4	88.60	5.51	.....
SECONDARY TAILS	313204	.....	.....	.....	0.23	16.62	3.06	.....

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	313201	1.09	0.13	2.06	
AGGLOMERATES	313202	0.56	0.11	2.26	.....
PRIMARY TAILS	313203	.....	.....	.....	.....
SECONDARY TAILS	313204	.....	.....	.....	.....

[illegible]

313201
 AGG. FED
 Record Number: 2746

22-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #:	34802							
SAMPLE DATE:	12-12-89	QUICK	QUICK				TOTAL	
		ASH	SULFUR	MOISTURE	SOLIDS	ASH	SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	WT. %	WT. %	BTU
=====								
AGGLOMERATES	313301	3.78	2.67	49.00	-----	4.20	2.87	13856
PRIMARY TAILS	313302	87.10	5.87	-----	2.14	87.98	5.88	-----
SECONDARY TAILS	313303	-----	-----	-----	2.92	5.76	2.79	-----

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
=====				
AGGLOMERATES	313301	0.50	0.11	2.26
PRIMARY TAILS	313302	-----	-----	-----
SECONDARY TAILS	313303	-----	-----	-----

22-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #:	34901							
SAMPLE DATE:	12-15-89		QUICK	QUICK			TOTAL	
			ASH	SULFUR	MOISTURE	SOLIDS	ASH	SULFUR
BECHTEL REFERENCE:	ETCi #	WT. %	WT. %	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	313401	15.78	3.11	-----	14.48	16.12	3.28	11732
AGGLOMERATES	313402	3.89	2.79	33.85	-----	3.99	2.79	13731
PRIMARY TAILS	313403	86.44	6.23	-----	2.35	87.31	6.33	-----
SECONDARY TAILS	313404	-----	-----	-----	6.18	9.04	2.96	-----

		<---- FORMS OF SULFUR ---->			
BECHTEL REFERENCE:	ETCi #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	313401	1.13	0.18	1.97	
AGGLOMERATES	313402	0.43	0.09	2.27	-----
PRIMARY TAILS	313403	-----	-----	-----	-----
SECONDARY TAILS	313404	-----	-----	-----	-----

[illegible]

313401
AGG. FEED
Record Number: 2749

22-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #:	35001							
SAMPLE DATE:	12-16-89	QUICK	QUICK				TOTAL	
		ASH	SULFUR	MOISTURE	SOLIDS	ASH	SULFUR	
BECHTEL REFERENCE:	ETCi #	WT. %	WT. %	WT. %	WT. %	WT. %	WT. %	BTU
=====								
BALL MILL FEED	313501	17.77	4.13	9.57	-----	18.43	4.31	11283
FINAL PRODUCT	313502	16.39	3.08	-----	13.95	16.57	3.08	11602
SPIRAL TAILS	313503	34.62	11.06	-----	45.82	36.20	10.93	-----

		<---- FORMS OF SULFUR ---->			
BECHTEL REFERENCE:	ETCi #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
=====					
BALL MILL FEED	313501	1.97	0.25	2.09	-----
FINAL PRODUCT	313502	0.78	0.25	2.05	
SPIRAL TAILS	313503	-----	-----	-----	-----

```

: ch-top 8pass 8-ch : summary data
: 704.00 100.0 0.0 : dv: 0.0460
: 150.00 100.0 0.0 : 810: 2.28
***** 75.00 100.0 0.0 : 850: 6.23
MICROTRAC DATA: MANUAL MODE : 59.69 100.0 0.0 : 870: 16.28
measured t/present n0: 2752 - 1: 42.21 100.0 0.3 : av: 7.69
7797 0.69-704. SRA res: NORMAL : 29.85 99.7 3.0 : cs: 1.321
then select bounds: 0.69- 704.00 : 21.10 96.8 9.5 :
progression: geom/sqrt2 8 chans:20 : 14.92 87.3 12.7 : sd: 5.52
sample date/time: 12/10/89 15:44 : 10.55 74.6 16.1 : ea: 4.54
sample ident: 313502 : 7.46 58.5 14.9 *****
sample ID : F.P. : 5.28 43.6 11.0 : parameters
lot code: : 3.73 32.7 16.6 : name value
account 0: printer: OFF: 2.64 16.1 13.0 : sapl ant
run time: 30 sec. run 0: 100/ 2 : 1.69 3.0 2.7 : disprnt
sample preparation code: : 1.01 0.4 0.4 : disp ant
notes: : : disp ned
: : : deed ant
: : : agitat'n
: : : agit tia
: : : rcircul'n
: : : rcirc tia
: : : param 01
***** : param 02
Esc-exit F2-commands : : param 03

```

313502
F.P.
Record Number: 2752

22-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 35301
SAMPLE DATE: 12-19-89

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	313601	30.44	-----	3.89	2.74	13897
PRIMARY TAILS	313602	-----	2.20	84.76	5.34	-----
SECONDARY TAILS	313603	-----	11.30	9.60	2.91	-----

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	313601	0.35	0.07	2.32
PRIMARY TAILS	313602	-----	-----	-----
SECONDARY TAILS	313603	-----	-----	-----

22-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 35302
SAMPLE DATE: 12-19-89

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	313701	8.74	.....	17.40	4.03	11480
FINAL PRODUCT	313702	.....	13.26	15.16	2.96	11858
SPIRAL TAILS	313703	.....	47.97	40.11	13.01	.....

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	313701	1.81	0.24	1.98	.....
FINAL PRODUCT	313702	0.73	0.20	2.03	
SPIRAL TAILS	313703	.....	.....	.....	.....

	: ch-top %pass %ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0423
	: 150.00 100.0 0.0	: %10: 2.49
#####	: 75.00 100.0 0.0	: %50: 7.44
MICROTRAC DATA: MANUAL MODE	: 59.69 100.0 0.0	: %90: 18.17
measured't/present'n0: 2845 - 1:	: 42.21 100.0 0.7	: mv: 8.85
1997 0.69-704. SPA res: NORMAL	: 29.85 99.3 5.5	: cs: 1.142
chan select bounds: 0.69- 704.00	: 21.10 93.8 9.5	:
progression: geom/sqrt2 0 chaps:20	: 14.92 84.3 16.4	: sd: 5.92
sample date/time: 12/20/89 13:31	: 10.55 68.0 17.9	: ea: 5.26
sample ident: 313702	: 7.46 50.1 14.7	#####
sample 10 : FINAL PRODUCT	: 5.28 35.4 10.7	: parameters
lot code:	: 3.73 24.7 12.9	: name value
account 0: printer: Off:	: 2.64 11.9 9.8	:sep1 ant
run time: 30 sec. run 0: 100/ 2	: 1.69 2.1 2.0	:disprnt
sample preparation code:	: 1.01 0.1 0.1	:disp ant
notes:	:	:disp ned
	:	:doed ant
	:	:agitat'n
	:	:agit tin
	:	:circul'n
	:	:circ tin
	:	:para0 01
#####	:	:para0 02
Esc-exit f2-commands :	:	:para0 03

313702
FINAL PRODUCT
Record Number: 2845

22-Dec-89 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 35401
SAMPLE DATE: 12-20-89

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	313801	28.84	.....	3.60	2.66	13878
PRIMARY TAILS	313802	.....	1.94	88.10	5.11	.....
SECONDARY TAILS	313803	.....	0.68	12.84	2.88	.....

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	313801	0.25	0.09	2.32
PRIMARY TAILS	313802	.....	.....	.....
SECONDARY TAILS	313803	.....	.....	.....

15-Feb-90 ... EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

SUBCONTRACT 19307-P-31

RUN #: 35401
SAMPLE DATE: 12-20-89

MEASUREMENTS REPORTED DECEMBER 22, 1989:

REFERENCE:	ETC#	MOISTURE WT. %	SOLIDS WT. %	ASH WT. %	TOTAL SULFUR WT. %	BTU	<.... FORMS OF SULFUR>		
							%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	313801	28.84	.....	3.60	2.66	13878	0.25	0.09	2.32

ADDITIONAL ANALYSES REQUESTED JANUARY 18, 1990:

PROXIMATE ANALYSIS

TOTAL MOISTURE	28.84 %
ASH	3.63 %
VOLATILE MATTER	42.44 %
FIXED CARBON	53.93 %
TOTAL SULFUR	2.56 %
ORGANIC SULFUR	2.17 %
PYRITIC SULFUR	0.27 %
SULFATE SULFUR	0.12 %
PYRITIC SULFUR/TOTAL SULFUR	10.55 %
HEATING VALUE (BTU/lb)	13763
HEATING VALUE (BTU/lb MAF)	14281
FREE SWELLING INDEX	1

MINERAL ASH ANALYSIS

SILICA SiO2	40.14 %
ALLUMINA Al2O3	19.49 %
TITANIA TiO2	2.93 %
FERRIC OXIDE Fe2O3	25.34 %
LIME CaO	3.60 %
MAGNESIA MgO	1.35 %
POTASSIUM OXIDE K2O	2.72 %
SODIUM OXIDE Na2O	1.79 %
SULFUR TRIOXIDE SO3	1.05 %
PHOSPHOROUS PENTOXIDE P2O5	0.30 %
STRONTIUM OXIDE SrO	0.05 %
BARIUM OXIDE BaO	0.00 %
MANGANESE OXIDE Mn3O4	0.09 %

TOTAL: 98.85 %

ASH FUSION CHARACTERISTICS

REDUCING:	
INITIAL DEFORMATION	2053
SOFTENING	2180
HEMISPHERICAL	2260
FLUID	2340

OXIDIZING:	
INITIAL DEFORMATION	2269
SOFTENING	2380
HEMISPHERICAL	2440
FLUID	2515

ULTIMATE ANALYSIS

CARBON	76.44 %
HYDROGEN	5.16 %
NITROGEN	1.39 %
CHLORINE	0.02 %
SULFUR	2.56 %
ASH	3.63 %
OXYGEN	10.80 %

(BY DIFFERENCE)

TRACE ELEMENT ANALYSIS:
CONCENTRATIONS IN PPM

ARSENIC (As)	53
BORON (B)	180
CADMIUM (Cd)	0.6
MERCURY (Hg)	0.02
MOLYBDENUM (Mo)	16
NITROGEN (N)	13900
LEAD (Pb)	31
SULFUR (S)	4200
SELENIUM (Se)	3
CHROMIUM (Cr)	80
COPPER (Cu)	41
FLUORINE (F)	180
NICKEL (Ni)	60
VANADIUM (V)	102
ZINC (Zn)	215
BARIUM (Ba)	24
BROMINE (Br)	7
CHLORINE (Cl)	200
COBALT (Co)	12
GERMANIUM (Ge)	4
LITHIUM (Li)	580
SODIUM (Na)	13250
MANGANESE (Mn)	880
STRONTIUM (Sr)	490

15-Feb-90 ... EXPORech Company, Inc.

EXPORech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

SUP/CONTRACT 19307-F-31

RUN #: 39401
SAMPLE DATE: 12-20-89

MEASUREMENTS REPORTED DECEMBER 22, 1989:

REFERENCE:	ETC#	SOLIDS WT. %	ASH WT. %	SULFUR WT. %
PRIMARY TAILS	313802	1.94	88.10	5.11

ADDITIONAL ANALYSES REQUESTED JANUARY 18, 1990:

REFERENCE:	ETC#	BTU	<.... FORMS OF SULFUR>		
			%PYRITIC	%SULFATE	%ORGANIC
PRIMARY TAILS	313802	*	3.27	0.99	0.85

* UNABLE TO DETERMINE

MINERAL ASH ANALYSIS

SILICA SiO2	56.03
ALLUMINA Al2O3	23.69
TITANIA TiO2	0.59
FERRIC OXIDE Fe2O3	11.01
LIME CaO	2.35
MAGNESIA MgO	1.04
POTASSIUM OXIDE K2O	2.72
SODIUM OXIDE Na2O	0.31
SULFUR TRIOXIDE SO3	1.93
PHOSPHOROUS PENTOXIDE P2O5	0.27
STRONTIUM OXIDE SrO	0.03
BARIUM OXIDE BaO	0.05
MANGANESE OXIDE Mn3O4	0.00
TOTAL:	100.02

TRACE ELEMENT ANALYSIS
(CONCENTRATIONS IN PPM)

ARSENIC (As)	54
BORON (B)	120
CADMIUM (Cd)	0.3
MERCURY (Hg)	0.04
MOLYBDENUM (Mo)	5
NITROGEN (N)	2600
LEAD (Pb)	55
SULFUR (S)	7720
SELENIUM (Se)	4
CHROMIUM (Cr)	120
COPPER (Cu)	45
FLUORINE (F)	210
NICKEL (Ni)	49
VANADIUM (V)	90
ZINC (Zn)	310
BARIUM (Ba)	435
BROMINE (Br)	7
CHLORINE (Cl)	30
COBALT (Co)	20
GERMANIUM (Ge)	9
LITHIUM (Li)	610
SODIUM (Na)	2294
MANGANESE (Mn)	30
STRONTIUM (Sr)	310

```

: summary data
: dv: 0.0266
: $10: 1.48
: $50: 2.60
: $90: 4.32
: mv: 2.91
: cs: 2.518

```

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: sd: 0.94
: sd: 2.38

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: parameters
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Record Number: 3478

09-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 36801
SAMPLE DATE: 01-03-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	313901	.....	.....	3.54	2.57	.....
PRIMARY TAILS	313902	.....	1.66	86.39	4.89	.....
SECONDARY TAILS	313903	.....	0.17	23.00	3.01	.....
BINDER SOLUTION	313904	.....	28.29	0.04	3.13	17767

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	313901	0.21	.....	.....
PRIMARY TAILS	313902	.....	.....	.....
SECONDARY TAILS	313903	.....	.....	.....
BINDER SOLUTION	313904	0.01	0.01	3.11

RUN #: 36801
SAMPLE DATE: 01-03-90

		MOISTURE	
BECHTEL REFERENCE:	ETCI #	WT. %	BTU
AGGLOMERATES	313901	33.05	13811

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	313901	0.21	0.11	2.25
PRIMARY TAILS	313902	3.29	0.93	0.67

09-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 36802

SAMPLE DATE: 01-03-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	314001	7.35	.....	18.82	4.34	11283
SPIRAL TAILS	314002	.....	50.82	36.99	11.25	.....
FINAL PRODUCT	314003	.....	18.23	16.85	3.56	11536

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	314001	2.11	0.31	1.92	.....
SPIRAL TAILS	314002	.....	.....	.....	.....
FINAL PRODUCT	314003	1.15	0.42	1.99	

[illegible][illegible]

314003
FINAL PRODUCT
Record Number: 3181

09-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 36803

SAMPLE DATE: 01-03-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	314101	29.57	-----	3.87	2.84	13739
PRIMARY TAILS	314102	-----	2.56	88.22	5.95	-----
SECONDARY TAILS	314103	-----	0.74	12.01	2.99	-----

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	314101	0.46	0.11	2.27
PRIMARY TAILS	314102	-----	-----	-----
SECONDARY TAILS	314103	-----	-----	-----

09-Jan-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 36804

SAMPLE DATE: 01-03-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	314201	29.72	-----	3.93	2.89	13783
PRIMARY TAILS	314202	-----	7.90	87.02	5.31	-----

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	314201	0.50	0.12	2.27
PRIMARY TAILS	314202	-----	-----	-----

10-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 36901

SAMPLE DATE: 01-04-90

		MOISTURE	SOLIDS	ASH	TOTAL
		WT. %	WT. %	WT. %	SULFUR
BECHTEL REFERENCE:	ETC#				WT. %
=====					
AGGLOMERATES	314301	36.54	-----	3.93	2.87
PRIMARY TAILS	314302	-----	2.38	89.31	5.45
SECONDARY TAILS	314303	-----	9.19	8.70	2.95

10-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 36902
SAMPLE DATE: 01-04-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	314401	39.76	-----	4.10	2.80	13870
PRIMARY TAILS	314402	-----	2.34	88.21	6.02	-----
SECONDARY TAILS	314403	-----	0.78	11.54	2.98	-----

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	314401	0.36	0.13	2.31
PRIMARY TAILS	314402	-----	-----	-----
SECONDARY TAILS	314403	-----	-----	-----

10-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 36903

SAMPLE DATE: 01-04-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	314501	7.88	-----	16.16	3.84	11629
SPIRAL TAILS	314502	-----	52.38	44.14	14.52	-----
FINAL PRODUCT	314503	-----	13.02	14.35	3.01	12013

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
BALL MILL FEED	314501	1.61	0.23	2.00
SPIRAL TAILS	314502	-----	-----	-----
FINAL PRODUCT	314503	0.73	0.33	1.95

10-Jan-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 36904
SAMPLE DATE: 01-04-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
=====						
AGGLOMERATES	314601	36.90	-----	5.60	2.80	13881
PRIMARY TAILS	314602	-----	2.44	88.52	5.99	-----
SECONDARY TAILS	314603	-----	0.26	38.26	4.22	-----

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
=====				
AGGLOMERATES	314601	0.39	0.12	2.29
PRIMARY TAILS	314602	-----	-----	-----
SECONDARY TAILS	314603	-----	-----	-----

10-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37001

SAMPLE DATE: 01-05-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	SULFUR WT. %
AGGLOMERATES	314701	35.54	-----	4.22	2.99
PRIMARY TAILS	314702	-----	1.84	89.10	3.53
SECONDARY TAILS	314703	-----	0.53	30.36	2.83

10-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37002
SAMPLE DATE: 01-05-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC# #	WT. %	WT. %	WT. %	SULFUR WT. %
AGGLOMERATES	314801	40.14	.....	4.13	3.03
PRIMARY TAILS	314802	.....	1.79	88.23	4.23
SECONDARY TAILS	314803	.....	0.52	12.80	2.93

10-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37003

SAMPLE DATE: 01/05/90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	314901	34.17	.....	3.74	2.74	14217
PRIMARY TAILS	314902	.....	1.65	89.13	5.16	.....
SECONDARY TAILS	314903	.....	1.50	6.12	2.93	.....

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	314901	0.49	0.07	2.18
PRIMARY TAILS	314902			
SECONDARY TAILS	314903			

10-Jan-90 -- EXPORTEch Company, Inc.

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P. O. Box 588
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Subcontract No. 19307-F-31

RUN #: 37301
SAMPLE DATE: 01-08-90

		MOISTURE	SOLIDS	ASH	TOTAL	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR	BTU
AGGLOMERATES	315001	24.99	.....	4.05	3.05	13923
PRIMARY TAILS	315002	.....	1.87	87.67	3.78	.....
SECONDARY TAILS	315003	.....	6.81	4.18	2.85	.....

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	315001	0.65	0.06	2.34
PRIMARY TAILS	315002	.....	.....	.....
SECONDARY TAILS	315003	.....	.....	.....

10-Jan-90 -- EXPORtech Company, Inc.

EXPORtech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37302

SAMPLE DATE: 01-08-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	315101	28.61	.....	3.91	2.98
PRIMARY TAILS	315102	.....	1.93	87.96	4.46
SECONDARY TAILS	315103	.....	13.80	4.47	2.91

15-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37303

SAMPLE DATE: 01-08-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC! #	WT. %	WT. %	WT. %	SULFUR WT. %
AGGLOMERATES	315201	28.99	-----	3.84	2.88
PRIMARY TAILS	315202	-----	1.95	88.09	5.38
SECONDARY TAILS	315203	-----	1.08	9.45	3.01

15-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37401
SAMPLE DATE: 01-09-90

BECHTEL REFERENCE:	ETCI #	MOISTURE	SOLIDS	ASH	TOTAL	BTU
		WT. %	WT. %	WT. %	SULFUR	
=====						
AGGLOMERATES	315301	21.68	-----	4.91	3.39	13899
PRIMARY TAILS	315302	-----	2.34	87.13	6.41	-----
SECONDARY TAILS	315303	-----	3.58	5.08	2.95	-----
AGGLOMERATION FEED	315304	-----	16.49	15.70	3.94	12057

BECHTEL REFERENCE:	ETCI #	<---- FORMS OF SULFUR ---->			
		%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
=====					
AGGLOMERATES	315301	0.93	0.10	2.36	-----
PRIMARY TAILS	315302	-----	-----	-----	-----
SECONDARY TAILS	315303	-----	-----	-----	-----
AGGLOMERATION FEED	315304	1.56	0.31	2.07	

```

: ch-top 1pass 6-ch      : summary data
: 704.00 100.0 0.0      : dv: 0.0448
: 150.00 100.0 0.0      : s10: 2.70
: 75.00 100.0 0.2      : s50: 9.43
*****
MICROTRAC DATA: MANUAL MODE : 59.69 99.8 1.8 : s90: 25.66
measured/present no: 3277 - 1: 42.21 98.0 3.8 : av: 12.04
7777 0.69-704. SRA res: NORMAL : 29.85 94.2 9.8 : cs: 0.765
than select bounds: 0.69- 704.00 : 21.10 84.4 14.7 :
regression: gosa/sqrt2 0 chans:20 : 14.72 70.2 15.0 : sd: 8.81
sample date/time: 01/10/90 11:53 : 10.55 55.2 14.7 : na: 6.22
sample ident: 315304 : 7.46 40.5 11.9 *****
sample 10 : AGG. FEED : 5.28 28.6 8.2 : parameters
int code: : 3.73 20.4 11.0 : name value
run count 0: printer: OFF: 2.64 9.3 8.1 :sed ant
run time: 30 sec. run 0: 100/ 2 : 1.67 1.2 1.2 :disp ant
sample preparation code: : 1.01 0.0 0.0 :disp ant
notes: :disp ned
: :doed ant
: :soit at'n
: :soit tin
: :circul'n
: :circ tin
: :para 01
***** :para 02
: :para 03
esc:exit f2:commands

```

315304
AGG. FEED
Record Number: 3277

15-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37403
SAMPLE DATE: 01-09-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	315401	5.10	-----	13.00	4.05	12559
SPIRAL TAILS	315402	-----	7.03	51.53	25.24	-----
FINAL PRODUCT	315403	-----	13.49	12.81	<u>3.29</u>	12533

		<---- FORMS OF SULFUR ---->			
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	315401	1.71	0.09	2.25	-----
SPIRAL TAILS	315402	-----	-----	-----	-----
FINAL PRODUCT	315403	1.04	0.22	2.03	

15-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37501

SAMPLE DATE: 01-10-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR WT. %
=====	=====	=====	=====	=====	=====
AGGLOMERATES	315601	31.77	-----	4.21	3.16
PRIMARY TAILS	315602	-----	1.59	89.21	5.17
SECONDARY TAILS	315603	-----	10.68	5.84	3.29

15-Jan-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37502
SAMPLE DATE: 01-10-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR WT. %
AGGLOMERATES	315701	36.88	-----	3.84	3.10
PRIMARY TAILS	315702	-----	1.39	88.29	4.99
SECONDARY TAILS	315703	-----	13.76	6.07	3.17

15-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37503
SAMPLE DATE: 01-10-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	315801	24.29	-----	3.85	3.03	14143
PRIMARY TAILS	315802	-----	5.26	86.17	8.04	-----
SECONDARY TAILS	315803	-----	0.48	41.66	3.87	-----

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	315801	0.87	0.06	2.10
PRIMARY TAILS	315802	-----	-----	-----
SECONDARY TAILS	315803	-----	-----	-----

15-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37504

SAMPLE DATE: 01-10-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	315901	31.67	-----	3.90	2.94
PRIMARY TAILS	315902	-----	1.24	89.44	5.50
SECONDARY TAILS	315903	-----	1.99	12.31	3.36

16-Jan-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37601

SAMPLE DATE: 01-11-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	316001	41.25	4.45	3.37

16-Jan-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37602

SAMPLE DATE: 01-11-90

		MOISTURE	ASH	TOTAL SULFUR
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %
=====				
AGGLOMERATES	316101	22.18	4.02	3.17

16-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37603

SAMPLE DATE: 01-11-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
AGGLOMERATES	316201	36.70	4.13	3.12

18-Jan-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37701

SAMPLE DATE: 01-12-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	316301	32.52	3.68	2.92

18-Jan-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 37702

SAMPLE DATE: 01-12-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
AGGLOMERATES	316401	27.19	3.54	2.87

18-Jan-90 -- EXPORech Company, Inc.

EXPORech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 38001

SAMPLE DATE: 01-15-90

		MOISTURE	ASH	TOTAL SULFUR
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %
AGGLOMERATES	316501	25.86	3.82	2.87

18-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 38002

SAMPLE DATE: 01-15-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	316601	34.54	3.79	2.86

18-Jan-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 38003

SAMPLE DATE: 01-15-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
AGGLOMERATES	316701	50.01	3.86	2.77

25-Jan-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 38301

SAMPLE DATE: 01-18-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETCi #	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	316801	32.19	3.94	2.76

25-Jan-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 38401

SAMPLE DATE: 01-19-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	316901	32.68	4.02	2.69

25-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 38701

SAMPLE DATE: 01-22-90

		MOISTURE	ASH	TOTAL SULFUR
BECHTEL REFERENCE:	ETCi #	WT. %	WT. %	WT. %
=====				
AGGLOMERATES	317001	46.88	5.25	3.14

25-Jan-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 38702

SAMPLE DATE: 01-22-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETCi #	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	317101	32.51	4.41	3.02

01-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 38801

SAMPLE DATE: 01-23-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETCi #	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	317201	26.11	4.20	3.03

01-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 38802

SAMPLE DATE: 01-23-90

		MOISTURE	ASH	TOTAL SULFUR
BECHTEL REFERENCE:	ETCi #	WT. %	WT. %	WT. %
=====				
AGGLOMERATES	317301	26.33	4.06	2.99

01-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 38803

SAMPLE DATE: 01-23-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	317401	25.00	3.97	2.87

01-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
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New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #:	38901			
SAMPLE DATE:	01-24-90			TOTAL
		MOISTURE	ASH	SULFUR
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %
=====				
AGGLOMERATES	317501	31.70	3.65	2.70

01-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 38902

SAMPLE DATE: 01-24-90

		MOISTURE	ASH	TOTAL SULFUR
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %
=====				
AGGLOMERATES	317601	30.39	3.47	2.66

01-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 38903

SAMPLE DATE: 01-24-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
AGGLOMERATES	317701	34.46	3.52	2.68

15-Feb-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 39001
SAMPLE DATE: 01-25-90

BECHTEL REFERENCE:	ETCI #	MOISTURE	SOLIDS	ASH	TOTAL	BTU
		WT. %	WT. %	WT. %	SULFUR	
=====						
AGGLOMERATION FEED	317901	-----	15.59	14.66	3.00	11882
AGGLOMERATES	317902	33.12	-----	3.65	2.70	13887
PRIMARY TAILS	317903	-----	2.12	88.68	5.65	-----

BECHTEL REFERENCE:	ETCI #	<---- FORMS OF SULFUR ---->				ASPHALT	HEPTANE
		%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC	WT. %	PPM
=====							
AGGLOMERATION FEED	317901	0.71	0.36	1.93		-----	-----
AGGLOMERATES	317902	0.28	0.09	2.33	---	2.16	1769.23
PRIMARY TAILS	317903	-----	-----	-----	-----	0.00	205.55

FLOAT SINK ANALYSIS
AGGLOMERATION FEED, Sample 317901

SAMPLE#	SPECIFIC GRAVITY	WTX	ASH WTX	SULFUR WTX	<---- FORMS OF SULFUR ---->		
					%PYRITIC	%SULFATE	%ORGANIC
=====							
317904	F @1.30	5.23	2.74	2.31	0.09	0.06	2.16
317905	F @1.40	9.66	3.18	2.41	0.10	0.06	2.25
317906	F @1.60	67.48	7.51	2.43	0.24	0.16	2.03
317907	F @1.80	7.23	17.93	2.68	0.73	0.39	1.56
317908	S @1.80	10.40	69.13	6.91	4.54	1.72	0.65

<----- CUMULATIVE ----->							
SAMPLE#	WTX	ASH WTX	SULFUR WTX	<---- FORMS OF SULFUR ---->			
				%PYRITIC	%SULFATE	%ORGANIC	
=====							
317904	5.23	2.74	2.31	0.09	0.06	2.16	
317905	14.89	3.03	2.37	0.10	0.06	2.22	
317906	82.37	6.70	2.42	0.21	0.14	2.06	
317907	89.60	7.61	2.44	0.26	0.16	2.02	
317908	100.00	14.00	2.91	0.70	0.32	1.88	

```

                : ch-top $pass %ch          : summary data
                : 704.00 100.0 0.0           : dv:    0.0827
                : 150.00 100.0 0.0           : %10:   2.21
*****          : 75.00 100.0 0.0           : %50:   6.39
MICROTAC DATA: MANUAL MODE      : 59.69 100.0 0.0       : %90:  16.90
measurem't/present'nB: 3961 -     1: 42.21 100.0 0.3       : mv:    7.88
7007 0.69-704. SRA res: NORMAL   : 29.85 99.7 3.1        : cs:   1.343
chan select bounds:    0.69- 704.00 : 21.10 96.6 10.7      :
progression: geom/sqrt2 8 chans:20 : 14.92 86.0 13.8      : sd:    5.84
sample date/time: 01/30/90 13:45   : 10.55 72.2 15.4      : na:    4.47
sample ident: 317901               : 7.46 56.7 13.5       LLLLLLLLLLLLLLLLLL
sample ID :                         : 5.28 43.2 10.1       : parameters
lot code:                           : 3.73 33.1 15.9       : name value
account #: printer: OFF:            : 2.64 17.2 13.3       :smpl ant
run time: 30 sec. run #: 100/ 2    : 1.69 3.9 3.4         :disprnt
sample preparation code:             : 1.01 0.6 0.6         :disp ant
notes:                               :                      :disp sed
                                   :                      :dmed ant
                                   :                      :agitat'n
                                   :                      :agit tm
                                   :                      :circul'n
                                   :                      :circ tim
                                   :                      :param #1
****          :                          :param #2
Esc-exit F2-commands :                  :param #3

```

MICROTRAC DATA: MANUAL MODE

7227 0.69-704. SRA res: NORMAL

```
progression: geom/sqrt2  # chans:20
```

sample date/time: 01/30/90 13:45

sample ident: 317901

sample ID :

lot code:

account 0: printer: OFF:

run time: 30 sec. run #: 100/ 2

sample preparation code:

notes:

Esc-exit

F2-commands

317901

15-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
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(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 39002

SAMPLE DATE: 01-25-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	318001	31.31	-----	3.65	2.63	13884
PRIMARY TAILS	318002	-----	1.85	88.88	5.64	-----

		<---- FORMS OF SULFUR ---->			ASPHALT	HEPTANE
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	WT. %	PPM
AGGLOMERATES	318001	0.28	0.08	2.27	4.26	1828.91
PRIMARY TAILS	318002	-----	-----	-----	0.00	261.4

01-Feb-90 -- EXPORTech Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 39003

SAMPLE DATE: 01-25-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
AGGLOMERATES	317801	67.34	4.83	2.77

07-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 39101

SAMPLE DATE: 01-26-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	318201	48.69	3.76	2.68

07-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 39501

SAMPLE DATE: 01-30-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
=====					
AGGLOMERATES	318301	65.15	-----	4.19	2.59
AGGLOMERATION FEED	318302	-----	17.57	13.77	2.85

15-Feb-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 39502

SAMPLE DATE: 01-30-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	318601	26.13	3.52	2.53

15-Feb-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 39601

SAMPLE DATE: 01-31-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	318401	33.92	3.46	2.51

15-Feb-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 39602

SAMPLE DATE: 01-31-90

		MOISTURE	ASH	TOTAL SULFUR	ASPHALT	HEPTANE
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	PPM
AGGLOMERATES	318501	33.75	3.44	2.49	0.79	3760

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Subcontract No. 19307-F-31

RUN #: 39701

SAMPLE DATE: 02-01-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
=====					
AGGLOMERATION FEED	318701	-----	16.66	14.92	2.97
AGGLOMERATES	318702	35.48	-----	3.56	2.59

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RUN #: 39702

SAMPLE DATE: 02-01-90

		MOISTURE	ASH	TOTAL SULFUR	ASPHALT	HEPTANE
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	PPM
=====						
AGGLOMERATES	318801	30.66	3.64	2.52	4.35	3840

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Subcontract No. 19307-F-31

RUN #: 39703

SAMPLE DATE: 02-01-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	318901	29.56	3.08	2.52

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Subcontract No. 19307-F-31

RUN #: 39801

SAMPLE DATE: 02-02-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	ASPHALT	HEPTANE
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	WT. %	WT. %	PPM
AGGLOMERATION FEED	319001		15.59	13.65	2.84		
AGGLOMERATES	319002	44.11		3.56	2.48	4.25	7550

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Subcontract No. 19307-F-31

RUN #: 40101
SAMPLE DATE: 02-05-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	330101	4.02	-----	24.00	4.01	-----
BALL MILL PRODUCT	330102	-----	27.31	22.14	3.60	12023
FGM FEED	330103	-----	42.52	41.09	8.98	8360
FINAL PRODUCT	330104	-----	14.96	22.13	3.17	11764

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	330101	-----	-----	-----	-----
BALL MILL PRODUCT	330102	2.86	0.05	0.69	
FGM FEED	330103	7.58	0.33	1.07	
FINAL PRODUCT	330104	2.16	0.12	0.89	

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 19.5	: dv: 0.0737
	: 150.00 80.5 15.5	: 810: 3.01
#####	: 75.00 65.0 4.6	: 850: 42.16
MICROTRAC DATA: MANUAL MODE	: 59.69 60.4 10.4	: 890: 219.16
pressure't/present'n0: 4126 - 1:	: 42.21 50.0 6.6	: av: 85.42
7997 0.69-704. SRA res: NORMAL	: 29.85 43.4 7.0	: co: 0.462
chan select bounds: 0.69- 704.00	: 21.10 36.4 9.4	:
progression: geom/sqrt2 8 chans:20	: 14.92 27.0 5.4	: sd: 81.02
sample date/time: 02/08/90 16:43	: 10.55 21.6 5.0	: aa: 13.00
sample ident: 330102	: 7.46 16.6 4.0	LM#####
sample 10 : B.N.P.	: 5.28 12.6 2.9	: parameters
lot code:	: 3.73 9.6 4.9	: name value
account 0: printer: OFF:	: 2.64 4.7 4.1	:sopl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 0.6 0.6	:disprant
sample preparation code:	: 1.01 0.0 0.0	:disp ant
notes:	:	:disp ned
	:	:dred ant
	:	:egitat'n
	:	:egit tin
	:	:circul'n
	:	:circ tin
	:	:para0 01
#####	:	:para0 02
-exit F2-commands :	:	:para0 03

330102
B.N.P.
Record Number: 4126

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 4.0	: dv: 0.0465
	: 150.00 95.2 4.1	: 810: 2.68
*****	: 75.00 91.0 2.6	: 850: 11.43
MICPOTRAC DATA: MANUAL MODE	: 59.69 88.4 8.6	: 890: 64.43
pressure't/present'n0: 4129 - 1:	: 42.21 79.8 1.9	: av: 28.29
7797 0.69-704. SRA res: NORMAL	: 29.85 77.9 7.3	: co: 0.885
chan select bounds: 0.69- 704.00	: 21.10 70.7 13.4	:
compression: geom/sqrt2 8 chans:20	: 14.92 57.2 9.7	: sd: 24.06
sample date/time: 02/08/90 16:49	: 10.55 47.5 11.2	: na: 6.79
sample ident: 330103	: 7.46 36.2 9.3	*****
sample ID : F.G.M. FEED	: 5.28 26.9 7.6	: parameters
lot code:	: 3.73 19.4 9.8	: name value
account 0: printer: OFF:	: 2.64 9.6 7.7	:supl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 1.9 1.8	:disprnt
sample preparation code:	: 1.01 0.1 0.1	:disp ant
notes:	:	:disp ned
:	:	:dred ant
:	:	:agitat'n
:	:	:agit tin
:	:	:circul'n
:	:	:circ tin
:	:	:para0 01
*****	:	:para0 02
-exit F2-commands :	:	:para0 03

330103
F.G.M. FEED
Record Number: 4129

F2-commands

330104

FINAL PRODUCT

Record Number: 4150

VOLUME

‰

16-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40101-A

SAMPLE DATE: 02-05-90

		ASH	TOTAL
BECHTEL REFERENCE:	ETCi #	WT. %	SULFUR
		WT. %	MICROTRAC
FGM PRODUCT	330401	41.46	9.00

	: ch-top \$pass 1-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0315
	: 150.00 100.0 0.0	: 110: 2.34
*****	: 75.00 100.0 0.0	: 150: 6.46
MICROTRAC DATA: MANUAL MODE	: 59.69 100.0 0.1	: 190: 17.02
pressure't/present'n0: 4159 - 1:	: 42.21 99.9 0.9	: mv: 0.26
1997 0.69-704. SRA res: NORMAL	: 29.85 99.0 4.5	: cs: 1.270
chan select bounds: 0.69- 704.00	: 21.10 94.5 9.4	:
regression: geom/sqrt2 8 chans:20	: 14.92 85.1 13.2	: sd: 5.90
sample date/time: 02/14/90 13:00	: 10.55 71.9 15.4	: wa: 4.72
sample ident: 330401	: 7.46 56.6 14.4	*****
sample ID :	: 5.20 42.2 11.5	: parameters
lot code:	: 3.73 30.7 16.0	: name value
account 0:	printer: OFF: 2.64 14.7 12.0	:sepl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 2.7 2.4	:disprant
sample preparation code:	: 1.01 0.3 0.3	:disp ant
notes:	:	:disp ned
	:	:doed ant
	:	:agitat'n
	:	:agit tin
	:	:circul'n
	:	:circ tin
	:	:para0 01
*****	:	:para0 02
Esc-exit F2-commands :	:	:para0 03

330401

Record Number: 4159

EXPORTEch Company, Inc.
P. O. Box 588
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Subcontract No. 19307-F-31

RUN #:	40201					
SAMPLE DATE:	02-06-90					
		MOISTURE	SOLIDS	ASH	TOTAL	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR	BTU
AGGLOMERATION FEED	330201	-----	18.10	21.01	2.92	11922
AGGLOMERATES	330202	26.60	-----	6.61	1.77	14674
PRIMARY TAILS	330203	-----	2.94	86.68	8.94	-----

<---- FORMS OF SULFUR ---->					
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	330201	1.94	0.15	0.83	
AGGLOMERATES	330202	0.82	0.08	0.87	-----
PRIMARY TAILS	330203	-----	-----	-----	-----

FLOAT SINK ANALYSIS AGGLOMERATION FEED, Sample 330201

SPECIFIC		ASH		SULFUR		<---- FORMS OF SULFUR ---->	
SAMPLE#	GRAVITY	WT%	WT%	WT%	%PYRITIC	%SULFATE	%ORGANIC
330204	F @1.30	13.79	2.21	0.86	0.08	0.02	0.76
330205	F @1.40	34.73	3.63	0.94	0.11	0.03	0.80
330206	F @1.60	25.78	10.40	1.46	0.42	0.12	0.92
330207	F @1.80	4.70	25.09	2.10	1.13	0.26	0.71
330208	S @1.80	21.00	68.72	9.29	7.83	0.56	0.90

<----- CUMULATIVE ----->							
		ASH		SULFUR		<---- FORMS OF SULFUR ---->	
SAMPLE#	WT%	WT%	WT%	%PYRITIC	%SULFATE	%ORGANIC	
330204	13.79	2.21	0.86	0.08	0.02	0.76	
330205	48.52	3.23	0.92	0.10	0.03	0.79	
330206	74.30	5.72	1.11	0.21	0.06	0.83	
330207	79.00	6.87	1.16	0.27	0.07	0.83	
330208	100.00	19.86	2.87	1.85	0.17	0.84	

02-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 40202

SAMPLE DATE: 02-06-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR		
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU	MICROTRAC
LAB GRIND	330301	.....	.....	.....	.....	.....	

```

: ch-top $pass 8-ch : summary data
: 704.00 100.0 0.0 : dv: 0.0360
: 150.00 100.0 0.1 : $10: 2.25
: 75.00 99.9 0.2 : $50: 7.03
MICROTAC DATA: MANUAL MODE : $90: 23.54
: 59.69 99.7 1.5 : $v: 10.32
: 42.21 98.2 3.5 : cs: 1.257
: 29.85 94.7 7.3 :
: 21.10 87.4 10.7 :
: 14.92 76.7 12.1 : sd: 8.19
: 10.55 64.6 12.4 : na: 4.77
: 7.46 52.3 11.3 LNNNNNNNNNNNNNNNNNNNNNN
: 5.28 40.9 8.9 : parameters
: 3.73 32.0 15.5 : name value
: 2.64 16.5 13.0 :sopl aut
: 1.69 3.5 3.0 :disprnt
: 1.01 0.5 0.5 :disp aut
: :disp ned
: :rmed aut
: :agitat'n
: :agit tin
: :circul'n
: :circ tin
: :para 01
: :para 02
: :para 03
:sc-exit f2-commands :

```

330301
U.F. Lab Grind
Record Number: 4156

16-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40401

SAMPLE DATE: 02-08-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
=====						
PRIMARY TAILS	330501	-----	3.69	80.93	8.22	-----
AGGLOMERATION	330502	23.12	-----	6.95	1.77	14431

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
=====				
PRIMARY TAILS	330501	-----	-----	-----
AGGLOMERATION	330502	0.93	0.10	0.74

14-Mar-90 --- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

SUBCONTRACT 19307-F-31

RUN #: 40401

SAMPLE DATE: 02/08/90

			ASH	TOTAL
			WT. %	SULFUR
REFERENCE:		ETC'i #		WT. %
=====				
AGGLOMERATION	ORIGINAL	330502	6.95	1.77
AGGLOMERATION	RE-CHECK	330502	6.92	1.74

RUN #: 40501A

SAMPLE DATE: 02/09/90

			ASH	TOTAL
			WT. %	SULFUR
REFERENCE:		ETC'i #		WT. %
=====				
AGGLOMERATION	ORIGINAL	331002	6.98	1.77
AGGLOMERATION	RE-CHECK	331002	6.98	1.77

RUN #: 42001 @ 11:00

SAMPLE DATE: 02/24/90

			ASH	TOTAL
			WT. %	SULFUR
REFERENCE:		ETC'i #		WT. %
=====				
FINAL PRODUCT	ORIGINAL	332706	27.17	2.81
FINAL PRODUCT	RE-CHECK	332706	27.09	2.80

16-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40402 @10:20

SAMPLE DATE: 02-08-90

BECHTEL REFERENCE:	ETC#	MOISTURE WT. %	SOLIDS WT. %	ASH WT. %	TOTAL SULFUR WT. %	BTU
BALL MILL FEED	330601	3.74	-----	23.92	4.09	-----
BALL MILL PRODUCT	330602	-----	38.13	23.27	3.86	11674
FGM FEED	330603	-----	48.58	40.14	8.51	8535
FGM PRODUCT	330604	-----	45.05	33.60	6.57	9759
SPIRAL TAILS	330605	-----	29.21	60.13	12.66	4739
FINAL PRODUCT	330606	-----	17.71	19.15	2.50	12168

<---- FORMS OF SULFUR ---->

REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	330601	3.16	0.01	0.92	-----
BALL MILL PRODUCT	330602	2.91	0.04	0.91	
FGM FEED	330603	6.99	0.19	1.33	
FGM PRODUCT	330604	5.14	0.33	1.10	
SPIRAL TAILS	330605	9.96	0.08	2.62	
FINAL PRODUCT	330606	1.58	0.15	0.77	

NOTE: Forms of Sulfur Measurements on Ball Mill Feed, ETC# Sample 330601 were made prior to the receipt of Revision 2 of the Specification Sheet and will be billed.

