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Title/Desc:

HC-21C OFF GAS TEST REPORT

<div style="display: flex; justify-content: space-between; align-items: center;"> <div> Sta 5 SEP 20 1995 </div> <div style="text-align: center;"> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;">12</div> ENGINEERING DATA TRANSMITTAL </div> <div> Page 1 of 1 1. EDT 155821 </div> </div>				
2. To: (Receiving Organization) Distribution		3. From: (Originating Organization) PFP Process Engineering		4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Sludge Stab.		6. Cog. Engr.: W.S. Lewis		7. Purchase Order No.: N/A
8. Originator Remarks: None				9. Equip./Component No.:
				10. System/Bldg./Facility: 73T/234-5Z/PFP
11. Receiver Remarks:				12. Major Assm. Dwg. No.:
				13. Permit/Permit Application No.: N/A
				14. Required Response Date:

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-CP-TRP-063	1	0	HC-21C Off-Gas Test Report	NA	1	1	

16. KEY					
Approval Designator (F)		Reason for Transmittal (G)		Disposition (H) & (I)	
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)		1. Approval	4. Review	1. Approved	4. Reviewed no/comment
		2. Release	5. Post-Review	2. Approved w/comment	5. Reviewed w/comment
		3. Information	6. Dist. (Receipt Acknow. Required)	3. Disapproved w/comment	6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G)	(H)	(J) Name (K) Signature (L) Date (M) MSIN				(J) Name (K) Signature (L) Date (M) MSIN				(G)	(H)
Reason	Disp.									Reason	Disp.
1		Cog. Eng. W.S. Lewis <i>[Signature]</i> 8/1/95 15-55									
1		Cog. Mgr. M.W. Gibson <i>[Signature]</i> 8/9/95 15-55									
		QA									
		Safety									
		Env. <i>[Signature]</i> 8/1/95									
3		CENTRAL FILES AB-88 LB-04									
3		O.S.T.I. <i>[Signature]</i> 8/1/95 (2) LB-07									

18. <i>[Signature]</i> L.T. Cunningham Signature of EDT Originator Date 8-9-95		19. N/A Authorized Representative Date for Receiving Organization		20. <i>[Signature]</i> M.W. Gibson Cognizant Manager Date 8/1/95		21. DOE APPROVAL (if required) Ctrl. No. N/A ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments	
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RELEASE AUTHORIZATION

Document Number: WHC-SD-CP-TRP-063, REV 0

Document Title: HC-21C Off-Gas Test Report

Release Date: 9/12/95

**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara M. Broz

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SUPPORTING DOCUMENT

1. Total Pages 35

2. Title

HC-21C Off-Gas Test Report

3. Number

WHC-SD-CP-TRP-063

4. Rev No.

0

5. Key Words

HC-21C, Thermal Stabilization, Off-gas, 26-inch Vacuum, Plutonium

6. Author

Name: L.T. Cunningham

Signature

LTC - L 8-9-95

Organization/Charge Code 15530/K6031

7. Abstract

This test report provides the results and conclusions from the HC-21C Off-Gas Test Procedure.

8.

RELEASE STAMP

OFFICIAL RELEASE
BY WHC
DATE SEP 20 1995

(12)

Sta 5

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1.0 INTRODUCTION

Test procedure WHC-SD-CP-TC-032, HC-21C Off-Gas Test Procedure, was performed to determine the cause and establish a method of the elimination of liquid formation in the HC-21C Furnace off-gas system. This report discusses the findings of the test procedure and the changes implemented.

2.0 DESCRIPTION OF TEST

2.1 Pre-Test Modifications

Prior to initiating test procedure WHC-SD-CP-TC-032, the following design changes were implemented:

- The off-gas heat exchangers were removed.
- The plastic rotameters were replaced with a borosilicate glass rotameter.
- The Inconel 600 off-gas tubing downstream of the filter housing was replaced with 304L stainless steel tubing.
- The needle valves were moved to allow the rotameters to be on the vacuum side of the valve.

Advantages gained through these changes were:

- Removal of the off-gas heat exchangers helped maintain a higher off-gas temperature in hopes to reduce condensation in the rotameters.
- The new glass rotameters provide a greater temperature rating and have a larger float diameter than the previously used plastic rotameters. Should liquid accumulate in the rotameter, the larger diameter float reduces the effect on gas flow measurements.
- Resistance to nitric acid corrosion was increased by the replacement of the Inconel 600 with 304L stainless steel piping.
- Relocation of the needle valves maintains a greater portion of the off-gas system (including the rotameters) in a vacuum atmosphere. The acid or water vapors will be at a greater temperature once they reach the vacuum atmosphere, thus minimizing vapor will condensation.