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 4.4	: dv: 0.0665
	: 150.00 95.6 12.8	: 810: 3.12
#####	75.00 82.8 5.3	: 850: 22.02
MICROTRAC DATA: MANUAL MODE	: 59.69 77.6 9.6	: 890: 105.07
pressure't/present'n: 4162 - 1:	42.21 68.0 9.6	: av: 40.40
7777 0.69-704. SRA res: NORMAL	: 29.85 58.3 9.6	: co: 0.634
chan select bounds: 0.69- 704.00	: 21.10 48.7 9.1	:
progression: geom/sqrt2 8 chans:20	: 14.92 39.6 8.2	: sd: 37.29
sample date/time: 02/14/90 13:13	: 10.55 31.4 7.0	: sa: 9.46
sample ident: 330602	: 7.46 24.3 5.9	#####
sample ID :	: 5.28 18.4 4.3	: parameters
lot code:	: 3.73 14.1 7.5	: name value
account 0: printer: OFF:	2.64 6.6 5.9	:sopl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 0.7 0.7	:disprnt
sample preparation code:	: 1.01 0.0 0.0	:disp ant
notes:	:	:disp ned
:	:	:dmed ant
:	:	:agitat'n
:	:	:agit tin
:	:	:circul'n
:	:	:circ tin
:	:	:para 01
#####	:	:para 02
Esc-exit f2-commands :	:	:para 03

330602

Record Number: 4162

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 4.0	: dv: 0.0604
	: 150.00 95.2 10.1	: \$10: 2.07
#####	75.00 85.1 3.7	: \$50: 14.40
NICOTRAC DATA: MANUAL MODE	: 59.49 81.4 6.4	: \$90: 102.04
pressure't/present'n0: 4165 - 1:	42.21 75.0 6.5	: mv: 35.56
777 0.69-704. GRA res: NORMAL	: 29.85 68.5 8.0	: co: 0.760
chan select bounds: 0.69- 704.00	: 21.10 60.6 9.5	:
progression: geom/sqrt2 0 chans:20	: 14.92 51.1 9.9	: sd: 33.24
sample date/time: 02/14/90 13:10	: 10.55 41.2 9.7	: na: 7.01
sample idnt: 330603	: 7.46 31.5 8.3	L#####
sample ID :	: 5.28 23.2 6.0	: parameters
lot code:	: 3.73 17.2 9.1	: name value
account 0: printer: OFF:	2.64 8.0 7.0	:sopl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 1.1 1.0	:disprnt
sample preparation code:	: 1.01 0.0 0.0	:disp ant
notes:	:	:disp ned
	:	:doed ant
	:	:agitat'n
	:	:agit tin
	:	:circul'n
	:	:circ tin
	:	:para 01
#####		:para 02
Esc-exit F2-commands :		:para 03

330603

Record Number: 4165

```

: ch-top 8pass 8-ch : summary data
: 704.00 100.0 0.0 : dv: 0.0387
: 150.00 100.0 0.0 : q10: 2.34
: 75.00 100.0 0.0 : q50: 6.72
MICROTRAC DATA: MANUAL MODE : 59.69 100.0 0.1 : q90: 18.74
measured/present'n0: 4160 - 1: 42.21 99.9 1.3 : av: 0.63
7397 0.69-704. SRA res: NORMAL : 29.85 98.6 5.1 : co: 1.249
chan select bounds: 0.69- 704.00 : 21.10 93.5 10.1 :
progression: geom/sqrt2 8 chans:20 : 14.92 83.4 13.7 : sd: 6.20
sample date/time: 02/14/90 13:24 : 10.55 69.7 15.0 : oa: 4.80
sample ident: 330604 : 7.46 54.7 13.0 : LLLLLLLLLLLLLLLLLLLLLL
sample ID : : 5.20 40.9 10.0 : parameters
int code: : 3.73 30.1 15.4 : name value
account 0: printer: OFF: 2.64 14.7 11.9 :sopl ant
run time: 30 sec. run 0: 100/ 2 : 1.69 2.8 2.5 :disprnt
sample preparation code: : 1.01 0.3 0.3 :disp ant
notes: : :disp ned
: : :ned ant
: : :agitat'n
: : :agit tin
: : :circul'n
: : :circ tin
: : :para0 01
: : :para0 02
: : :para0 03
Esc-exit F2-commands :

```

330604

Record Number: 4168

	: ch-top 8pass 3-ch	: summary data
	: 704.00 100.0 77.1	: dv: 0.3114
	: 150.00 22.9 12.2	: 810: 67.06
#####	: 75.00 10.7 1.3	: 850: 265.23
MICROTAC DATA: MANUAL MODE	: 59.69 9.4 1.1	: 890: 543.70
pressure't/present'n0: 4171 - 1:	: 42.21 0.3 0.5	: av: 202.23
704 0.69-704. SRA res: NORMAL	: 29.05 7.0 0.6	: cs: 0.107
chan select bounds: 0.69- 704.00	: 21.10 7.1 1.0	
compression: geo/sart2 0 chans:20	: 14.92 6.2 1.1	: sd: 170.61
sample date/time: 02/14/90 13:32	: 10.55 5.0 1.3	: ea: 56.06
sample ident: 330605	: 7.46 3.0 1.1	#####
sample 10 :	: 5.20 2.6 0.7	: parameters
lot code:	: 3.73 1.9 1.2	: name value
account 0: printer: OFF:	: 2.64 0.7 0.7	:sopl ant
run time: 30 sec. run #: 100/ 2	: 1.69 0.0 0.0	:disprant
sample preparation code:	: 1.01 0.0 0.0	:disp ant
notes:		:disp oed
		:daed ant
		:agitat'n
		:agit tin
		:circul'n
		:circ tin
		:para0 01
#####		:para0 02
Esc-exit F2-commands :		:para0 03

330605

Record Number: 4171

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0295
	: 150.00 100.0 0.0	: 810: 2.16
#####	: 75.00 100.0 0.0	: 850: 5.59
MI/PTAC DATA: MANUAL MODE	: 59.69 100.0 0.0	: 890: 16.05
capture't/present'n0: 4174 -	: 42.21 100.0 0.4	: nv: 7.40
737 0.69-704. SRA res: NORMAL	: 29.85 99.6 3.6	: cs: 1.435
han select bounds: 0.69- 704.00	: 21.10 96.0 8.1	:
regression: geom/sqrt2 8 chans:20	: 14.92 87.9 11.5	: sd: 5.43
sample date/time: 02/14/90 13:36	: 10.55 76.3 14.4	: na: 4.10
sample ident: 330606	: 7.46 61.9 13.8	#####
sample ID :	: 5.28 48.2 10.7	: parameters
nt code:	: 3.73 37.5 10.2	: name value
count 0: printer: OFF:	: 2.64 19.3 15.1	:sopl ant
un time: 30 sec. run 0: 100/ 2	: 1.69 4.2 3.5	:disprnt
sample preparation code:	: 1.01 0.7 0.7	:disp ant
ofes:	:	:disp ned
:	:	:dmed ant
:	:	:agitat'n
:	:	:agit tin
:	:	:circul'n
:	:	:circ tin
:	:	:para0 01
#####	:	:para0 02
Esc-exit F2-commands :	:	:para0 03

330606

Record Number: 4174

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40402 @11:20

SAMPLE DATE: 02-08-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	330701	3.56	-----	23.63	3.78	-----
BALL MILL PRODUCT	330702	-----	37.44	23.65	3.76	11622
FGM FEED	330703	-----	49.40	41.76	9.02	8346
FGM PRODUCT	330704	-----	46.99	38.56	8.02	9150
SPIRAL TAILS	330705	-----	44.82	63.87	14.41	4087
FINAL PRODUCT	330706	-----	16.74	20.67	2.75	12104

<---- FORMS OF SULFUR ---->

REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	330701	3.12	0.01	0.65	-----
BALL MILL PRODUCT	330702	3.03	0.04	0.69	
FGM FEED	330703	7.59	0.22	1.21	
FGM PRODUCT	330704	6.37	0.38	1.27	
SPIRAL TAILS	330705	12.34	0.22	1.85	
FINAL PRODUCT	330706	1.68	0.27	0.80	

NOTE: Forms of Sulfur Measurements on Ball Mill Feed, ETC# sample 330701 were made prior to the receipt of Revision 2 of the Specification Sheet and will be billed.

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 0.6	: dv: 0.0709
	: 150.00 91.4 15.6	: 810: 3.37
#####	75.00 75.7 5.6	: 850: 28.45
MICROTRAC DATA: MANUAL MODE	: 59.69 70.1 9.9	: 890: 139.46
measured/present no: 4177 -	1: 42.21 60.2 0.9	: uv: 52.18
7777 0.69-704. SRA res: NORMAL	: 29.85 51.3 0.7	: co: 0.555
chan select bounds: 0.69- 704.00	: 21.10 42.6 0.5	:
progression: geom/sqrt2 8 chans:20	: 14.92 34.2 7.2	: sd: 50.40
sample date/time: 02/14/90 13:41	: 10.55 26.9 6.0	: wa: 10.81
sample ident: 330702	: 7.46 20.9 5.0	#####
sample ID :	: 5.28 15.9 3.8	: parameters
lot code:	: 3.73 12.1 6.5	: name value
account 0:	printer: OFF: 2.64 5.6 5.0	:sopl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 0.6 0.6	:disprnt
sample preparation code:	: 1.01 0.9 0.0	:disp ant
notes:	:	:disp aed
:	:	:doed ant
:	:	:agitat'n
:	:	:agit tin
:	:	:circul'n
:	:	:circ tin
:	:	:para 01
#####	:	:para 02
Esc-exit F2-commands :	:	:para 03

330702

Record Number: 4177

	: ch-top 3pass 8-ch	: summary data
	: 704.00 100.0 5.4	: dv: 0.0519
	: 150.00 94.6 9.9	: \$10: 2.91
#####	: 75.00 84.7 3.6	: \$50: 13.00
HIPOTRAC DATA: MANUAL MODE	: 59.69 81.1 5.7	: \$90: 103.04
measured/present'n0: 4100 - 1:	: 42.21 75.4 5.9	: mv: 36.60
7777 0.69-704. SRA res: NORMAL	: 29.05 69.5 7.6	: co: 0.760
chan select bounds: 0.69- 704.00	: 21.10 61.9 9.6	:
progression: geom/sqrt2 0 chans:20	: 14.92 52.3 10.1	: sd: 34.04
sample date/time: 02/14/90 13:55	: 10.55 42.2 10.3	: na: 7.01
sample ident: 330703	: 7.46 31.9 0.9	#####
sample 10 :	: 5.20 23.0 6.4	: parameters
int code:	: 3.73 16.6 0.9	: name value
account 0: printer: OFF:	: 2.64 7.7 6.7	:appl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 1.0 1.0	:disprnt
sample preparation code:	: 1.01 0.0 0.0	:disp ant
notes:	:	:disp ned
	:	:dnd ant
	:	:agitat'n
	:	:agit tin
	:	:circul'n
	:	:circ tin
	:	:para 01
#####	:	:para 02
Esc-exit F2-commands :	:	:para 03

330703

Record Number: 4100

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0351
	: 150.00 100.0 0.0	: 810: 2.27
#####	: 75.00 100.0 0.0	: 850: 6.30
MICROTRAC DATA: MANUAL MODE	: 59.69 100.0 0.0	: 890: 17.27
pressure't/present'no: 4183 -	: 42.21 100.0 0.5	: mv: 7.98
7397 0.69-704. SRA res: NORMAL	: 29.35 99.5 4.1	: co: 1.320
chan select bounds: 0.69- 704.00	: 21.10 95.4 9.6	:
progression: geom/sqrt2 8 chans:20	: 14.92 85.8 13.1	: sd: 5.82
sample date/time: 02/14/90 13:59	: 10.55 72.7 15.2	: wa: 4.55
sample ident: 330704	: 7.46 57.5 14.2	#####
sample ID :	: 5.28 43.4 10.9	: parameters
lot code:	: 3.73 32.4 16.2	: name value
amount 0: printer: OFF:	: 2.64 16.2 12.8	:sopl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 3.4 2.9	:disprnt
sample preparation code:	: 1.01 0.5 0.5	:disp ant
notes:	:	:disp ned
:	:	:dnd ant
:	:	:agitat'n
:	:	:agit tim
:	:	:circul'n
:	:	:circ tim
:	:	:para 01
#####	:	:para 02
Esc-exit F2-commands :	:	:para 03

330704

Record Number: 4183

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 86.6	: dv: 0.4247
	: 150.00 13.4 9.6	: \$10: 130.77
#####	75.00 3.8 1.0	: \$50: 317.02
MICPOTRAC DATA: MANUAL MODE	: 59.69 2.8 0.8	: \$90: 592.19
measured/present no: 4186 -	: 42.21 2.1 0.2	: av: 332.27
7997 0.69-704. SRA res: NORMAL	: 29.85 1.8 0.2	: cs: 0.034
chan select bounds: 0.69- 704.00	: 21.10 1.6 0.4	
progression: geom/sqrt2 8 chans:20	: 14.92 1.2 0.4	: sd: 180.31
sample date/time: 02/14/90 14:03	: 10.55 0.8 0.5	: se: 177.43
sample ident: 330705	: 7.46 0.3 0.3	#####
sample ID :	: 5.28 0.0 0.0	: parameters
lot code:	: 3.73 0.0 0.0	: name value
account #: printer: OFF:	: 2.64 0.0 0.0	: repl ant
run time: 30 sec. run #: 100/ 2	: 1.69 0.0 0.0	: disprnt
sample preparation code:	: 1.01 0.0 0.0	: disp ant
notes:		: disp ned
		: dned ant
		: agit at'n
		: agit tin
		: circul'n
		: circ tin
		: para 01
#####		: para 02
Esc-exit F2-commands :		: para 03

330705

Record Number: 4186

	: ch-top 3pass 3-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0320
	: 150.00 100.0 0.0	: 910: 2.14
#####	: 75.00 100.0 0.0	: 950: 5.43
MICROTRAC DATA: MANUAL MODE	: 59.69 100.0 0.0	: 990: 15.31
measured/present no: 4192 -	: 42.21 100.0 0.3	: av: 7.17
7297 0.69-704. SRA res: NORMAL	: 29.05 99.7 3.0	: co: 1.463
chan select bounds: 0.69- 704.00	: 21.10 96.7 7.6	:
progression: geom/sqrt2 8 chans:20	: 14.92 89.1 11.5	: sd: 5.19
sample date/time: 02/14/90 14:23	: 10.55 77.6 14.5	: sa: 4.10
sample ident: 330706	: 7.46 63.1 14.0	#####
sample ID :	: 5.28 49.0 11.3	: parameters
lot code:	: 3.73 37.7 10.1	: name value
account 0: printer: OFF:	: 2.64 19.6 15.0	:supl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 4.6 3.9	:disprnt
sample preparation code:	: 1.00 0.7 0.7	:disp ant
notes:	:	:disp oed
:	:	:doed ant
:	:	:agitat'n
:	:	:agit tin
:	:	:circul'n
:	:	:circ tin
:	:	:para0 01
#####	:	:para0 02
Esc-exit F2-commands :	:	:para0 03

330706

Record Number: 4192

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40402 012:20

SAMPLE DATE: 02-08-90

		MOISTURE	SOLIDS	ASH	TOTAL	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR	BTU
BALL MILL FEED	330801	3.63	-----	24.63	3.95	-----
BALL MILL PRODUCT	330802	-----	36.69	23.23	3.83	11666
FGM FEED	330803	-----	49.46	41.73	9.15	8277
FGM PRODUCT	330804	-----	48.35	39.47	8.29	8809
SPIRAL TAILS	330805	-----	46.94	65.10	15.47	3745
FINAL PRODUCT	330806	-----	12.94	20.07	2.65	12200

<---- FORMS OF SULFUR ---->

REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	330801	-----	-----	-----	-----
BALL MILL PRODUCT	330802	3.16	0.03	0.44	
FGM FEED	330803	7.78	0.42	0.95	
FGM PRODUCT	330804	6.72	0.42	1.15	
SPIRAL TAILS	330805	13.37	0.14	1.96	
FINAL PRODUCT	330806	1.93	0.20	0.52	

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 10.0	: dv: 0.0749
	: 150.00 82.0 16.9	: s10: 3.72
#####	: 75.00 65.1 5.0	: s50: 39.76
MICROTRAC DATA: MANUAL MODE	: 59.69 60.1 0.6	: s90: 214.54
measur'n't/present'n0: 4216 - 1:	: 42.21 51.5 7.9	: av: 70.49
777 0.69-704. SRA res: NORMAL	: 29.85 43.6 7.6	: ca: 0.467
chan select bounds: 0.69- 704.00	: 21.10 36.1 7.3	:
progression: geom/sqrt2 0 chans:20	: 14.92 28.0 6.1	: sd: 77.37
sample date/time: 02/16/90 12:27	: 10.55 22.7 5.2	: aa: 12.06
sample ident: 330002	: 7.46 17.5 4.3	#####
sample 10 :	: 5.28 13.3 3.2	: parameters
lot code:	: 3.73 10.1 5.6	: name value
account 0: printer: OFF:	: 2.64 4.5 4.2	:sopl ent
run time: 30 sec. run 0: 100/ 2	: 1.69 0.3 0.3	:disprnt
sample preparation code:	: 1.01 0.0 0.0	:disp ent
notes:	:	:disp ned
:	:	:doed ent
:	:	:egitat'n
:	:	:egit tie
:	:	:circul'n
:	:	:circ tie
:	:	:para0 01
#####	:	:para0 02
Esc-exit F2-commands :	:	:para0 03

330002

Record Number: 4216

	: ch-top 3pass 1:ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0633
	: 150.00 92.0 10.5	: 110: 3.01
#####	75.00 81.4 3.1	: 150: 14.63
MICROTRAC DATA: MANUAL MODE	: 59.69 70.3 5.7	: 190: 130.76
resurea't/present'n0: 4219 - 1:	42.21 72.6 5.0	: av: 42.51
7797 0.69-704. SRA res: NORMAL	: 29.05 66.0 7.2	: co: 0.736
then select bounds: 0.69- 704.00	: 21.10 59.6 0.9	:
progression: geom/sqrt2 0 chams:20	: 14.92 50.6 9.6	: sd: 42.67
sample date/time: 02/16/90 12:32	: 10.55 41.0 10.0	: na: 0.15
sample ident: 330003	: 7.46 31.0 0.0	#####
sample 10 :	: 5.20 22.2 6.5	: parameters
int code:	: 3.73 15.6 0.5	: name value
account 0: printer: OFF:	2.64 7.1 6.2	:smp ant
run time: 30 sec. run 0: 100/ 2	: 1.69 0.9 0.9	:disprant
sample preparation code:	: 1.01 0.0 0.0	:disp ant
notes:	:	:disp aed
:	:	:doed ant
:	:	:agitat'n
:	:	:agit tin
:	:	:circul'n
:	:	:circ tin
:	:	:para0 01
#####	:	:para0 02
Esc-exit f2-commands :	:	:para0 03

330003

Record Number: 4219

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0337
	: 150.00 100.0 0.0	: 810: 2.29
*****	: 75.00 100.0 0.0	: 850: 6.33
MICROTRAC DATA: MANUAL MODE	: 59.69 100.0 0.1	: 890: 17.59
measured t/present no: 4222 - 1:	: 42.21 99.9 0.9	: dv: 0.13
7997 0.69-704. 9RA res: NORMAL	: 29.05 99.1 4.4	: co: 1.304
chan select bounds: 0.69- 704.00	: 21.10 94.7 9.1	:
compression: geos/sqrt2 0 chana:20	: 14.92 85.6 12.0	: sd: 5.04
sample date/time: 02/16/90 12:36	: 10.55 72.7 15.4	: na: 4.60
sample idnt: 330804	: 7.46 57.4 14.2	*****
sample ID :	: 5.20 43.2 11.4	: parameters
lot code:	: 3.73 31.7 16.2	: name value
account 0: printer: OFF:	: 2.64 15.5 12.3	: suppl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 3.2 2.0	: diaprnt
sample preparation code:	: 1.01 0.4 0.4	: disp ant
notes:	:	: disp ned
	:	: dned ant
	:	: agit at'n
	:	: agit tin
	:	: circul'n
	:	: circ tin
	:	: para 01
*****	:	: para 02
Esc-exit F2-commands :	:	: para 03

330804

Record Number: 4222

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 4.7	: dv: 0.0530
	: 150.00 95.3 7.5	: 010: 2.74
#####	: 75.00 87.7 2.2	: 030: 10.70
MICROTAC DATA: MANUAL MODE	: 59.69 85.5 4.0	: 090: 92.97
measured't/present'nd: 4225 - 1:	: 42.21 81.6 4.0	: av: 30.93
7197 0.69-704. SRA res: NORMAL	: 29.05 76.7 7.0	: co: 0.077
chan select bounds: 0.69- 704.00	: 21.10 69.7 9.5	:
compression: geom/sqrt2 0 chans:20	: 14.92 60.2 10.7	: sd: 24.50
sample date/time: 02/16/90 12:41	: 10.35 49.5 11.6	: na: 6.04
sample ident: 330005	: 7.46 37.0 10.5	#####
sample ID :	: 5.20 27.3 7.9	: parameters
lot code:	: 3.75 19.4 10.4	: name value
account 0: printer: OFF:	: 2.64 9.0 7.6	:sopl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 1.4 1.3	:disprant
sample preparation code:	: 1.01 0.1 0.1	:disp ant
notes:	:	:disp oed
	:	:doed ant
	:	:agitat'n
	:	:agit tin
	:	:circul'n
	:	:circ tin
	:	:para0 01
#####	:	:para0 02
Esc-exit F2-commands :	:	:para0 03

330005

Record Number: 4225

```

: ch-top 8pass 8-ch : summary data
: 704.00 100.0 0.0 : dv: 0.0231
: 150.00 100.0 0.0 : d10: 2.09
: 75.00 100.0 0.0 : d50: 4.00
MICROTRAC DATA: MANUAL MODE : 59.69 100.0 0.0 : d90: 14.06
pressure't/present'n0: 4220 - 1: 42.21 100.0 0.1 : av: 6.40
777 0.69-704. SRA res: NORMAL : 29.05 99.9 1.3 : co: 1.552
chan select bounds: 0.69- 704.00 : 21.10 90.7 6.7 :
progression: geom/sqrt2 0 chans:20 : 14.92 92.0 10.0 : sd: 4.51
sample date/time: 02/16/90 12:45 : 10.55 81.2 13.0 : no: 3.07
sample ident: 330006 : 7.46 67.3 14.2 LLLLLLLLLLLLLLLLLLLLLL
sample 10 : : 5.20 53.2 12.1 : parameters
lot code: : 3.73 41.1 19.0 : name value
account 0: printer: OFF: 2.64 21.3 16.1 :sopl ant
run time: 30 sec. run 0: 100/ 2 : 1.69 5.2 4.2 :disprant
sample preparation code: : 1.01 0.9 0.9 :disp ant
notes: : :disp ned
: : :doed ant
: : :agitat'n
: : :agit tie
: : :circul'n
: : :circ tie
: : :para 01
: : :para 02
: : :para 03
Esc-exit F2-commands :

```

330006

Record Number: 4220

16-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40501

SAMPLE DATE: 02-09-90

		SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	BTU
=====					
AGGLOMERATION FEED	330901	16.67	20.90	2.74	11925

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
=====					
AGGLOMERATION FEED	330901	2.15	0.27	0.32	

Record Number: 4231

16-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40501

SAMPLE DATE: 02-09-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
PRIMARY TAILS	331001	-----	2.48	85.11	7.80	-----
AGGLOMERATES	331002	22.22	-----	6.98	1.77	14452

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
PRIMARY TAILS	331001	-----	-----	-----
AGGLOMERATES	331002	0.96	0.09	0.72

16-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40502

SAMPLE DATE: 02-09-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
PRIMARY TAILS	331101	-----	2.97	86.14	7.49	-----
AGGLOMERATES	331102	19.78	-----	7.07	1.79	14298

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
PRIMARY TAILS	331101	-----	-----	-----
AGGLOMERATES	331102	1.07	0.06	0.66

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40503 @ 2:00

SAMPLE DATE: 02-09-90

		MOISTURE	SOLIDS	ASH	TOTAL	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	SULFUR	MICROTRAC
=====						
BALL MILL FEED	331201	3.70	-----	22.83	3.83	-----
BALL MILL PRODUCT	331202	-----	19.09	23.06	3.55	
FINAL PRODUCT	331203	-----	20.71	24.22	3.84	

	: ch-top	space	8-ch	: summary data
	: 704.00	100.0	16.8	: dv: 0.0049
	: 150.00	83.2	17.5	: s10: 3.84
*****	75.00	65.7	5.6	: s50: 40.26
NICOTRAC DATA: MANUAL MODE	: 59.69	60.1	0.8	: s90: 203.47
pressure't/present'n0: 4198 -	1: 42.21	51.2	0.1	: ov: 70.14
7297 0.69-704. SRA res: NORMAL	: 29.85	43.1	7.7	: co: 0.452
chan select bounds: 0.69- 704.00	: 21.10	35.4	7.2	:
progression: geom/sqrt2 0 chans:20	: 14.92	20.2	6.2	: sd: 73.92
sample date/time: 02/15/90 13:32	: 10.55	22.1	5.2	: na: 13.27
sample ident: 331202	: 7.46	16.0	4.2	*****
sample 10 :	: 5.20	12.7	3.2	: parameters
int code:	: 3.73	9.5	5.4	: name value
account 0: printer: OFF:	2.64	4.1	3.9	: repl ant
run time: 30 sec. run 0: 100/ 2	: 1.69	0.2	0.2	: displrnt
sample preparation code:	: 1.01	0.0	0.0	: disp ant
notes:	:			: disp ned
	:			: deed ant
	:			: agit'at'n
	:			: agit tin
	:			: circul'n
	:			: circ tin
	:			: para0 01
*****	:			: para0 02
Esc-exit F2-commands :	:			: para0 03

331202

Record Number: 4198

	: ch-top tpass t-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0379
	: 150.00 100.0 0.0	: s10: 2.37
*****	: 75.00 100.0 0.1	: s50: 7.29
MICROTRAC DATA: MANUAL MODE	: 59.69 99.9 1.1	: s90: 22.67
sample's/present'no: 4201 -	: 42.21 90.0 3.6	: dv: 10.22
7317 0.69-704. SRA res: NORMAL	: 29.85 95.2 7.2	: co: 1.104
chan select bounds: 0.69- 704.00	: 21.10 80.0 10.0	:
regression: geo/sqrt2 0 chans:20	: 14.92 77.3 12.7	: sd: 7.92
sample date/time: 02/15/90 13:54	: 10.55 64.6 13.6	: na: 5.07
sample ident: 331203	: 7.46 50.9 12.3	*****
sample ID :	: 5.20 30.7 9.0	: parameters
lot code:	: 3.73 20.0 14.9	: name value
account #: printer: OFF:	: 2.64 13.9 11.3	: repl ent
run time: 30 sec. run #: 100/ 2	: 1.69 2.6 2.3	: displ ent
sample preparation code:	: 1.01 0.3 0.3	: disp ent
notes:	:	: disp ned
:	:	: deed ent
:	:	: agitat'n
:	:	: agit tin
:	:	: circul'n
:	:	: circ tin
:	:	: para 01
*****	:	: para 02
Esc-exit F2-commands :	:	: para 03

331203

Record Number: 4201

16-Feb-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40503 @ 3:00

SAMPLE DATE: 02-09-90

		MOISTURE	SOLIDS	ASH	TOTAL	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR	MICROTRAC
					WT. %	
BALL MILL FEED	331301	3.68	.....	22.31	3.77	.....
BALL MILL PRODUCT	331302	.....	16.91	23.63	3.70	
FINAL PRODUCT	331303	.....	16.15	24.56	3.86	

	: ch-top & pass 1-ch	: summary data
	: 704.00 100.0 9.1	: dv: 0.0631
	: 150.00 90.9 14.6	: 810: 3.46
*****	75.00 76.2 5.0	: 850: 20.46
micromed DATA: MANUAL MODE	: 59.69 70.4 9.4	: 890: 140.34
*****	42.21 61.0 9.6	: av: 60.29
*****	29.85 51.4 9.0	: co: 0.536
chan select bounds: 0.69- 704.00	: 21.10 42.4 0.6	:
compression: geom/sqrt2 0 chana:20	: 14.92 33.7 7.4	: sd: 40.60
*****	10.55 26.4 6.3	: na: 11.20
*****	7.46 20.1 5.0	*****
*****	5.20 15.0 3.5	: parameters
int code:	: 3.73 11.5 6.4	: name value
account 0: printer: OFF:	2.64 5.2 4.0	: repl aut
run time: 30 sec. run 0: 100/ 2	: 1.69 0.3 0.3	: displant
*****	1.01 0.0 0.0	: disp aut
notes:	:	: disp sed
	:	: dmed aut
	:	: agitot'n
	:	: agit tin
	:	: circul'n
	:	: circ tin
	:	: para 01
*****	:	: para 02
Esc-exit F2-commands	:	: para 03

331362

Record Number: 4204

: ch-top 8pass 8-ch	: summary data
: 704.00 100.0 0.0	: dv: 0.0370
: 150.00 100.0 0.0	: 810: 2.42
***** 75.00 100.0 0.1	: 850: 7.63
MINIPAC DATA: MANUAL MODE	: 890: 23.94
source't/present'n0: 4207 - 1: 42.21 98.9 4.1	: av: 10.59
0.69-704. GRA res: NORMAL : 29.85 94.0 0.0	: co: 1.137
han select bounds: 0.69- 704.00 : 21.10 86.9 11.3	:
gression: geom/sqrt2 0 chana:20 : 14.92 75.5 12.0	: sd: 0.29
sale date/time: 02/15/90 14:06 : 10.55 62.7 13.7	: sa: 5.20
sale ident: 331303	*****
sale ID :	: parameters
rt code:	: name value
count 0: printer: OFF: 2.64 13.1 10.9	:sopl ant
in time: 30 sec. run 0: 100/ 2 : 1.69 2.2 2.1	:disprant
sale preparation code: : 1.01 0.1 0.1	:disp ant
tag:	:disp ned
:	:doed ant
:	:agitat'n
:	:agit tie
:	:circul'n
:	:circ tie
:	:para0 01
*****	:para0 02
Esc-exit F2-commands :	:para0 03

331303

Record Number: 4207

16-Feb-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40503 @ 4:00

SAMPLE DATE: 02-09-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	WT. %	MICROTRAC
BALL MILL FEED	331401	3.55	.....	23.34	3.70	.....
BALL MILL PRODUCT	331402	.....	17.10	23.00	3.62	
FINAL PRODUCT	331403	.....	17.87	23.64	3.68	

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 12.3	: dv: 0.0736
	: 150.00 87.7 17.4	: 010: 3.67
#####	: 75.00 70.3 6.0	: 050: 34.71
MICROTRAC DATA: MANUAL MODE	: 59.69 64.4 9.1	: 090: 160.29
measure't/present'no: 4210 -	: 42.21 55.3 9.0	: ov: 60.35
1997 0.69-704. SRA res: NORMAL	: 29.05 46.3 0.4	: co: 0.405
chan select bounds: 0.69- 704.00	: 21.10 30.0 7.0	:
progression: geo/sqrt2 0 chans:20	: 14.92 30.2 6.6	: sd: 57.00
sample date/time: 02/15/90 14:14	: 10.55 25.6 5.7	: oa: 12.30
sample ident: 331402	: 7.46 17.9 4.4	#####
sample 10 :	: 5.20 13.5 3.2	: parameters
lot code:	: 3.73 10.3 5.7	: name value
amount 0: printer: OFF:	: 2.64 4.6 4.3	: repl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 0.3 0.3	: dispant
sample preparation code:	: 1.01 0.0 0.0	: disp ant
notes:	:	: disp ned
:	:	: doed ant
:	:	: regitot'n
:	:	: regit tie
:	:	: circul'n
:	:	: circ tie
:	:	: paran 01
#####	:	: paran 02
esc-exit f2-commands :	:	: paran 03

331402

Record Number: 4210

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40801
SAMPLE DATE: 02-12-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	331501	.....	17.75	24.02	3.75	11507
PRIMARY TAILS	331502	.....	1.23	87.81	7.01	.....
AGGLOMERATES	331503	16.48	.....	10.45	2.97	13887

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	331501	2.72	0.26	0.77	
PRIMARY TAILS	331502	.....	.....	.....	.....
AGGLOMERATES	331503	2.14	0.07	0.76	.....

FLOAT SINK ANALYSIS
AGGLOMERATION FEED, Sample 331501

SAMPLE#	SPECIFIC GRAVITY	WT%	ASH WT%	SULFUR WT%	<---- FORMS OF SULFUR ---->		
					%PYRITIC	%SULFATE	%ORGANIC
331504	F 81.30	28.84	1.93	0.79	0.06	0.02	0.71
331505	F 81.40	18.99	4.26	1.02	0.12	0.08	0.82
331506	F 81.60	21.43	10.09	1.40	0.46	0.18	0.76
331507	F 81.80	4.60	21.75	1.75	0.97	0.20	0.58
331508	S 81.80	26.14	74.14	11.34	9.88	0.74	0.72

<----- CUMULATIVE ----->

SAMPLE#	WT%	ASH WT%	SULFUR WT%	<---- FORMS OF SULFUR ---->		
				%PYRITIC	%SULFATE	%ORGANIC
331504	28.84	1.93	0.79	0.06	0.02	0.71
331505	47.83	2.86	0.88	0.08	0.04	0.75
331506	69.26	5.09	1.04	0.20	0.09	0.76
331507	73.86	6.13	1.09	0.25	0.09	0.74
331508	100.00	23.91	3.77	2.77	0.26	0.74

```

: ch-top %pass %ch      : summary data
: 704.00 100.0 0.0      : dvi      0.0387
: 150.00 100.0 0.0      : %10:     2.53
: 75.00 100.0 0.3       : %50:     8.34
: 59.88 99.7 2.1        : %90:    20.05
MICROTRAC DATA: MANUAL MODE : 42.21 97.6 4.1      : mv:     11.59
measurment/present'n: 4279 - 1: 29.88 93.5 8.8      : ci:     1.063
1997 0.89-704. SRA      res: NORMAL : 21.10 84.6 12.2      :
han select bounds:      0.89- 704.00 : 14.92 72.5 13.0      : ed:      8.88
gression: geom/sqrt2 # chans:20 : 10.55 59.5 13.6      : ma:      5.64
sample date/time: 02/28/90 15:33 : 7.46 45.8 12.0      :
sample ID :              : 5.28 33.9 9.2       : parameters
ct      code:            : 3.73 24.7 13.3      : name      value
count #:                  printer: OFF: 2.64 11.4 9.7      : %spl amt
un time: 30 sec. run #: 100/ 2 : 1.69 1.7 1.6        : %disprnt
sample preparation code:      : 1.01 0.1 0.1        : %diap amt
otes:                      : %diap med
:                          : %dmed amt
:                          : %agitat'n
:                          : %agit tim
:                          : %circul'n
:                          : %circ tim
:                          : %param #1
:                          : %param #2
:                          : %param #3
*****
Fec-exit      F2-commands :

```

331501

06-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40802

SAMPLE DATE: 02-12-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
PRIMARY TAILS	331601	-----	2.20	80.79	7.80	-----
AGGLOMERATES	331602	21.13	-----	10.29	2.81	13690

<---- FORMS OF SULFUR ---->

BECTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
PRIMARY TAILS	331601	-----	-----	-----
AGGLOMERATES	331602	1.95	0.05	0.81

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40803 @ 1:00

SAMPLE DATE: 02-12-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	331701	3.48	-----	23.26	3.58	-----
BALL MILL PRODUCT	331702	-----	33.63	23.27	3.67	11704
FGM FEED	331703	-----	43.75	33.57	6.32	9826
FGM PRODUCT	331704	-----	47.17	33.34	6.14	9999
FINAL PRODUCT	331705	-----	14.93	18.92	2.41	11791

<---- FORMS OF SULFUR ---->

REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	331701	-----	-----	-----	-----
BALL MILL PRODUCT	331702	2.93	0.07	0.67	
FGM FEED	331703	5.15	0.20	0.97	
FGM PRODUCT	331704	4.92	0.55	0.67	
FINAL PRODUCT	331705	1.49	0.21	0.71	

	: ch-top	%pass	%-ch	: summary data		
	: 704.00	100.0	12.1	: dv: 0.0678		
	: 150.00	87.9	11.7	: %10: 3.09		
*****	: 75.00	76.2	3.6	: %50: 18.98		
MICROTRAC DATA: MANUAL MODE	: 59.59	72.6	6.2	: %90: 166.24		
measurment/present'n#:	4285 -	1:	42.21	66.4	6.1	: mv: 54.13
1997 0.69-704. SRA	res: NORMAL	:	29.85	60.3	7.5	: ca: 0.666
then select bounds:	0.69- 704.00	:	21.10	52.8	8.6	:
regression: geom/sqrt2	# chans:20	:	14.92	44.2	6.4	: sd: 58.05
sample date/time:	02/26/90 15:45	:	10.55	35.8	6.5	: ma: 9.01
sample ident:	331703	:	7.46	27.3	7.3	*****
sample ID :	:	:	5.28	20.0	5.3	: parameters
lot code:	:	:	3.73	14.6	8.0	: name value
account #:	printer: OFF:	:	2.64	6.7	5.9	:empl amt
run time: 30 sec.	run #: 100/ 2	:	1.69	0.8	0.7	:disprent
sample preparation code:	:	:	1.01	0.0	0.0	:diap amt
notes:	:	:				:diap med
	:	:				:dmed amt
	:	:				:agitat'n
	:	:				:agit tim
	:	:				:circul'n
	:	:				:circ tim
	:	:				:param #1
*****	:	:				:param #2
Esc-exit	F2-commands	:				:param #3

331703

Record Number: 4285

	: ch-top %pass %-ch	: summary data
	: 704.00 100.0 19.0	: dv: 0.1029
	: 150.00 81.0 19.5	: x10: 5.14
*****	: 75.00 61.5 5.9	: x50: 48.58
MICROTRAC DATA: MANUAL MODE	: 59.69 55.8 9.1	: x90: 213.11
measuram't/present'n#:	4282 - 1: 42.21 46.8 8.0	: mv: 80.59
1997 0.69-704. SRA res: NORMAL	: 29.85 38.8 7.5	: ca: 0.390
chan select bounds: 0.69- 704.00	: 21.10 31.1 6.8	
regression: geom/sqrt2 9 chans:20	: 14.92 24.3 5.6	: sd: 78.22
sample date/time: 02/28/90 15:38	: 10.55 18.7 4.7	: ma: 15.39
sample ident: 331702	: 7.48 13.9 3.7	*****
sample ID :	: 5.28 10.2 2.5	: parameters
lot code:	: 3.73 7.7 4.4	: name value
account #:	printer: OFF: 2.64 3.2 3.1	:empl amt
run time: 30 sec. run #: 100/ 2	: 1.69 0.1 0.1	:disp amt
sample preparation code:	: 1.01 0.0 0.0	:disp med
notes:		:dmed amt
		:agitat'n
		:agit tim
		:circul'n
		:circ tim
		:param #1
*****		:param #2
Esc-exit F2-commands :		:param #3

331702

Record Number: 4282

	: ch-top	%pass	%-ch	: summary data		
	: 704.00	100.0	0.0	: dv: 0.0294		
	: 150.00	100.0	0.0	: %10: 2.16		
#####	: 75.00	100.0	0.0	: %50: 5.86		
MICROTRAC DATA: MANUAL MODE	: 59.69	100.0	0.0	: %90: 16.19		
measurment/present'n#:	4288 -	1:	42.21	100.0	0.8	: mv: 7.41
0.69-704. SRA	res: NORMAL	:	29.85	99.5	4.0	: cs: 1.442
plan select bounds:	0.69- 704.00	:	21.10	95.5	7.6	:
progression: geom/sqrt2 # chans:20	:	14.92	87.9	10.9		: sd: 5.37
sample date/time:	02/28/90 15:52	:	10.55	77.0	14.7	: ma: 4.16
sample ident:	331704	:	7.46	62.3	14.0	#####
sample ID :	:	5.28	48.3	10.9		: parameters
int code:	:	3.73	37.4	18.1		: name value
account #:	printer: OFF:	2.64	19.3	15.0		:empl amt
run time: 30 sec. run #:	100/ 2	: 1.69	4.3	3.6		:disprnt
sample preparation code:	:	1.01	0.7	0.7		:disp amt
notes:	:					:disp med
	:					:dmed amt
	:					:agitat'n
	:					:agit tim
	:					:circul'n
	:					:circ tim
	:					:param #1
#####	:					:param #2
Esc-exit	F2-commands	:				:param #3

331704

Record Number: 4288

	: ch-top xpass x-ch	: summary data
	: 704.00 100.0 0.0	: dvi: 0.0274
	: 150.00 100.0 0.0	: x10: 2.09
#####	: 75.00 100.0 0.0	: x50: 4.89
MICROTRAC DATA: MANUAL MODE	: 59.99 100.0 0.0	: x90: 14.36
measurment/present'n# 4291 - 1:	: 42.21 100.0 0.3	: mv: 6.66
7997 0.69-704. SRA res: NORMAL	: 29.85 99.7 2.4	: cs: 1.546
chan select bounds: 0.69- 704.00	: 21.10 97.3 6.2	:
progression: geom/sqrt2 8 chans:20	: 14.92 91.1 10.0	: sd: 4.52
sample date/time: 02/28/90 15:57	: 10.55 81.2 14.3	: wa: 3.88
sample ident: 331705	: 7.46 66.9 14.3	#####
sample ID :	: 5.28 52.8 11.5	: parameters
lot code:	: 3.73 41.1 19.6	: name value
account #:	printer: OFF: 2.64 21.5 16.4	:empl amt
run time: 30 sec. run #: 100/ 2	: 1.69 5.1 4.2	:disp amt
sample preparation code:	: 1.01 0.9 0.9	:disp amt
notes:	:	:disp med
	:	:dmed amt
	:	:agitat'n
	:	:agit tim
	:	:circul'n
	:	:circ tim
	:	:param #1
#####	:	:param #2
Esc-exit F2-commands :	:	:param #3

331705

Record Number: 4291

08-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40803 @ 2:00

SAMPLE DATE: 02-12-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	331801	3.50	.....	21.40	3.47	.....
BALL MILL PRODUCT	331802	.....	32.33	21.86	3.35	11971
FGM FEED	331803	.....	42.56	35.61	7.01	9566
FGM PRODUCT	331804	.....	43.62	35.90	6.98	9575
FINAL PRODUCT	331805	.....	15.68	19.51	2.55	12398

<---- FORMS OF SULFUR ---->

REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	331801	.....	.....	.....	.....
BALL MILL PRODUCT	331802	2.59	0.03	0.73	
FGM FEED	331803	5.81	0.23	0.97	
FGM PRODUCT	331804	5.87	0.52	0.59	
FINAL PRODUCT	331805	1.58	0.34	0.63	


```

      / ch-top %pass %ch      / summary data
      / 704.00 100.0  8.0    /  dv:   0.0613
      / 190.00  94.0  9.7    /  %10:   2.90
      / 78.00  84.3  3.2     /  %50:  14.33
MICROTRAC DATA: MANUAL MODE / 59.89 81.2  6.1    /  %90: 113.30
measurment/present'nd: 4297 - / 42.21 75.1  6.1    /  av:   37.19
7997 0.69-704. SRA      res: NORMAL / 29.85 69.0  8.1    /  co:   0.764
chan select bounds: 0.69- 704.00 / 21.10 60.9  9.8    /
progression: geom/sqrt2 8 chans:20 / 14.92 51.3  9.9    /  sd:   34.72
sample date/time: 02/28/90 16:13 / 10.55 41.4 10.0    /  ma:   7.89
sample ident: 331803      /  7.46 31.4  8.8    /
sample ID :              /  5.28 22.9  6.2    /  parameters
int codes:              /  3.73 18.6  8.8    /  name  value
account #: printer: OFF:  2.84  7.9  6.7    /  emp1 ant
run time: 30 sec. run #: 100/ 2 /  1.69  1.2  1.1    /  disp ant
sample preparation code: /  1.01  0.0  0.0    /  disp ant
notes:                  /  disp med
                        /  dmed ant
                        /  agitat'n
                        /  agit tim
                        /  circul'n
                        /  circ tim
                        /  param #1
                        /  param #2
                        /  param #3
Eac-exit      P2-commands

```

331803

Record Number: 4297

```

      : ch-top tpass 8-ch       : summary data
      : 704.00 100.0 0.0       : dv:    0.0300
      : 150.00 100.0 0.0       : s10:   2.42
***** 75.00 100.0 0.0         : s50:   7.10
MICROTRAC DATA: MANUAL MODE   : s90:  19.69
measures't/present'no: 4309 - 1: 42.21 99.9 1.5     : av:    9.00
?? 0.69-704, SRA res: NORMAL  : 29.85 98.4 6.1     : co:   1.00
has select bounds: 0.69- 704.00 : 21.10 92.3 11.0
      :                          :
regression: geom/sqrt2 0 chans:20 : 14.92 81.3 13.6   : sd:    6.60
sample date/time: 03/02/90 12:12 : 10.35 67.7 15.4   : na:    5.09
sample ident: 331004            : 
*****                               LLLLLLLLLLLLLLLLLLLLLL
sample ID : F.O.N.P.           : parameters
sample code:                   : name value
count 8: printer: Off:        : sample aut
run time: 30 sec. run 0: 100 / 2 : 1.69 2.2 2.1     : disprant
sample preparation code:         : disp aut
tag:                             : disp ned
      :                         : doed aut
      :                         : agit at'n
      :                         : agit tio
      :                         : circulat'n
      :                         : circ tio
      :                         : parae s1
*****                               *****
tsc-exit f2-commands          : parae s2
                                : parae s3

```

331804
F.G.M.P.
Record Number: 4399

08-Mar-90 .. EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40803 @ 3:00

SAMPLE DATE: 02-12-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	331901	3.57	.....	20.72	3.60	.....
BALL MILL PRODUCT	331902	.....	29.31	22.97	3.66	11821
FGM FEED	331903	.....	45.61	37.16	7.49	9206
FGM PRODUCT	331904	.....	37.07	37.52	7.54	9260
FINAL PRODUCT	331905	.....	14.64	21.30	2.91	11868

<---- FORMS OF SULFUR ---->

REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	331901	.....	.....	.....	.....
BALL MILL PRODUCT	331902	2.87	0.04	0.75	
FGM FEED	331903	6.30	0.12	1.07	
FGM PRODUCT	331904	5.91	0.56	1.07	
FINAL PRODUCT	331905	2.12	0.23	0.56	

	: ch-top	xpase	%-ch		: summary data
	: 704.00	100.0	8.8		: dv: 0.0804
	: 180.00	91.4	15.1		: %10: 3.42
#####	: 79.00	76.3	9.9		: %50: 27.79
MICROTRAC DATA: MANUAL MODE	: 59.89	70.8	9.9		: %90: 139.88
measurment/present's: 4300 -	: 42.21	61.3	9.2		: mvi 80.89
7997 0.89-704. SRA res: NORMAL	: 29.88	52.1	9.1		: csi 0.883
chan select bounde: 0.89- 704.00	: 21.10	43.0	8.7		:
pinerssion: geom/sqrt2 8 chane:20	: 14.92	34.3	7.3		: edi 49.88
sample date/time: 02/28/90 10:19	: 10.88	27.0	6.3		: mai 10.84
sample ident: 331902	: 7.48	20.7	5.2		#####
sample ID :	: 5.28	15.5	3.7		: parameters
lot code:	: 3.73	11.8	6.2		: name value
account 8:	printer: OFF:	2.84	9.8	4.8	:empl amt
run time: 30 sec. run 8: 100/ 2	: 1.89	0.8	0.8		:disprent
sample preparation code:	: 1.01	0.0	0.0		:disp amt
notes:	:				:disp med
	:				:dmed amt
	:				:agitat'n
	:				:agit tim
	:				:circul'n
	:				:circ tim
	:				:param 81
#####	:				:param 82
Esc-exit	F2-commands	:			:param 83

331902

Record Number: 4300

	;	ch-top	space	x-ch		;	summary data
	;	704.00	100.0	8.7		;	dv: 0.0638
	;	150.00	84.3	8.5		;	x10: 2.85
#####	;	75.00	84.8	8.3		;	x50: 13.98
MICROTRAC DATA: MANUAL MODE	;	59.89	81.5	8.9		;	x90: 108.77
measured/present no: 4303 -	1;	42.21	75.8	8.8		;	mv: 38.21
1997 0.69-704. SRA	res: NORMAL	;	29.85	89.8	7.7	;	ca: 0.788
then select bounds: 0.69- 704.00	;	21.10	82.0	8.1		;	
progression: geom/sqrt2 8 chans:20	;	14.82	82.8	8.8		;	ed: 33.56
sample date/time: 02/28/80 18:24	;	10.55	43.0	10.4		;	ma: 7.62
sample ident: 331903	;	7.48	32.8	8.8		;	#####
sample ID :	;	9.28	23.8	8.8		;	parameters
int code:	;	9.73	17.2	8.0		;	name value
account 8:	printer: OFF;	2.84	8.2	8.8		;	empl ant
run time: 30 sec. run 8: 100/ 2	;	1.89	1.3	1.2		;	disprent
sample preparation code:	;	1.01	0.1	0.1		;	disp ant
notes:	;					;	disp med
	;					;	dmmed ant
	;					;	agitat'n
	;					;	agit tim
	;					;	circul'n
	;					;	circ tim
	;					;	param #1
#####	;					;	param #2
Esc-exit	F2-commands	;				;	param #3

331903

Record Number: 4303

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0360
	: 150.00 100.0 0.0	: \$10: 2.29
#####	: 75.00 100.0 0.0	: \$50: 6.49
MICROTRAC DATA: MANUAL MODE	: 59.69 100.0 0.0	: \$90: 10.40
measures't/present'n0: 4315 - 1:	: 42.21 100.0 0.0	: av: 8.36
0.69-704. SRA res: NORMAL	: 29.85 99.2 3.3	: cs: 1.207
can select bounds: 0.69- 704.00	: 21.10 93.9 10.0	:
gression: geom/sqrt2 8 chans:20	: 14.92 83.9 12.6	: sd: 6.14
sample date/time: 03/02/90 12:25	: 10.55 71.3 15.0	: aa: 4.66
sample ident: 331904	: 7.46 56.3 14.1	#####
sample 10 : F.G.M.P.	: 5.20 42.2 11.0	: parameters
lot code:	: 3.73 31.3 15.7	: name value
count 0: printer: OFF:	: 2.64 15.5 12.3	: repl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 3.2 2.0	: disprnt
sample preparation code:	: 1.01 0.4 0.4	: disp ant
notes:	:	: disp ned
	:	: dmed ant
	:	: agit' n
	:	: agit tie
	:	: circul' n
	:	: circ tie
	:	: para 01
#####	:	: para 02
Esc-exit F2-commands :	:	: para 03

331904
F.G.M.P.
Record Number: 4315

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0370
	: 150.00 100.0 0.0	: 810: 2.29
*****	: 75.00 100.0 0.0	: 850: 6.42
MICROTAC DATA: MANUAL MODE	: 59.69 100.0 0.0	: 890: 10.67
Measure't/present'n0: 4318 - 1:	: 42.21 100.0 0.0	: av: 0.37
7227 0.69-704. SRA res: NORMAL	: 29.85 99.2 5.5	: cs: 1.290
chan select bounds: 0.69- 704.00	: 21.10 93.7 10.1	:
regression: geom/sqrt2 8 chans:20	: 14.92 83.6 12.4	: sd: 6.21
sample date/time: 03/02/90 12:32	: 10.55 71.2 14.5	: aa: 4.65
sample ident: 331905	: 7.46 56.7 13.9	*****
sample 10 : Final Product	: 5.20 42.7 11.2	: parameters
int code:	: 3.73 31.6 16.0	: none value
account 0:	printer: OFF: 2.64 15.6 12.4	:sopl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 3.1 2.7	:disprnt
sample preparation code:	: 1.01 0.4 0.4	:disp ant
info:	:	:disp ned
:	:	:ded ant
:	:	:egitat'n
:	:	:egit tin
:	:	:circul'n
:	:	:circ tin
:	:	:paran 01
*****	:	:paran 02
Esc-exit F2-commands :	:	:paran 03

331905
Final Product
Record Number: 4318

06-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 40901

SAMPLE DATE: 02-14-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	332001	-----	18.18	20.67	2.80	12086
AGGLOMERATES	332002	15.31	-----	9.23	2.07	13993
PRIMARY TAILS	332003	-----	2.11	85.45	7.50	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	332001	1.83	0.26	0.71	
AGGLOMERATES	332002	1.27	0.06	0.74	-----
PRIMARY TAILS	332003	-----	-----	-----	-----

	: ch-top	xpass	x-ch	: summary data
	: 704.00	100.0	0.0	: dv: 0.0324
	: 150.00	100.0	0.0	: x10: 2.12
#####	: 75.00	100.0	0.0	: x50: 8.34
MICROTRAC DATA: MANUAL MODE	: 59.69	100.0	0.0	: x90: 15.46
measurment/present'n9: 4306 - 1:	42.21	100.0	0.4	: mv: 7.17
7997 0.69-704. SRA res: NORMAL	: 29.85	99.6	3.9	: cs: 1.481
chan select bounds: 0.69- 704.00	: 21.10	96.9	7.6	:
progression: geom/sqrt2 8 chans:20	: 14.92	88.8	11.0	: sd: 5.21
sample date/time: 02/28/90 16:29	: 10.55	77.8	14.2	: ma: 4.05
sample ident: 332001	: 7.46	63.6	13.9	#####
sample ID :	: 5.28	49.6	10.6	: parameters
int code:	: 3.73	38.8	18.5	: name value
account #:	printer: OFF:	2.64	20.9	:empl amt
run time: 30 sec. run #: 100/ 2	: 1.69	4.7	3.9	:disprent
sample preparation code:	: 1.01	0.8	0.8	:disp amt
notes:	:			:disp med
	:			:dmed amt
	:			:agitat'n
	:			:agit tim
	:			:circul'n
	:			:circ tim
	:			:param #1
#####	:			:param #2
Esc-exit F2-commands :	:			:param #3

332001

Record Number: 4306

06-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 41101

SAMPLE DATE: 02-15-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
PRIMARY TAILS	332101	-----	2.62	85.71	7.76	-----
AGGLOMERATES	332102	21.52	-----	7.39	1.80	14232

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
PRIMARY TAILS	332101	-----	-----	-----
AGGLOMERATES	332102	0.97	0.10	0.73

09-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 41102
SAMPLE DATE: 02-15-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	332201	3.58	-----	22.61	3.86	-----
BALL MILL PRODUCT	332202	-----	15.87	22.27	3.36	11902

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	332201	-----	-----	-----	-----
BALL MILL PRODUCT	332202	2.63	0.11	0.62	

FLOAT SINK ANALYSIS
BALL MILL PRODUCT, Sample 332202

	SPECIFIC GRAVITY	WT%	ASH WT%	SULFUR WT%	<---- FORMS OF SULFUR ---->		
SAMPLE#					%PYRITIC	%SULFATE	%ORGANIC
332203	F @1.30	27.11	2.90	0.89	0.21	0.01	0.67
332204	F @1.40	28.03	6.45	1.12	0.43	0.03	0.66
332205	F @1.60	19.16	16.29	1.80	1.08	0.08	0.64
332206	F @1.80	4.68	29.90	3.09	2.53	0.11	0.45
332207	S @1.80	21.02	71.48	11.34	9.83	0.36	1.15

<----- CUMULATIVE ----->

	ASH	SULFUR	<---- FORMS OF SULFUR ---->			
SAMPLE#	WT%	WT%	WT%	%PYRITIC	%SULFATE	%ORGANIC
332203	27.11	2.90	0.89	0.21	0.01	0.67
332204	55.14	4.70	1.01	0.32	0.02	0.66
332205	74.30	7.69	1.21	0.52	0.04	0.66
332206	78.98	9.01	1.32	0.64	0.04	0.65
332207	100.00	22.14	3.43	2.57	0.11	0.75

```

: ch-top 1pass 8-ch      : summary data
: 704.00 100.0 3.7      : dv: 0.0648
: 150.00 96.3 14.5      : $10: 3.50
*****9 75.00 81.0 6.5  : $50: 25.93
***** DATA: MANUAL MODE : 59.69 75.3 10.7 : $90: 102.79
*****t/present'nd: 4321 - 1: 42.21 64.5 10.1 : av: 41.60
*** 0.69 704. SRA res: NORMAL : 29.85 54.4 10.2 : co: 0.547
*** select bounds: 0.69- 704.00 : 21.10 44.2 9.6 :
*** compression: zero/sqrt2 8 chans:20 : 14.92 34.6 7.7 : sd: 37.44
*** date/time: 03/02/90 12:30 : 10.55 27.0 6.6 : na: 10.97
*** idnt: 332202 : 7.46 20.4 5.3 *****
*** 10 : B.M.P. : 5.28 15.1 3.0 : parameters
*** code: : 3.73 11.3 6.2 : name value
*** account 8: printer: OFF: 2.64 5.0 4.7 :sopl ant
*** run time: 30 sec. run 8: 100/ 2 : 1.69 0.3 0.3 :disprnt
*** sample preparation code: : 1.01 0.0 0.0 :disp ant
*** : :disp ned
*** : :dnd ant
*** : :agitat'n
*** : :agit tin
*** : :circul'n
*** : :circ tin
*** : :para 01
***** : :para 02
*** : :para 03
*** exit F2-commands :

```

ONE-STAGE
GRIND

332202
B.M.P.
Record Number: 4321

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 41103

SAMPLE DATE: 02-15-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	332301	-----	16.14	22.75	3.46	-----
PRIMARY TAILS	332302	-----	1.29	77.21	4.58	-----
AGGLOMERATES	332303	19.53	-----	12.53	3.15	13649

		<---- FORMS OF SULFUR ---->		
REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATION FEED	332301	-----	-----	-----
PRIMARY TAILS	332302	-----	-----	-----
AGGLOMERATES	332303	2.40	0.06	0.69

09-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 41201

SAMPLE DATE: 02-16-90

		MOISTURE	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	332401	21.40	12.36	3.14	13732

<---- FORMS OF SULFUR ---->

REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	332401	2.38	0.06	0.70

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Subcontract No. 19307-F-31

RUN #: 42001 @ 9:00

SAMPLE DATE: 02-24-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %
BALL MILL FEED	332501	3.72	.....	23.64	3.84
BALL MILL PRODUCT	332502	.....	40.28	23.62	3.85
FGM FEED	332503	.....	45.69	38.13	7.60
FGM PRODUCT	332504	.....	47.18	37.16	7.34
SPIRAL TAILS	332505	.....	33.55	56.21	12.59
FINAL PRODUCT	332506		15.49	18.71	2.29

08-Mar-90 .. EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 42001 @ 10:00

SAMPLE DATE: 02-24-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	SULFUR
					WT. %
BALL MILL FEED	332601	4.04	.....	23.96	3.57
BALL MILL PRODUCT	332602	.....	41.10	22.76	3.54
FGM FEED	332603	.....	47.50	42.09	8.58
FGM PRODUCT	332604		47.27	41.45	8.64
SPIRAL TAILS	332605		24.52	59.46	13.40
FINAL PRODUCT	332606		15.93	20.36	2.58

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Subcontract No. 19307-F-31

RUN #: 42001 @ 11:00

SAMPLE DATE: 02-24-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC'l #	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	332701	3.78	.....	24.23	3.78	.....
BALL MILL PRODUCT	332702	.....	41.42	23.27	3.74	11818
FGM FEED	332703	.....	53.08	33.78	6.93	.....
FGM PRODUCT	332704	.....	48.88	40.63	8.43	.....
SPIRAL TAILS	332705	.....	57.21	60.72	14.28	.....
FINAL PRODUCT	332706	.....	6.29	27.17	2.81	11138

<.... FORMS OF SULFUR>

REFERENCE:	ETC'l #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	332701	.....	.....	.....	.....
BALL MILL PRODUCT	332702	2.87	0.11	0.76	
FGM FEED	332703	.....	.....	.....	
FGM PRODUCT	332704	.....	.....	.....	
SPIRAL TAILS	332705	.....	.....	.....	
FINAL PRODUCT	332706	2.09	0.13	0.59	

```

# - - - - -
{cc-exit      F2-commands      :

```

332702
B.N.P.
Record Number: 4330

	: ch-top Xpass S-ch	: summary data
	: 704.00 100.0 11.0	: dv: 0.0700
	: 150.00 80.2 14.7	: S10: 3.60
#####	: 75.00 73.5 4.9	: S50: 25.90
W/PROTRAC DATA: MANUAL MODE	: 59.60 60.7 7.3	: S90: 163.52
measurment/present no: 4333 -	: 42.21 61.4 7.5	: mv: 59.21
1997 0.00-704. SRA	res: NORMAL	: cs: 0.537
select bounds: 0.00- 704.00	: 21.10 45.0 0.1	:
compression: geom/sqrt2 0 chans:20	: 14.92 37.6 0.2	: sd: 57.30
sample date/time: 03/07/90 13:23	: 10.55 29.4 0.1	: wa: 11.10
sample ident: 332703	: 7.40 21.3 0.5	#####
sample ID : FGM FEED	: 5.20 14.0 4.6	: parameters
int code:	: 3.73 10.3 0.0	: name value
count 0:	printer: OFF:	: smpl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 0.2 0.2	: disprnt
sample preparation code:	: 1.01 0.0 0.0	: disp ant
notes:	:	: disp med
:	:	: dmed ant
:	:	: agitat'n
:	:	: agit tim
:	:	: circuli'n
:	:	: circ tim
:	:	: param 01
#####	:	: param 02
Esc-exit F2-commands :	:	: param 03

332703
FGM FEED
Record Number: 4333

	: ch-top Xpass X-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0244
	: 150.00 100.0 0.2	: X10: 2.07
#####	: 75.00 99.8 0.3	: X50: 4.10
MICROTRAC DATA: MANUAL MODE	: 59.69 99.5 0.9	: X90: 14.50
measured/present'at: 4342 - 1:	: 42.21 98.6 1.7	: mv: 7.19
704.00-704.000 SRA ren: NORMAL	: 29.85 96.9 2.8	: cu: 1.613
select bounds: 0.69- 704.00	: 21.10 94.1 3.5	
compression: geom/sqrt2 8 chann:20	: 14.92 90.6 7.4	: sd: 4.22
sample date/time: 03/07/90 13:32	: 10.55 83.2 12.2	: na: 3.72
sample ident: 332704	: 7.46 71.0 13.4	#####
sample ID : FGM PRODUCT	: 5.28 57.6 12.2	: parameters
lot code:	: 3.73 45.4 22.3	: name value
count 0:	printer: OFF: 2.64 23.2 18.0	:supl aut
run time: 30 sec. run 0: 100/ 2	: 1.69 5.2 4.3	:discrent
sample preparation code:	: 1.01 0.9 0.9	:disp aut
rating:		:disp med
		:dmed aut
		:agitat'n
		:agit tin
		:circul'n
		:circ tin
		:param 01
#####		:param 02
Esc-exit P2-commands :		:param 03

332704
FGM PRODUCT
Record Number: 4342

```

      : ch-top 8pass 8-ch      : summary data
      : 704.00 100.0 4.2      : dv: 0.0499
      : 150.00 95.8 12.4      : 810: 3.19
***** 75.00 83.3 4.4      : 850: 16.20
MICROTRAC DATA: MANUAL MODE : 59.69 78.9 6.8      : 890: 106.13
measured t/present no: 4345 - 1: 42.21 72.2 7.4      : av: 36.25
0.69-704. SRA res: NORMAL : 29.85 64.7 0.3      : cs: 0.607
chan select bounds: 0.69- 704.00 : 21.10 56.4 0.6      :
compression: geom/sqrt2 8 chans:28 : 14.92 47.8 9.6      : sd: 36.65
sample date/time: 03/07/90 13:36 : 10.55 38.2 10.0      : na: 0.73
sample ident: 332705      : 7.46 28.2 8.3 *****
sample ID : SPIRAL TAILS : 5.28 19.9 6.2      : parameters
lot code:      : 3.73 13.7 7.5      : name value
count 0:      printer: OFF: 2.64 6.2 5.4      :sopl aut
run time: 30 sec. run 0: 100/ 2 : 1.69 0.8 0.8      :disprnt
sample preparation code:      : 1.01 0.0 0.0      :disp aut
notes:      :      :disp ned
      :      :doed aut
      :      :agitat'n
      :      :agit tin
      :      :circul'n
      :      :circ tin
      :      :para0 01
*****      :para0 02
Esc-exit      F2-commands :      :para0 03

```

332705
SPIRAL TAILS
Record Number: 4345

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0204
	: 150.00 100.0 0.0	: \$10: 1.98
*****	: 75.00 100.0 0.0	: \$50: 3.74
ALPOTRAC DATA: MANUAL MODE	: 59.69 100.0 0.1	: \$90: 11.60
measured/present no: 4348 - 1:	42.21 99.9 1.2	: av: 5.87
0.69-704. SRA res: NORMAL	: 29.85 98.7 1.8	: cs: 1.752
select bounds: 0.69- 704.00	: 21.10 96.9 2.0	:
compression: geom/sqrt2 8 chans:20	: 14.92 94.9 7.6	: sd: 3.74
sample date/time: 03/07/90 13:40	: 10.55 87.3 12.8	: na: 3.42
sample ident: 332706	: 7.46 74.6 13.1	*****
sample 10 : FINAL PRODUCT	: 5.28 61.5 11.6	: parameters
code:	: 3.73 49.9 23.2	: name value
count 8: printer: OFF:	2.64 26.7 20.0	:sopl ant
run time: 30 sec. run 8: 100/ 2	: 1.69 6.7 5.4	:disprent
sample preparation code:	: 1.01 1.3 1.3	:diso ant
note:	:	:disp ned
	:	:dmed ant
	:	:agitat'n
	:	:agit tin
	:	:circul'n
	:	:circ tin
	:	:para0 01
*****		:para0 02
fsc-exit f2-commands :		:para0 03

332706
FINAL PRODUCT
Record Number: 4348

08-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 42002

SAMPLE DATE: 02-24-90

		SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	BTU
=====					
AGGLOMERATES	332801	27.42	7.95	1.85	14173

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
=====				
AGGLOMERATES	332801	1.00	0.07	0.78

08-Mar-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 42201

SAMPLE DATE: 02-26-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	332901	19.75	7.06	1.65

08-Mar-90 -- EXPORTEch Company, Inc.

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P. O. Box 588
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Subcontract No. 19307-F-31

RUN #: 42202

SAMPLE DATE: 02-26-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	333001	-----	12.80	17.81	2.16	12655
AGGLOMERATES	333002	24.43	-----	6.00	1.49	14740

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATION FEED	333001	1.39	0.14	0.63
AGGLOMERATES	333002	0.68	0.07	0.74

08-Mar-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 42203

SAMPLE DATE: 02-26-90

		MOISTURE	SOLIDS	ASH	TOTAL	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR	BTU
AGGLOMERATES	333101	22.18	-----	5.48	1.35	14872
PRIMARY TAILS	333102	-----	1.55	86.49	6.34	-----

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	333101	0.52	0.07	0.76
PRIMARY TAILS	333102	-----	-----	-----

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Purchase Order 19307-F-79H

RUN #: 42203
SAMPLE DATE: 02-26-90

BECHTEL REFERENCE: FINAL PRODUCT
ETCI SAMPLE #: 333101

PROXIMATE ANALYSIS:		ULTIMATE ANALYSIS:	
.....			
	Dry Basis		Dry Basis
% Ash	5.52	% Moisture	0.92 (As Received)
% Volatile	32.24	% Carbon	82.54
% Fixed Carbon	62.24	% Hydrogen	5.24
	-----	% Nitrogen	1.44
	100.00	% Sulfur	1.34
		% Ash	5.52
Btu/lb	14845	% Oxygen (diff)	3.92
% Sulfur	1.34		-----
			100.00
		Btu/lb (MAF)	15924
		Alkalies as Sodium Oxide	0.11

MINERAL ANALYSIS OF ASH:	WEIGHT %, DRY BASIS
.....	
Silicon dioxide	48.61
Aluminum oxide	24.37
Titanium dioxide	0.98
Iron oxide	14.07
Calcium oxide	4.67
Magnesium oxide	0.81
Potassium oxide	2.14
Sodium oxide	0.63
Sulfur trioxide	2.07
Phosphorus pentoxide	0.21
Strontium oxide	0.06
Barium oxide	0.03
Manganese oxide	0.02
Undetermined	1.33

Silica Value = 71.32	100.00
Base:Acid Ratio =0.30	

Fouling Index = 0.19
Slagging Index = 0.40

08-Mar-90 -- EXPORTEch Company, Inc.

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P. O. Box 588

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Subcontract No. 19307-F-31

RUN #: 42301

SAMPLE DATE: 02-27-90

		SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	333201	32.41	7.31	1.40

08-Mar-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

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Subcontract No. 19307-F-31

RUN #: 42302

SAMPLE DATE: 02-27-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	333301	3.35	.....	23.71	3.97	.....
SPIRAL TAILS	333302	.....	51.44	51.85	11.14	.....
FINAL PRODUCT	333303	.....	11.10	15.60	1.80	13048

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	333301	.....	.....	.....	.....
SPIRAL TAILS	333302	.....	.....	.....	.....
FINAL PRODUCT	333303	1.03	0.17	0.60	


```

      : ch-top tpass 8-ch          : summary data
      : 704.00 100.0 0.0           : dv:    0.0245
      : 150.00 100.0 0.0           : $10:   2.14
*****9       75.00 100.0 0.0     : $50:   4.04
MICROTRAC DATA: MANUAL MODE      : $90:  13.76
resources't/present'nt: 4351 -    1: 42.21 100.0 0.0 : mv:    6.42
rate 0.69 704. SRA res: NORMAL    : 29.85 100.0 1.1 : cs:   1.524
then select bounds: 0.69- 704.00 : 21.10 98.0 6.4 :
compression: geom/sqrt2 8 chans:20 : 14.92 92.4 10.1 : sd:    4.25
sample date/time: 03/08/90 09:14 : 10.55 82.3 14.5 : ea:    3.93
sample ident: 333303               : 7.46 67.8 14.0 *****
sample 10 :                        : 5.28 53.0 12.2 : parameters
bit code:                             : 3.73 40.7 20.3 : name value
count 0: printer: OFF:              : 2.64 20.4 16.0 :seol ant
run time: 30 sec. run 0: 100/ 2 : 1.69 4.4 3.7 :disprant
sample preparation code:             : 1.01 0.7 0.7 :disp ant
rate:                                : : :disp oed
:                                     : : :doed ant
:                                     : : :agitat'n
:                                     : : :agit tin
:                                     : : :circul'n
:                                     : : :circ tin
:                                     : : :paran fl
*****9       : : :paran fl
Fec-exit F2-commands : : :paran fl

```

BEST RESULTS WITH FEED

Record Number: 4351

19-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
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(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 42302
SAMPLE DATE: 02-27-90

PREVIOUSLY REPORTED:

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	SULFUR
					WT. %
BALL MILL FEED	333301	3.35	-----	23.71	3.97

ADDITIONAL MEASUREMENTS:

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
BALL MILL FEED	333301	3.35	0.01	0.61

08-Mar-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 42303
SAMPLE DATE: 02-27-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	333401	.....	13.31	16.18	1.89	.....
AGGLOMERATES	333402	26.09	.....	6.22	1.28	14731
PRIMARY TAILS	333403	.....	2.00	68.15	4.96	.....

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATION FEED	333401	1.23	0.18	0.48
AGGLOMERATES	333402	0.56	0.06	0.66
PRIMARY TAILS	333403			

08-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 42304

SAMPLE DATE: 02-27-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	333501	33.01	.....	5.61	1.24	14862
PRIMARY TAILS	333502	.....	1.83	86.74	6.63	.....

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	333501	0.50	0.08	0.66
PRIMARY TAILS	333502			

08-Mar-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 42305

SAMPLE DATE: 02-27-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	333601	27.47	-----	5.76	1.23	14847
PRIMARY TAILS	333602	-----	1.67	85.20	6.41	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	333601	0.48	0.08	0.67
PRIMARY TAILS	333602	-----	-----	-----

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Subcontract No. 19307-F-31

RUN #: 42401

SAMPLE DATE: 02-28-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	333701	3.32	-----	22.79	3.73	-----
SPIRAL TAILS	333702	-----	50.69	51.41	10.94	-----
FINAL PRODUCT	333703	-----	13.82	15.35	1.80	13115
AGGLOMERATES	333704	20.87	-----	5.89	1.23	14806

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	333701	-----	-----	-----	-----
SPIRAL TAILS	333702	-----	-----	-----	-----
FINAL PRODUCT	333703	1.12	0.14	0.54	
AGGLOMERATES	333704	0.46	0.07	0.70	-----

19-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 42401
SAMPLE DATE: 02-28-90

PREVIOUSLY REPORTED:

.....

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %
=====					
BALL MILL FEED	333701	3.32	-----	22.79	3.73

ADDITIONAL MEASUREMENTS:

.....

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
=====				
BALL MILL FEED	333701	3.19	0.02	0.52

13-Mar-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

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New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 42402

SAMPLE DATE: 02-28-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR
BECHTEL REFERENCE:	ETCi #	WT. %	WT. %	WT. %	WT. %
AGGLOMERATES	333801	33.47	-----	5.89	1.32
PRIMARY TAILS	333802	-----	1.63	86.86	7.24

13-Mar-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 42403

SAMPLE DATE: 02-28-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
=====						
AGGLOMERATES	333901	28.54	-----	5.70	1.29	14838
PRIMARY TAILS	333902	-----	2.34	84.11	7.00	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
=====				
AGGLOMERATES	333901	0.49	0.07	0.73
PRIMARY TAILS	333902	-----	-----	-----

13-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 42501

SAMPLE DATE: 03-01-90

BECHTEL REFERENCE:	ETC#	MOISTURE	SOLIDS	ASH	TOTAL	BTU
		WT. %	WT. %	WT. %	SULFUR	
=====						
AGGLOMERATION FEED	334001	-----	16.74	16.78	2.04	12878
AGGLOMERATES	334002	39.69	-----	6.58	1.47	14685
PRIMARY TAILS	334003	-----	2.00	77.70	6.53	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
=====				
AGGLOMERATION FEED	334001	1.19	0.21	0.64
AGGLOMERATES	334002	0.63	0.08	0.76
PRIMARY TAILS	334003	-----	-----	-----

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EXPORTEch Company, Inc.