2.2 Test Performance

Testing was performed with temporary thermocouples installed on the off-gas systems as shown in Attachments 1 and 2. The thermocouple wire was run through the 11-inch bag port on the south end of HC-21C. Off-gas piping temperatures from in the glovebox were monitored with a temperature monitor. The temperatures taken on the exterior of the glovebox were taken with a WAHL Thermocouple with a type K probe or a WAHL Heat Spy.

Limited difficulties transpired during testing. Periodically, small amounts of liquid were seen in the rotameters. The condensation formed a ring above the float. The amount of liquid that condensed did not create a problem, but the residue after evaporation would cause the float to temporarily stick. The rotameters were eventually changed out and cleaned. The green coloration of

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2.2 Test Performance (cont.)

the residual material indicates the presence of corrosion products remaining from the degradation of the Inconel 600 tubing.

The rotameters were subject to off-gases that appeared to contain NO_x fumes. The NO_x gases would discolor the rotameter sight glass and required the rotameters to be replaced or removed and cleaned.

2.3 Off-gas Temperature Profile

The off-gas test provided an increased knowledge of the temperature profile for the off-gas piping. Test data shows a rapid decrease in temperature for the off-gas tubing. During testing, the highest inlet filter housing temperature was 322°C and 374°C for furnace 1 and 2, respectively. The average measured maximum temperatures for filter inlet, glovebox wall, and rotameter inlet for furnace 1 are 313°C, 104°C, and 69°C, respectively. The temperatures for furnace 2 are 231°C, 98°C, and 65°C. The development of this temperature profile for each of the two furnaces was significant as it provides additional justification for the removal of the heat exchangers and replacement of the Inconel 600 tubing. Attachments 3 and 4 show the temperature profiles of the peak temperatures attained at each reading location for both furnaces. Attachments 5-14 show the temperature profiles for the data locations for each of the test runs. Attachment 16 contains the data sheets.

2.4 After Test Modifications

A orifice design to monitor off-gas flow was completed and installed. This modification was driven by the discoloration of the rotameter sight glass. This limited the operators ability to read the flow rate. A test done by the Plutonium Process Support Laboratories (PPSL) tested a calculated orifice size under processing conditions. This information was incorporated into the design. Attachment 15 shows the off-gas configuration with the orifices. The new configuration calls for the rotameters to be used to setup flow and then be by-passed during the furnace operation. The differential pressure across the orifice is used to monitor the off-gas flow.

3.0 CONCLUSIONS

The modifications done to the off-gas system before and after the testing reduced the frequency of liquid formation in the off-gas piping. These changes have also reduce the consequences should condensation occur in the off-gas tubing. The installation of the orifice design has reduced the frequency the rotameters need to be replaced or cleaned. As a result, process down time has been reduced.

The temperature profile provides an idea where condensation would most likely occur. This provides a basis for where the more corrosive resistant 304L stainless steel can be used to replace Inconel 600.