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(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 42502

SAMPLE DATE: 03-01-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
=====					
AGGLOMERATES	334101	23.43	-----	5.88	1.39
PRIMARY TAILS	334102	-----	2.21	87.05	7.70

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Subcontract No. 19307-F-31

RUN #: 42504
SAMPLE DATE: 03-01-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	334201	-----	18.67	16.86	2.02	12743
AGGLOMERATES	334202	25.74	-----	6.39	1.43	14819
PRIMARY TAILS	334203	-----	2.47	85.95	7.20	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATION FEED	334201	1.02	0.14	0.86
AGGLOMERATES	334202	0.57	0.07	0.79
PRIMARY TAILS	334203	-----	-----	-----

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Subcontract No. 19307-F-31

RUN #: 42601

SAMPLE DATE: 03-02-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	334301	31.01	-----	6.57	1.39
PRIMARY TAILS	334302	-----	3.99	83.37	6.93

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	334301	0.56	0.13	0.70
PRIMARY TAILS	334302	-----	-----	-----

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Subcontract No. 19307-F-31

RUN #: 42602

SAMPLE DATE: 03-02-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	334401	20.53	.....	6.42	1.34
PRIMARY TAILS	334402	.....	5.04	87.14	7.60

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	334401	0.53	0.06	0.75
PRIMARY TAILS	334402			

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Subcontract No. 19307-F-31

RUN #: 42603

SAMPLE DATE: 03-02-90

		MOISTURE	SOLIDS	ASH	TOTAL
		WT. %	WT. %	WT. %	SULFUR
BECHTEL REFERENCE:	ETC1 #				WT. %
BALL MILL FEED	334501	3.20	-----	22.27	3.74
SPIRAL TAILS	334502	-----	60.22	61.56	14.56
FINAL PRODUCT	334503	-----	16.41	15.76	1.83
AGGLOMERATION FEED	334504	-----	17.49	16.11	1.87
AGGLOMERATES	334505	21.83	-----	6.32	1.33
PRIMARY TAILS	334506	-----	2.50	77.78	6.19

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	334501	3.15	0.02	0.57	-----
SPIRAL TAILS	334502	-----	-----	-----	-----
FINAL PRODUCT	334503	1.05	0.20	0.58	-----
AGGLOMERATION FEED	334504	1.12	0.14	0.61	-----
AGGLOMERATES	334505	0.52	0.06	0.75	-----
PRIMARY TAILS	334506	-----	-----	-----	-----

	: ch-top \$pass \$-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0224
	: 150.00 100.0 0.0	: \$10: 2.16
#####	: 75.00 100.0 0.0	: \$50: 5.35
MICROTRAC DATA: MANUAL MODE	: 59.69 100.0 0.0	: \$90: 14.94
pressure't/present'n0: 4357 -	1: 42.21 100.0 0.2	: mv: 7.02
7997 0.69-704. SRA res: NORMAL	: 29.85 99.0 2.3	: co: 1.459
chan select bounds: 0.69- 704.00	: 21.10 97.5 7.5	:
progression: geom/sqrt2 8.chans:20	: 14.92 90.0 11.6	: sd: 5.00
sample date/time: 03/00/90 09:26	: 10.55 70.3 15.0	: na: 4.11
sample ident: 334504	: 7.46 63.3 13.7	#####
sample ID :	: 5.20 49.5 11.4	: parameters
lot code:	: 3.73 30.1 10.9	: name value
account 0: printer: OFF:	: 2.64 19.3 15.0	: :smpl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 4.3 3.6	: :disprnt
sample preparation code:	: 1.01 0.7 0.7	: :disp ant
notes:	:	: :disp ned
	:	: :doed ant
	:	: :agitat'n
	:	: :agit tin
	:	: :circul'n
	:	: :circ tin
	:	: :para0 01
#####	:	: :para0 02
Esc-exit F2-commands :	:	: :para0 03

334504

Record Number: 4357

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P. O. Box 588
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Subcontract No. 19307-F-31

RUN #: 42701

SAMPLE DATE: 03-02-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATION FEED	334601	-----	19.91	16.31	1.92
AGGLOMERATES	334602	23.90	-----	6.48	1.46
PRIMARY TAILS	334603	-----	3.60	78.94	5.73

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	334601	1.13	0.17	0.62	
AGGLOMERATES	334602	0.62	0.08	0.76	-----
PRIMARY TAILS	334603	-----	-----	-----	-----

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0200
	: 150.00 100.0 0.0	: 810: 2.15
*****	: 75.00 100.0 0.0	: 850: 5.33
MICROTRAC DATA: MANUAL MODE	: 59.69 100.0 0.0	: 890: 16.03
pressure't/present'n0: 4360 - 1:	: 42.21 100.0 0.4	: av: 7.20
707 0.69-704. SRA res: NORMAL	: 29.85 99.6 3.6	: cs: 1.460
chan select bounds: 0.69- 704.00	: 21.10 96.0 7.9	:
compression: geom/sqrt2 8 chans:20	: 14.92 88.0 10.7	: sd: 5.33
sample date/time: 03/00/90 09:31	: 10.55 77.3 14.2	: na: 4.11
sample ident: 334601	: 7.46 63.1 13.4	*****
sample 10 :	: 5.20 49.7 11.2	: parameters
lot code:	: 3.73 38.5 18.8	: name value
account 0: printer: OFF:	: 2.64 19.7 13.3	:sopl ant
run time: 30 sec. run 0: 100/ 2	: 1.69 4.4 3.7	:disprnt
sample preparation code:	: 1.01 0.7 0.7	:disp ant
notes:	:	:disp med
:	:	:dmed ant
:	:	:agitat'n
:	:	:agit tio
:	:	:circul'n
:	:	:circ tio
:	:	:para0 01
*****	:	:para0 02
Esc-exit F2-commands :	:	:para0 03

334601

Record Number: 4360

19-Mar-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 42702

SAMPLE DATE: 03-02-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	334701	21.13	-----	8.08	1.41
PRIMARY TAILS	334702	-----	1.61	86.55	6.53

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	334701	0.61	0.11	0.69
PRIMARY TAILS	334702	-----	-----	-----

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Subcontract No. 19307-F-31

RUN #: 42703

SAMPLE DATE: 03-02-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
BALL MILL FEED	334801	3.12	-----	23.15	3.80
SPIRAL TAILS	334802	-----	61.87	59.65	14.47
FINAL PRODUCT	334803	-----	17.37	15.93	1.82

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
BALL MILL FEED	334801	3.14	0.01	0.65	-----
SPIRAL TAILS	334802	-----	-----	-----	-----
FINAL PRODUCT	334803	0.97	0.17	0.68	

```

: ch-top 8pass 8-ch : summary data
: 704.00 100.0 0.0 : dv: 0.0280
: 150.00 100.0 0.0 : $10: 2.15
***** 75.00 100.0 0.0 : $50: 5.32
MICROTRAC DATA: MANUAL MODE : 59.69 100.0 0.0 : $90: 15.68
pressure't/present'n0: 4363 - 1: 42.21 100.0 0.3 : mv: 7.20
704.00-704.00 SRA res: NORMAL : 29.85 99.7 3.2 : co: 1.465
chan select bounds: 0.69- 704.00 : 21.10 96.4 0.0 :
progression: geom/sqrt2 8 chans:20 : 14.92 88.4 10.8 : sd: 5.25
sample date/time: 03/08/90 09:35 : 10.55 77.6 14.4 : na: 4.10
sample ident: 334803 : 7.46 63.2 13.5 *****
sample ID : : 5.28 49.7 10.9 : parameters
lot code: : 3.73 38.9 19.0 : name value
account 0: printer: OFF: 2.64 19.8 15.5 :sopl ant
run time: 30 sec. run 8: 100/ 2 : 1.69 4.4 3.7 :disprnt
sample preparation code: : 1.01 0.7 0.7 :disp ant
notes: : :disp ned
: : :deed ant
: : :agitat'n
: : :agit tin
: : :circul'n
: : :circ tin
: : :para0 01
***** :para0 02
Esc-exit F2-commands : :para0 03

```

334803

Record Number: 4363

19-Mar-90 -- EXPORTEch Company, Inc.

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P. O. Box 588

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Subcontract No. 19307-F-31

RUN #: 43101

SAMPLE DATE: 03-07-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	334901	34.92	6.99	1.33

19-Mar-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #:	43201			
SAMPLE DATE:	03-08-90			TOTAL
		MOISTURE	ASH	SULFUR
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %
=====				
AGGLOMERATES	335001	22.73	6.70	1.30

19-Mar-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 43202

SAMPLE DATE: 03-08-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	335101	29.84	6.56	1.30

19-Mar-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 43203

SAMPLE DATE: 03-08-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
AGGLOMERATES	335201	28.07	5.99	1.31

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Subcontract No. 19307-F-31

RUN #: 43204

SAMPLE DATE: 03-08-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	SULFUR
					WT. %
BALL MILL FEED	335301	2.98	-----	21.73	3.53
SPIRAL TAILS	335302	-----	50.87	45.35	9.15
FINAL PRODUCT	335303	-----	17.90	14.40	1.60

19-Mar-90 -- EXPORTEch Company, Inc.

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P. O. Box 588

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Subcontract No. 19307-F-31

RUN #: 43301

SAMPLE DATE: 03-09-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	335401	29.81	5.93	1.33

19-Mar-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 43302

SAMPLE DATE: 03-09-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	335501	38.89	6.69	1.35

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Subcontract No. 19307-F-31

RUN #:	43303			
SAMPLE DATE:	03-09-90			
		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	335601	21.87	5.98	1.30

21-Mar-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 43601

SAMPLE DATE: 03-02-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	335701	3.23	-----	4.13	0.68	14802
BALL MILL PRODUCT	335702	-----	39.84	3.36	0.71	-----
FGM FEED	335703	-----	36.44	4.22	0.80	-----
FGM PRODUCT	335704	-----	32.71	4.81	0.77	-----
FINAL PRODUCT	335705	-----	18.62	3.35	0.69	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC
BALL MILL FEED	335701	0.23	0.01	0.44
BALL MILL PRODUCT	335702	-----	-----	-----
FGM FEED	335703	-----	-----	-----
FGM PRODUCT	335704	-----	-----	-----
FINAL PRODUCT	335705	-----	-----	-----

21-Mar-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 43701

SAMPLE DATE: 03-02-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	335801	-----	16.29	3.57	0.72	15109
AGGLOMERATES	335802	42.59	-----	1.87	0.81	15259
PRIMARY TAILS	335803	-----	0.08	18.16	-----	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	335801	0.08	0.07	0.58	
AGGLOMERATES	335802	0.08	0.06	0.67	-----
PRIMARY TAILS	335803	-----	-----	-----	-----


```

: ch-top 8pass 8-ch : summary data
: 704.00 100.0 0.0 : dv: 0.0358
: 150.00 100.0 0.0 : t10: 2.34
***** 75.00 100.0 0.0 : t50: 6.01
MICROTAC DATA: MANUAL MODE : 59.69 100.0 0.0 : t90: 17.48
measured t/present'n0: 4708 - 1: 42.21 100.0 0.6 : av: 7.91
0.69-704. SRA res: NORMAL : 29.85 99.4 4.6 : cs: 1.295
chan select bounds: 0.69- 704.00 : 21.10 94.8 8.9 :
progression: geom/sqrt2 8 chans:20 : 14.92 85.9 11.6 : sd: 5.72
sample date/time: 03/20/90 15:50 : 10.55 74.3 14.4 : na: 4.63
sample ident: 335801 : 7.46 59.9 15.0 L*****
sample 10 : : 5.28 45.0 12.6 : parameters
1st code: : 3.73 32.3 17.4 : none value
account 0: printer: OFF: 2.64 14.9 12.5 :smp ant
run time: 30 sec. run 0: 100/ 2 : 1.69 2.4 2.3 :disprnt
sample preparation code: : 1.01 0.1 0.1 :disp ant
notes: : :disp ned
: : :dnd ant
: : :agitat'n
: : :agit tin
: : :circul'n
: : :circ tin
: : :param 01
***** :param 02
Esc-exit f2-commands : :param 03

```

335801

Record Number: 4708

21-Mar-90 -- EXPORTEch Company, Inc.

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Subcontract No. 19307-F-31

RUN #: 43702

SAMPLE DATE: 03-02-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
=====						
AGGLOMERATES	335901	33.30	-----	1.47	0.82	15421
PRIMARY TAILS	335902	-----	0.22	56.34	2.43	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
=====				
AGGLOMERATES	335901	0.04	0.04	0.74
PRIMARY TAILS	335902	-----	-----	-----

21-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
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Subcontract No. 19307-F-31

RUN #: 43801

SAMPLE DATE: 03-14-90

		MOISTURE	SOLIDS	ASH	TOTAL	
BECHTEL REFERENCE:	ETC! #	WT. %	WT. %	WT. %	SULFUR	BTU
AGGLOMERATES	336001	24.20	-----	1.81	0.79	15322
PRIMARY TAILS	336002	-----	0.30	87.45	2.73	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC! #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	336001	0.05	0.03	0.71
PRIMARY TAILS	336002	-----	-----	-----

28-Mar-90 -- EXPORTEch Company, Inc.

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P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 43802

SAMPLE DATE: 03-14-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	BTU
BALL MILL FEED	336301	3.80	-----	9.43	2.42	13690
SPIRAL TAILS	336302	-----	34.91	12.52	2.95	-----
FINAL PRODUCT	336303	-----	11.86	9.05	1.93	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
BALL MILL FEED	336301	1.25	0.01	1.16
SPIRAL TAILS	336302	-----	-----	-----
FINAL PRODUCT	336303	-----	-----	-----

21-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 43901
SAMPLE DATE: 03-15-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	336101	.....	13.11	10.46	1.87	13580
AGGLOMERATES	336102	31.44	.....	3.32	1.63	14915
PRIMARY TAILS	336103	.....	0.95	82.28	5.37	.....

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	336101	0.47	0.23	1.17	
AGGLOMERATES	336102	0.31	0.06	1.26	.....
PRIMARY TAILS	336103	.....	.....	.....	.....

```

: ch-top 8pass 8-ch      : summary data
: 704.00 100.0 0.0      : dv: 0.0335
: 150.00 100.0 0.0      : 410: 2.25
: 75.00 100.0 0.0       : 450: 5.73
*****                    : 490: 15.60
: POTRAC DATA: MANUAL MODE : 42.21 100.0 0.4 : dv: 7.42
: 0.69-704. SRA res: NORMAL : 29.85 99.6 3.3 : cs: 1.376
: select bounds: 0.69- 704.00 : 21.10 96.4 8.0 :
: compression: geom/sqrt2 8 chans:20 : 14.92 88.4 11.7 : sd: 5.28
: sample date/time: 03/20/90 16:02 : 10.55 76.6 15.0 : na: 4.36
: sample ident: 336101 : 7.46 61.7 14.8 : L*****
: sample 10 : 5.28 46.9 12.0 : parameters
: test code: 3.73 34.9 17.9 : name value
: amount 0: printer: OFF: 2.64 17.0 13.7 :sopl ant
: run time: 30 sec. run 0: 100/ 2 : 1.69 3.3 2.9 :disprnt
: sample preparation code: 1.01 0.4 0.4 :disp ant
: : :disp ned
: : :dmed ant
: : :acitat'n
: : :agit tie
: : :circul'n
: : :circ tie
: : :para0 01
: : :para0 02
*****                    : :para0 03
Esc-exit F2-commands :

```

336101

Record Number: 4717

21-Mar-90 .. EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 43902

SAMPLE DATE: 03-15-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	336201	23.28	.....	3.61	1.66	14939
PRIMARY TAILS	336202	.....	0.55	87.69	5.72	.....

<.... FORMS OF SULFUR>

BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	336201	0.34	0.05	1.27
PRIMARY TAILS	336202	.....	.....	.....

28-Mar-90 -- EXPORtech Company, Inc.

EXPORtech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44001

SAMPLE DATE: 03-16-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	336401	25.17	.....	3.40	1.59	14699
PRIMARY TAILS	336402	.....	0.71	87.78	5.20	.....

<.... FORMS OF SULFUR>

BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATES	336401	0.34	0.06	1.19	
PRIMARY TAILS	336402				

28-Mar-90 .. EXPORTEch Company, Inc.

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P. O. Box 588
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Subcontract No. 19307-F-31

RUN #: 44002

SAMPLE DATE: 03-16-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	336501	.....	15.09	11.42	2.76	13425
AGGLOMERATES	336502	21.97	.....	6.32	2.51	14280
PRIMARY TAILS	336503	.....	0.82	84.71	5.45	.....

<.... FORMS OF SULFUR>

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	336501	1.43	0.14	1.19	
AGGLOMERATES	336502	1.10	0.05	1.36	.....
PRIMARY TAILS	336503	.....	.....	.....	.....

```

: ch-top 8pass 8-ch : summary data
: 704.00 100.0 0.0 : dv: 0.0445
: 150.00 100.0 0.4 : 810: 2.00
: 75.00 99.6 0.5 : 850: 10.00
***** 59.69 99.1 2.5 : 890: 20.53
: source DATA: MANUAL MODE : av: 18.37
: source't/present'n0: 4720 - 1: 42.21 96.6 5.2 : ca: 0.919
: 64-704. SRA res: NORMAL : 29.05 91.4 10.2 :
: select brands: 0.69- 704.00 : 21.10 81.2 14.3 :
: session: gene/egrt2 0 chans:20 : 14.92 66.9 14.5 : sd: 9.69
: date/time: 03/20/90 16:00 : 10.55 52.4 13.0 : ea: 6.53
: ident: 336501 : 7.46 30.6 11.4 L*****
: 10 : 5.20 27.2 0.2 : parameters
: code: : 3.73 10.9 10.5 : name value
: printer: OFF: 2.64 0.4 7.4 :serial ant
: live: 30 sec. run 0: 100/ 2 : 1.69 1.0 1.0 :disprnt
: preparation code: : 1.01 0.0 0.0 :disp ant
: : :disp ned
: : :deed ant
: : :agitat'n
: : :agit tin
: : :circul'n
: : :circ tin
: : :para0 01
***** : :para0 02
: exit F2-commando : :para0 03

```

336501

Record Number: 4720

EXPOrTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

SUBCONTRACT 19307-F-31

RUN #: 44003

DESCRIPTION: PITTSBURGH SEAM COAL, BLACKSVILLE No. 2 MINE,
MONONGALIA COUNTY, WEST VIRGINIA *pit-coal*

SAMPLE#: 336800

FULL PROXIMATE:

ULTIMATE:

TOTAL MOISTURE	3.87 %	CARBON	75.54 %
ASH	9.62 %	HYDROGEN	5.02 %
VOLATILE MATTER	37.25 %	NITROGEN	1.40 %
FIXED CARBON	53.13 %	CHLORINE	0.05 %
TOTAL SULFUR	2.63 %	SULFUR	2.63 %
ORGANIC SULFUR	1.14 %	ASH	9.62 %
PYRITIC SULFUR	1.46 %	OXYGEN (DIF)	5.79 %
SULFATE SULFUR	0.03 %		
PYRITIC SULFUR/TOTAL SULFUR	55.51 %		
HEATING VALUE	13635		
GRINDABILITY INDEX	57		
FREE SWELLING INDEX	7.5		

MINERAL ASH:

TRACE ELEMENTS: CONCENTRATION IN PPM

SILICA SiO2	41.15 %	ARSENIC (As)	4	BARIUM (Ba)	980
ALLUMINA Al2O3	19.60 %	BORON (B)	9	BROMINE (Br)	11
TITANIA TiO2	0.90 %	CADMIUM (Cd)	1	CHLORINE (Cl)	500
FERRIC OXIDE Fe2O3	18.93 %	MERCURY (Hg)	0	COBALT (Co)	62
LIME CaO	7.08 %	MOLYBDENUM (Mo)	9	GERMANIUM (Ge)	22
MAGNESIA MgO	1.26 %	LEAD (Pb)	23	LITHIUM (Li)	380
POTASSIUM OXIDE K2O	3.53 %	SULFUR (S) *WT.%	2.01	SODIUM (Na)	4900
SODIUM OXIDE Na2O	0.66 %	SELENIUM (Se)	16	MANGANESE (Mn)	500
SULFUR TRIOXIDE SO3	5.01 %	CHROMIUM (Cr)	76	STRONTIUM (Sr)	1020
PHOSPHOROUS PENTOXIDE P2O5	0.57 %	COPPER (Cu)	160		
STRONTIUM OXIDE SrO	0.12 %	FLUORINE (F)	14		
BARIUM OXIDE BaO	0.11 %	NICKEL (Ni)	220		
MANGANESE OXIDE Mn3O4	0.07 %	VANADIUM (V)	120		
UNDETERMINED	1.01 %	ZINC (Zn)	180		

TOTAL: 100.00 %

ASH FUSION: (F)

REDUCING:

INITIAL DEFORMATION: 2020
 SOFTENING 2169
 HEMISPHERICAL 2243
 FLUID 2360

OXIDIZING:

INITIAL DEFORMATION: 2200
 SOFTENING 2328
 HEMISPHERICAL 2400
 FLUID 2459

COMBUSTION CHARACTERISTICS:

SILICA PERCENTAGE: 60.14
 BASE/ACID RATIO: 0.51
 FOULING INDEX: 0
 SLAGGING INDEX: 1

SIZING ANALYSIS

SAMPLE#	SIZE	WT.%	% ASH	% SULFUR	BTU	<----- CUMULATIVE ----->			
						WT.%	% ASH	% SULFUR	BTU
336801	+6.3	9.12	16.66	2.54	12580	9.12	16.66	2.54	12580
336802	6.3x.600	65.63	8.90	2.36	13915	74.75	9.85	2.38	13752
336803	.600x.250	10.75	8.55	2.39	13771	85.50	9.68	2.38	13754
336804	.250x.150	4.11	9.27	2.55	13618	89.61	9.66	2.39	13748
336805	.150x.075	4.66	9.98	2.71	13570	94.27	9.68	2.41	13739
336806	.075x.045	1.81	11.33	2.94	13313	96.08	9.71	2.42	13731
336807	-.045	3.92	12.67	2.58	13097	100.00	9.83	2.42	13707

FLOAT SINK ANALYSIS

+28 MESH

SAMPLE#	SPECIFIC GRAVITY	WEIGHT PERCENT	PERCENT ASH	PERCENT SULFUR	BTU	<----- CUMULATIVE ----->					
						% PYRITIC SULFUR	WEIGHT PERCENT	PERCENT ASH	PERCENT SULFUR	% PYRITIC SULFUR	
336808	F 01.25	0.71	2.82	1.77	14925	0.19	0.71	2.82	1.77	14925	0.19
336809	F 01.30	61.06	4.22	1.72	14571	0.38	61.77	4.20	1.72	14575	0.38
336810	F 01.40	26.28	9.80	2.60	13668	1.30	88.05	5.81	1.98	14304	0.65
336811	F 01.50	4.45	19.80	4.27	12018	2.97	92.50	6.49	2.09	14194	0.76
336812	F 01.60	2.25	27.40	5.91	10678	4.81	94.75	6.98	2.18	14111	0.86
336813	F 01.80	1.79	36.60	6.41	9336	5.05	96.54	7.53	2.26	14022	0.94
336814	F 02.00	0.93	45.52	6.14	7118	5.42	97.47	7.90	2.30	13956	0.98
336815	S 02.00	2.53	75.44	9.14	1589	8.48	100.00	9.60	2.47	13644	1.17

-28 MESH

SAMPLE#	SPECIFIC GRAVITY	WEIGHT PERCENT	PERCENT ASH	PERCENT SULFUR	BTU	<----- CUMULATIVE ----->					
						% PYRITIC SULFUR	WEIGHT PERCENT	PERCENT ASH	PERCENT SULFUR	% PYRITIC SULFUR	
336816	F 01.25	6.21	1.62	1.62	14959	0.08	6.21	1.62	1.62	14959	0.08
336817	F 01.30	49.48	2.78	1.60	14680	0.23	55.69	2.65	1.60	14711	0.21
336818	F 01.40	27.53	6.88	2.04	13990	0.72	83.22	4.05	1.75	14473	0.38
336819	F 01.50	5.41	12.20	2.73	13006	1.46	88.63	4.55	1.81	14383	0.45
336820	F 01.60	2.73	16.53	3.29	12175	1.77	91.36	4.91	1.85	14317	0.49
336821	F 01.80	2.02	25.98	4.49	10477	3.81	93.38	5.36	1.91	14234	0.56
336822	F 02.00	1.11	37.95	5.70	8277	5.18	94.49	5.74	1.95	14164	0.61
336823	S 02.00	5.51	71.23	13.81	2309	11.49	100.00	9.35	2.61	13511	1.21

28-Mar-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44301

SAMPLE DATE: 03-19-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	336601	-----	18.59	8.79	2.34	13830
AGGLOMERATES	336602	33.19	-----	5.84	2.53	14413
PRIMARY TAILS	336603	-----	0.93	87.19	6.71	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	336601	1.38	0.03	0.93	
AGGLOMERATES	336602	1.11	0.06	1.36	-----
PRIMARY TAILS	336603	-----	-----	-----	-----

28-Mar-90 -- EXPORTEch Company, Inc.

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P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44302

SAMPLE DATE: 03-19-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	336701	21.30	-----	6.27	2.31	14302
PRIMARY TAILS	336702	-----	1.09	23.56	2.61	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATES	336701	0.90	0.01	1.40	-----
PRIMARY TAILS	336702	-----	-----	-----	-----

10-Apr-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

44303 ONE STAGE GRIND

RUN #: ~~44301~~
SAMPLE DATE: 03-19-90

		MOISTURE	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	SULFUR
				WT. %
=====				
AGGLOMERATES	337501	26.30	6.46	2.34

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
=====				
AGGLOMERATES	337501	0.76	0.04	1.54

11-Apr-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44501

SAMPLE DATE: 03-21-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	336901	-----	19.25	8.05	2.05	13985
AGGLOMERATES	336902	26.65	-----	4.03	1.96	14704
PRIMARY TAILS	336903	-----	1.05	86.08	5.96	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	336901	0.66	0.12	1.27	
AGGLOMERATES	336902	0.53	0.06	1.37	-----
PRIMARY TAILS	336903	-----	-----	-----	-----

11-Apr-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44502

SAMPLE DATE: 03-21-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	337001	28.00	-----	3.82	1.89	14807
PRIMARY TAILS	337002	-----	1.10	84.70	6.44	-----

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	337001	0.49	0.05	1.35
PRIMARY TAILS	337002	-----	-----	-----

11-Apr-90 -- EXPORTEch Company, Inc.

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P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44601

SAMPLE DATE: 03-22-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	337101	-----	17.72	8.36	2.17	13964
AGGLOMERATES	337102	35.65	-----	3.59	1.87	14748
PRIMARY TAILS	337103	-----	0.85	81.91	7.53	-----

		<---- FORMS OF SULFUR ---->				HEPTANE	ASPHALT
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC	WT. %	WT. %
AGGLOMERATION FEED	337101	0.72	0.19	1.26	-----	-----	-----
AGGLOMERATES	337102	0.43	0.06	1.38	-----	-----	1.26
PRIMARY TAILS	337103	-----	-----	-----	-----	-----	0.02

	: ch-top 8pass 8-ch	: summary data
	: 704.00 100.0 0.0	: dv: 0.0304
	: 150.00 100.0 0.0	: 810: 2.28
*****	: 75.00 100.0 0.0	: 850: 6.20
MICROTRAC DATA: MANUAL MODE	: 59.69 100.0 0.0	: 890: 17.14
sample no: 4813 - 1:	: 42.21 100.0 0.5	: av: 7.91
size: 0.69-704. SPA res: NORMAL	: 29.85 99.5 4.1	: ca: 1.317
size select bounds: 0.69- 704.00	: 21.10 95.5 9.4	
compression: gene/sort2 8 chans:20	: 14.92 86.1 12.7	: sd: 5.75
sample date/time: 03/27/90 17:01	: 10.55 73.4 15.1	: pa: 4.55
sample ident: 337101	: 7.46 58.3 14.4	*****
sample ID : AGGLOMERATION FEED	: 5.28 43.9 11.3	: parameters
sample code:	: 3.73 32.6 16.6	: name value
sample 0: printer: OFF:	: 2.64 16.0 12.9	: repl aut
time: 30 sec. run 0: 100/ 2	: 1.69 3.1 2.7	: disenrnt
sample preparation code:	: 1.01 0.4 0.4	: disen aut
size:		: disp sed
		: deod aut
		: agitst'n
		: agit tie
		: circul'n
		: circ tie
		: para0 01
*****		: para0 02
for-exit f2-commands :		: para0 03

337101
AGGLOMERATION FEED
Record Number: 4813

11-Apr-90 .. EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44602
SAMPLE DATE: 03-22-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	337201	28.27	.....	3.67	1.86	14710
PRIMARY TAILS	337202	.....	1.20	71.28	6.63	.....

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	337201	0.37	0.05	1.44
PRIMARY TAILS	337202			

11-Apr-90 ** EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

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Subcontract No. 19307-F-31

RUN #: 44603

SAMPLE DATE: 03-22-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATES	337301	26.25	.....	3.75	1.84	14829
PRIMARY TAILS	337302	.....	0.85	89.01	7.90	.....

		<.... FORMS OF SULFUR>			HEPTANE	ASPHALT
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	WT. %	WT. %
AGGLOMERATES	337301	0.34	0.05	1.45		2.17
PRIMARY TAILS	337302	.....	.....	.....		0.05

13-Apr-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P.O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Bechtel Subcontract No. 19307-F-31

HYDROCARBON ANALYSIS P1198 WT. PCT.

	AGG	1 ϕ TLS	AGG	1 ϕ TLS
BECHTEL RUN #	44601	44601	44603	44603
ETCI SAMPLE #	337102	337103	337301	337302

BENZENE	0.02	0.02	0.02	0.01
N HEPTANE	TRACE	TRACE	TRACE	TRACE
TOLUENE	99.85	99.92	99.91	99.96
ETHYL BENZENE	0.03	0.03	0.03	0.02
M&P XYLENE	0.01	0.02	0.01	0.01
ORTHO XYLENE	TRACE	TRACE	TRACE	TRACE
ISO OCTANE	0.03	0.01	0.02	TRACE
UNIDENTIFIED	0.06	0.00	0.01	0.00
TOTAL	100.00	100.00	100.00	100.00

[illegible]

11-Apr-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44700
SAMPLE DATE: 03-23-90

		ASH		TOTAL		
				<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETCI #	WT. %	BTU	%PYRITIC	%SULFATE	%ORGANIC
=====						
PITTSBURGH SEAM ROM	337401	13.18	13081	1.53	0.01	1.34

↑ FROM PREPARATION PLANT FEED

PLANT YIELD = 90%

10-Apr-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44701

SAMPLE DATE: 03-23-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECTEL REFERENCE:	ETC# #	WT. %	WT. %	WT. %	WT. %	BTU
=====						
AGGLOMERATION FEED	337601	-----	19.12	8.58	2.17	13867
AGGLOMERATES	337602	23.64	-----	4.31	1.96	-----
PRIMARY TAILS	337603	-----	1.02	86.56	6.24	-----

<---- FORMS OF SULFUR ---->

BECTEL REFERENCE:	ETC# #	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
=====					
AGGLOMERATION FEED	337601	0.62	0.19	1.36	
AGGLOMERATES	337602	0.45	0.10	1.41	-----
PRIMARY TAILS	337603	-----	-----	-----	-----

```

: ch-top 8pass 8-ch      : summary data
: 704.00 100.0 0.0      : dv: 0.0331
: 150.00 100.0 0.0      : $10: 2.31
: 75.00 100.0 0.0       : $50: 6.40
***** 59.69 100.0 0.0  : $90: 17.05
MICROTRAC DATA: MANUAL MODE
: 42.21 100.0 0.6       : mv: 0.17
: 29.85 99.4 4.8        : co: 1.290
: 21.10 94.6 9.6        :
: 14.92 85.0 13.0       : sd: 5.94
: 10.55 72.0 15.2      : no: 4.65
: 7.46 56.8 14.0       L*****
: 5.28 42.8 11.2       : parameters
: 3.73 31.6 16.2       : none value
: 2.64 15.4 12.4       : ampl ant
: 1.69 3.0 2.6         : disprant
: 1.01 0.4 0.4         : disp ant
:                       : disp eed
:                       : deed ant
:                       : agitat'n
:                       : agit tin
:                       : circul'n
:                       : circ tin
:                       : para 01
:                       : para 02
:                       : para 03
*****
Esc-exit      F2-commands

```

337601
AGGLOMERATION FEED
Record Number: 4816

10-Apr-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44702

SAMPLE DATE: 03-23-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
=====					
AGGLOMERATES	337701	35.10	-----	3.99	1.86
PRIMARY TAILS	337702	-----	1.07	87.02	7.82

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
=====				
AGGLOMERATES	337701	0.39	0.11	1.36
PRIMARY TAILS	337702	-----	-----	-----

10-Apr-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44703

SAMPLE DATE: 03-23-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	337801	24.07	-----	3.71	1.84
PRIMARY TAILS	337802	-----	0.75	85.51	7.94

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	337801	0.35	0.07	1.42
PRIMARY TAILS	337802	-----	-----	-----

10-Apr-90 -- EXPORTEch Company, Inc.

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44801
SAMPLE DATE: 03-24-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	337901	.....	19.03	8.38	2.20	13867
AGGLOMERATES	337902	23.98	.....	3.96	1.93	.....
PRIMARY TAILS	337903	.....	1.11	78.24	6.81	.....

		<---- FORMS OF SULFUR ---->			
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC
AGGLOMERATION FEED	337901	0.65	0.14	1.41	
AGGLOMERATES	337902	0.38	0.08	1.47	
PRIMARY TAILS	337903				

XXXXXXXXXXXXXXXXXXXX

:supl ant

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agitation

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page 01

para 12

para 13

11

10-Apr-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44802

SAMPLE DATE: 03-24-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC1 #	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	338001	18.48	-----	3.73	1.91
PRIMARY TAILS	338002	-----	0.85	86.07	8.28

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC1 #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	338001	0.39	0.06	1.46
PRIMARY TAILS	338002	-----	-----	-----

10-Apr-90 .. EXPORTech Company, Inc.

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 44803

SAMPLE DATE: 03-24-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	338101	16.07	.....	3.64	1.90
PRIMARY TAILS	338102	.....	0.87	84.85	8.24

<.... FORMS OF SULFUR>

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	338101	0.35	0.06	1.49
PRIMARY TAILS	338102	.....	.....	.....

18-Apr-90 .. EXPORech Company, Inc.

EXPORech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 45001

SAMPLE DATE: 03-26-90

BECHTEL REFERENCE:	ETCI #	MOISTURE	SOLIDS	ASH	TOTAL	BTU
		WT. %	WT. %	WT. %	SULFUR	
AGGLOMERATION FEED	338201	.....	18.92	8.48	2.12	13715
AGGLOMERATES	338202	38.64	.....	3.63	1.81	.....
PRIMARY TAILS	338203	.....	0.88	83.64	7.91	.....

<.... FORMS OF SULFUR>

BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATION FEED	338201	0.86	0.11	1.15
AGGLOMERATES	338202	0.35	0.09	1.37
PRIMARY TAILS	338203	.....	.....	.....

18-Apr-90 ** EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 45002

SAMPLE DATE: 03-26-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	338301	19.89	.....	3.82	1.83
PRIMARY TAILS	338302	.....	1.03	87.40	9.15

<.... FORMS OF SULFUR>

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	338301	0.41	0.05	1.37
PRIMARY TAILS	338302	.....	.....	.....

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 45003

SAMPLE DATE: 03-26-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	338401	22.81	.....	3.93	1.85
PRIMARY TAILS	338402	.....	1.10	84.24	9.01

		<.... FORMS OF SULFUR >....		
BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	338401	0.41	0.04	1.40
PRIMARY TAILS	338402	.....	.....	.....

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 45101
SAMPLE DATE: 03-27-90

		MOISTURE	SOLIDS	ASH	TOTAL SULFUR	
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	WT. %	BTU
AGGLOMERATION FEED	338501	.....	17.29	7.89	2.08	13895
AGGLOMERATES	338502	22.65	.....	3.68	1.81	.....
PRIMARY TAILS	338503	.....	0.81	85.31	8.47	.....

<.... FORMS OF SULFUR>

BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATION FEED	338501	0.72	0.07	1.29
AGGLOMERATES	338502	0.35	0.04	1.42
PRIMARY TAILS	338503	.....	.....	.....

18-Apr-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 45102

SAMPLE DATE: 03-27-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	SULFUR
=====					
AGGLOMERATES	338601	22.76	.....	3.78	1.81
PRIMARY TAILS	338602	.....	1.71	77.94	7.96

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
=====				
AGGLOMERATES	338601	0.38	0.03	1.40
PRIMARY TAILS	338602	.....	.....	.....

18-Apr-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 45103

SAMPLE DATE: 03-27-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETCI #	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	338701	24.87	.....	3.99	1.84
PRIMARY TAILS	338702	.....	1.03	78.49	8.12

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETCI #	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	338701	0.36	0.10	1.38
PRIMARY TAILS	338702	.....	.....	.....

18-Apr-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 45201

SAMPLE DATE: 03-28-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	338801	29.60	-----	3.48	1.74
PRIMARY TAILS	338802	-----	0.83	81.01	7.63

<---- FORMS OF SULFUR ---->

BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	338801	0.30	0.01	1.43
PRIMARY TAILS	338802	-----	-----	-----

18-Apr-90 -- EXPORTech Company, Inc.

EXPORTech Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 45401
SAMPLE DATE: 03-30-90

		MOISTURE	SOLIDS	ASH	TOTAL
BECHTEL REFERENCE:	ETC#	WT. %	WT. %	WT. %	SULFUR
					WT. %
AGGLOMERATES	338901	52.37	-----	3.97	1.84
PRIMARY TAILS	338902	-----	0.97	78.49	7.45

		<---- FORMS OF SULFUR ---->		
BECHTEL REFERENCE:	ETC#	%PYRITIC	%SULFATE	%ORGANIC
AGGLOMERATES	338901	0.37	0.13	1.34
PRIMARY TAILS	338902	-----	-----	-----

EXPORTEch Company, Inc.
P. O. Box 588
New Kensington, PA 15068-0588
(412) 337-4415; FAX: (412) 337-4470

Purchase Order 19307-F-79H

RUN #: 45402
SAMPLE DATE: 03-30-90

BECHTEL REFERENCE: FINAL PRODUCT
ETC! SAMPLE #: 339002

PROXIMATE ANALYSIS:

.....
Dry Basis
% Ash 3.80
% Volatile 42.21
% Fixed Carbon 53.99
.....
100.00
Btu/lb 14843
% Sulfur 1.80

ULTIMATE ANALYSIS:

.....
Dry Basis
% Moisture 1.31 (As Received)
% Carbon 83.46
% Hydrogen 5.11
% Nitrogen 1.31
% Sulfur 1.80
% Ash 3.80
% Oxygen (diff) 4.52
.....
100.00
Btu/lb (MAF) 15429
Alkalies as Sodium Oxide 0.07

MINERAL ANALYSIS OF ASH:

.....

WEIGHT %, DRY BASIS

.....

Silicon dioxide	44.89
Aluminum oxide	23.06
Titanium dioxide	1.04
Iron oxide	18.19
Calcium oxide	4.89
Magnesium oxide	0.80
Potassium oxide	1.93
Sodium oxide	0.59
Sulfur trioxide	2.88
Phosphorus pentoxide	0.29
Strontium oxide	0.08
Barium oxide	0.03
Manganese oxide	0.03
Undetermined	1.30
	
Silica Value = 65.28	100.00
Base:Acid Ratio =0.38	

Fouling Index = 0.22
Slagging Index = 0.68

EXPORTEch Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 45402

SAMPLE DATE: 03-30-90

BECHTEL REFERENCE:	ETC#	MOISTURE		SOLIDS		TOTAL		FREE		
		WT. %		WT. %		WT. %		SWELLING		
								BTU	INDEX	
=====										
AGGLOMERATION FEED	339001	-----		19.06		7.76		2.09	14002	6.0
AGGLOMERATES	339002	19.38	-----			3.74		1.89	14476	5.5
PRIMARY TAILS	339003	-----		0.96		82.72		8.16	-----	-----

BECHTEL REFERENCE:	ETC#	<---- FORMS OF SULFUR ---->				HEPTANE		ASPHALT	
		%PYRITIC	%SULFATE	%ORGANIC	MICROTRAC	WT. %		WT. %	
AGGLOMERATION FEED	339001	0.68	0.13	1.28		-----		-----	
AGGLOMERATES	339002	0.37	0.06	1.46	-----	* SEE		3.13	-
PRIMARY TAILS	339003	-----	-----	-----	-----	BELOW *		0.12	

SAMPLE#	339002	339003
BENZENE	0.01	0.01
N HEPTANE	0.00	0.00
TOLUENE	99.94	99.96
ETHYL BENZENE	0.02	0.02
M & P XYLENE	0.02	0.01
ORTHO XYLENE	0.00	0.00
ISO OCTANE	0.01	0.00
UNIDENTIFIED	0.01	0.00
	-----	-----
	100.00	100.00

REFERENCE: ETC# 339001

ASH FUSION: (F)

REDUCING:

INITIAL DEFORMATION: 2122
 SOFTENING 2295
 HEMISPHERICAL 2347
 FLUID 2560

OXIDIZING:

INITIAL DEFORMATION: 2340
 SOFTENING 2460
 HEMISPHERICAL 2510
 FLUID 2668

REFERENCE: ETC# 339002

ASH FUSION: (F)

REDUCING:

INITIAL DEFORMATION: 2108
 SOFTENING 2273
 HEMISPHERICAL 2353
 FLUID 2490

OXIDIZING:

INITIAL DEFORMATION: 2329
 SOFTENING 2420
 HEMISPHERICAL 2510
 FLUID 2590

EXPORTech Company, Inc.

P. O. Box 588

New Kensington, PA 15068-0588

(412) 337-4415; FAX: (412) 337-4470

Subcontract No. 19307-F-31

RUN #: 45402

SAMPLE DATE: 03-30-90

AGGLOMERATION FEED ETCI # 339001

FLOAT SINK ANALYSIS:

SAMPLE#	SPECIFIC GRAVITY	WT%	ASH WT%	SULFUR WT%	<---- FORMS OF SULFUR ---->		
					%PYRITIC	%SULFATE	%ORGANIC
339004	F 81.30	17.89	1.55	1.50	0.04	0.01	1.45
339005	F 81.40	51.40	2.80	1.56	0.07	0.03	1.46
339006	F 81.60	21.45	7.35	1.74	0.31	0.11	1.32
339007	F 81.80	3.53	17.42	2.42	0.78	0.46	1.18
339008	S 81.80	5.73	67.92	10.12	7.89	1.34	0.89

<----- CUMULATIVE ----->

SAMPLE#	SPECIFIC GRAVITY	WT%	ASH WT%	SULFUR WT%	<---- FORMS OF SULFUR ---->		
					%PYRITIC	%SULFATE	%ORGANIC
339004	F 81.30	17.89	1.55	1.50	0.04	0.01	1.45
339005	F 81.40	69.29	2.48	1.54	0.06	0.02	1.46
339006	F 81.60	90.74	3.63	1.59	0.12	0.04	1.42
339007	F 81.80	94.27	4.15	1.62	0.15	0.06	1.42
339008	S 81.80	100.00	7.80	2.11	0.59	0.13	1.39

```

: ch-top 8pass 8-ch      : summary data
: 704.00 100.0 0.0      : dv: 0.0350
: 150.00 100.0 0.0      : d10: 2.35
: 75.00 100.0 0.0       : d50: 6.74
MICROTRAC DATA: MANUAL MODE : d90: 18.22
: 59.69 100.0 0.1       : av: 0.52
measures't/present'n0: 4915 - 1: 42.21 99.9 1.1 : cs: 1.245
7997 0.69-704. SRA res: NORMAL : 29.85 98.8 4.4 :
:                               :
chan select bounds: 0.69- 704.00 : 21.10 94.4 10.3 :
:                               :
progression: geom/sqrt2 8 chans:20 : 14.92 84.0 14.0 : sd: 6.00
sample date/time: 04/03/90 16:11 : 10.55 70.1 15.4 : oa: 4.02
sample ident: 339001 : 7.46 54.6 14.1 LHHHHHHHHHHHHHHHHHH
sample 10 : AGGLOMERATION FEED : 5.20 40.6 11.0 : parameters
lot code: : 3.73 29.5 15.1 : name value
account 0: printer: OFF: 2.64 14.4 11.6 :saml aut
run time: 30 sec. run 0: 100/ 2 : 1.69 2.0 2.5 :disprant
sample preparation code: : 1.01 0.3 0.3 :disp aut
notes: : :disp ned
: : :dmed aut
: : :agitat'n
: : :agit tin
: : :circul'n
: : :circ tin
: : :para0 01
: : :para0 02
: : :para0 03
Esc-exit F2-commands :

```

339001
AGGLOMERATION FEED
Record Number: 4915

TRIPURGE
FINE GRINDING
MILL FEED MIXER
EX-7
FINE GRINDING
MILL FEED BUMP
EX-8
FINE GRINDING
MILL
EX-11
PRIMARY BUMP

NOTES:

1. --- DENOTES EXISTING EQUIPMENT IN PLACE
2. (DELETED)
3. * DENOTES EQUIPMENT VENDOR SUPPLIED
4. DISCONNECT FROM EXISTING CONVEYOR & REPIPE TO EX-8
5. ALL MAJOR EQUIPMENT TO HAVE LOCAL START / EMERGENCY STOP SWITCH
6. FOR SAMPLE CONNECTIONS TYPE SEE SAMPLE POINT INDEX
7. ALL PANEL MOUNTED DEVICES TO BE LOCATED IN CGDC CONTROL ROOM UNLESS OTHERWISE NOTED
8. FOR PIPING SPECIFICATION REFER TO PIPE CLASS INDEX. PVC IS PLASTIC PIPE.

SCALE	DATE	REVISION	BY	CHK	ENR	PE	APD
BECHTEL NATIONAL INC.							
U.S. DOE (PETC) ADVANCED PHYSICAL FINE COAL CLEANING SPHERICAL AGGLOMERATION							
PIPING AND INSTRUMENT DIAGRAM COAL SLURRY PREPARATION (CGDC BUILDING)							
	JOB NO.	DRAWING NO.		REV			
	19307	M-01		2			

D-8
 SLURRY PD TANK
 SIZE 1'-6" DIA X 8'-6" H
 DESIGN PRESS.: 1 ATM
 DESIGN TEMP.: 100 DEG F
 MATERIAL: C.S.

Y-8
 HIGH SHEAR MIXER
 CAP: 20 HP
 DRIVE: VAR. SPEED
 MATERIAL: 304 S.S.

Y-8
 SLURRY FEED
 TANK MIXER
 CAP: 2 HP
 MATERIAL: C.S.

C-8
 HIGH SHEAR MIXER
 SIZE 18" DIA X 1'-6" H
 DESIGN PRESS.: 1 ATM
 DESIGN TEMP.: 100 DEG F
 MATERIAL: 304 S.S.

Y-1
PRODUCT DRAINAGE BELT
SIZE 3'-4" X 14'-6"
DESIGN TEMP.: 200 DEG F
MATERIAL: SYNTHETIC
FABRIC MEDIA
NP: 2

D-3
FINAL TAILINGS
SURGE TANK
SIZE 6'-0" DIA X 4'-0" HT
DESIGN PRESS.: ATM
DESIGN TEMP.: 200 DEG F
MATERIAL: C.S.

NOTES:

1. * DENOTES EQUIPMENT VENDOR SUPPLIED
2. ALL MAJOR EQUIPMENT TO HAVE LOCAL START / EMERGENCY STOP SWITCH
3. REFER TO SPEC J-02 APPENDIX A FOR SEQUENCE OF OPERATION
4. FOR SAMPLE CONNECTIONS TYPE SEE SAMPLE POINT INDEX
5. ALL VENTS AND DRAIN CONNECTIONS OPEN TO ATMOSPHERE SHALL BE CAPPED OR PLUGGED
6. ALL PANEL MOUNTED DEVICES TO BE LOCATED IN THE ADVANCED PROCESS BUILDING CONTROL ROOM
7. LOCATE UV-YO1A AT LOW POINT IN SEAL TRAP

S-10
SECONDARY TAILINGS PUMP
DESIGN CAP.: 100 GPM
DIFF. PRESS.: 54 FT
NP: 2
MATERIAL: CS

2	8/15/90	ISSUED "AS BUILT" FOR FINAL REPORT	FL	MC	FL	
1	6/16/89	REISSUED PER REDUCED SCOPE	MS	FS	SD	FS
0	4/7/88	ISSUED FOR CONSTRUCTION	MS	FS	SD	FS
8	3/6/88	ISSUED FOR S/DG	MS	FS		FS
A	1/28/88	ISSUED FOR REVIEW & APPROVAL	MS	FS	SD	FS
RE	REV	REVISION	BY	CHK	ENR	PE
SCALE	1"=10'	SECTION	DRW	REV		
BECHTEL NATIONAL INC.						
U.S. DOE (PFC) ADVANCED PHYSICAL FINE COAL CLEANING SPHERICAL AGGLOMERATION						
PIPING AND INSTRUMENT DIAGRAM HIGH SHEAR REACTOR AND AGGLOMERATE LOADOUT (ADVANCED PROCESS BUILDING)						
19307	JOB NO.	DRAWING NO.		REV		
		M-02		2

NOTES:

1. * DENOTES EQUIPMENT VENDOR SUPPLIED
2. ALL MAJOR EQUIPMENT TO HAVE LOCAL START / EMERGENCY STOP SWITCH
3. REFER TO SPEC J-08 APPENDIX A FOR SEQUENCE OF OPERATION
4. FOR SAMPLE CONNECTIONS TYPE SEE SAMPLE POINT INDEX
5. ALL VENTS AND DRAIN CONNECTIONS OPEN TO ATMOSPHERE SHALL BE CAPPED OR PLUGGED
6. DELETED
7. PROVISION TO INSTALL BLIND FLANGES & C-8 SHAL BE MADE. PROVIDE SET OF BLINDS FOR ONE VESSEL.

2	8/5/90	ISSUED AS BUILT FOR FINAL REPORT	FS	MS	DO	FE	MM
1	8/15/88	RE-5.1.1.1.0 FOR REDUCED SCOPE	FS	MS	DO	FE	MM
0	4/7/88	ISSUED FOR CONSTRUCTION	MS	DO	FE	MM	
B	3/8/88	ISSUED FOR BIDD	MS			FE	MM
A	1/30/88	ISSUED FOR REVIEW AND APPROVAL	MS	DO	MY	FE	MM
RE.	DATE	REVISION	BY	CHK	SR	FE	APD
SCALE: NONE							
BECHTEL NATIONAL INC.							
U.S. DOE (PETC) ADVANCED PHYSICAL FINE COAL CLEANING SPHERICAL AGGLOMERATION							
PIPING AND INSTRUMENT DIAGRAM LOW SHEAR REACTOR/STRIPPERS (ADVANCED PROCESS BUILDING)							
	JOB NO.	DRAWING NO.		REV			
	19307	M-03		2

0-25
HSA BINDER FEED PUMP
DESIGN CAP.: 10 GPM
DIFF. PRESS.: 67 FT
HP: 0.33
MATERIAL: 316SS/VITON

2	8/15/90	ISSUED AS BUILT FOR FINAL REPORT	FS	MS		FS	
1	6/15/88	EMERGED FOR REDUCED SCOPE	FS	MS	SO	FS	MS
0	4/7/88	ISSUED FOR CONSTRUCTION	FS	MS	SO	FS	MS
B	3/6/88	ISSUED FOR BIDS	FS	MS		FS	MS
A	1/30/88	ISSUED FOR REVIEW & APPROVAL	MS	SO	HV	FS	MS
RE.	BAT	REVIEW	BY	OK	OK	RE	APR

HEPTANE/ BINDER SECTION
PIPING AND INSTRUMENT DIAGRAM
(ADVANCED PROCESS BUILDING)

REV

2.

C-15
SLURRY SAMPLING POT
SIZE: 1'-6" DIAM. x 3'-6" TT
DESIGN PRESS.: 15 PSIG
DESIGN TEMP.: 250 DEG. F.
MATERIAL: C.S.
INSUL.: 1" PP

C-13
 EMERGENCY SLOP TANK
 SIZE: 5'-6" DIAM. x 5'-6" T-T
 DESIGN PRESS.: 25 PSIG
 DESIGN TEMP.: 250066. F.
 MATERIAL: C.S.
 INSUL.: 1" PP

- NOTES:
1. _____ DENOTES EXISTING EQUIPMENT
 2. ALL MAJOR EQUIPMENT TO HAVE LOCAL START / EMERGENCY STOP SWITCH
 3. REFER TO SPEC J-02 APPENDIX A FOR SEQUENCE OF OPERATION
 4. FOR SAMPLE CONNECTIONS TYPE SEE SAMPLE POINT INDEX
 5. ALL VENTS AND DRAIN CONNECTIONS OPEN TO ATMOSPHERE SHALL BE CAPPED OR PLUGGED

2	8/15/90	ISSUED AS BUILT FOR FINAL REPORT	FS	MS	BD	FS	HH
1	6/15/88	REISSUED PER REDUCED SCOPE	FS	MS	BD	FS	HH
0	4/1/88	ISSUED FOR CONSTRUCTION	FS	MS	BD	FS	HH
B	3/6/88	ISSUED FOR BIDS	FS	MS	BD	FS	HH
A	1/30/88	ISSUED FOR REVIEW & APPROVAL	FS	MS	BD	FS	HH
EL	DATE	REVISION	BY	CHK	EDR	FE	APD
SCALE: 1" = 10' (TYPICAL) BECTEL NATIONAL INC. U.S. DOE (PCT) ADVANCED PHYSICAL FINE COAL CLEANING SPHERICAL AGLOMERATION PIPING AND INSTRUMENT DIAGRAM TAILINGS TREATMENT SECTION (ADVANCED PROCESS BUILDING)							
		JOB NO.	DRAWING NO.			REV	
19307		M-05			2		

D-8
TAILINGS SUMP I
(EXISTING)

Y-4
REFUSE FILTER I
(EXISTING)

D-14
FILTRATE RECYCLE TANK
SIZE: 4'W x 8'L x 4'H
MATERIAL: CS
INSUL.: NONE

D-7
FILTRATE TANK
SIZE: 3'-6" DIAM x 3'-6" HIGH
MATERIAL: CS

1
TAILINGS SUMP II
(EXISTING)

Y-5
REFUSE FILTER II
(EXISTING)

NOTES:

1. _____ DENOTES EXISTING EQUIPMENT
2. ALL MAJOR EQUIPMENT TO HAVE LOCAL START / EMERGENCY STOP SWITCH
3. _____
4. FOR SAMPLE CONNECTIONS TYPE SEE SAMPLE POINT INDEX
5. REFER TO DRAWING M-01 & M-02 BECHTEL JOB 17846 FOR EXISTING EQUIPMENT

2	8/15/90	ISSUED AS BUILT FOR FINAL REPORT	FS	MY	FS	
1	6/15/89	REISSUED PER REDUCED SCOPE	FS	MS	DOO	FS
0	4/7/89	ISSUED FOR CONSTRUCTION	FS	MS		FS
B	3/6/89	ISSUED FOR BIDS				FS
A	1/30/89	ISSUED FOR REVIEW & APPROVAL	FS	MS	BDD	FS
NO.	DATE	REVISION	BY	CHK	GR	APP
SCALE	DATE	ISSUED	DATE	DATE		
BECHTEL NATIONAL INC.						
U.S. DOE (PETC) ADVANCED PHYSICAL FINE COAL CLEANING SPHERICAL AGGLOMERATION						
PIPING AND INSTRUMENT DIAGRAM TAILINGS DEWATERING (CGDC BUILDING)						
	JOB NO.	DRAWING NO.				REV
	19307	M-06				2

E-3 FLUSH WATER COOLER
 SIZE: 3" DIAH x 42" LONG
 DUTY: 342,000 BTU/Hr
 DESIGN PRESS.: 150 PSIG
 DESIGN TEMP.: 180 DEG. F
 MATERIAL: CS
 INSUL.: NONE
 (Double Tube)

C-21 CARBON FILTER DRUM
 SIZE: 4'-6" DIAH x 6'-0" T-T
 DESIGN PRESS.: 15 PSIG
 DESIGN TEMP.: 135 DEG. F.
 MATERIAL: CS

D-4 WATER SURGE TANK
 (EXISTING 10,000 GAL.)

G-8 COOLING WATER PUMP
 DESIGN CAP.: 185 GPM
 DIFF. PRESS.: 80 FT
 HP: 20
 MATERIAL: CS

G-34 COOLING WATER PUMP
 DESIGN CAP.: 185 GPM
 DIFF. PRESS.: 80 FT
 HP: 20
 MATERIAL: CS

G-32 BOILER FEED PUMP
 DESIGN CAP.: 30 GPM
 DIFF. PRESS.: 100 FT
 HP: 7.5
 MATERIAL: CS

D-8
HEAD TANK
(EXISTING)

D-15
BOILER FEED WATER TANK
SIZE: 6'-6" DIAM. X 8'-6" H

F-1
PACKAGE BOILER
SIZE: -4,000 LB/HR 25 PSIG STEAM
WATER SOFTENER: INCLUDED

- NOTES:
1. BOILER CONTROLS ARE SELF CONTAINED
 2. ALL MAJOR EQUIPMENT TO HAVE LOCAL START/ EMERGENCY SHUT DOWN SWITCHES
 3. OUTSIDE LINES EXPOSED TO WEATHER SHALL DRAIN TO A LOW POINT OR BACK TO EQUIPMENT INSIDE BUILDING FOR FREEZE PROTECTION.

G-24
RECOVERED WATER PUMP
DESIGN CAP.: 500 GPM
DIFF. PRESS.: 87 FT
HP: 20
MATERIAL: CS

G-33
RECOVERED WATER PUMP
DESIGN CAP.: 500 GPM
DIFF. PRESS.: 87 FT
HP: 15
MATERIAL: CS

2	8/15/90	ISSUED "AS BUILT" FOR FINAL REPORT	FS	MS	FS	
1	6/15/89	REISSUED PER REDUCED SCOPE	FS	MS	FS	
0	4/1/89	ISSUED FOR CONSTRUCTION	FS	MS	FS	
B	3/6/89	ISSUED FOR BIDS	FS	MS	FS	
A	1/30/88	ISSUED FOR REVIEW & APPROVAL	FS	MS	FS	
REV	DATE	REVISION	BY	CHK	APP	REV

BECHTEL NATIONAL INC.

US DOE (PETC) ADVANCED PHYSICAL FINE COAL CLEANING
SPHERICAL AGGLOMERATION

PIPING AND INSTRUMENT DIAGRAM
WATER SYSTEM
(ADVANCED PROCESS BUILDING)

19307	M-07	2
-------	------	---

E-5
VENT CONDENSER
SIZE: 3" DIA. x 21' LONG
CAP: 1700 BTU/HR
DESIGN PRESS.: 10 PSIG
DESIGN TEMP.: 150 DEG. F.
MATERIAL: CS
INSUL.: NONE
(DOUBLE TUBE)

C-20
RELIEF K.O. DRUM
SIZE: 2'-6" DIAM. x 7'-6" TT
DESIGN PRESS.: 16 PSIG
DESIGN TEMP.: 450 DEG F.
MATERIAL: CS
INSUL.: NONE

D-10
GAS HOLDER
SIZE: 10'-6" DIAM. x 7'-6" HT
DESIGN PRESS.: 20" WG
DESIGN TEMP.: 150 DEG F.
MATERIAL: CS
INSUL.: NONE
(PISTON/DRY SEAL TYPE)

F-3
FLARE STACK
25'-0" TALL
4" DIAM.

NOTES:

1. ALL VENT AND DRAIN CONNECTIONS OPEN TO ATMOSPHERE SHALL BE CAPPED OR PLUGGED

2. * DENOTES EQUIPMENT VENDOR SUPPLIED

3. OUTSIDE LINES EXPOSED TO WEATHER SHALL DRAIN TO A LOW POINT OR BACK TO EQUIPMENT INSIDE BLDG FOR FREEZE PROTECTION

4. PILOT GAS LINE & FLAME FRONT GENERATOR LINE FROM FLARE BASE ARE SUPPLIED BY EQUIP. VENDOR

2	8/15/90	ISSUED AS BUILT FOR FINAL REPORT	FS	MS	BS
1	6/15/89	REISSUED PER REDUCED SCOPE	FS	MS	BS
0	4/7/89	ISSUED FOR CONSTRUCTION	FS	MS	BS
B	3/6/89	ISSUED FOR BIDS	FS	MS	BS
A	1/30/88	ISSUED FOR REVIEW & APPROVAL	FS	MS	BS
REV.	DATE	REVISION	BY	CHK	APP

SCALE: ISSUED: DATE: REV:

BECHTEL NATIONAL INC.
US DOE (PETC) ADVANCED PHYSICAL FINE COAL CLEANING
SPHERICAL AGGLOMERATION

PIPING AND INSTRUMENT DIAGRAM
RELIEF /VAPORS HANDLING SYSTEM
(ADVANCED PROCESS BUILDING)

JOB NO.	DRAWING NO.	REV
19307	M-08	2

2-8
 AIR COMPRESSOR PACKAGE
 CAP: 200 SCFM AT 80 PSIG
 HP: 80

EXPORTech Company, Inc.
A RESEARCH AND DEVELOPMENT COMPANY

December 22, 1989

Mr. Horst Huettenhain
Bechtel National, Inc.
P.O. Box 92
Homer City, PA 15748

RE: Bechtel Subcontract 19307-F-31
Run 33106

Dear Horst,

The effect of Henkel A-23M dispersant on the low shear viscosity of minus 20 micron Illinois No. 6 coal supplied by Bechtel was measured at 65°F using a model LVF Brookfield viscometer. The #1 spindle was used at 12 RPM for all measurements.

The viscosities of slurries of differing solids levels are given in Table I. Two measurements were made to show reproducibility. No dispersant was employed.

The effect of dispersant concentration was investigated. The results are given in Figure 1. A dispersant level of 1 wt.% (based on dry solids) was used for the remainder of the work.

Table II shows the effects of the dispersant on the viscosity of slurries for different solids levels. The data of Tables I and II are compared in Figure 2.

The effects on the viscosity of shear stress (RPM) and time of measurement are shown in Figure 3.

A particle size was measured for the Illinois coal. It is shown in Figure 4.

Four bottles of slurry will be sent to Homer City at the time of our next pickup. They are:

	Solids	Viscosity (cp)
No Dispersant:	20%	43
	30%	414
1% Dispersant:	30%	38
	40%	447

Mr. Horst Huettenhain
December 22, 1989
Page Two

I trust that this has been helpful. Call if you have any questions.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Robin".

Robin R. Oder

RRO:mro

Enclosures

Table 1

SPINDLE #1, 12 RPM, NO DISPERSANT

SOLIDS	READING	FACTOR	VISCOSITY	SOLIDS	READING	FACTOR	VISCOSITY
*****				*****			
15	3.1	5	15.5	15	2.9	5	14.5
20	8.6	5	43.0	20	9.4	5	47.0
25	29.1	5	145.5	25	29.4	5	147.0
30	82.9	5	414.5	30	81.5	5	407.5
35 OFF SCALE							

ILLINOIS #6 FILTER CAKE

90% < 20 MICRONS

Figure 1

Table II

SPINDLE #1, 12 RPM, 1% DISPERSANT (BY WT.)

SOLIDS	READING	FACTOR	VISCOSITY
=====			
15	1	5	5.0
20	0.9	5	4.5
25	2.7	5	13.5
30	7.6	5	38.0
35	32.4	5	162.0
40	89.5	5	447.5
45	OFF SCALE		

ILLINOIS #6 FILTER CAKE

90% < 20 MICRONS

Figure 2

ILLINOIS #6 FILTER CAKE

30% SOLIDS, NO DISPERSANT, #1 SPINDLE

Figure 3

Figure 4

```

NORMAL          : ch-top 8pass 8-ch      : summary data
NORMAL or HIGH resolution : 704.00 100.0 0.0      : dv: 0.0534
                     : 497.80 100.0 0.0      : v10: 2.39
*****          : 352.00 100.0 0.0      : v50: 7.58
NORMAL DATA: MANUAL MODE : 248.70 100.0 0.0      : v70: 17.75
*****          : 176.00 100.0 0.0      : v7: 7.26
res: 0.69-704. SPA res: NORMAL : 174.45 100.0 0.0      : cs: 1.172
has collect bounds: 0.69- 704.00 : 88.00 100.0 0.0      :
regression: geom/sqrt2 8 chans:20 : 62.23 100.0 0.0      : sd: 6.97
sample date/time: 12/19/89 16:32 : 44.00 100.0 0.0      : r3: 5.12
sample ident: 312800          : 31.11 100.0 5.5      :
sample ID : FILTER CAKE      : 22.00 94.5 12.7      : parameters
code:          : 15.56 81.6 15.0      : name value
count 0: printer: OFF: 11.00 66.6 15.4      : disp ant
un tpe: 30 sec. run 0: 100/ 2 : 7.78 51.2 13.5      : disp ant
sample preparation code: : 5.50 37.7 8.3      : disp ant
size: : 3.89 29.5 14.3      : disp med
      : 2.75 15.2 11.6      : disp ant
      : 1.94 3.6 2.3      : agitat'n
      : 1.38 1.3 1.2      : agit tin
      : 0.97 0.2 0.2      : circul'n
      :                   : agit tin
      :                   : paran 01
*****          :                   : paran 02
vit      F2-commands :                   : paran 03
  
```

312800
FILTER CAKE
Record Number: 2812

EXPORTech Company, Inc.
A RESEARCH AND DEVELOPMENT COMPANY

February 1, 1990

Mr. Horst Huettenhain
Bechtel National, Inc.
P.O. Box 92
Homer City, PA 15748

RE: Bechtel Subcontract 19307-F-31
Run 33106

Dear Horst,

At your request, we have extended our earlier measurements of the effect of Henkel A-23M dispersant on the low shear viscosity of minus 20 micron Illinois No. 6 coal supplied by Bechtel. The measurements were made at 65°F using a model LVF Brookfield viscometer. The measurements are given in Table I and illustrated in Figure 1. The #1, #2, and #3 spindles were used at 12 RPM for all measurements. The attached results extend the measurements transmitted by letter dated December 22, 1989.

Information on effects of dispersant level and shear rate and time as well as particle size data were transmitted in my letter of December 22, 1989.

Five bottles of slurry will be sent to Homer City at the time of our next pickup. They are:

	90% < 20 microns	
	Solids	Viscosity (cp)
No Dispersant:	35%	875
	40%	2340
	45%	6380
1% Dispersant:	45%	1405
	50%	4790

This completes your assignment for Bechtel run 33106 dated December 6, 1989. The above measurements were made at no additional charge to Bechtel.

Sincerely yours,

Robin R. Oder

RRO:mro
Enclosures

Table I

BECHTEL RUN 33106
RHEOLOGY OF ILLINOIS #6 FILTER CAKE
90% < 20 MICRONS

NO DISPERSANT, SPINDLE #1 @ 12 RPM (UNLESS OTHERWISE NOTED)

SOLIDS	READING	FACTOR	VISCOSITY
15	3.1	5	15.5
20	8.6	5	43.0
25	29.1	5	145.5
30	82.9	5	414.5
35	35	25	875.0 (#2 @12 RPM)
40	93.6	25	2340.0 (#2 @12 RPM)
45	63.8	100	6380.0 (#3 @12 RPM)

1% DISPERSANT (BY WT.), SPINDLE #1 @ 12 RPM (UNLESS OTHERWISE NOTED)

SOLIDS	READING	FACTOR	VISCOSITY
15	1	5	5.0
20	0.9	5	4.5
25	2.7	5	13.5
30	7.6	5	38.0
35	32.4	5	162.0
40	89.5	5	447.5
45	56.2	25	1405.0 (#2 @12 RPM)
50	47.9	100	4790.0 (#3 @12 RPM)

Figure 1

EXPORTech Company, Inc.
A RESEARCH AND DEVELOPMENT COMPANY

February 1, 1990

Mr. Horst Huettenhain
Bechtel National, Inc.
P.O. Box 92
Homer City, PA 15748

RE: Bechtel Subcontract 19307-F-31
Run 37404 (1/9/90)

Dear Horst,

Viscosity measurements for two stage grind sample, Run 37404, are given in Table I and Figure 1.

Seven bottles of slurry will be sent to Homer City at the time of our next pickup. They are:

	2 Stage Grind	
	Solids	Viscosity (cp)
No Dispersant:	30%	498
	40%	1288
	50%	4250
1% Dispersant:	42%	288
	45%	365
	50%	800
	55%	3230

For your information I am enclosing information on the operation of the Brookfield viscometer.

This completes your assignment for run No. 37404.

Sincerely yours,

Robin R. Oder

RRO:mro
Enclosures

Table I

BECHTEL RUN 37404
RHEOLOGY OF ILLINOIS #6 FILTER CAKE
2 STAGE GRIND

NO DISPERSANT, SPINDLE #1 @ 12 RPM (UNLESS OTHERWISE NOTED)

SOLIDS	READING	FACTOR	VISCOSITY
15	4.8	5	24.0
20	14.7	5	73.5
25	42	5	210.0
30	99.6	5	498.0
40	51.5	25	1287.5 (#2 @ 12 RPM)
45	85	50	4250.0 (#2 @ 6 RPM)

1% DISPERSANT (BY WT.), SPINDLE #1 @ 12 RPM (UNLESS OTHERWISE NOTED)

SOLIDS	READING	FACTOR	VISCOSITY
15	0.5	5	2.5
20	1	5	5.0
25	2.6	5	13.0
30	6.9	5	34.5
35	13.5	5	67.5
40	38	5	190.0
42	57.6	5	288.0
45	14.6	25	365.0 (#2 @ 12 RPM)
50	32	25	800.0 (#2 @ 12 RPM)
55	32.3	100	3230.0 (#3 @ 12 RPM)

Figure 1

```

: ch-top 3pass 3-ch : summary data
: 704.00 100.0 0.0 : dv: 0.0475
: 497.00 100.0 0.0 : s10: 2.57
: 352.00 100.0 0.0 : s50: 0.57
MICROTRAC DATA: DATA BASE UPDATE : 248.90 100.0 0.1 : s90: 24.61
: suren't/present no: 3388 - 1: 176.00 99.9 1.6 : av: 13.54
: 0.69-704. SRA res: NORMAL : 124.45 98.3 0.2 : cs: 1.043
: n select bounds: 0.69- 704.00 : 88.00 98.0 0.6 :
: pgression: geom/sqrt2 8 chans:20 : 62.23 97.4 0.4 : sd: 8.51
: ple date/time: 01/12/90 12:22 : 44.00 97.1 1.2 : ea: 5.75
: ple ident: 315500 : 31.11 95.9 0.2 LNNNNNNNNNNNNNNNNNNNNNN
: ple ID : ILL. #6 FILTER CAKE : 22.00 87.6 12.3 : parameters
: code: : 15.56 75.4 14.0 : name value
: count 0: printer: OFF: 11.00 61.4 15.1 :sopl aut 0.000
: n time: 30 sec. run 0: 100/ 2 : 7.78 46.3 12.5 :disprnt
: ple preparation code: 0 : 5.50 33.8 8.5 :diop aut 0.000
: tes: : 3.89 25.3 13.1 :diop ned
: : 2.75 12.3 9.9 :dmed aut 0.000
: : 1.94 2.3 1.6 :agitat'n
: : 1.38 0.7 0.7 :agit tin 0
: : 0.97 0.0 0.0 :circul'n
: : :circ tin 0
: : :paran 01 0.000
: : :paran 02 0.000
: : :paran 03 0.000
Esc-exit F2-commands :

```

315500
ILL. #6 FILTER CAKE
Record Number: 3388

Section 1

BENCH-SCALE TESTING

1.1 INTRODUCTION

The spherical agglomeration coal cleaning process includes two distinct steps. The first step includes the grinding operation where the feed is ground to an extremely fine size to render most of the coal and the impurities (and pyritic minerals) into discrete particles. In the second step, slurry is intensely mixed with a hydrocarbon bridging agent (e.g., normal heptane). Under these conditions the hydrocarbon selectively wets and agglomerates the coal, thus rejecting the minerals as tailings. The small agglomerates (approximately 50-100 mesh size) are then grown to a larger size by adding a solution of binder material, typically asphalt dissolved in heptane. Mixing is continued under less severe conditions to allow the agglomerates to grow to 2-3 mm in size. The ash-laden water is then drained or screened from the agglomerates. The heptane is then recovered for reuse by steam stripping. The residual asphalt serves to maintain the physical stability of the agglomerates, facilitating their dewatering, storage, and handling.

Bench-scale tests were performed between November 19, 1987 and March 25, 1988, and again from June 1 to July 15, 1988 at the laboratories of Arcanum, Inc., in Ann Arbor, Michigan. The tests were performed to develop process scaleup data using the Spherical Agglomeration Process for the removal of ash and pyritic sulfur from coal in a 1 tph proof-of-concept (POC) plant. Bench-scale testing was carried out using high sulfur coals from the Pittsburgh No. 8, Illinois No. 6, and Upper Freeport seams. These particular coals had been designated as being important to the power industry and showed promise in sulfur reduction. A detailed evaluation of the test data and conclusions are presented in this section.

1.1.1 Objectives

The specific objectives achieved in the bench-scale tests were as follows:

- o Evaluation of fine coal cleaning and pyrite rejection potential of the spherical agglomeration process. Comparison of process performance with washability data generated for the feed coals at specific grind levels
- o Screening of pyrite suppression additives and their dosages
- o Determination of whether the currently proposed grinding scheme (i.e., using the equipment now installed at the Coal Quality Development Center [CQDC] for microbubble flotation) or a new scheme can provide the optimum particle size consist for maximum pyrite removal
- o Investigation of the "aging" effects of finely ground coals on agglomeration performance
- o Determination of high shear reactor design and operating parameters
- o Determination of appropriate feed pulp density
- o Determination of low shear reactor design and operating parameters
- o Determination of ranges to be used for variables in the POC plant tests
- o Verification of the steam stripping of the final agglomerates and determination of residual heptane in the agglomerates
- o Product screening tests

1.1.2 Summary of Results

The three run-of-mine (ROM) coals from the Pittsburgh No. 8, Illinois No. 6, and Upper Freeport seams were precleaned at the EPRI CQDC in Homer City, Pennsylvania. The clean coal from the precleaning operation was ground and tested in the laboratory using the spherical agglomeration process in a batch and continuous mode.

Table 1-1 presents a summary of the bench-scale test results for batch and continuous runs with all the three coals. The table shows that 75 to 79 percent of pyritic sulfur in the ROM coal was effectively removed, even as

TABLE 1
Summary Bench-Scale Test Results
Average of Continuous Testing
(Dry Basis)

		Pittsburgh Coal	Illinois No. 6 Coal	Upper Freeport Coal
ROM Coal	Ash, %	39.16	15.71	57.31
	Total Sulfur, %	4.71	4.54	2.11
	Pyritic Sulfur, %	2.93	2.46	1.93
	Heating Value, Btu/lb	8528	11837	5947
Precleaning	Product (clean coal)			
	Ash, %	12.10	9.60	16.30
	Total Sulfur, %	4.37	3.17	2.18
	Pyritic Sulfur, %	2.02	0.96	1.62
	Heating Value, Btu/lb	12791	12705	12698
	Yield, wt. %	62.6	79.8	43.3
	Energy Recovery	93.9	85.7	92.5
	SO ₂ Reduction, % ¹	38.1	34.9	51.6
	Pyritic SO ₂ Reduction, %	54.0	63.6	60.7
Agglomeration	Clean Coal:			
	Ash, %	4.81	4.23	8.04
	Total Sulfur, %	3.38	3.05	1.58
	Pyritic Sulfur, %	1.06	0.71	0.85
	Heating Value, Btu/lb	13908	13541	14080
	Yield, wt. %	91.0	93.4	92.3
	Energy Recovery	98.9	99.6	99.8
Overall Results	ROM Basis:			
	Energy Recovery	92.9	85.3	91.8
	Ash Reduction, %	92.5	76.5	94.1
	SO ₂ Reduction, %	56.0	41.3	68.4
	Pyritic SO ₂ Reduction, %	77.8	74.8	81.4

¹ All reductions are a constant energy (lb/MMBtu) basis.

energy recoveries were as high as 85 to 92 percent. Ash reduction ranged between 85 to 92 percent. Sulfur dioxide reduction for Pittsburgh No. 8 and Illinois No. 6 seam coals at 57 and 42 percent, respectively, appears relatively modest. This is due to the high organic sulfur content of these coals, equivalent to over 3 lb of sulfur dioxide per MBtu. Organic sulfur in coal is not removable by physical means. The agglomeration step itself showed a near total energy recovery at these clean coal quality levels.

Pyrite depressants did not improve pyrite reduction. Liberated pyrite was rejected even without the requirement of an additive. However, finer grinding resulted in a higher pyrite rejection. A new closed-circuit grinding scheme has been developed and is being tested which improves pyrite liberation without overgrinding the coal. Anticipating successful completion of the tests, the concept designs for the POC include the new concept.

The aging of coal and its effect on process performance was investigated by a literature search and confirmed by selective laboratory testing. Some of the coal samples used for the bench-scale tests were over 6 months old. Aging of coal had no noticeable effect on process performance. This is explained in greater detail in Section 1.2.5.

The viscosity of the slurry increases sharply with the fines of the coal grind. A solids concentration of 15 percent was found to be suitable for most grinds tested. However, the concentration can be lower for a finer grind or higher ash feed, or higher for a coarser ground feed.

A heptane recovery system using steam for stripping has been developed which ensures a safe plant design and substantially complete recovery and reuse of heptane from the agglomerated coal product. A batch process is used and the depth of heptane recovery is predictably controlled by the steam flow rate and its duration.

Initial batch processing has suggested a need to screen the fine agglomerates for ash slurry removal before final growth of the agglomerates with asphalt in clean water.

Continuous agglomerations tests, however, showed that these two separate steps were unnecessary except possibly for a coal feed containing 50 percent or more mineral matter. Since coal will normally be precleaned as part of the size reduction processing, such a high mineral content feed need not be accommodated in the design. Elimination of the fine particle screening simplifies the process and facilitates design of a tight system for heptane control and recovery.

The coal agglomerates bound only by heptane were found to be quite fragile. The incorporation of asphalt increases their physical strength, but the agglomerates still require gentle handling to facilitate product dewatering without excessive screening loss of coal fines. This led to a decision to drain water from the agglomerates and steam them as a stationary bed rather than in a turbulent water suspension. For this same reason a continuous drainage belt instead of a vibrating screen was selected for final product dewatering. On a drainage belt, relative movement between the screen surface and agglomerates and movement between agglomerates is avoided. Product stability can also be increased by the use of more asphalt or special binder material, but for economic reasons binder use will be reduced to the minimum needed for adequate product recovery.

The results of continuous tests were marginally better than those seen during the batch tests. A discussion of these results is presented in Section 1.3. The report also addresses problems associated with accurate determination of pyritic sulfur content. The report discusses a comparison of specific test results from the emerging centrifugal float/sink analytical technique for ultra-fine coal, and the effects of variables on performance of spherical agglomeration. Data for reactor scaleup are also presented.

Conclusions and recommendations complete this report. Full details of testing procedures, equipment, and data for both batch and continuous tests are presented in the appendices.

1.1.3 Definitions of Terms

The following definitions of terms have been used consistently throughout this report. Sample calculations are given in Appendix B.

Yield. The yield refers to the weight percentage of material fed to a cleaning facility which reports to the clean coal:

$$\text{Yield, \%} = \frac{\text{Weight of clean coal obtained}}{\text{Weight of feed coal treated}} \times 100$$

Often, coal cleaning plants do not have facilities to accurately measure the weights of the feed and products. Accurate measurement of material flows becomes particularly difficult when a large number of solid and slurry streams have to be monitored. In such instances, the ash balance technique is widely used in the coal industry to determine the yield of products. The technique uses laboratory determined values for the ash content of the feed coal, clean coal, refuse and, in some cases, middlings.

The ash balance technique is based on the principle that the quantity of ash in the feed coal appears in the products, and these products together account for all the coal fed to the plant.

For example, the yield of clean coal is calculated as follows:

$$\text{Yield, \%} = \frac{A_r - A_f}{A_r - A_c} \times 100$$

Where: A_r = Ash content of the refuse, %
 A_f = Ash content of the feed, %
 A_c = Ash content of the clean coal, %

Energy Recovery. Energy (Btu) recovery represents the percentage of heat content (Btus) in the feed to the cleaning operation that is recovered as part of the clean coal. This is represented as follows:

$$\text{Energy (Btu) recovery, \%} = \frac{\text{Total Energy (Btus) in the clean coal}}{\text{Total Energy (Btus) in the feed}} \times 100$$

It is calculated as follows:

$$\text{Energy (Btu) recovery, \%} = \frac{\text{Yield, \%} \times HV_c}{HV_f}$$

Where: HV_c = Heating value of the clean coal, Btu/lb
 HV_f = Heating value of the feed, Btu/lb

The heating value of the clean coal and the feed are usually determined in the laboratory. Heating value determinations are time consuming. Where large number of samples of the same coal are involved with a relatively narrow range of heating values, it is possible to establish and use a statistically determined relationship between heating value and the sample's ash content. Repeated analyses and verification have shown that the relationship is linear and is valid to an acceptable level. For example, for Pittsburgh No. 8 coal, the following relationship was established:

$$\text{Heating value (Btu/lb)} = (14,646) - (153.3 \times A)$$

Where: A = Ash content, %

The relationship, derived from 22 sets of laboratory analyses, was found to have an acceptable coefficient of determination (R^2) of 0.99. The constant in the equation, 14,646, may be interpreted as the heating value (Btu/lb) of ash-free coal.

The relationships for the other two coals, derived from regression analysis, are given below:

o Illinois No. 6 coal

- Heating Value, Btu/lb = $(14,199) - (155.6 \times A)$
- $R^2 = 0.96$
- Number of observations = 22

o Upper Freeport coal

- Heating value, Btu/lb = $(15,425) - (167.3 \times A)$
- $R^2 = 0.986$
- Number of observations = 29

Ash Reduction. Ash reduction is calculated as follows:

$$\text{Ash Reduction, \%} = \frac{100 (\text{ASHM}_f - \text{ASHM}_c)}{\text{ASHM}_f}$$

Where: ASHM_f = Ash content in the feed, lb/MBtu

ASHM_c = Ash content in the clean coal, lb/MBtu

Sulfur Dioxide Emission Potential. The sulfur dioxide (SO_2) emission potential of a coal is expressed in terms of pounds of SO_2 emitted per million Btu's (MBtu) of heat release during combustion. It is calculated as follows:

$$\text{Total } \text{SO}_2 \text{ emission potential, lb/MBtu} = \frac{S \times 20,000}{\text{Heating value, Btu/lb}}$$

Where: S = Total sulfur content of sample, %

The above expression, which uses the total sulfur content, gives sulfur dioxide emitted by all forms of sulfur in coal namely, organic, pyritic, and sulfate. Use of analytical value of, say, pyritic sulfur, in the expression in place of total sulfur, gives the emissions attributable to the pyritic sulfur content of the coal:

$$\text{Pyritic } \text{SO}_2 \text{ emission potential, lb/MBtu} = \frac{\text{PS} \times 20,000}{\text{Heating value, Btu/lb}}$$

Where: PS = Pyritic sulfur content of sample, %

Similar values can be calculated to determine the emission due to organic sulfur.

Sulfur Dioxide Reduction. The sulfur dioxide reduction in a coal cleaning operation is calculated as follows:

$$\text{Sulfur dioxide reduction, \%} = \frac{100(\text{SO}_{2f} - \text{SO}_{2c})}{\text{SO}_{2f}}$$

Where: SO_{2f} = SO_2 emission potential of the feed, lb/MBtu

SO_{2c} = SO_2 emission potential of the clean coal, lb/MBtu

Pyritic Sulfur Reduction. This is usually calculated as follows:

$$\text{Pyritic sulfur reduction, \%} = \frac{100(\text{PSMf} - \text{PSMc})}{\text{PSMf}}$$

Where: PSMf = Pyritic sulfur content in the feed, lb/MBtu
PSMc = Pyritic sulfur content in the clean coal, lb/MBtu

During the bench-scale tests, calculation of pyritic sulfur reductions using the sulfur form data indicated a large difference in pyritic sulfur reductions for similar quality (total sulfur content) clean coal due to scatter in the laboratory reported pyritic sulfur contents.