Attachment 1 - Furnace 1 Reading Locations

Attachment 1: Furnace 1 Arrangement

Attachment 2 - Furnace 2 Reading Locations

Attachment 2: Furnace 2 Arrangement

Attachment 3 - Furnace 1 Temperature Profile

Temperature Profile

by Position for Furnace 1

Attachment 4 - Furnace 2 Temperature Profile

Temperature Profile
by Position for Furnace 2

Attachment 5 - Furnace 1 Temperature Profile for 2/3/95

Attachment 6 - Furnace 2 Temperature Profile for 2/3/95

Temperature Profile

For Furnace 2 Operation on 2/3/95

Attachment 7 - Furnace 1 Temperature Profile for 2/6/95

Temperature Profile

For Furnace 1 Operation on 2/6/95

Attachment 8 - Furnace 2 Temperature Profile for 2/6/95

Temperature Profile

For Furnace 2 Operation on 2/6/95

Attachment 9 - Furnace 1 Temperature Profile for 2/7/95

Temperature Profile

For Furnace 1 Operation on 2/7/95

Attachment 10 - Furnace 2 Temperature Profile for 2/7/95

Temperature Profile

For Furnace 2 Operation on 2/7/95

Attachment 11 - Furnace 1 Temperature Profile for 2/8/95

Temperature Profile

For Furnace 2 Operation on 2/8/95

Attachment 12 - Furnace 2 Temperature Profile for 2/8/95

Temperature Profile

For Furnace 1 Operation on 2/8/95

Attachment 13 - Furnace 1 Temperature Profile for 2/13/95

Temperature Profile

For Furnace 1 Operation on 2/13/95

Attachment 14 - Furnace 2 Temperature Profile for 2/13/95

Temperature Profile

For Furnace 2 Operation on 2/13/95

Attachment 15 - HC-21C Orifice Design

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Attachment 16 - Data Sheets

THINK **ALARA** IN ALL WE DO

VACUUM ON ROTAMETER TEST DATA SHEET

Page 1 of 3

Date Test is Started: 2/3/95

Test Engineer: <i>DC/L</i>		Date: 1986-12-30													
Time	<i>0950</i>	1020	1030	1045	1100	1115	1130	1145	1200	1215	1230	1245	1300	1315	
TIC-21C-2A <i>23.9</i> Furn 1 Inlet (°C)	96	252	313	380	454	530	573	621	671	715	743	779	806	840	
Filter F-21C-1 Inlet (°C)	-10	96	112	129	145	152	177	188	199	211	218	226	233	240	
Filter F-21C-1 Outlet (°C)	19	41	47	53	59	63	72	81	87	93	100	106	110	114	
Off-gas Tubing (Furn 1) @ glovebox wall (°F)	74	78	82	87	104	112	119	125	132	137	141	163	164	170	
FI-21C-1 Inlet (°F)	76	81	82	83	93	95	100	103	110	108	117	124	120	115	
FI-21C-1 Outlet <i>23.9</i> Furn 1 Inlet (°F)	75	76	77	80	80	86	93	97	99	89	87	92	90	90	
TIC-21C-2B <i>23.7</i> Furn 2 Inlet (°C)	25	112	167	235	309	405	460	529	573	623	672	721	746	780	
Filter F-21C-2 Inlet (°C)	21	43	54	62	69	78	93	98	100	106	115	122	125	130	
Filter F-21C-2 Outlet (°C)	21	24	27	30	33	37	42	47	51	54	58	62	65	69	
Filter F-21C-2 Bottom (°C)	22	26	25	29	35	39	44	52	59	66	72	80	86	92	
Off-gas Tubing (Furn 2) @ glovebox wall (°F)	75	77	80	84	92	99	104	108	114	120	125	133	138	140	
FI-21C-2 Inlet (°F)	74	79	79	78	81	91	96	102	106	99	105	108	108	113	
FI-21C-2 Outlet (°F)	74	76	77	75	77	84	86	86	94	85	88	86	86	86	
Initial Vacuum Reading PI-21C-1 => <i>29</i> in.Hg		Initial setting for FI-21C-1 => <i>40</i> % and FI-21C-2 => <i>38</i> %													

Comments ROTAMETER INLET/OUTLET TEMPS TAKEN USING WAHL HEAT SPY, 'GLOVEY WALL' READINGS TAKEN WITH WAHL THERMOCOUPLE, TYPE K, ROBE. FURNACE 1 STARTED AT 0936 WITH OXIDE CHARGES 95-02-001 IN FURNACE 1 AND 95-02-2 IN FURNACE 2. FURNACE 2 STARTED AT 1004. THE THERMOCOUPLE WIRES WERE CONNECTED BACKWARDS FOR 0150 READING.

TEST PROCEDURE	SLUDGE STABILIZATION TEST PROCEDURE	WHC-SD-CP-TC-032 REV-1 PAGE 17 OF 23
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VACUUM ON ROTAMETER TEST DATA SHEET

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Date Test is Started: 2/3/95