In view of these problems, identical sample splits were sent to two additional laboratories which reported again widely varying pyritic sulfur contents for the sample splits. Until the issue is resolved, Bechtel has proposed an alternate method for calculation of pyritic sulfur reduction. The method is based on the premise that all sulfur reduction during physical coal cleaning is achieved by removing only pyrite. Organic sulfur, being an integral part of the coal matter, remains at the same level per MBtu in the clean coal as it is in the ROM and precleaned coals. This method avoids questions regarding the accuracy of pyritic sulfur analyses of the micronized product by using total sulfur analyses for the clean coal as in the following equation:

$$\text{Pyritic sulfur reduction, \%} = \frac{100 (\text{TSMf} - \text{TSMc})}{\text{PSMf}}$$

Where: TSMf = Total sulfur content in the feed, lb/MBtu
TSMc = Total sulfur content in the clean coal, lb/MBtu
PSMf = Pyritic sulfur content in the feed, lb/MBtu

For reduction calculations, PSM includes sulfate sulfur as well as some of the coal pyrites which were seen to have been oxidized to sulfates in many cases.

Efficiency Factor. Several researchers have proposed the efficiency factor as an index of the performance of a coal cleaning operation. The factor has been defined as follows:

$$\text{Efficiency Factor} = \frac{\text{Yield, \%} \times \text{Ar}}{\text{Ac}}$$

Where: Ar = Ash content of the refuse, %
Ac = Ash content of the clean coal, %

The factor is structured to give a large number for cleaning operations which provide a high quality clean coal (low ash content) simultaneously with high yields and low loss of combustibles in the refuse.

Bench-Scale Test Basis Calculations. For each of the tests, energy recovery, sulfur dioxide reduction, etc., have been calculated based on analytical values for samples of the feed, clean coal, and refuse of the tests.

ROM Basis Calculations. The calculations, on a ROM basis, for ash reduction, sulfur dioxide reduction, and pyritic sulfur reduction are based on analytical values for ROM coal for the feed and those of clean coal agglomerates for the individual tests. The ROM basis energy (Btu) recovery is calculated as follows:

ROM basis Btu recovery, % =

$$\frac{(\text{Bench-scale test Btu Recovery, \%}) \times (\text{Btu recovery, \%}, \text{ for CQDC precleaning operation})}{100}$$

1.2 BATCH TESTING

Samples of coals from the Pittsburgh No. 8, Illinois No. 6, and Upper Freeport seams were tested at Arcanum's laboratories. ROM coal from the above seams was cleaned at the CQDC facilities to remove mainly mine dilutions and obvious rock. The CQDC-generated precleaned coal was sent to Arcanum for the bench-scale agglomeration tests as ground slurry and as dry 1/4 inch x 0 crushed coal. Table 1-2 presents quality data for the ROM coal, precleaned coal, and refuse generated during the precleaning operations at the CQDC. The table also includes a summary performance evaluation of the precleaning

Table 1-2

CQDC PRECLEANING OPERATION RESULTS
(Dry Basis)

	<u>Pittsburgh</u> <u>No. 8</u>	<u>Illinois</u> <u>No. 6</u>	<u>Upper</u> <u>Freeport</u>
<u>ROM Coal:</u>			
Ash, %	39.16	15.71	57.31
Total sulfur, %	4.71	4.54	2.11
Pyritic sulfur, %	3.39	2.46	1.93
Organic sulfur, %	1.24	2.03	0.16
Sulfate sulfur, %	0.08	0.05	0.03
Heating value, Btu/lb	8,528	11,837	5,947
<u>CQDC Clean Coal:</u>			
Ash, %	11.94	8.67	17.48
Total sulfur, %	4.25	3.15	2.13
Pyritic sulfur, %	2.27	0.95	1.54
Organic sulfur, %	1.89	2.19	0.56
Sulfate sulfur, %	0.09	0.01	0.03
Heating value, Btu/lb	12,794	12,992	12,425
<u>CQDC Refuse:</u>			
Ash, %	84.49	39.90	88.68
Total sulfur, %	2.96	10.57	1.83
Pyritic sulfur, %	2.67	8.36	1.70
Organic sulfur, %	0.27	2.04	0.13
Sulfate sulfur, %	0.02	0.17	0.00
Heating value, Btu/lb	1,523	7,903	689
<u>CQDC Plant Performance:</u>			
Yield, % (a)	62.5	77.4	44.1
Energy recovery, % (b)	93.7	85.0	92.1
Ash reduction, % (c)	79.7	49.7	85.4
Sulfur Removal (d)	43.6	46.3	55.5
SO ₂ reduction, % (c)	39.9	36.7	51.7
Pyritic sulfur reduction, % (c)	55.5	67.7	56.5

(a) Percentage (weight) of ROM coal recovered as clean coal

(b) Total Energy Recovered in Clean Coal
Total Energy in ROM Coal Feed

(c) lb/MBtu basis

(d) Percentage (weight) of sulfur in the ROM coal rejected with refuse

operation. Samples for the bench-scale tests were ground at the grinding systems of the POC test module installed at the CQDC as part of DOE/Bechtel's Advanced Physical Fine Coal Cleaning (Microbubble Flotation) Program. The samples were ground in two stages using a ball mill followed by an agitated bead mill.

1.2.1 Description of Operation

A detailed description of the batch tests is given in Appendix C. The operation is summarized here.

All batch tests were performed with a Waring blender. The feed slurry was diluted to the specified solids concentration according to the test plan. Approximately 600 cc of the slurry were fed into the Waring blender. Heptane bridging liquid was added while running the blender at a high speed of approximately 12,000 rpm. The high speed agitation was continued for a maximum of 2 minutes. The speed was then reduced to 8,000 rpm or less for another minute or two. This procedure transformed the coal particles into microagglomerates. The fine agglomerates were collected and rinsed over a 50- or 100-mesh screen. The agglomerates were returned to the blender together with fresh water and resheared at a high speed. Next, a binder was added consisting of asphalt dissolved in heptane. Agitation was rapidly reduced to the minimum speed required to maintain a vortex - about 6,000 rpm - which allowed the agglomerates to grow to 2 to 3 mm in diameter. This process was continued for up to 10 minutes. Finally the larger agglomerates were again screened and rinsed over a 100-mesh screen. They were then oven-dried at 105°C. The tailings from the first and second rinsing were collected, filtered, and processed for ash determination. Each test condition was repeated in a duplicate run.

Each of the three coals was tested:

- o As as-received ground slurry
- o After a brief polishing operation in an attritor to potentially activate the coal surface
- o After additional grinding to reduce particle size

1.2.2 Test Results

Pittsburgh No. 8. The slurry sample from the Pittsburgh No. 8 seam was collected at the two-stage grinding system of the existing DOE/Bechtel POC test module from August 4 to 7, 1987. A crushed coal sample (1/4 inch x 0) was also sent to Arcanum for testing. Analysis of the slurry sample received at Arcanum is shown in Table 1-3.

Table 1-3

PITTSBURGH NO. 8 COAL
BENCH-SCALE TESTS FEED SAMPLE ANALYSIS
(Dry Basis)

Ash, %	12.10
Total sulfur, %	4.37
Pyritic sulfur, %	1.65
Organic sulfur, %	2.35
Sulfate sulfur, %	0.37
Heating value, Btu/lb	12,791

Batch testing began on November 19, 1987 and concluded on December 22, 1987. Twenty-nine tests were performed, most using the ground slurry. Table 1-4 presents summary data for all batch tests conducted with Pittsburgh No. 8 coal. Detailed data sheets and summary are included in Appendix C.

The tests yielded clean coals with ash contents of 3.4 to 5.4 percent. Above 90 percent of the Btus found in the ROM coal were recovered in the clean coal for all tests. The sulfur dioxide emission potential per million Btu of the ROM coal was reduced by 48 to 56 percent. The indicated reduction in pyritic sulfur was between 67 and 77 percent.

The best results with the lowest clean coal ash and sulfur content at the same high energy recovery were obtained when the particle size was further reduced from 12.4 microns to 3.7 microns (50 percent passing). By finer grinding, the clean coal ash was lowered from 4.8 to 3.3 percent. Reduction in the sulfur

Table 1-4
PITTSBURGH NO. 8 COAL
BENCH-SCALE BATCH TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO.	11/19 P-1-A	11/19 P-1-B	11/20 P-2-A	11/20 P-2-B	11/23 P-3-A	11/23 P-3-B	11/24 P-4-A	11/24 P-4-B	12/1 P-5-A	12/1 P-5-B	12/ P-6-
Grind Size, microns (D50)	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12
Clean Coal (Excluding Binder):											
Ash, %	5.06	4.96	5.07	5.06	5.07	5.17	4.76	4.76	5.06	5.37	5.
Heating Value, Btu/lb	13870	13885	13869	13870	13869	13854	13916	13916	13870	13823	138
Clean Coal:											
Ash, %	4.90	4.90	5.00	5.00	5.00	5.10	4.70	4.70	5.00	5.30	5.
Total Sulfur, %	3.67	4.00	3.80	3.73	3.84	3.73	3.68	3.71	3.94	3.98	3.
Pyritic Sulfur, %	1.28	ND	ND	ND	ND	ND	1.34	ND	ND	ND	NE
Organic Sulfur, %	2.33	ND	ND	ND	ND	ND	2.32	ND	ND	ND	NE
Sulfate Sulfur, %	0.06	ND	ND	ND	ND	ND	0.02	ND	ND	ND	NE
Heating Value, Btu/lb	14139	13991	13983	13976	13983	13968	14021	14029	13976	13930	139
lb Ash/MBtu	3.47	3.50	3.58	3.58	3.58	3.65	3.35	3.35	3.58	3.80	3
lb Total SO ₂ /MBtu	5.19	5.72	5.44	5.34	5.49	5.34	5.25	5.29	5.64	5.71	5
Refuse:											
Ash, %	69.40	80.00	74.30	80.96	84.20	66.30	75.90	75.20	84.70	81.70	85
Bench-Scale Performance:											
Yield, %	89.1	90.5	89.8	90.7	91.1	88.7	89.7	89.6	91.2	91.2	9
Energy Recovery, %	96.6	98.2	97.4	98.4	98.8	96.0	97.6	97.5	98.9	98.5	9
Ash Reduction, %	63.4	63.0	62.2	62.2	62.2	61.4	64.6	64.6	62.2	59.8	6
Sulfur Removal, %	25.2	17.2	21.9	22.6	19.9	24.3	24.5	23.9	17.8	17.0	1
SO ₂ Reduction, %	24.0	16.3	20.5	21.9	19.6	21.8	23.2	22.6	17.5	16.4	1
Pyritic Sulfur Reduction, %	52.0	35.3	44.3	47.3	42.4	47.2	50.1	48.9	37.8	35.4	3
Efficiency Factor	1221	1459	1317	1451	1514	1137	1430	1414	1525	1388	1
Run-of-Mine Performance:											
Energy Recovery, %	90.5	92.1	91.3	92.2	92.6	90.0	91.5	91.4	92.7	92.4	9
Ash Reduction, %	92.5	92.4	92.2	92.2	92.2	92.0	92.7	92.7	92.2	91.7	9
Sulfur Removal, %	56.7	52.0	54.8	55.2	53.6	56.2	56.3	56.0	52.4	51.9	5
SO ₂ Reduction, %	52.8	48.0	50.6	51.5	50.1	51.4	52.3	51.9	48.7	48.1	4
Pyritic Sulfur Reduction, %	73.4	66.7	70.3	71.5	69.6	71.5	72.6	72.1	67.7	66.8	6
Efficiency Factor	901	953	917	938	946	872	977	974	948	891	

Composite Sample Analysis, ROM Coal:
Ash, % 39.16
Total Sulfur, % 4.71
Pyritic Sulfur, % 3.39
Heating Value, Btu/lb 8528

Composite Feed Sample Analysis
Prcleaned Coal:*
Ash, % 1
Total Sulfur, %
Pyritic Sulfur, %
Heating Value, Btu/lb 1

Prcleaning Energy Recovery = 93.74%
Heating Value (Btu/lb) = 14646 - (153.3 x Ash,%)

*As received by Arcanum

ND-Not Determined

Table 1-4 (Cont.)
PITTSBURGH NO. 8 COAL
BENCH-SCALE BATCH TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO.	12/2 P-6-B	12/3 P-7-A	12/3 P-7-B	12/3 P-8-A	12/17 P-8-B	12/7 P-9-A	12/21 P-9-B	12/7 P-10-A	12/21 P-10-B	12/9 P-11-A	12/9 P-12-A
Grind Size, microns (D50)	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	3.7	3.7
Clean Coal (Excluding Binder):											
Ash, %	ND	4.69	4.87	4.58	5.07	5.17	4.97	5.07	4.87	3.87	3.36
Heating Value, Btu/lb	ND	13928	13899	13943	13868	13854	13884	13869	13900	14052	14130
Clean Coal:											
Ash, %	ND	4.60	4.80	4.50	5.00	5.10	4.90	5.00	4.80	3.80	3.30
Total Sulfur, %	ND	3.68	3.71	3.70	3.69	3.90	3.75	ND	3.61	3.49	3.48
Pyritic Sulfur, %	ND	ND	ND	1.16	ND	1.45	ND	ND	1.28	0.86	0.98
Organic Sulfur, %	ND	ND	ND	2.51	ND	2.45	ND	ND	2.32	2.63	2.50
Sulfate Sulfur, %	ND	ND	ND	0.03	ND	0.00	ND	ND	0.01	0.00	0.00
Heating Value, Btu/lb	ND	14081	14021	14096	13990	13968	14006	13983	14014	14211	14288
lb Ash/MBtu	ND	3.27	3.42	3.19	3.57	3.65	3.50	3.58	3.43	2.67	2.31
lb Total SO ₂ /MBtu	ND	5.23	5.29	5.25	5.28	5.58	5.36	ND	5.15	4.91	4.87
Refuse:											
Ash, %	ND	84.70	85.40	85.00	86.70	85.50	84.90	85.60	85.10	86.00	87.80
Bench-Scale Performance:											
Yield, %	ND	90.7	91.0	90.7	91.4	91.4	91.1	91.3	91.0	90.0	89.7
Energy Recovery, %	ND	98.8	98.9	98.8	99.1	99.0	98.9	99.0	98.9	98.9	99.0
Ash Reduction, %	ND	65.5	63.8	66.3	62.2	61.4	63.0	62.2	63.8	71.7	75.6
Sulfur Removal, %	ND	23.6	22.7	23.2	22.8	18.5	21.8	ND	24.8	28.1	28.6
SO ₂ Reduction, %	ND	23.5	22.5	23.2	22.8	18.3	21.6	ND	24.6	28.1	28.7
Pyritic Sulfur Reduction, %	ND	50.8	48.8	50.1	49.3	39.5	46.8	ND	53.2	60.8	62.1
Efficiency Factor	ND	1640	1596	1681	1562	1511	1555	1542	1591	1998	2340
Run-of-Mine Performance:											
Energy Recovery, %	ND	92.6	92.7	92.6	92.9	92.8	92.7	92.8	92.7	92.7	92.8
Ash Reduction, %	ND	92.9	92.5	93.0	92.2	92.0	92.4	92.2	92.5	94.2	95.0
Sulfur Removal, %	ND	55.8	55.3	55.6	55.3	52.8	54.7	ND	56.5	58.4	58.7
SO ₂ Reduction, %	ND	52.5	51.9	52.3	52.0	49.2	51.3	ND	53.2	55.3	55.7
Pyritic Sulfur Reduction, %	ND	72.9	72.1	72.6	72.3	68.4	71.3	ND	73.9	76.9	77.4
Efficiency Factor	ND	1020	985	1042	951	932	965	950	985	1226	1411

Composite Sample Analysis, ROM Coal:

Ash, % 39.16
Total Sulfur, % 4.71
Pyritic Sulfur, % 3.39
Heating Value, Btu/lb 8528

Precleaning Energy Recovery = 93.74%
Heating Value (Btu/lb) = 14646 - (153.3 x Ash,%)

Composite Feed Sample Analysis,
Precleaned Coal:*

Ash, % 12.10
Total Sulfur, % 4.37
Pyritic Sulfur, % 2.02
Heating Value, Btu/lb 12791

*As received by Arcanum

ND-Not Determined

Table 1-4 (Cont.)
PITTSBURGH NO. 8 COAL
BENCH-SCALE BATCH TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO.	12/15 P-12-B	12/10 P-13-A	12/13 P-13-B	12/16 P-14-A	12/16 P-14-B	12/22 P-15-A	12/22 P-15-B
	=====	=====	=====	=====	=====	=====	=====
Grind Size, microns (D50)	3.7	12.1	12.1	12.1	12.1	12.1	12.1
Clean Coal (Excluding Binder):							
Ash, %	3.35	5.00	4.87	5.07	5.17	5.27	5.17
Heating Value, Btu/lb	14133	13880	13900	13869	13854	13838	13854
Clean Coal:							
Ash, %	3.30	4.90	4.80	5.00	5.10	5.20	5.10
Total Sulfur, %	3.48	3.70	3.65	ND	3.78	3.83	3.81
Pyritic Sulfur, %	0.86	ND	ND	ND	ND	1.30	ND
Organic Sulfur, %	2.61	ND	ND	ND	ND	2.53	ND
Sulfate Sulfur, %	0.01	ND	ND	ND	ND	0.00	ND
Heating Value, Btu/lb	14251	14043	14014	13983	13968	13952	13968
lb Ash/MBtu	2.32	3.49	3.43	3.58	3.65	3.73	3.65
lb Total SO ₂ /MBtu	4.88	5.27	5.21	ND	5.41	5.49	5.46
Refuse:							
Ash, %	87.90	84.70	85.10	85.80	84.80	86.20	87.50
Bench-Scale Performance:							
Yield, %	89.6	91.1	91.0	91.3	91.3	91.6	91.6
Energy Recovery, %	99.1	98.8	98.9	99.0	98.9	99.1	99.2
Ash Reduction, %	75.5	63.1	63.8	62.2	61.4	60.6	61.4
Sulfur Removal, %	28.6	22.9	24.0	ND	21.0	19.8	20.2
SO ₂ Reduction, %	28.5	22.9	23.8	ND	20.8	19.7	20.2
Pyritic Sulfur Reduction, %	61.7	49.5	51.4	ND	45.0	42.5	43.6
Efficiency Factor	2354	1544	1591	1545	1498	1497	1550
Run-of-Mine Performance:							
Energy Recovery, %	92.9	92.7	92.7	92.8	92.7	92.9	93.0
Ash Reduction, %	95.0	92.4	92.5	92.2	92.0	91.9	92.0
Sulfur Removal, %	58.7	55.3	56.0	ND	54.3	53.5	53.8
SO ₂ Reduction, %	55.6	52.1	52.6	ND	50.8	50.1	50.4
Pyritic Sulfur Reduction, %	77.3	72.4	73.1	ND	70.6	69.6	70.0
Efficiency Factor	1418	960	985	950	930	917	937

Composite Sample Analysis, ROM Coal:
Ash, % 39.16
Total Sulfur, % 4.71
Pyritic Sulfur, % 3.39
Heating Value, Btu/lb 8528

Composite Feed Sample Analysis
Precleaned Coal:*
Ash, % 12.1
Total Sulfur, % 4.3
Pyritic Sulfur, % 2.0
Heating Value, Btu/lb 1279

Precleaning Energy Recovery = 93.74%
Heating Value (Btu/lb) = 14646 - (153.3 x Ash,%)

*As received by Arcanum

ND-Not Determined

content was less pronounced due to the high organic sulfur content of this coal. Clean coal sulfur content was reduced from 3.6 percent to 3.5 percent. The comparative results are shown in Table 1-5 on the following page.

Table 1-5 shows mean values of several tests with different process conditions, all at a grind size of 12.1 microns. These are compared to results obtained with reduced size feed. It is noted that none of the variables other than the size of grind affected process performance to any significant degree. This is indicated by the small standard deviations of results at the same grind size despite variations in process conditions.

Illinois No. 6. On October 27-29, 1987, the Illinois No. 6 ground coal sample was gathered at the DOE/Bechtel POC test module in the CQDC complex in the same manner as was done with the Pittsburgh No. 8 sample. This coal was analyzed by Commercial Testing and Engineering (CT&E) of Chicago, and found to have the characteristics listed in Table 1-6.

Table 1-6

ILLINOIS NO. 6 COAL
BENCH-SCALE TESTS FEED SAMPLE ANALYSIS
(Dry Basis)

Ash, %	9.60
Total sulfur, %	3.17
Pyritic sulfur, %	0.71
Organic sulfur, %	2.21
Sulfate sulfur, %	0.25
Heating value, Btu/lb	12,705

Batch type bench-scale tests were performed between January 12 and February 9, 1988. In all, 36 tests were run. Full details of the tests and their results are contained in Appendix C. A summary of batch test results for all tests conducted with Illinois No. 6 coal is provided in Table 1-7. The results show that the process can clean coal to an ash content level of 2.9 to 4.1 percent while recovering 84 to 91 percent energy in the ROM coal.

Table 1-5

PITTSBURGH NO. 8 COAL
BENCH-SCALE BATCH TESTS
EFFECT OF GRIND SIZE ON PERFORMANCE
(Dry Basis)

	<u>Fine Grind</u>	<u>Typical</u>	<u>Coarse Grind Mean</u>	<u>Std. Deviation</u>
<u>Agglomerated Clean Coal:</u> (with binder)				
Test number	P-12- B	P-10-B	-----23 tests-----	
Grind size - microns (50 percent passing)	3.7	12.1	12.1	ND
Binder content, %	1.5	1.4	1.5	ND
Ash, %	3.3	4.8	4.93	0.19
Total sulfur, %	3.48	3.61	3.78	0.11
Heating value, Btu/lb	14,251	14,014	14,003	48
<u>Run-of-Mine Performance:</u>				
Energy recovery, % (a)	92.9	92.7	92.3	0.8
Ash reduction, % (b)	95.0	92.5	92.3	0.3
Sulfur removal, % (c)	58.7	56.5	54.6	1.5
SO ₂ reduction, % (b)	55.6	53.2	51.0	1.5
Pyritic sulfur reduction, % (b)	77.3	73.9	70.8	2.2

(a) $\frac{\text{Total Energy Recovered in Clean Coal (less binder)}}{\text{Total Energy in ROM Coal Feed}} \times 100$

(b) lb/MBtu basis; based on quality of agglomerates (with binder)

(c) Percentage (weight) of sulfur in the ROM coal rejected with refuse/tailings

ND = Not determined

Table 1-7
ILLINOIS NO. 6 COAL
BENCH-SCALE BATCH TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO.	1/12 1-1-A	1/11 1-1-B	1/12 1-2-A	1/12 1-2-B	1/13 1-3-A	1/13 1-3-B	1/14 1-4-A	1/14 1-4-B	1/14 1-5-A	1/15 1-5-B	1/18 1-6-A
	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
Grind Size, Microns (D50)	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
Clean Coal (Excluding Binder):											
Ash, %	3.76	3.96	4.06	4.06	3.96	3.86	3.86	3.76	3.96	3.76	3.55
Heating Value, Btu/lb	13614	13583	13567	13567	13583	13599	13599	13614	13583	13614	13646
Clean Coal:											
Ash, %	3.70	3.90	4.00	4.00	3.90	3.80	3.80	3.70	3.90	3.70	3.50
Total Sulfur, %	2.72	2.79	2.90	2.82	2.85	2.74	2.71	2.68	2.73	2.71	2.75
Pyritic Sulfur, %	0.54	ND	0.69	ND	ND	ND	ND	0.52	ND	ND	ND
Organic Sulfur, %	2.33	ND	2.26	ND	ND	ND	ND	2.15	ND	ND	ND
Sulfate Sulfur, %	0.06	ND	0.01	ND	ND	ND	ND	0.01	ND	ND	ND
Heating Value, Btu/lb	13749	13717	13702	13702	13717	13733	13733	13749	13717	13749	13780
lb Ash/MBtu	2.69	2.84	2.92	2.92	2.84	2.77	2.77	2.69	2.84	2.69	2.54
lb Total SO ₂ /MBtu	3.96	4.07	4.23	4.12	4.16	3.99	3.95	3.90	3.98	3.94	3.99
Refuse:											
Ash, %	86.20	89.30	89.30	89.90	87.70	86.90	74.40	74.30	86.20	86.80	85.80
Bench-Scale Performance:											
Yield, %	92.9	93.4	93.5	93.5	93.3	93.1	91.9	91.7	93.1	93.0	92.6
Energy Recovery, %	99.6	99.8	99.8	99.9	99.7	99.6	98.3	98.3	99.6	99.6	99.5
Ash Reduction, %	64.4	62.4	61.4	61.4	62.4	63.4	63.4	64.4	62.4	64.4	66.4
Sulfur Removal, %	20.3	17.8	14.5	16.8	16.1	19.5	21.5	22.5	19.8	20.5	19.6
SO ₂ Reduction, %	20.7	18.5	15.2	17.5	16.7	20.0	20.9	21.9	20.2	21.0	20.0
Pyritic Sulfur Reduction, %	68.4	61.0	50.1	57.8	55.2	66.2	69.0	72.2	66.8	69.3	66.1
Efficiency Factor	2132	2106	2056	2071	2065	2096	1771	1814	2027	2148	2237
Run-of-Mine Performance:											
Energy Recovery, %	84.6	84.9	84.9	84.9	84.8	84.7	83.6	83.5	84.6	84.7	84.6
Ash Reduction, %	79.7	78.6	78.0	78.0	78.6	79.1	79.1	79.7	78.6	79.7	80.9
Sulfur Removal, %	56.9	55.5	53.7	55.0	54.6	56.5	57.5	58.0	56.6	57.0	56.5
SO ₂ Reduction, %	48.4	47.0	44.8	46.3	45.8	48.0	48.5	49.2	48.1	48.6	48.0
Pyritic Sulfur Reduction, %	89.3	86.7	82.7	85.5	84.6	88.5	89.6	90.7	88.8	89.7	88.5
Efficiency Factor	890	850	827	829	846	868	830	853	842	892	943

Composite Sample Analysis, ROM Coal:

Ash, % 15.71
Total Sulfur, % 4.54
Pyritic Sulfur, % 2.46
Heating Value, Btu/lb 11837

Precleaning Energy Recovery = 85.0%

(= 91.0% for 1-16 to 1-18)

Heating Value (Btu/lb) = 14199 - (155.6 x Ash,%)

Composite Sample Analysis,

Precleaned Coal:*

Ash, % 9.60
Total Sulfur, % 3.17
Pyritic Sulfur, % 0.96
Heating Value, Btu/lb 12705

*As received by Arcanum

ND-Not Determined

Table 1-7 (Cont.)
ILLINOIS NO. 6 COAL
BENCH-SCALE BATCH TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO.	1/18 1-6-B	1/19 1-7-A	1/19 1-7-B	1/20 1-8-A	1/20 1-8-B	1/22 1-9-A	1/21 1-9-B	1/22 1-10-A	1/22 1-10-B	1/25 1-11-A	1/25 1-11-B
Grind Size, Microns (D50)	9.8	9.8	9.8	9.8	9.8	3.7	3.7	9.8	9.8	9.7	9.7
Clean Coal (Excluding Binder):											
Ash, %	3.45	3.75	3.75	4.17	3.96	2.94	3.24	3.96	3.96	3.04	3.04
Heating Value, Btu/lb	13662	13616	13615	13551	13583	13742	13694	13583	13583	13726	13726
Clean Coal:											
Ash, %	3.40	3.70	3.70	4.10	3.90	2.90	3.20	3.90	3.90	3.00	3.00
Total Sulfur, %	2.77	2.75	2.79	2.85	2.79	2.56	2.67	2.76	2.71	2.66	2.78
Pyritic Sulfur, %	ND	ND	0.51	ND	0.63	0.36	ND	ND	ND	0.49	ND
Organic Sulfur, %	ND	ND	2.27	ND	2.11	2.18	ND	ND	ND	2.15	ND
Sulfate Sulfur, %	ND	ND	0.01	ND	0.05	0.04	ND	ND	ND	0.02	ND
Heating Value, Btu/lb	13795	13733	13741	13694	13717	13857	13811	13717	13717	13842	13842
lb Ash/MBtu	2.46	2.69	2.69	2.99	2.84	2.09	2.32	2.84	2.84	2.17	2.17
lb Total SO ₂ /MBtu	4.02	4.00	4.06	4.16	4.07	3.69	3.87	4.02	3.95	3.84	4.02
Refuse:											
Ash, %	85.77	85.40	83.00	88.30	88.80	89.60	90.50	89.10	86.80	86.50	88.40
Bench-Scale Performance:											
Yield, %	92.5	92.8	92.6	93.5	93.4	92.3	92.7	93.4	93.2	92.1	92.3
Energy Recovery, %	99.5	99.5	99.3	99.8	99.8	99.8	99.9	99.8	99.6	99.5	99.7
Ash Reduction, %	67.4	64.3	64.4	60.4	62.4	72.3	69.3	62.4	62.4	71.3	71.3
Sulfur Removal, %	19.1	19.5	18.5	15.9	17.8	25.5	21.9	18.7	20.3	22.7	19.0
SO ₂ Reduction, %	19.5	19.7	18.6	16.6	18.5	26.0	22.5	19.4	20.8	23.0	19.5
Pyritic Sulfur Reduction, %	64.5	65.2	61.5	54.8	61.0	85.7	74.3	63.9	68.7	75.9	64.4
Efficiency Factor	2299	2114	2048	1982	2093	2815	2588	2101	2043	2622	2685
Run-of-Mine Performance:											
Energy Recovery, %	84.6	84.6	84.4	84.8	84.8	84.9	84.9	84.9	84.7	84.6	84.8
Ash Reduction, %	81.4	79.7	79.7	77.4	78.6	84.2	82.5	78.6	78.6	83.7	83.7
Sulfur Removal, %	56.2	56.4	55.9	54.5	55.5	59.7	57.7	56.0	56.9	58.2	56.2
SO ₂ Reduction, %	47.6	47.8	47.1	45.7	47.0	51.8	49.6	47.5	48.5	49.9	47.6
Pyritic Sulfur Reduction, %	87.9	88.2	86.8	84.4	86.7	95.6	91.5	87.7	89.5	92.1	87.9
Efficiency Factor	972	890	882	803	849	1164	1053	849	844	1112	1119

Composite Sample Analysis, ROM Coal:
Ash, % 15.71
Total Sulfur, % 4.54
Pyritic Sulfur, % 2.46
Heating Value, Btu/lb 11837

Precleaning Energy Recovery = 85.0%
(= 91.0% for 1-16 to 1-18)
Heating Value (Btu/lb) = 14199 · (155.6 x Ash,%)

*As received by Arcanum

ND-Not Determined

#ASH/MBtu 13.27
#SO₂/MBtu 7.67
#Pyritic Sulfur/MBtu 4.16

Composite Sample Analysis,
Precleaned Coal:*
Ash, % 9.60
Total Sulfur, % 3.17
Pyritic Sulfur, % 0.96
Heating Value, Btu/lb 12705

#ASH/MBtu 7.56
#SO₂/MBtu 4.99
#Pyritic Sulfur/MBtu 1.51

Table 1-7 (Cont.)
ILLINOIS NO. 6 COAL
BENCH-SCALE BATCH TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO.	1/26 1-12-A	1/26 1-12-B	1/28 1-13-A	1/28 1-13-B	1/29 1-14-A	1/29 1-14-B	1/29 1-15-A	2/4 1-15-B	2/4 1-16-A	2/4 1-16-B	2/4 1-17-A
	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
Grind Size, Microns (D50)	3.7	3.7	9.7	9.7	9.7	9.7	9.7	9.7	4.6	4.6	4.6
Clean Coal (Excluding Binder):											
Ash, %	3.55	3.95	3.85	3.55	3.55	3.55	3.85	3.55	3.55	3.45	3.85
Heating Value, Btu/lb	13647	13584	13600	13647	13647	13647	13600	13647	13646	13662	13600
Clean Coal:											
Ash, %	3.50	3.90	3.80	3.50	3.50	3.50	3.80	3.50	3.50	3.40	3.80
Total Sulfur, %	2.53	2.59	2.59	2.62	2.60	2.58	2.58	2.58	2.70	2.69	2.67
Pyritic Sulfur, %	0.20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Organic Sulfur, %	2.32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sulfate Sulfur, %	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heating Value, Btu/lb	13764	13702	13717	13764	13764	13764	13717	13764	13780	13795	13710
lb Ash/MBtu	2.54	2.85	2.77	2.54	2.54	2.54	2.77	2.54	2.54	2.46	2.77
lb Total SO ₂ /MBtu	3.68	3.78	3.78	3.81	3.78	3.75	3.76	3.75	3.92	3.90	3.90
Refuse:											
Ash, %	90.00	90.50	87.50	87.80	89.00	88.60	88.10	88.40	88.70	91.70	89.40
Bench-Scale Performance:											
Yield, %	93.0	93.5	93.1	92.8	92.9	92.9	93.2	92.9	92.1	92.2	92.5
Energy Recovery, %	99.9	99.9	99.7	99.7	99.8	99.8	99.7	99.8	99.8	99.9	99.8
Ash Reduction, %	66.3	62.3	63.3	66.3	66.3	66.3	63.3	66.3	68.9	69.9	66.1
Sulfur Removal, %	25.8	23.6	23.9	23.3	23.8	24.4	24.2	24.4	19.0	19.2	19.6
SO ₂ Reduction, %	26.3	24.2	24.3	23.7	24.3	24.9	24.6	24.9	19.6	20.0	20.1
Pyritic Sulfur Reduction, %	86.9	80.0	80.3	78.3	80.2	82.1	81.3	82.1	53.3	54.3	54.6
Efficiency Factor	2360	2140	2116	2298	2332	2320	2132	2315	2298	2450	2148
Run-of-Mine Performance:											
Energy Recovery, %	84.9	84.9	84.7	84.7	84.8	84.8	84.8	84.8	90.8	90.9	90.8
Ash Reduction, %	80.8	78.6	79.1	80.8	80.8	80.8	79.1	80.8	80.9	81.4	79.1
Sulfur Removal, %	59.8	58.7	58.8	58.5	58.8	59.1	59.0	59.1	53.2	53.3	53.5
SO ₂ Reduction, %	52.1	50.7	50.8	50.4	50.7	51.1	51.0	51.1	48.9	49.2	49.2
Pyritic Sulfur Reduction, %	96.1	93.6	93.7	92.9	93.6	94.3	94.0	94.3	90.3	90.7	90.8
Efficiency Factor	957	854	871	951	954	953	872	953	1345	1404	1243

Composite Sample Analysis for 1-16 to 1-18,
Precleaned Coal:*

Ash, %	10.30
Total Sulfur, %	3.07
Pyritic Sulfur, %	1.13
Heating Value, Btu/lb	12596

*As received by Arcanum

ND-Not Determined

Table 1-7 (Cont.)
ILLINOIS NO. 6 COAL
BENCH-SCALE BATCH TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO.	2/4 1-17-B *****	2/9 1-18-A *****	2/9 1-18-B *****
Grind Size, Microns (D50)	4.6	4.6	4.6
Clean Coal (Excluding Binder):			
Ash, %	3.85	3.55	3.34
Heating Value, Btu/lb	13600	13647	13679
Clean Coal:			
Ash, %	3.80	3.50	3.30
Total Sulfur, %	2.66	2.71	2.66
Pyritic Sulfur, %	ND	ND	ND
Organic Sulfur, %	ND	ND	ND
Sulfate Sulfur, %	ND	ND	ND
Heating Value, Btu/lb	13710	13764	13795
lb Ash/MBtu	2.77	2.54	2.39
lb Total SO ₂ /MBtu	3.88	3.94	3.86
Refuse:			
Ash, %	88.60	88.10	87.60
Bench-Scale Performance:			
Yield, %	92.4	92.0	91.7
Energy Recovery, %	99.8	99.7	99.6
Ash Reduction, %	66.1	68.9	70.7
Sulfur Removal, %	20.0	18.8	20.5
SO ₂ Reduction, %	20.4	19.2	20.9
Pyritic Sulfur Reduction, %	55.4	52.2	56.7
Efficiency Factor	2128	2286	2403
Run-of-Mine Performance:			
Energy Recovery, %	90.8	90.7	90.7
Ash Reduction, %	79.1	80.8	82.0
Sulfur Removal, %	53.7	53.0	54.0
SO ₂ Reduction, %	49.4	48.7	49.7
Pyritic Sulfur Reduction, %	91.2	89.8	91.8
Efficiency Factor	1238	1344	1424

Composite Sample Analysis For 1-16 to 1-18,
Pretreated Coal:*

Ash, %	10.30
Total Sulfur, %	3.07
Pyritic Sulfur, %	1.13
Heating Value, Btu/lb	12596

*As received by Arcanum

ND-Not Determined

The agglomeration step itself rejected near pure mineral matter (90 percent ash content) even as clean coal yields were 95 percent. This corresponds to a near total energy recovery for the agglomeration step.

The ROM basis ash reduction varied between 78 and 84 percent and the ROM sulfur dioxide reduction varied between 46 and 54 percent. The ROM pyritic sulfur reduction was about 90 percent.

Table 1-8 presents the effects of grind size on performance with Illinois No. 6 coal. Finer grinding to 3.7 microns, from 9.8 microns (50 percent passing), resulted in improvement in the clean coal ash and sulfur contents.

Mean values for all the 18 tests conducted with a grind size of 9.8 microns (50 percent passing), and their standard deviation, are shown in Table 1-8. It may be noted from the small value of the standard deviation that differences between tests were minimal as in the case of Pittsburgh No. 8 coal.

Upper Freeport Coal. The bench-scale batch tests with the Upper Freeport seam coal were conducted February 1 to 11, 1988. The tests were performed with two feed samples whose characteristics were appreciably different. The samples analyzed by Arcanum, were found to have the characteristics listed in Table 1-9.

It is apparent that the 1/4 inch x 0 coal had undergone deeper cleaning than is indicated by Table 1-2. The energy recovery for the precleaning operation associated for this feed was determined to be 89.2 percent in the CQDC. This is lower than the 92 percent energy recovery indicated by Table 1-2.

A summary of all test results obtained with Upper Freeport Coal is shown in Table 1-10. The results with Upper Freeport seam coal showed that the coal could be cleaned with high ROM energy recoveries (89 to 92 percent) and the clean coal ash could be reduced to between 9.0 and 6.1 percent. Very fine grinding to 2.9 microns (50 percent passing) did not improve the results. The ash reductions obtained were between 74 and 95 percent. Complete details of all the tests are included in Appendix C.

Table 1-8
ILLINOIS NO. 6 COAL
BENCH-SCALE BATCH TESTS
EFFECT OF GRIND SIZE ON PERFORMANCE
(Dry Basis)

	Fine Grind	Coarse Grind		Standard Deviation
		Typical	Mean	
<u>Agglomerated Clean Coal:</u> (with binder)				
Test Number	I-9-A	I-6-A	18 tests	
Grind Size - microns (50 percent passing)	3.7	9.8	9.8	ND
Binder Content, %	1.4	1.6	1.6	ND
Ash, %	2.9	3.5	3.7	0.27
Total Sulfur, %	2.56	2.75	2.72	0.09
Heating Value, Btu/lb	13,857	13,780	13,744	38
<u>Run-of-Mine Performance:</u>				
Energy Recovery, % ^(a)	84.9	84.6	84.6	0.3
Ash Reduction, % ^(b)	84.2	80.9	79.7	1.5
Sulfur Removal, % ^(c)	59.7	56.5	56.8	1.5
SO ₂ Reduction, % ^(b)	51.8	48.0	48.3	1.7
Pyritic Sulfur Reduction, % ^(b)	95.6	88.5	89.2	3.2

(a) $\frac{\text{Total Energy Recovered in Clean Coal (less binder)}}{\text{Total Energy in ROM Coal Feed}} \times 100$

(b) lb/MBtu basis; based on quality of agglomerates (with binder)

(c) Percentage (weight) of sulfur in the ROM coal rejected with refuse/tailings.

Table 1-9

UPPER FREEPORT COAL
BENCH-SCALE TESTS FEED SAMPLE ANALYSIS
(Dry Basis)

	<u>CQDC Precleaned and Ground Slurry</u>	<u>CQDC Precleaned and Crushed Coal</u>
Size: - microns (50 percent passing)	4.3	NA
- inches	NA	1/4 x 0
Ash, %	16.3	12.5
Total Sulfur, %	2.18	1.94
Pyritic Sulfur, %	1.22	1.07
Organic Sulfur, %	0.56	0.72
Sulfate Sulfur, %	0.40	0.15
Heating Value, Btu/lb	12,698	13,334

Table 1-10
UPPER FREEPORT COAL
BENCH-SCALE BATCH TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO.	2/1 F-1-A	2/1 F-1-B	2/2 F-2-A	2/2 F-2-B	2/3 F-3-A	2/3 F-3-B	2/3 F-4-A	2/3 F-4-B	2/5 F-5-A	2/5 F-5-B	2/8 F-6-A
Grind Size, microns (D50)	4.1	4.1	4.1	4.1	4.3	4.3	4.3	4.3	3.9	3.9	4.3
Clean Coal (Excluding Binder):											
Ash, %	9.12	9.12	8.91	8.41	8.02	8.52	6.49	8.33	6.18	6.18	6.38
Heating Value, Btu/lb	13900	13900	13934	14019	14084	13999	14338	14031	14390	14390	14358
Clean Coal:											
Ash, %	9.00	9.00	8.80	8.30	7.90	8.40	6.40	8.20	6.10	6.10	6.30
Total Sulfur, %	1.67	1.63	1.62	1.59	1.50	1.55	1.52	1.50	1.33	1.31	1.58
Heating Value, Btu/lb	14005	14005	14039	14122	14202	14119	14453	14159	14497	14497	14457
lb Ash/MBtu	6.43	6.43	6.27	5.88	5.56	5.95	4.43	5.79	4.21	4.21	4.36
lb Total SO ₂ /MBtu	2.38	2.33	2.31	2.25	2.11	2.20	2.10	2.12	1.83	1.81	2.19
Refuse:											
Ash, %	90.10	90.10	90.30	90.00	88.40	88.70	88.10	88.90	91.20	91.00	88.70
Bench-Scale Performance:											
Yield, %	91.1	91.1	90.9	90.3	89.7	90.3	88.0	90.1	92.6	92.6	87.9
Energy Recovery, %	99.8	99.8	99.8	99.7	99.5	99.6	99.4	99.6	99.9	99.9	99.4
Ash Reduction, %	49.9	49.9	51.2	54.2	56.7	53.7	65.5	54.9	55.1	55.1	66.1
Sulfur Removal, %	30.2	31.9	32.4	34.1	38.3	35.8	38.7	38.0	36.5	37.5	36.3
SO ₂ Reduction, %	30.5	32.2	32.8	34.4	38.5	36.1	38.7	38.3	36.9	37.9	36.3
Pyritic Sulfur Reduction, %	41.1	43.3	44.1	46.3	51.8	48.5	52.1	51.5	58.7	60.3	48.9
Efficiency Factor	901	901	921	967	989	940	1194	962	1365	1362	1223
Run-of-Mine Performance:											
Energy Recovery, %	91.9	91.9	91.9	91.8	91.6	91.7	91.5	91.7	89.1	89.1	91.6
Ash Reduction, %	93.3	93.3	93.5	93.9	94.2	93.8	95.4	94.0	75.2	75.2	95.5
Sulfur Removal, %	68.2	69.0	69.2	70.0	71.9	70.8	72.1	71.8	52.3	53.0	71.0
SO ₂ Reduction, %	66.4	67.2	67.5	68.3	70.2	69.1	70.4	70.2	55.1	55.8	69.2
Pyritic Sulfur Reduction, %	72.6	73.5	73.8	74.7	76.8	75.5	76.9	76.7	74.1	75.0	75.7
Efficiency Factor	395	395	403	424	441	418	534	427	812	811	544

Composite Sample Analysis, ROM Coal:

Ash, % 57.31
Total Sulfur, % 2.11
Pyritic Sulfur, % 1.93
Heating Value, Btu/lb 5947

Composite Sample Analysis,
Precleaned Coal:*

Ash, % 16.30
Total Sulfur, % 2.18
Pyritic Sulfur, % 1.62
Heating Value, Btu/lb 12698

Precleaning Energy Recovery = 92.1%
Heating Value (Btu/lb) = 15425 · (167.3 x Ash,%)

*As received by Arcanum

Table 1-10 (Cont.)
UPPER FREEPORT COAL
BENCH-SCALE BATCH TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO.	2/8 F-6-B	2/8 F-7-A	2/8 F-7-B	2/10 F-8-A	2/10 F-8-B	2/11 F-9-A	2/11 F-9-B	2/11 F-10-A	2/11 F-10-B
	*****	*****	*****	*****	*****	*****	*****	*****	*****
Grind Size, microns (D50)	4.3	5.2	5.2	2.9	2.9	2.9	2.9	4.3	4.3
Clean Coal (Excluding Binder):									
Ash, %	7.90	6.08	6.39	8.51	7.60	9.01	8.51	8.41	8.41
Heating Value, Btu/lb	14103	14407	14357	14002	14154	13917	14002	14019	14019
Clean Coal:									
Ash, %	7.80	6.00	6.30	8.40	7.50	8.90	8.40	8.30	8.30
Total Sulfur, %	1.56	1.30	1.27	1.40	1.40	1.53	1.48	1.64	1.61
Heating Value, Btu/lb	14206	14514	14464	14106	14256	14022	14106	14122	14122
lb Ash/MBtu	5.49	4.13	4.36	5.96	5.26	6.35	5.96	5.88	5.88
lb Total SO ₂ /MBtu	2.20	1.79	1.76	1.99	1.96	2.18	2.10	2.32	2.28
Refuse:									
Ash, %	88.80	89.70	89.70	92.10	92.40	92.20	92.20	89.50	88.40
Bench-Scale Performance:									
Yield, %	89.6	92.3	92.7	90.7	89.7	91.2	90.7	90.3	90.1
Energy Recovery, %	99.5	99.8	99.8	99.9	99.9	99.9	99.9	99.7	99.5
Ash Reduction, %	57.2	55.9	53.5	53.6	59.0	50.6	53.6	54.2	54.2
Sulfur Removal, %	35.9	38.1	39.3	41.8	42.4	36.0	38.4	32.1	33.4
SO ₂ Reduction, %	36.0	38.4	39.6	42.2	42.8	36.4	38.9	32.4	33.6
Pyritic Sulfur Reduction, %	48.5	61.1	63.0	56.8	57.6	49.0	52.3	43.5	45.2
Efficiency Factor	1007	1362	1301	982	1092	933	983	961	948
Run-of-Mine Performance:									
Energy Recovery, %	91.7	89.0	89.0	92.0	92.0	92.0	92.0	91.8	91.6
Ash Reduction, %	94.3	75.7	74.4	93.8	94.5	93.4	93.8	93.9	93.9
Sulfur Removal, %	70.8	53.5	54.4	73.5	73.8	70.8	72.0	69.1	69.7
SO ₂ Reduction, %	69.1	56.2	57.1	72.0	72.3	69.3	70.4	67.3	67.9
Pyritic Sulfur Reduction, %	75.5	75.5	76.7	78.8	79.1	75.7	77.0	73.6	74.2
Efficiency Factor	448	821	782	422	468	400	422	424	423

Composite Sample Analysis, ROM Coal
After Air Tables, Tests F-5 and F-7:
Ash, % 20.78
Total Sulfur, % 2.50
Pyritic Sulfur, % 1.86
Heating Value, Btu/lb 12233

Composite Sample Analysis,
Precleaned Coal, Tests F-5 and F-7:
Ash, % 12.50
Total Sulfur, % 1.94
Pyritic Sulfur, % 1.22
Heating Value, Btu/lb 13334

Precleaning Energy Recovery = 89.2%
Heating Value (Btu/lb) = 15425 - (167.3 x Ash,%)

*As received by Arcanum

The ROM coal's sulfur content, shown in Table 1-2, indicates that while the total sulfur content is relatively low, most of it is in the pyritic form. This would indicate high sulfur reduction potential. In fact, the total SO₂ reductions achieved varied from 56 percent to as high as 72 percent. The corresponding pyritic sulfur reductions were between 73 and 79 percent. The ash content in the tailings was high (88.1 to 92.4 percent), showing a good carbon capture efficiency.

Comparative results with coarse and finely ground Upper Freeport coal are shown in Table 1-11. As with the other two coals, all tests with the coarser grind produced very similar results. However, when the feed was reground to a finer size of 2.9 microns from 4.5 microns (50 percent passing), an increase in the clean coal ash content occurs accompanied by a slight reduction in the sulfur content.

1.2.3 Centrifugal Float/Sink Analysis

Washability data was generated using centrifugal float/sink (F/S) analysis for the precleaned CQDC coal ground at the DOE/Bechtel Test Module. The washability results are shown in Table 1-12.

With respect to yield of clean coal at comparable clean coal ash contents, the results show that agglomeration exceeds the performance predicted by the F/S data for all three coals. Agglomeration seems to be a more effective separator of ultra-fine clay from coal than is specific gravity, which forms the basis for centrifugal F/S tests. Another possible reason could be inaccuracies in F/S analysis of micronized coals, which is still an emerging technique.

Details of the comparison between F/S analysis and the bench-scale test results with reference to yield and clean coal ash content are presented in Table 1-13.

Table 1-11

UPPER FREEPORT COAL
BENCH-SCALE BATCH TESTS
EFFECT OF GRIND SIZE ON PERFORMANCE
(Dry Basis)

	<u>Fine Grind</u>	<u>Coarse Grind</u>		
		<u>Typical</u>	<u>Mean</u>	<u>Standard Deviation</u>
<u>Agglomerated Clean Coal:</u> (with binder)				
Test Number	F-8-A	F-6-B	12 tests	
Grind Size - microns (50 percent passing)	2.9	4.3	4.3	ND
Binder Content, %	1.3	1.4	1.4	ND
Ash, %	8.5	7.8	8.1	0.85
Total Sulfur, %	1.40	1.56	1.58	0.05
Heating Value, Btu/lb	14,106	14,206	14,168	143
<u>Run-of-Mine Performance:</u>				
Energy Recovery, %(a)	92.0	91.7	91.7	0.1
Ash Reduction, %(b)	93.8	94.3	94.1	0.7
Sulfur Removal, %(c)	73.5	70.8	70.3	1.2
SO ₂ Reduction, %(b)	72.0	69.1	68.6	1.3
Pyritic Sulfur Reduction, %(b)	78.8	75.5	75.0	1.4

-
- (a) $\frac{\text{Total Energy Recovered in Clean Coal (less binder)}}{\text{Total Energy in ROM Coal Feed}} \times 100$
- (b) lb/MBtu basis; based on quality of agglomerates (with binder)
- (c) Percentage (weight) of sulfur in the ROM coal rejected with refuse/tailings.

Table 1-12

CENTRIFUGAL FLOAT/SINK
ANALYSIS OF FEED SAMPLESPittsburgh No. 8 Coal

Test: Bench
 Sample No. 158509
 Size (D50): 12.1 microns

<u>Sp. Gr.</u>	<u>Wt %</u>	<u>Ash %</u>	<u>S %</u>	<u>Cum. Wt %</u>	<u>Cum. Ash %</u>	<u>Cum. S %</u>
- 1.30	41.90	3.11	2.81	41.90	3.11	2.81
1.30 - 1.50	39.60	6.88	2.82	81.50	4.94	2.81
1.50 - 1.70	10.10	13.57	3.17	91.60	5.89	2.85
+ 1.70	11.10	59.43	13.20	102.70	11.68	3.97
Head Sample:					11.72	4.02

Illinois No. 6 Coal

Test: Bench
 Sample No. 158508
 Size (D50): 9.8 microns

<u>Sp. Gr.</u>	<u>Wt %</u>	<u>Ash %</u>	<u>S %</u>	<u>Cum. Wt %</u>	<u>Cum. Ash %</u>	<u>Cum. S %</u>
-1.30	25.70	2.05	2.35	25.70	2.05	2.35
1.30 - 1.50	36.30	4.12	2.32	62.00	3.26	2.33
1.50 - 1.70	29.40	8.16	2.26	91.40	4.84	2.31
+1.70	8.60	52.25	9.50	100.00	8.91	2.93
Head Sample:					8.79	2.89

Upper Freeport Coal

Test: Bench
 Sample No. 158507
 Size (D50): 4.0 microns

<u>Sp. Gr.</u>	<u>Wt %</u>	<u>Ash %</u>	<u>S %</u>	<u>Cum. Wt %</u>	<u>Cum. Ash %</u>	<u>Cum. S %</u>
-1.30	13.10	2.53	0.88	13.10	2.53	0.88
1.30 - 1.50	52.40	7.17	0.94	65.50	6.24	0.93
1.50 - 1.70	17.50	13.97	1.38	83.00	7.87	1.02
+1.70	17.00	58.48	6.64	100.00	16.47	1.98
Head Sample:					16.64	2.02

Cum. = Cumulative

Table 1-13

COMPARISON OF FLOAT/SINK ANALYSIS AND BENCH-SCALE TESTS
YIELD AND CLEAN COAL ASH CONTENT

	<u>Cumulative Yield %</u>	<u>Cumulative Clean Coal Ash %</u>	<u>Sp. Gr. or Test Number</u>
<u>Pittsburgh No. 8</u>			
Float/Sink Analysis	92	5.9	1.70
Bench-Scale Test	90	4.8-5.4	P-1 through P-5
<u>Illinois No. 6</u>			
Float/Sink Analysis	91	4.8	1.70
Bench-Scale Test	93	3.5-4.1	I-1 through I-6
<u>Upper Freeport</u>			
Float/Sink Analysis	83	7.9	1.70
Bench-Scale Test	88	6.5	F-4-A

The data indicate that the bench-scale tests were less effective than the F/S analysis for sulfur reduction at comparable clean coal yields. A summary of the data is provided in Table 1-14. An explanation for the phenomenon is provided by the petrographic analysis of the feed samples.

Table 1-14

COMPARISON OF FLOAT/SINK ANALYSIS AND BENCH-SCALE TESTS
YIELD AND CLEAN COAL SULFUR CONTENT

	<u>Cumulative Yield %</u>	<u>Cumulative Clean Coal (Total) S %</u>	<u>Sp. Gr. or Test Number</u>
<u>Pittsburgh No. 8</u>			
Float/Sink Analysis	92	2.9	1.70
Bench-Scale Test	90	3.7 - 4.0	P-1 through P-5
<u>Illinois No. 6</u>			
Float/Sink Analysis	91	2.3	1.70
Bench-Scale Test	93	2.7 - 2.9	I-1 through I-6
<u>Upper Freeport</u>			
Float/Sink Analysis	92	1.0	1.70
Bench-Scale Test	88	1.5	F-4-A

Petrographic analysis indicated significant amounts of semi-locked and fully locked pyrite in the feed coal in spite of the fine grind. The petrographic analysis of the ground agglomeration feed is discussed further in the next section.

Gravity-based separation systems like the F/S analysis can effectively utilize the large difference in the specific gravity of pyrite (specific gravity = 5) and coal (specific gravity = 1.4). Even a small amount of pyrite, either locked or semi-locked, causes significant increase in the specific gravity of the coal particle, thereby making its rejection with the tailings easy. For example, a coal particle containing 32 percent (by weight) of pyrite will report to the sink 1.7 sp.gr. fraction. Yet, the pyrite in this particle comprises only 10.9 percent of the particle volume. It therefore contributes little to the overall surface properties of the particle. The behavior of such a particle during agglomeration will be largely governed by the dominant surface, namely, that of coal. The process agglomerates all carbonaceous material in the feed coal as clean coal, and the refuse is almost wholly made up of liberated mineral matter, both ash-forming and pyritic. Thus, pyrite particles that are not fully liberated would be agglomerated with the clean coal. This would explain the higher sulfur content in the clean coal agglomerates as compared to F/S. The data further confirms that for better pyrite rejection with the agglomeration process a more complete liberation of pyrites is called for. The proposed selective grinding system, described in Section 2, is designed to meet this requirement.

1.2.4 Petrographic Analysis

Petrographic analysis was conducted on each precleaned coal by Ralph Gray of Process & Energy Management Corporation of Pittsburgh, Pennsylvania. The samples were analyzed to evaluate the potential for pyrite removal by agglomeration.

The photomicrograph of Pittsburgh No. 8 feed to the agglomeration bench-scale unit is shown in Figure 1-1. This coal had the most free pyrite as compared to the other coals. However, 41 percent of pyrite is locked or semi-locked. The coarser pyrite particles are actually made up of smaller crystals clumped together.

Figure 1-1 Photomicrographs of Pittsburgh No. 8 feed to agglomeration showing very fine-sized coal with a variety of pyrite size and associations, and one large calcite particle. Reflected light in oil, x515.

Photomicrographs of the Illinois No. 6 coal are shown in Figure 1-2. The pyrite is mostly semi-locked. This is true of even the finest size pyrite crystals.

The Upper Freeport feed sample photomicrographs are shown in Figure 1-3. The pyrite is mostly semi-locked with a significant amount of locked pyrite. The pyrite in this coal has a top size of 32 microns; an occasional crystal of up to 65 microns is found. In the pyrite count, however, none larger than 14 microns is encountered.

Table 1-15 presents the frequency distribution and nature of pyrite particles (free, semi-locked, and locked) seen in the samples. The particle count and mean sizes of the particles were used to convert the data to weight percentages assuming spherical particles. The data is presented in Tables 1-16 through 1-18. It indicates that in spite of the fine grinding substantial amounts of pyrite were still either semi-locked or fully locked. For the feed samples tested, the following percentages of the total pyrites were found locked or semi-locked:

o Pittsburgh No. 8	41.3%
o Illinois No. 6	81.9%
o Upper Freeport	77.2%

Substantial percentages of the locked pyrites occurred at the coarser sizes indicating significant benefits for the proposed selective grinding system designed to separate these sizes and subject them to intensive grinding. Such grinding should liberate a significant amount of the locked and semi-locked minerals for their eventual rejection with the tailings during agglomeration.

Tables 1-16 through 1-18 indicate that the coal with the greatest potential for liberation using selective grinding is the Illinois No. 6 coal. Next in order of liberation potential is the Pittsburgh No. 8 coal. The data for the Upper Freeport coal does not indicate significant improvement in pyrite liberation using the selective grinding technique.

Figure 1-2 Photomicrographs of Illinois No. 6 feed to agglomeration showing the vitrinite-rich coal with widely distributed and frequently small semi-locked and locked pyrite particles. Reflected light in oil, x515.

Figure 1-3 Photomicrographs of Upper Freeport feed to agglomeration showing a wide range of coal particle sizes and a variety of pyrite sizes, shapes, and associations. Reflected light in oil, $\times 515$.

Table 1-15

FREQUENCY DISTRIBUTION AND ASSOCIATION OF PYRITE
IN BENCH-SCALE TEST FEED SAMPLES

Size (microns)	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34
Pittsburgh No. 8 Sample No. 158509 D ₅₀ -12.1 microns																	
Free	16.7	6.8	1.2	0.7	0.3	0.1	-	-	-	-	0.1	-	-	0.2	-	-	0.1
Semi-locked	36.9	10.9	3.0	1.6	0.5	0.4	0.1	0.2	-	0.1	0.1	0.1					
Locked	15.6	2.9	1.1	0.1	-	0.1	-	0.1									
Illinois No. 6 Sample No. 158508 D ₅₀ -9.8 microns																	
Free	15.7	2.5	0.8	0.5	-	0.2	-	-	-	-	0.1						
Semi-locked	45.3	9.1	1.8	1.4	0.2	-	-	-	-	-	-	-	-	-	-	-	0.2
Locked	18.1	2.7	1.0	0.4													
Upper Freeport Sample No. 158507 D ₅₀ -4.0 microns																	
Free	13.0	4.4	1.3	0.6	0.1												
Semi-locked	39.7	9.3	2.2	0.7	0.2	-	0.1										
Locked	23.3	4.1	0.7	0.3													

Table 1-16

PITTSBURGH NO. 8 COAL
PETROGRAPHIC ANALYSIS, BENCH-SCALE FEED
PYRITE OCCURRENCE BY WEIGHT

<u>Mean Size, Microns</u>	<u>Free Pyrite Weight %</u>	<u>Semi-Locked Pyrite Weight %</u>	<u>Locked Pyrite Weight %</u>	<u>Total Pyrite in Size Fraction Weight %</u>	<u>Cumulative Weight %</u>
1.0	0.1	0.2	0.1	0.4	0.4
3.0	1.2	1.8	0.5	3.5	3.9
5.0	0.9	2.3	0.9	4.1	8.0
7.0	1.5	3.4	0.2	5.1	13.1
9.0	1.4	2.3	0.0	3.7	16.8
11.0	0.8	3.3	0.8	4.9	21.7
13.0	0.0	1.4	0.0	1.4	23.1
15.0	0.0	4.2	2.1	6.3	29.4
17.0	0.0	0.0	0.0	0.0	29.4
19.0	0.0	4.3	0.0	4.3	33.7
21.0	5.8	5.8	0.0	11.6	45.3
23.0	0.0	7.7	0.0	7.7	53.0
25.0	0.0	0.0	0.0	0.0	53.0
27.0	24.6	0.0	0.0	24.6	77.6
29.0	0.0	0.0	0.0	0.0	77.6
31.0	0.0	0.0	0.0	0.0	77.6
33.0	<u>22.4</u>	<u>0.0</u>	<u>0.0</u>	<u>22.4</u>	100.0
Total in Mode	58.7	36.7	4.6	100.0	

Table 1-17

ILLINOIS NO. 6 COAL
PETROGRAPHIC ANALYSIS, BENCH-SCALE FEED
PYRITE OCCURRENCE BY WEIGHT

<u>Mean Size, Microns</u>	<u>Free Pyrite Weight %</u>	<u>Semi-Locked Pyrite Weight %</u>	<u>Locked Pyrite Weight %</u>	<u>Total Pyrite in Size Fraction Weight %</u>	<u>Cumulative Weight %</u>
1.0	0.2	0.5	0.2	0.9	0.9
2.5	0.4	1.6	0.5	2.5	3.4
5.0	1.1	2.5	1.4	5.0	8.4
7.0	1.9	5.4	1.6	8.9	17.3
9.0	0.0	1.6	0.0	1.6	18.9
11.0	3.0	0.0	0.0	3.0	21.9
13.0	0.0	0.0	0.0	0.0	21.9
15.0	0.0	0.0	0.0	0.0	21.9
17.0	0.0	0.0	0.0	0.0	21.9
19.0	0.0	0.0	0.0	0.0	21.9
21.0	10.5	0.0	0.0	10.5	32.4
23.0	0.0	0.0	0.0	0.0	32.4
25.0	0.0	0.0	0.0	0.0	32.4
27.0	0.0	0.0	0.0	0.0	32.4
29.0	0.0	0.0	0.0	0.0	32.4
31.0	0.0	67.6	0.0	67.6	100.0
33.0	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	100.0
Total in Mode	17.1	79.2	3.7	100.0	

Table 1-18

UPPER FREEPORT COAL
PETROGRAPHIC ANALYSIS, BENCH-SCALE FEED
PYRITE OCCURRENCE BY WEIGHT

<u>Mean Size, Microns</u>	<u>Free Pyrite Weight %</u>	<u>Semi-Locked Pyrite Weight %</u>	<u>Locked Pyrite Weight %</u>	<u>Total Pyrite in Size Fraction Weight %</u>	<u>Cumulative Weight %</u>
1.0	0.6	1.7	0.7	3.0	3.0
2.5	3.0	6.3	2.0	11.3	14.3
5.0	7.1	12.0	6.0	25.1	39.4
7.0	9.0	10.5	1.5	21.0	60.4
9.0	3.1	6.4	0.0	9.5	69.9
11.0	0.0	0.0	5.8	5.8	75.7
13.0	0.0	9.6	0.0	9.6	85.3
15.0	0.0	0.0	14.7	14.7	100.0
17.0	0.0	0.0	0.0	0.0	100.0
19.0	0.0	0.0	0.0	0.0	100.0
21.0	0.0	0.0	0.0	0.0	100.0
23.0	0.0	0.0	0.0	0.0	100.0
25.0	0.0	0.0	0.0	0.0	100.0
27.0	0.0	0.0	0.0	0.0	100.0
29.0	0.0	0.0	0.0	0.0	100.0
31.0	0.0	0.0	0.0	0.0	100.0
33.0	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	100.0
Total in Mode	22.8	46.5	30.7	100.0	

1.2.5 Effects of Oxidation and Aging on Process Performance

When discussing the effects of "oxidation" on the surface properties of coal and its response to physical coal cleaning, it is useful to distinguish between weathered coals, and what might be termed "wet aged" coals, both of which are commonly referred to as oxidized. Weathered coals, mined from seams which have been exposed at the surface of the earth over geologic time, or coal mined and stockpiled outdoors for extended periods of time (years) are often characterized by a high degree of hydrophilicity, porosity, and friability. They are also often extremely resistant to collection via surface property dependent physical cleaning methods, such as froth flotation. These coals should be distinguished from wet aged coals, such as tailings pond materials, stored slurry samples, or, indeed, any coal stored in a wet or damp condition for a substantial period of time. These materials are characterized by increases in acidity and conversion of pyritic sulfur to sulfate. They often also show poor performance in froth flotation systems. Yet despite the fact that there are similarities in the physical phenomena involved in flotation and those controlling agglomeration, there are substantial differences. The differences have been shown in a large body of work done in agglomeration of tailings pond materials.

It has been repeatedly noted that the response of a coal to oil agglomeration is seldom detrimentally affected by wet aging. Data concerning this was published by C. E. Capes and others (Society of Chemical Engineering, Ottawa, 1987). They reported that plants in the 25 to 50 tph capacity range were operated in the northeastern United States. One of the plants, in Pennsylvania, worked on accumulated reject fines in a pond. Published results of this operation are reproduced below:

Feed:	
Size	-100M
Ash, %	37
Clean Coal:	
Ash, %	8
Refuse:	
Ash, %	+75
Combustible Recovery, %	+90

It may be noted that the feed material, accumulated over the years in a refuse pond, responded satisfactorily to agglomeration even with a low level of oil dosage (less than 4 percent by weight). The high combustible recovery (above 90 percent) and high ash content in the refuse (above 75 percent) are both indicative of very high heat recovery rate and very acceptable selectivity.

The bench-scale test results are consistent with the above conclusion. For each of three coals tested, samples with different histories and degree of sulfating yielded very similar results.

The Pittsburgh No. 8 ground slurry received from CQDC showed considerable conversion of pyrite to sulfate (sulfate sulfur at 0.37 percent, Table 1-3) and had required buffering to neutralize the pH before shipment to Arcanum. Test No. P-12 showed that with some additional size reduction to 3.7 microns, the wet aged coal produced agglomerates with 3.3 percent ash and 3.5 percent total sulfur, at an energy recovery of 93 percent. In comparison, Arcanum received a sample of the same Pittsburgh No. 8 coal from DOE which had been dried, inerted, and stored in a sealed container. This material, which showed no conversion to sulfate (sulfate sulfur at 0.06 percent) when ground to a similar size (50 percent passing 4.23 microns), agglomerated to a very comparable product with 4.0 percent ash and 3.3 percent sulfur, and at an energy recovery of 93 percent.

Illinois No. 6 slurry, as received, had only a modest amount of sulfate conversion (sulfate sulfur at 0.25 percent). This material, with a median size of 9.8 microns, agglomerated to a product with 3.7 to 4.0 percent ash and 2.7 to 2.8 percent total sulfur. Energy recovery was 85 percent to 87 percent (Test Nos. I-1 and 2). A sample of the same Illinois No. 6 material was also received as damp 1/4 inch x 0 crushed coal. This material was highly sulfated (sulfate sulfur at 0.63 percent). Yet when ground to a roughly comparable size of 7.3 microns, it agglomerated to give an almost identical product with 3.5 percent ash and 2.7 percent total sulfur. Energy recovery was 87 percent (Test No. I-12).

For Upper Freeport coals, the conditions were as follows. The 1/4 inch x 0 material was fairly fresh, showing 0.15 percent sulfate sulfur. As noted in Table 1-9, the crushed coal with 12.5 percent ash was significantly better than the ground sample from CQDC which has an ash content of 16.3 percent. When the 1/4 inch coal was ground to a size of 3.92 microns, it agglomerated to a product with 6.1 percent ash and 1.3 percent sulfur. Energy recovery was 87 percent (Test No. F-5). In comparison, Upper Freeport slurry ground at CQDC (D50 = 4.3 microns) was received by Arcanum showing a higher (0.40 percent) sulfate sulfur. Typical results of agglomeration for this coal showed a clean coal ash of 8.2 percent and total sulfur of 1.5 percent at an energy recovery of 91 percent.

The material ground from 1/4 inch x 0, and promptly agglomerated, can be considered fresh as contrasted with the CQDC ground slurries which were all at least 60 days old before they were agglomerated. Under either view, there is no significant effect on performance.

Finally, experiments were conducted in which the aged CQDC slurry was given an "abrasive" grind. This was a short grind with a light alumina media which had no measurable effect on the particle size but could be expected to renew the surface properties of the coal. Following this grind step, samples were either agglomerated promptly or allowed to age 2 or 3 days. No significant effect was seen for either the ground or the ground and re-aged material for Illinois No. 6 or Pittsburgh No. 8 coal (see Test Nos. P-2, P-8, P-10; I-2, I-14, and I-15).

1.2.6 Effects of Additives

Several inorganic detergents and oxidizing agents were used in an attempt to enhance rejection of pyrite by increasing its hydrophilicity. The results showed that no additive produced any significant effect on pyrite rejection. However, NaPO_4 , a useful grinding aid, was found marginally effective in improving separation efficiency, particularly in the very fine grinds (reference Test Nos. P-11 vs P-12, and Test Nos. I-9 vs I-12). The effectiveness of NaPO_4 is most likely attributable to its detergent properties, namely, preventing the buildup of carbonaceous films on the inorganic species during grinding and vice versa.

The additives that were bench-tested included the following:

- o Sodium metaphosphate
- o Sodium carbonate
- o Potassium ferrocyanide
- o Sodium tripolyphosphate
- o Potassium permanganate
- o Hydrogen peroxide
- o Sodium phosphate

The first three of the additives were suggested in earlier work on agglomeration by NRCC and EPRI. The phosphates and carbonates were selected for their action as detergents to separate clay and mineral particles from coal surfaces.

It was noted that free pyrite did not need any special treatment to report with the aqueous phase and thus to the tailings. However, even with ultrafine grinds, there was a significant amount of locked and semi-locked pyrite recovered in the coal.

1.2.7 Pulp Density

Tests were run at 10, 15, 20, and 25 percent solids by weight. At 25 percent solids, the sample slurries of the fine ground coal all became too strongly non-Newtonian under high shear to agglomerate properly. Illinois No. 6 and Pittsburgh No. 8 samples were run at 20 percent solids, where their fluid mechanical properties were marginal. The results indicated that Pittsburgh No. 8 performed marginally worse at 20 percent solids (Test Nos. P-14 and P-15), but that Illinois No. 6 showed no significant change (Test Nos. I-8 and I-10). No detectable change in performance was seen for any of the samples agglomerated at 10 percent solids as compared to 15 percent. These results lead to the selection of a solid concentration of 15 percent to operate the POC plant.

1.3 CONTINUOUS TESTING

A limited number of continuous agglomeration tests was conducted using the same coal samples that were used for the batch tests. Tests were performed during March, June, and July 1988. A brief description of the operations and experimental setup follows.

1.3.1 Description of Operation

A detailed description of the laboratory equipment and procedures can be found in Appendix C.

Figure 1-4 shows the laboratory setup and flow of material used during continuous testing. Coal slurry was pumped into a high shear reactor together with heptane. Microagglomerates of coal and minerals suspended in water were transferred from the reactor to a holding tank. This tank was equipped with an agitator and as soon as the slurry level in the tank had submerged the impeller, low shear mixing was started with the continuous addition of the binder, namely, asphalt dissolved in heptane. Low shear agitation was continued until the agglomerates had reached the expected size of 2 to 3 mm. The content of the low shear tank was discharged onto a screen. The tailings and water were drained from the agglomerates and a portion of the clean coal was transferred to the heptane stripping apparatus.

Heptane stripping operations are described under Section 1.4.

Figure 1-5 shows the overall apparatus employed for the continuous tests. The high and low shear reactors are illustrated in Figure 1-6. Figure 1-7 shows the screening operation where agglomerated coal and the separated mineral matter are seen distinctly. Figure 1-8 shows the separated mineral (tailings) matter with a few black specks of coal. Figure 1-9 shows the agglomerates after the steam stripping operation.

1.3.2 Test Results

Pittsburgh No. 8 Coal. Summary test results of continuous tests with Pittsburgh No. 8 coal and a comparison of batch and continuous tests are

Figure 1-4 Continuous Bench-Scale Agglomeration and Solvent Recovery

Figure 1-5 Bench-scale spherical agglomeration unit for testing continuous operation

Figure 1-6 High-shear and low-shear reactors

Figure 1-7 Screening of the agglomerates showing separation of coal and mineral matter

Figure 1-8 Filtered tailings of spherical agglomeration

Figure 1-9 Representative sample of agglomerates produced in the continuous bench-scale unit after steam stripping of heptane

presented in Table 1-19 and Table 1-20. Table 1-19 presents summary test results for all the continuous experiments conducted with Pittsburgh No. 8 coal and Table 1-20 presents mean values of tests of each type. Results of both testing methods are near identical in terms of product quality and energy recovery. The continuous tests show a slightly better sulfur removal. Tests that addressed heptane recovery and residual asphalt/heptane in agglomerates are discussed under Section 1.4.

The results confirmed that the elimination of the second-stage high shear mixing operation during the continuous tests had no harmful effect on process performance.

Illinois No. 6 Coal. Summary test results of continuous tests using coal samples from Illinois No. 6 seam coal and a comparison of batch and continuous tests are shown in Table 1-21 and 1-22. Results of the individual continuous test with the Illinois No. 6 coal are shown in Table 1-21. Table 1-22 shows mean values for each mode of test.

With Illinois No. 6 coal, the two-stage high shear batch tests showed a marginally better performance in terms of clean coal ash content and sulfur content. Clean coal ash content for the batch tests was 3.7 percent versus 4.1 percent for the continuous tests.

The Illinois No. 6 coal, being geologically the youngest of the three coals tested, requires a surface activator to be effectively agglomerated. During the batch tests a light solvent like toluene was used, while the continuous tests used an asphalt heptane mixture (binder). The binder produced somewhat stronger microagglomerates, thus hindering the destruction and reforming cycle for the agglomerates during continuous mode operation of the high shear reactor. Even though not planned for the POC test module, the use of a light hydrocarbon for conditioning of the Illinois No. 6 coal is a possibility for a commercial operation specifically designed for that coal.

Table 1-19
PITTSBURGH NO. 8 COAL
BENCH-SCALE CONTINUOUS TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO. EXP:	3/25 1 P8C-1	3/25 11 P8C-2	3/25 111 P8C-3	6/16 1 P8C-4	6/16 11 P8C-5	6/17 1 P8C-6	6/20 1 P8C-7	6/20 11 P8C-8	Mean	Standard Deviation
	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
Clean Coal (Excl. Binder):										
Ash, %	5.19	5.09	4.91	5.30	4.98	4.59	4.11	4.34	4.81	0.40
Heating Value, Btu/lb	13850	13865	13893	13833	13882	13942	14017	13981	13908	61
Clean Coal:										
Ash, %	4.98	4.95	4.77	5.15	4.84	4.48	3.95	4.16	4.66	0.40
Total Sulfur, %	3.47	3.61	3.48	3.13	3.36	3.28	3.26	3.44	3.38	0.14
Pyritic Sulfur, %	1.10	1.09	1.08	1.05	1.05	1.00	1.03	1.09	1.06	0.03
Organic Sulfur, %	2.33	2.50	2.38	2.08	2.30	2.26	2.22	2.33	2.30	0.11
Sulfate Sulfur, %	0.04	0.02	0.02	0.00	0.01	0.02	0.01	0.02	0.02	0.01
Heating Value, Btu/lb	14198	14104	14136	14076	14125	14154	14335	14318	14181	91
lb Ash/MBtu	3.51	3.51	3.37	3.66	3.43	3.16	2.76	2.91	3.29	0.30
lb Total SO ₂ /MBtu	4.89	5.12	4.92	4.45	4.76	4.63	4.55	4.81	4.77	0.20
Refuse:										
Ash, %	82.54	82.54	82.54	81.36	81.36	81.54	82.41	84.73	82.38	1.02
Bench-Scale Performance:										
Yield, %	90.8	90.8	90.6	90.9	90.5	90.1	89.6	90.1	90.4	0.4
Energy Recovery, %	98.3	98.4	98.4	98.3	98.2	98.2	98.2	98.5	98.3	0.1
Ash Reduction, %	62.9	62.9	64.3	61.3	63.8	66.6	70.9	69.3	65.2	3.1
Sulfur Removal, %	27.9	25.0	27.9	34.9	30.4	32.4	33.1	29.0	30.1	3.1
SO ₂ Reduction, %	28.4	25.0	27.9	34.9	30.3	32.1	33.4	29.6	30.2	3.0
Pyritic Sulfur Reduction, %	61.5	54.2	60.4	75.5	65.6	69.5	72.3	64.1	65.4	6.5
Efficiency Factor	1443	1471	1522	1394	1478	1600	1799	1762	1559	140
Run-of-Mine Performance:										
Energy Recovery, %	92.2	92.2	92.2	92.1	92.1	92.1	92.1	92.4	92.2	0.1
Ash Reduction, %	92.4	92.4	92.7	92.0	92.5	93.1	94.0	93.7	92.8	0.6
Sulfur Removal, %	58.2	56.5	58.2	62.3	59.7	60.8	61.2	58.9	59.5	1.8
SO ₂ Reduction, %	55.8	53.7	55.4	59.8	56.9	58.1	58.8	56.5	56.9	1.8
Pyritic Sulfur Reduction, %	77.5	74.6	77.0	83.0	79.1	80.7	81.8	78.5	79.0	2.6
Efficiency Factor	915	933	966	896	949	1026	1142	1092	990	83

Composite Sample Analysis, ROM Coal:

Ash, % 39.16
Total Sulfur, % 4.71
Pyritic Sulfur, % 3.39
Heating Value, Btu/lb 8528

Composite Sample Analysis,
Prcleaned Coal:*

Ash, % 12.10
Total Sulfur, % 4.37
Pyritic Sulfur, % 2.02
Heating Value, Btu/lb 12791

Prcleaning Energy Recovery = 93.74%
Heating Value (Btu/lb) = 14646 - (153.3 x Ash,%)

*As received by Arcanum

Table 1-20

PITTSBURGH NO. 8 COAL
BENCH-SCALE TESTS
COMPARISON OF BATCH AND CONTINUOUS TESTS
(Dry Basis)

	Batch Tests	Continuous Tests	
	Mean	Mean	Standard Deviation
<u>Agglomerated Clean Coal:</u> (with binder)			
Test Number	23 tests	8 tests	--
Grind Size - microns (50 percent passing)	12.1	12.1	ND
Binder Content, %	1.5	3.4	--
Ash, %	4.9	4.7	0.4
Total Sulfur, %	3.78	3.38	0.14
Heating Value, Btu/lb	14,003	14,181	91
<u>Run-of-Mine Performance:</u>			
Energy Recovery, % ^(a)	92.3	92.2	0.1
Ash Reduction, % ^(b)	92.3	92.8	0.6
Sulfur Removal, % ^(c)	54.6	59.5	1.8
SO ₂ Reduction, % ^(b)	51.0	56.9	1.8
Pyritic Sulfur Reduction, % ^(b)	70.8	79.0	2.6

(a) $\frac{\text{Total Energy Recovered in Clean Coal (less binder)}}{\text{Total Energy in ROM Coal Feed}} \times 100$

(b) lb/MBtu basis; based on quality of agglomerates (with binder)

(c) Percentage (weight) of sulfur in the ROM coal rejected with refuse/tailings.

ND = Not Determined

Batch test data from Table 1-5.

Table 1-21
ILLINOIS NO. 6 COAL
BENCH-SCALE CONTINUOUS TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO. EXP:	7/14 1 16C-1	7/14 11 16C-2	7/15 1 16C-3	7/20 1 16C-4	7/21 1 16C-5	7/21 11 16C-6	Mean *****	Standard Deviation *****
Clean Coal (Excl. Binder):								
Ash, %	4.29	4.23	4.09	4.07	4.34	4.34	4.23	0.11
Heating Value, Btu/lb	13531	13540	13562	13566	13523	13524	13541	17
Clean Coal:								
Ash, %	4.18	4.10	4.01	3.87	4.23	4.22	4.10	0.13
Total Sulfur, %	2.91	3.15	3.07	3.10	3.05	3.04	3.05	0.07
Pyritic Sulfur, %	0.40	0.79	0.74	0.82	0.75	0.73	0.71	0.14
Organic Sulfur, %	2.15	2.29	2.26	2.22	2.24	2.24	2.23	0.04
Sulfate Sulfur, %	0.36	0.07	0.07	0.06	0.06	0.07	0.12	0.11
Heating Value, Btu/lb	13759	13829	13750	13982	13760	13761	13807	83
lb Ash/MBtu	3.04	2.96	2.91	2.77	3.07	3.07	2.97	0.11
lb Total SO ₂ /MBtu	4.23	4.56	4.47	4.43	4.43	4.42	4.42	0.10
Refuse:								
Ash, %	89.42	90.12	89.41	89.27	85.91	89.61	88.96	1.39
Bench-Scale Performance:								
Yield, %	93.8	93.8	93.5	93.5	93.6	93.8	93.7	0.1
Energy Recovery, %	99.9	99.9	99.9	99.8	99.6	99.9	99.8	0.1
Ash Reduction, %	59.8	60.8	61.5	63.3	59.4	59.4	60.7	1.4
Sulfur Removal, %	13.9	6.8	9.4	8.6	10.0	10.0	9.8	2.1
SO ₂ Reduction, %	15.2	8.7	10.5	11.1	11.2	11.5	11.4	2.0
Pyritic Sulfur Reduction, %	50.3	28.7	34.7	36.8	36.9	37.8	37.5	6.4
Efficiency Factor	1954	1996	2044	2053	1850	1938	1973	69
Run-of-Mine Performance:								
Energy Recovery, %	84.9	84.9	84.9	84.9	84.6	84.9	84.8	0.1
Ash Reduction, %	77.1	77.7	78.0	79.1	76.8	76.9	77.6	0.8
Sulfur Removal, %	53.4	49.6	51.0	50.5	51.3	51.3	51.2	1.2
SO ₂ Reduction, %	44.9	40.6	41.8	42.2	42.2	42.4	42.3	1.3
Pyritic Sulfur Reduction, %	82.8	74.9	77.1	77.9	77.9	78.2	78.1	2.3
Efficiency Factor	779	792	819	825	761	770	791	24

Composite Sample Analysis, ROM Coal:

Ash, % 15.71
Total Sulfur, % 4.54
Pyritic Sulfur, % 2.46
Heating Value, Btu/lb 11837

Precleaning Energy Recovery = 85.0%
Heating Value (Btu/lb) = 14199 - (155.6 x Ash,%)

Composite Sample Analysis,
Precleaned Coal:*

Ash, % 9.60
Total Sulfur, % 3.17
Pyritic Sulfur, % 0.96
Heating Value, Btu/lb 12705

*As received by Arcanum

Table 1-22
ILLINOIS NO. 6 COAL
BENCH-SCALE TESTS
COMPARISON OF BATCH AND CONTINUOUS TESTS
(Dry Basis)

	<u>Batch Tests</u>	<u>Continuous Tests</u>	
	<u>Mean</u>	<u>Mean</u>	<u>Standard Deviation</u>
<u>Agglomerated Clean Coal:</u> (with binder)			
Test Number	18 tests	6 tests	--
Grind Size - microns (50 percent passing)	9.8	9.8	--
Binder Content, %	1.6 (?)	3.1	ND
Ash, %	3.7	4.1	0.13
Total Sulfur, %	2.72	3.05	0.07
Heating Value, Btu/lb	13,744	13,807	83
<u>Run-of-Mine Performance:</u>			
Energy Recovery, % ^(a)	84.6	84.8	0.1
Ash Reduction, % ^(b)	79.7	77.6	0.8
Sulfur Removal, % ^(c)	56.8	51.2	1.2
SO ₂ Reduction, % ^(b)	48.3	42.3	1.3
Pyritic Sulfur Reduction, % ^(b)	89.2	78.1	2.3

(a) $\frac{\text{Total Energy Recovered in Clean Coal (less binder)}}{\text{Total Energy in ROM Coal Feed}} \times 100$

(b) lb/MBtu basis; based on quality of agglomerates (with binder)

(c) Percentage (weight) of sulfur in the ROM coal rejected with refuse/tailings.

ND = Not Determined

Batch test data from Table 1-8.

Upper Freeport Coal. The results of the individual continuous tests with the Upper Freeport Coal are shown in Table 1-23. The comparison between the batch and continuous operation results with the Upper Freeport coal are shown in Table 1-24. There was very little difference between the two methods of operation. The ash content (7.8 percent) of the clean coal from the continuous operation was marginally better than that obtained from the batch operation (8.1 percent).

1.4 HEPTANE REMOVAL AND PRODUCT ASSESSMENT

Following the addition of the asphalt and the growth of the agglomerates under low shear conditions, the individual batches of agglomerates were screened from the ash-containing water, rinsed with clean water, and stored in tight containers. These agglomerate samples were then processed for heptane removal and the resulting agglomerates examined for loss of fines and for retained asphalt content, residual heptane, and ash and sulfur.

The heptane-containing agglomerates were observed to be quite fragile and easily distorted or crushed with light finger pressure. They were, however, strong enough to withstand water rinsing for rejection of the ash-laden water on a 50-mesh screen.

1.4.1 Oven Drying for Heptane Removal

During most of batch testing, the screened agglomerates were oven dried for heptane and water removal. Under these conditions, substantially all the water and heptane were removed (as indicated by lack of heptane odor over a sealed sample).

During the oven drying and the following cooling, the agglomerate size consist and particle integrity were retained. The strength of resulting products was related to their residual asphalt content, with the higher asphalt material exhibiting a greater strength. The dried and heptane-free agglomerates exhibited substantial strength, but those with minimum asphalt content were still subject to surface abrasion and potential for generation of coal fines.

Table 1-23
UPPER FREEPORT COAL
BENCH-SCALE CONTINUOUS TESTS
SUMMARY TEST RESULTS
(Dry Basis)

DATE: TEST NO. EXP:	7/5 1 UC-1	7/5 11 UC-2	7/6 11 UC-3	7/6 111 UC-4	7/8 1 UC-5	7/11 1 UC-6	7/11 11 UC-7	Mean	Standard Deviation
	*****	*****	*****	*****	*****	*****	*****	*****	*****
Clean Coal (Excl. Binder):									
Ash, %	8.11	7.68	7.68	8.19	8.26	8.40	7.99	8.04	0.26
Heating Value, Btu/lb	14068	13469	13469	13391	13380	13358	13421	13508	232
Clean Coal:									
Ash, %	7.86	7.46	7.45	7.96	8.03	8.25	7.83	7.84	0.27
Total Sulfur, %	1.47	1.56	1.68	1.59	1.57	1.59	1.60	1.58	0.06
Pyritic Sulfur, %	0.90	0.84	0.87	0.81	0.86	0.84	0.83	0.85	0.03
Organic Sulfur, %	0.57	0.52	0.76	0.71	0.65	0.74	0.66	0.66	0.08
Sulfate Sulfur, %	0.00	0.20	0.05	0.07	0.06	0.01	0.11	0.07	0.06
Heating Value, Btu/lb	14316	14367	14378	14285	14270	14168	14244	14290	67
lbs Ash/MBtu	5.49	5.19	5.18	5.57	5.63	5.82	5.50	5.48	0.21
lbs Total SO ₂ /MBtu	2.05	2.17	2.34	2.23	2.20	2.24	2.25	2.21	0.08
Refuse:									
Ash, %	86.83	86.83	84.69	86.14	85.51	87.25	87.04	86.33	0.87
Bench-Scale Performance:									
Yield, %	89.6	89.1	88.8	89.6	89.6	90.0	89.5	89.5	0.4
Energy Recovery, %	99.3	99.2	98.9	99.2	99.1	99.3	99.3	99.2	0.1
Ash Reduction, %	57.2	59.6	59.6	56.6	56.2	54.6	57.2	57.3	1.7
Sulfur Removal, %	39.6	36.2	31.6	34.7	35.5	34.4	34.3	35.2	2.2
SO ₂ Reduction, %	40.1	36.7	31.9	35.1	35.8	34.6	34.5	35.5	2.3
Pyritic Sulfur Reduction, %	54.0	49.4	42.9	47.2	48.2	46.5	46.4	47.8	3.1
Efficiency Factor	959	1008	979	943	927	934	975	961	26
Run-of-Mine Performance:									
Energy Recovery, %	91.4	91.4	91.1	91.3	91.3	91.5	91.4	91.3	0.1
Ash Reduction, %	94.3	94.6	94.6	94.2	94.2	94.0	94.3	94.3	0.2
Sulfur Removal, %	72.5	71.0	68.8	70.3	70.6	70.1	70.1	70.5	1.0
SO ₂ Reduction, %	71.1	69.4	67.1	68.6	69.0	68.4	68.4	68.9	1.1
Pyritic Sulfur Reduction, %	77.7	75.9	73.3	75.0	75.4	74.8	74.7	75.3	1.2
Efficiency Factor	435	457	455	431	427	422	441	438	13

Composite Sample Analysis, ROM Coal:

Ash, % 57.31
Total Sulfur, % 2.11
Pyritic Sulfur, % 1.93
Heating Value, Btu/lb 5947

Composite Sample Analysis,

Precleaned Coal:*

Ash, %	16.
Total Sulfur, %	2.
Pyritic Sulfur, %	1.
Heating Value, Btu/lb	126

Precleaning Energy Recovery = 92.1%
Heating Value (Btu/lb) = 15425 - (167.3 x Ash,%)

*As received by Arcanum

Table 1-24

UPPER FREEPORT COAL
BENCH-SCALE TESTS
COMPARISON OF BATCH AND CONTINUOUS TESTS
(Dry Basis)

	Batch Tests	Continuous Tests	
	Mean	Mean	Standard Deviation
<u>Agglomerated Clean Coal:</u> (with binder)			
Test Number	12 tests	7 tests	--
Grind Size - microns (50 percent passing)	4.2	4.2	--
Binder Content, %	1.4	2.7	ND
Ash, %	8.1	7.8	0.27
Total Sulfur, %	1.58	1.58	0.06
Heating Value, Btu/lb	14,168	14,290	67
<u>Run-of-Mine Performance:</u>			
Energy Recovery, % ^(a)	91.7	91.3	0.1
Ash Reduction, % ^(b)	94.1	94.3	0.2
Sulfur Removal, % ^(c)	70.3	70.5	1.0
SO ₂ Reduction, % ^(b)	68.6	68.9	1.1
Pyritic Sulfur Reduction, % ^(b)	75.0	75.3	1.2

(a) $\frac{\text{Total Energy Recovered in Clean Coal (less binder)}}{\text{Total Energy in ROM Coal Feed}} \times 100$

(b) lb/MBtu basis; based on quality of agglomerates (with binder)

(c) Percentage (weight) of sulfur in the ROM coal rejected with refuse/tailings.

ND = Not Determined

Batch test data from Table 1-11.

1.4.2 Steam Stripping in Water Suspension

To simulate a heptane removal process that could be used in the POC plant testing program, tests were conducted to steam strip the heptane from the agglomerates while they were suspended in water following the low shear agitation step. The tests were conducted under batch steaming conditions and the vaporized heptane and steam condensed for volumetric measurement.

Heptane was successfully removed by this method, but the turbulence in the container induced by steam sparging resulted in some agglomerate disintegration and difficulty in screening the stripped material from the water without excessive loss of coal fines. The breakup of the agglomerates was believed to be due to particle abrasion in the turbulent suspension coupled with the loss of particle binding strength as the heptane was lost and before the binding strength of the asphalt was developed through particle cooling.

1.4.3 Steam Stripping of Drained Agglomerates

To avoid the agglomerate disintegration observed with the suspension steam stripping, the stripping procedure was revised to first drain the water from the agglomerates. This was accomplished by transferring the stored samples into the stripping vessel in a water suspension and then removing the water by aspirating it from the bottom of the vessel. Steam was then admitted to the bottom of the bed at a velocity low enough so as not to disturb the particles. At the completion of the steaming cycle, the vessel was flooded with cool water to chill the agglomerates. The suspension was then removed from the stripping vessel and screened for product recovery. With this mode of operation there was very little breakup of the agglomerates and fines loss on screening was minimal.

The cooled agglomerates appeared to have comparable physical strength to those subjected to oven drying. They also appeared to have no detectable residual heptane as indicated by lack of heptane odor from a closed sample container. This was confirmed during a detailed analysis of the stripped agglomerates, described in the following section.

The apparatus employed for the batch steam stripping of the agglomerates is described in detail in Appendix C and is illustrated here in Figure 1-10.

With reference to this figure the stripping operation is briefly summarized as follows:

- o Steam was generated at low pressure and at a rate controlled by power input to a steam generator. The steam was admitted to the stripping vessel through a fritted glass distributor centered in the bottom of the stripping vessel.
- o The vapors from the sealed stripping vessel were withdrawn and condensed in a series of two water-jacketed condenser coolers.
- o The condensate was collected in a glass graduate and the heptane/water and heptane/air interfaces recorded as a function of time during the stripping. The stripping was assumed to be completed when the quantity of recovered heptane did not increase further.
- o The uninsulated glass stripping vessel was partially enclosed in a heating mantle to compensate for heat losses and minimize refluxing of heptane or water onto the bed of agglomerates. This was deemed desirable to assure consistent stripping and remove this as a possible source of agglomerate breakup.

The test data derived from the above stripping tests is detailed in Appendix C. The pattern of the heptane removal from the agglomerates as related to the cumulative stripping steam employed is illustrated in Figure 1-11 for the Pittsburgh No. 8 coal samples, Figure 1-12 for the Illinois No. 6 coal, and Figure 1-13 for the Upper Freeport coal.

In all cases the stripping was complete in 10 minutes from the time when the first drops of ~~heptane~~^{heptane} were condensed. This was indicated by a continuing increase in the accumulation of water condensate with no further increase in the heptane condensate. The generally linear nature of the logarithmic relationship between the residual heptane and the cumulative water to heptane condensate indicates that:

- o Substantially complete heptane removal is obtained with a ratio of steam to heptane of 1.5 to 4 (vis-a-vis basis liquid volumes)

Figure 1-10 Agglomerate Steam Stripping System

**Figure 1-11 Pittsburgh No. 8 Coal Agglomerates
Batch Stripping Steam Requirement**

**Figure 1-12 Illinois No. 6 Coal Agglomerates
Batch Stripping Steam Requirement**

**Figure 1-13 Upper Freeport Coal Agglomerates
Batch Stripping Steam Requirement**

- o The bulk of the heptane is removed rapidly at a ratio of hydrocarbon to steam reflecting the heterogeneous azeotrope ratio of heptane to water.
- o The remainder of the heptane is removed at a declining rate as limited by diffusion of the heptane from within the agglomerates to their surface. (This implies that overall steam usage may be reduced by slowing the steam flow during the later stages of the stripping.)
- o The data indicated a higher steam requirement for products having the larger average diameter agglomerates. With this exception there appeared to be no significant variable accounting for the observed range of stripping steam requirements.

The measurement of heptane removal by volume of condensate collected did not provide the precision to determine fractional residual heptane in the agglomerates at levels below about 1 to 2 percent of total heptane recovered. However, the regular exponential decline demonstrated by the data gives confidence that its removal rate is controlled by diffusion within the agglomerate and for the 2-4 mm diameter agglomerates is quite rapid. The bench-scale stripping tests all showed complete removal in under 10 minutes of active stripping, which is easily accommodated in the proposed POC batch cycle of 20 minutes.

1.4.4 Product Analysis via Toluene Extraction

The agglomerate product from the heptane removal was cooled by addition of water to the stripping vessel, and agitated to thoroughly blend the product. The resulting slurry was then screened and rinsed to recover the product agglomerates. A representative sample of the blend was oven dried to remove water and heptane but leave the asphalt residual in the coal. Another similar but undried sample was transferred to a dried and weighed filter thimble which was then subjected to repeated extraction with hot (boiling point) toluene in a Soxhlet type extractor. This is illustrated in Figure 1-14.

The toluene extraction was continued for a number of hours (generally overnight) until the extracted toluene from the coal sample appeared clear

Figure 1-14 Agglomerate Extractor for Asphalt and Heptane Recovery

and uncolored. Water extracted or vaporized from the sample and collected in a side-arm separator was measured volumetrically. At the termination of the extraction the sample thimble was removed, dried, and weighed to determine the mass of the sample after extraction with toluene.

An indication of asphalt extracted can be obtained by comparing the weights of the dried coal sample before and after toluene extraction. This weight is in general agreement with the asphalt content determined from the feed rates to the agglomeration.

The entire liquid contents of the extractor was then removed and distilled into convenient fractions for chromatographic analysis. This analytical procedure was intended to confirm the asphalt balance between quantity of asphalt added and the amount found in the product agglomerate. The extract analysis was also intended to detect residual traces of heptane in the stripped agglomerates. This trace analysis is, however, subject to the influence of heptane losses from the extractor vent condenser and losses during the distillation of the toluene extract. As of the date of this report, these analysis and compilations of results have not been completed.

1.5 SELECTIVE GRINDING

Most of the slurry samples tested during the bench-scale test program were ground in the two-stage grinding system installed at the CQDC as part of the microbubble flotation test program.

The coal was first ground in a wet open circuit ball mill. The product from the ball mill was fed to a bead mill to complete the grinding. Depending on grindability of the coal, the two-stage "straight-through" grinding system provided a product of size 4 to 10 microns (50 percent passing) as specified. However, it was noted that the spread of sizes in the product was very large. The softer and easier to grind components of coal which had low ash content were overground to extremely fine sizes (3 to 4 microns). On the other hand, the high ash and high sulfur components (which were harder) were not pulverized adequately to liberate the undesirable minerals. Moreover, overgrinding the cleaner components made their recovery and dewatering more difficult.

To improve liberation, avoid overgrinding of the cleaner components, and reduce energy and equipment costs for grinding, a novel selective grinding concept is being tested in the laboratory.

The two-stage selective grinding system incorporates, in the first stage, a closed-circuit ball mill. The product from the mill is classified in a cyclone at 100 mesh and the oversize material is fed back to the ball mill for further grinding. The minus 100 mesh material from the cyclone overflow is classified at 20 to 30 mesh in a solid bowl centrifuge.

The oversize from this classification step, consisting largely of hard-to-grind particles, is further ground in the bead mill. After grinding, it joins the minus 20 to 30 micron undersize from the centrifuge to form the finish ground coal.

The advantages of selective grinding over the straight-through system are:

- o Better liberation of pyritic and ash forming minerals
- o Elimination of overgrinding of softer coal components
- o A product with a narrow size range which makes downstream processing and dewatering easier
- o Lower energy consumption due to the closed circuit grinding; in a ball mill, the saving could be as much as 30 percent for an equivalent duty
- o Smaller grinding equipment

1.6 CONCLUSIONS AND RECOMMENDATIONS

It was shown by the bench-scale test program that significant ash and sulfur reductions can be achieved using the spherical agglomeration process. These were achieved in both a batch and continuous operation with a near total recovery of energy in the feed to the process. It was found that a single high shear stage followed by a low shear agglomerate growth stage were all that was necessary to obtain the program objectives.

The batch and continuous bench-scale tests evaluated several process variables and their effects on process performance in terms of ash and sulfur removal, energy recovery, and product size and strength.

1.6.1 Liberation

Liberation of ash and, more importantly, pyritic sulfur in the feed slurry was noted to be the most important factor affecting process performance in terms of ash and pyrite removal. While this is true for all physical cleaning processes, it is particularly so for agglomeration, which depends on surface characteristics rather than specific gravity of the particles to effect a separation.

The process rejected all fully liberated pyrite particles. All locked and most of the semi-locked pyrites in the coal feed report with the clean coal and thus adversely affect its quality. The float/sink analysis and the petrographic characterization studies of the ground feed to the bench-scale tests clearly indicated the presence of such locked and semi-locked pyrites in the micronized feed. In spite of intense grinding to single-digit micron sizes (50 percent passing) all pyrite particles were not fully liberated. Even though the coal had been ground to a low mean size, the coarser fractions harbored the hard to grind pyrite-rich coal particles. This phenomenon was most pronounced with Illinois No. 6 coal. The proposed selective grinding concept specifically addresses this problem. The hard to grind and pyrite-rich particles will be selectively subjected to severe grinding to achieve improved liberation.

1.6.2 Other Process Variables

The bench-scale tests helped evaluate various process variables with regard to their effects, the appropriate levels for the POC operation, and the specific variables and their testing levels to be used in the POC test matrix. Recommendations in these areas for each coal are given below.

Heptane Dosage at High Shear Reactor (HSR). Given adequate quantity to sustain agglomeration, heptane dosage affects only the size of agglomerates and not product quality or energy recovery. POC tests will start at the following dosages (weight percent of dry coal feed):

Pittsburgh No. 8	25%→
Illinois No. 6	25%
Upper Freeport	35%

Tests are to be planned at two additional levels, one lower and one higher.

Asphalt Dosage. Asphalt dosage affects product size and strength. Agglomerates of adequate strength are required to avoid carbon losses during product screening. POC tests are to start with the following dosages (weight percent of dry feed to the high shear reactor):

Pittsburgh No. 8	4%→
Illinois No. 6	4%
Upper Freeport	4%

Tests are to be planned at two additional levels, one lower (3 percent) and one higher (5 percent).

Solids Concentration. The recommended solids concentration in the feed to the HSR is 15 percent by weight for all POC tests.

Grind Size. Most tests will be performed at the finest grind possible with each coal. Additionally a few tests may be included using a) only the ball mill (coarse grind) and b) a larger separation size at the solid bowl centrifuge (medium grind).

Impeller Type/Speed. To obtain data on power consumption at the high and low shear reactors, tests using two types impellers for each unit are recommended. The high shear reactor has to be tested at two rpm's with each impeller. These tests have to be done only with the first coal to be tested at the POC unit.

Grinding Aids. Surfactant type grinding aids are recommended to help dispersal of clay and coal particles.

Pyrite Depressants. These were not found effective during bench-scale tests and none are recommended.

Aging of Coal. The bench-scale tests showed that aging of coal did not affect agglomeration.

Heptane Recovery. The bench-scale tests of the batch-wise steam stripping of coal agglomerates showed that substantially complete heptane recovery could be accomplished. The tests also indicated this stripping could be done with minimal agglomerate breakup, and the resulting product could be readily drained of free water.

Appendix C

BENCH-SCALE TESTING PROCEDURES, EQUIPMENT, AND DATA

The objective of the batch testing of the spherical agglomeration is to determine process performance for a particular feed material, i.e., yield, ash, and sulfur rejection achievable for coal of a particular seam of origin and size consist. It has been the consistent experience at both Arcanum and National Research Council Canada (NRCC) that even for large-scale and/or continuous processing, process separation and recoveries are accurately predicted from small batch testing. This is because, given an adequate shear field to achieve complete fine particle dispersal, the only factor (excepting possible screen losses) that fundamentally affects either recovery or separation is the distribution of particles between the phases. This distribution is, in turn, controlled solely by factors which are time and scale independent - the interfacial tensions between the liquid-liquid and solid-liquid surfaces.

The objective of the continuous testing is to gather data needed to design the high and low shear reactors in a system which represents a hydrodynamically sound model of larger scale equipment. Continuous testing also allows qualitative identification and observation of potential operating problems related to material handling, screening, and other factors.

The following paragraphs describe in detail the procedures and equipment used for both the batch and continuous agglomeration tests, and the procedures and equipment used for the heptane removal tests and product analyses. Detailed data sheets are included by subsection for each of the three major coals tested. The following subsections contain batch test and continuous test data sheets:

- o Batch tests

- Subsection C-1, Pittsburgh No. 8

- Subsection C-2, Upper Freeport
- Subsection C-3, Illinois No. 6
- o Continuous tests
 - Subsection C-4, Pittsburgh No. 8
 - Subsection C-5, Upper Freeport
 - Subsection C-6, Illinois No. 6

BATCH AGGLOMERATION TESTS

Feed Sampling/Preparation

The feed material for the batch tests came in two forms, fine grinding mill slurry from CQDC and damp 1/4 inch x 0 cleaned coal.

CQDC Slurry Feed. The CQDC coal samples arrived in 55-gallon drums approximately one-half full of 30 percent solids slurry. Microtrac analysis of these samples showed all three to be 100 percent minus 62 microns particle diameter. The drums were sampled by agitating them with a 1/2 hp drum mixer for approximately 15 minutes after all the solids had been picked up from the bottom and a turbulent, well roiling surface was achieved. While agitation continued, a dip tube was placed approximately half way down into the drum and a 4-gallon aliquot pumped out into a bucket. Aliquots were then taken from the bucket for individual runs by vigorously agitating the bucket and ladling out the required volume. Samples for feed analysis were taken either by sampling the pump flow while filling the bucket or by agitating the bucket and ladling. For feed analysis, a 50-150 cc sample of slurry would be transferred into a large petri dish and dried at 110°C. The dried solids were analyzed for ash and sulfur. The slurry sample was analyzed for particle size, washability, and petrographic characteristics. Total sulfur and sulfur forms analysis were done by CTE (Chicago) for each feed material. The sulfur forms analysis was replicated in blind tests (averages were used in the lab data sheets). Each feed bucket was analyzed twice for both solids and ash content, and the average was reported. The duplicates varied by less than 0.15 percent for both ash and solids.

Because of the extreme fineness of these materials, well agitated slurries may be assumed to be completely homogeneous. Under very conservative assumptions, the settling velocity of the largest, densest particles that could possibly occur in these slurries is still less than 3 mm/sec, and the settling flow is laminar. Thus, the achievement of obviously turbulent bulk mixing in a vessel with complete pickup of solids from the bottom virtually guarantees that any technique of sampling the agitated vessel will give a representative sample.

Samples with additional grinding are discussed below.

1-hour Burundum Grinds. The objective of the 1-hour grind is to produce some fresh active surface without significantly altering the particle size distribution. Approximately 500 cc of undiluted slurry is placed in a 00 ball jar with 400 cc of 3/8-inch burundum cylinders and additive if any. The jar is rotated 1 hour at 110 rpm. The media is screened out of the slurry without any rinsing and the solids and ash content of the slurry are assumed to be unchanged. The ground material is sampled and analyzed only for particle size (which in all cases showed virtually no change from the feed). This material is then either agglomerated immediately or aged a few days, depending on the particular test.

24-Hour Grinds. The objective of the 24-hour grind is to comminute the material to the limit of a ball milling system. Maximum size reduction, however, was not achieved as a result of excessive slurry dilution. For the grinding, approximately 500 cc of undiluted slurry is placed in a 00 ball jar with approximately 400 cc of stainless steel balls sized from 1/4 to 3/4 inch and additive if any. The jar is rotated 24 hours at 110 rpm. The media is screened out of the slurry without any rinsing and the solids and ash content of the slurry are assumed to be unchanged. A small (<50 cc) sample of the mill product is taken and analyzed for particle size. This material is then either agglomerated immediately or aged a few days, depending on the particular test.

In the case of the 24-hour grind tests attrition of the mill and media contributes up to 2 percent in the apparent ash content of the ground slurry and adds about 0 to 5 percent to the total slurry solids concentration. These mill-contributed solids are hydrophilic materials and are rejected with the ash during agglomeration. They thus contribute nothing to the yield or composition of the coal product, but do introduce an error in the tailings weight and reject ash. Since the only objective in doing the long grind experiments was to determine if the fine grind would reduce residual ash and sulfur in the product, the discrepancy in the tailing analysis was acceptable.

Dry Coal Feed. Five-gallon samples of clean, damp 1/4 inch x 0 Illinois No. 6 and Upper Freeport coals were also received for batch testing. The objective in running these samples was to agglomerate them immediately after grinding from 1/4 inch to increase the likelihood of having a 'fresh' active surface to work with. Reduction in average particle size from 1/8 inch to 10uM results in about a 200-fold increase in surface area.

The 5-gallon samples were crudely mixed by doing some bucket-to-bucket transfers, and two small samples were scooped out at random to determine approximate moisture and ash. Based on the average of the two moisture results, enough sample was scooped out to equal 450 gm of dry coal. This material was charged to a 0 ball jar with 14 lb of tungsten carbide balls ranging in size from 1/4 to 3/4 inch. The slurry concentration was brought to 35 percent with DI water and additive, if any, was charged. The mill was rotated the desired number of hours and the slurry plus mill rinsing was sampled and analyzed for ash and solids (duplicate or triplicate). The average value of the multiple runs was reported. Total sulfur and sulfur forms analysis were done by CTE for each raw material with the forms analysis done blind in triplicate (averages were reported). An aliquot of slurry was also analyzed for particle size. These product slurries were then either agglomerated immediately or stored, refrigerated, for later use.

Agglomeration

The specified amount of slurry was weighed into a 40 oz Waring blender jar and diluted to the specified pulp density. The slurry charge was selected to produce a diluted slurry of approximately 600 cc. Heptane bridging liquid was added while running the blender at approximately 12,000 rpm. High speed agitation was continued for 1 to 2 minutes and then reduced to 8,000 rpm or less for a minute or two. The fine agglomerates produced during this procedure were then collected and rinsed on a 50- or 100-mesh screen. The rinsed agglomerates were then returned to the blender with fresh DI water and resheared at high speed with the addition of the asphalt-heptane binder solution. Agitation was reduced to near the minimum speed which maintained the vortex - about 6,000 rpm - and growth allowed for 5 to 10 minutes. The now larger agglomerates were again separated and rinsed at 100 mesh and then dried at 105°C. The combined tailings and rinsings - about 4 litres - were filtered on a 50 cm paper to recover reject solids. The papers were then dried at 105°C. Each test condition was run in duplicate.

Product Analysis

Each agglomerate product was weighed and analyzed for ash and total sulfur (by CTE) with selected samples tested for sulfur forms (by CTE). One product sample derived from each feed coal was also extracted with toluene to remove binder, and sent for petrographic evaluation. The reject solids weight was determined by difference from the filter paper tare. The solids were scraped from the filter paper and ashed to give an indication of ash reject. Due to the small sample size, no further analysis was done on the tailings.

The methods used for handling the tailings are not totally satisfactory for quantitative work due to three sources of uncertainty:

- o Particularly on the finest grinds, some solids and all of the sulfate sulfur pass the filter. Yet use of any finer paper would result in unreasonable filtration times, a problem that could have become quite severe given the number of tests done. Use of total evaporation was considered but rejected, again due to the lack of facilities to simultaneously evaporate that many 4-litre samples in a reasonable time, as well as the unknown level of dissolved mineral matter in the water.

- o Use of ashless filter paper with ignition of the entire filter with ash would be preferable to scraping of material from the filter paper, since the nonrecoverable material which permeates the paper may not be representative of the sample whole. But, again, due to the fine size of the material, large filter areas (50 cm) are required to achieve reasonable turnarounds. This, in turn, makes total ignition impractical.
- o The 50 cm filter papers cannot be dried and dessicated before use because they embrittle and then fail at an unacceptable rate when used in this service. This creates a variable uncertainty of up to 0.4 gm in the ash weight since the level of hydration of the fresh filter papers is weather-dependent.

CONTINUOUS AGGLOMERATION TESTS

Feed Preparation

Ten to 15 gallons of the CQDC fine ball mill product are transferred to the feed tank and sampled for solids concentration. Tap water is then added to adjust the slurry to the desired solids concentration and the slurry is sampled through the feed pump, under agitation, analyzed in duplicate for solids and ash, and its specific gravity measured.

Binder solution is made up as needed in batches of approximately 1 kg by weighing out 300 gms of Sunoco Monor asphalt crushed to about minus 1 inch and by adding 700 gms heptane. The jar is then sealed and rolled for 1 hour at about 50 rpm. This results in complete breakdown of the bulk solids. A magnetic stir bar is placed in the jar which is put on a stirring plate, and the lid is replaced with one to which has been added a dip-pipe connected to the binder feed pump. The stir plate is left on continuously at minimum speed.

Equipment

The continuous agglomerater is capable of producing approximately 2.5 kg/hr of product when supplied a feed slurry of 15 percent solids. There is one stage of high shear and one stage of low shear comprising the following items:

- o Slurry feed tank - 30 gallons with 1/2 hp propeller agitator

- o Slurry feed pump - Masterflex 8 mm ID tubing pump with 1-100 and 6-600 rpm continuously adjustable drives; 0-2.2 l/min output capacity
- o Bridging liquid feed tank - 20 l polyethylene carboy
- o Bridging liquid feed pump - FMI precision metering pump, 150 rpm, 1/4 inch stainless steel piston head; delivers 0-45 ml/min, continuously variable with micrometer adjustment
- o Binder feed tank - 4-liter jar with stir bar set on a high torque stirring plate
- o Binder feed pump - FMI precision metering pump, 50 rpm, 1/4 inch stainless steel piston head; delivers 0-13 ml/min, continuously variable with micrometer adjustment
- o High shear tank
 - Vessel - 1/2-liter stainless steel beaker with rubber-sealed bakelite lid; 4 1/10 D baffles, L/D ratio approx 1; slurry and bridging liquid feed to the reactor are combined at a tee close coupled to the 6-mm center bottom inlet; product discharges by gravity through an 18-mm top side outlet directly into the low shear tank
 - Drive - 1/3 hp series wound AC motor capable of up to 12,000 rpm, with speed measured by digital strobe tach and controlled via variable transformer; the drive motor is carried in a ball-bearing gimble allowing for direct measurement of torque with a force gauge; the wet end of the drive may be terminated with any of a number of impellers of known power and discharge factor; torque, power, shear rate, effective impeller power factors, and impeller cavitation can all be determined on this apparatus

The system can also be similarly configured using a 1-litre vessel.

- o Low shear tank
 - Vessel - The low shear tank is close-coupled to the high shear tank via 5 cm of 18 mm stainless steel tubing running from the upper side of the high shear to the upper side of the low shear; the vessel is an 8-liter stainless steel beaker with L/D ratio of approximately 1, 4 1/10-D baffles, and a lexan splash lid; discharge is through an 18-mm bottom side outlet; a low form heating plate may be installed below the vessel for elevated temperature runs, although since this vessel is

splash tight rather than vapor tight only moderate temperature increases are feasible; binder mixture is introduced directly through the top of the low shear tank via a piercing in the lid

- Drive - Standard configuration turbine impellers with precalibrated power factors are driven by a 1/3 hp 0-950 rpm drive with a solid state load compensating variable speed control; the controller is calibrated using the digital strobe tach; the use of precalibrated impellers in conjunction with accurate rotational speed measurement enables determination of horsepower requirements without the direct measurement of torque on this drive
- o Product screen - the low shear tank discharges directly onto an open, fixed 12-inch screen, usually 16 mesh
- o Reject sump - product screen underflow is collected in a 40-liter bucket

Agglomeration

Based on the dose rates and high shear residence time chosen for the run, feed, bridging liquid, and binder requirements are calculated and the pumps preset to the desired flows. The slurry tank agitator is turned on and allowed to run for 10-15 minutes to ensure uniform feed at startup.

The system is usually started up with the high shear reactor full and the low shear reactor empty. If this is not the case, the first operation is to run the slurry feed pump long enough to fill the high shear reactor to the overflow point.

The process timer (at T0), bridging liquid pump, slurry feed pump (if not already running), and high shear drive are turned on simultaneously. By moving the splash shield on the low shear tank out of the way, the agglomerates overflowing the high shear reactor can be observed and a few ml spooned out for closer examination. These observations form the basis for any adjustments made in the slurry feed rates or agitator speed.

When the level in the low shear tank rises enough to cover the impeller, the time is noted as T1 and the low shear drive and the binder flow are turned on. The process now continues running until the low shear tank is full.

At this point the time is again noted (as T_2) and the high shear agitator, slurry feed, and bridging liquid feeds are turned off. The low shear agitator and binder feed continue running until T_3 , where T_3 equals $T_2 + (T_1 - T_0)$, at which time the binder flow is turned off. The result of this procedure is that binder is fed for exactly as long as slurry and bridging liquid, which simplifies subsequent calculations. Low shear agitation continues until the desired residence time is achieved, usually about 10 minutes.

The low shear tank is now discharged to the screen by unstoppering the side bottom outlet. During discharge, a 1-liter sample of screen underflow is collected. This sample is subsequently filtered and the solids dried for ash analysis. When draining is complete the tank is restoppered; 3 or 4 litres of wash water are quickly charged to the vessel, agitated, and discharged over the product. Immediately, several hundred grams of the damp material are scooped off and placed in a sealed container for subsequent stripping tests and analysis.

The screen containing the remainder of the product is placed in the oven to dry at 105°C and a clean screen put in place; the timer is reset to zero and the entire operation is repeated as required. A minimum of two runs are done at each process condition; reported samples and data collection are done on the second (or later) run to ensure attainment of equilibrium.

On the completion of the run, the slurry feed rate for the run is precisely determined by diversion of the feed line to a 500- or 1000-ml graduate, and at least three measurements of either the volume or mass delivered in 1 minute. (The FMI bridging liquid and binder pumps are extremely accurate, and their settings are precisely reproducible, so only spot calibration checks are done on them during normal operation.) While the feed line is diverted a check sample may also be drawn for solids and/or ash analysis on the feed.

Product Analysis

Several hundred grams of product are dried at 105°C and set aside for use for subsequent ash, sulfur, and BTU testing.

A portion of the wet product is quickly weighed into an extraction thimble, placed into a Soxhlet extraction apparatus fitted with a Dean & Stark water collector, and extracted with toluene until the water collection is complete and extract is draining clear. This analysis allows determination of solids, water, and the sum of extractable binder and heptane to be determined.

BATCH HEPTANE REMOVAL AND PRODUCT EXTRACTION

There are two primary objectives for the stripping/drying tests:

- o Verification that a steam stripping system is capable of completely removing all the heptane from the agglomerated product
- o Observation of the nature of the stripped product, such as its screenability and handleability, and the effect of binder concentration on these properties

Feed Sampling and Preparation

The feed for the heptane removal consisted of the agglomerates recovered during the above continuous agglomeration procedures. The samples were recovered from the agglomeration slurry by screening, and immediately transferred to tightly closed jars to prevent loss of heptane.

Equipment

The stripping unit consists of a resin flask, which is a 1-liter round bottom straight-sided glass flask with a ground glass flange around the top. This flange mates with a glass lid containing four standard taper joints for attachments. The flanges are sealed together by screwing together two metallic flange rings. To one of the tapered openings, a distillation head, with a vapor thermometer is attached. A modified Liebig condenser is attached to the distillation head and a Graham condensor (for subcooling of the condensate) is attached to the Liebig condensor by means of an elbow joint. A

small opening is left in the elbow joint to allow for release of pressure. In another tapered opening, a steam sparger is placed. The sparger, which has a 1-inch base, is connected to an 8-liter pressure cooker by means of a valved tube. Finally, a thermometer is placed into another opening to measure the bath temperature. The fourth opening is plugged with a glass stopper. A graduated cylinder is used to collect the distillate and provide measurement. A heating mantle, controlled by a transformer, is used to keep the resin flask warm. A Masterflex pump with a glass dip-tube attached is used for draining the resin flask of water when the procedure requires. Agitation is provided by a variable speed motor, monitored by a digital speed tachometer.

Heptane Removal

Prior to each stripping run, the pressure cooker is turned to "HI" and the steam tubing valved to allow the steam to vent. When steam is desired, the vent valve is closed and steam enters the resin flask through the sparger.

Approximately 150 gm of the damp product collected from the continuous unit discharge screen is charged to the resin flask with approximately 600 ml of distilled water, using a funnel. The water used to charge the flask is removed using the Masterflex pump. (This step was not done on early Pittsburgh No. 8 runs.) When the water is removed, the pump is stopped, the dip-tube is removed, and a thermometer is added to record the bath temperature. Initial temperatures of the bath and vapor are taken, and the mantle used for heating the resin flask is turned on to approximately 60 volts. The valve for the steam is opened and steam flows into the resin flask. Readings for the vapor temperature, bath temperature, total volume collected, and water volume collected (volume at the interface), are taken every 15 seconds until the vapor temperature becomes constant or, in a few cases, until the distillate receiver is too full to continue.

When the vapor temperature has stabilized for a minute or so, the steam bypass is opened, the mantle is turned off, and cold water is added to the resin flask to cool the product. The resin flask lid is removed, an agitator is placed inside the flask, and the product is agitated for 2 minutes at approximately 500 rpm. The purpose of this step is to determine how much

fines generation might be expected if the product requires complete reslurrying to remove it from the stripping vessels in the POC plant. After this, the product is screened through a 50-mesh screen. A sample of the +50 mesh solids is taken for an extraction analysis. The rest is oven dried; an ash analysis is done on the dried product. The -50 mesh underflow is filtered on an oven-dried, preweighted filter paper. The filter paper and filtrate are dried in the oven, and then weighed. The solids left on the filter paper are scraped off, and an ash analysis is done to determine if the losses are coal or residual ash.

Product Analysis

As noted above, ash analysis is done on the products from the stripping operation. Weights of these products are also recorded.

A sample of the +50 mesh product is extracted using the Soxhlet/Dean & Stark apparatus, which in this case has been charged with a weighed amount of fresh spectrascopic grade toluene as the extraction medium. Extraction is continued for approximately 12-15 hours to attempt to completely extract the binder asphalt from the product agglomerates. Since the heptane level in the stripped agglomerates is very low, the oil level determined in the solids-oil-water calculation should be equal to the asphalt concentration in the product, if the asphalt is completely extractable. Comparison of the oil levels determined from the extraction against the known asphalt charge for a given run will allow determination of whether toluene extraction is a viable method of determining the asphalt concentration in product agglomerates. When this extraction is complete, a sample of the toluene extract, which contains the residual heptane and binder components, is distilled to remove the nonvolatile asphalt residues and analyzed by gas chromatography to determine heptane residue.

END

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