Test Engineer:		Date: 12/3/1983															
Time		13:30	13:45	14:00	14:20	14:45	15:00	15:15	15:30	15:45	16:00	16:15	16:30	16:45	17:00	17:15	
TIC-21C-1A	(°C)	872	897	921	951	975	993	1000	1000	1000	1000	925	817	745	680	630	
Filter F-21C-1 Inlet	(°C)	248	255	261	269	275	280	284	280	283	284	275	254	239	224	213	
Filter F-21C-1 Outlet	(°C)	119	123	127	134	138	141	148	148	147	150	152	151	149	140	143	
Off-gas Tubing (Furn 1) @ glovebox wall	(°F)	175	176	186	188	196	188	189	188	189	212	206	210	213	212	209	
FI-21C-1 Inlet	(°F)	84	86	91	104	106	98	100	99	101	97	132	117	99	94	94	
FI-21C-1 Outlet	(°F)	80	82	83	94	94	96	97	98	99	87	88	92	90	87	95	
TIC-21C-2B	(°C)	811	837	873	916	939	957	1003	1002	1001	1000	1000	1000	914	834	754	
Filter F-21C-2 Inlet	(°C)	133	135	139	147	149	152	159	153	154	156	159	159	153	144	136	
Filter F-21C-2 Outlet	(°C)	72	75	78	84	87	90	97	96	98	100	102	104	105	100	100	
Filter F-21C-2 Bottom	(°C)	99	103	109	118	124	129	140	139	141	143	146	149	150	150	149	
Off-gas Tubing (Furn 2) @ glovebox wall	(°F)	142	144	149	154	165	166	173	180	205	167	165	180	181	185	181	
FI-21C-2 Inlet	(°F)	91	94	96	100	103	98	101	100	101	107	111	112	112	112	107	
FI-21C-2 Outlet	(°F)	84	86	87	89	93	90	96	96	95	88	91	89	93	94	95	
Initial Vacuum Reading PI-21C-1 =>		in.Hg				Initial setting for FI-21C-1 =>				% and FI-21C-2 =>				% and FI-21C-2 =>			

Comments At 16:40 Furnace 2 finished heating cycle.

TEST PROCEDURE

SLUDGE STABILIZATION TEST PROCEDURE

WMC-SD-CP-TC-032

REV-1

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VACUUM ON ROTAMETER TEST DATA SHEET

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Date Test is Started: 8/31/95

Test Engineer: M. H. DeCicco

Time	1730	1745	1800	1815	1830	1845	1900	1915	1930	1945	2000	2015	2030	2045	2145
TIC-21C-1-A ²⁻²⁻⁹⁵	582	544	506	476	442	418	395	370	349	330	313	296	281	265	138
Filter F-21C-1 Inlet (°C)	202	193	183	175	166	160	153	146	140	135	129	124	120	115	34
Filter F-21C-1 Outlet (°C)	139	136	132	129	125	122	119	116	112	109	106	103	100	98	51
Off-gas Tubing (Furn 1) @ glovebox wall (°F)	207	200	198	197	192	191	184	183	176	175	170	169	164	163	107
FI-21C-1 Inlet (°F)	94	96	96	96	96	96	96	94	94	93	92	92	91	92	79
FI-21C-1 Outlet (°F)	90	96	92	91	88	86	85	87	86	86	82	83	84	82	73
TIC-21C-2-B ²⁻²⁻⁹⁵	694	650	604	568	527	499	469	437	412	390	368	349	331	311	200
Filter F-21C-2 Inlet (°C)	130	124	118	113	108	106	101	97	93	89	86	84	81	77	62
Filter F-21C-2 Outlet (°C)	106	105	103	102	100	99	97	95	94	92	90	88	86	84	70
Filter F-21C-2 Bottom (°C)	146	143	139	136	132	129	125	121	118	114	111	108	105	101	79
Off-gas Tubing (Furn 2) @ glovebox wall (°F)	177	174	174	171	170	168	168	164	162	155	155	151	151	145	132
FI-21C-2 Inlet (°F)	107	109	109	110	110	109	105	106	104	103	103	103	104	95	81
FI-21C-2 Outlet (°F)	90	93	94	94	94	88	94	93	88	89	90	85	88	88	85
Initial Vacuum Reading FI-21C-1 =>															
Initial setting for FI-21C-1 =>															
Initial Vacuum Reading FI-21C-2 =>															
Initial setting for FI-21C-2 =>															

Comments At 16:53 26" vacuum pumps were switched no noticeable difference in flow was seen. Data

TEST PROCEDURE	SLUDGE STABILIZATION TEST PROCEDURE	WNC-SD-CP-TC-032 REV-1 PAGE 12 OF 23
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VACUUM ON ROTAMETER TEST DATA SHEET

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Date Test is Started: 2/06/95

Test Engineer: M.L. Davies		1010	1025	1040	1055	1110	1125	1140	1155	1210	1225	1240	1255	1310	1325	1340
Time	1010	1025	1040	1055	1110	1125	1140	1155	1210	1225	1240	1255	1310	1325	1340	
TIC-21C-1A Inlet (°C)	30	118	192	365	347	411	491	542	592	644	692	732	759	788	820	
Filter F-21C-1 Inlet (°C)	24	55	79	98	120	135	151	161	175	183	195	193	203	212	219	
Filter F-21C-1 Outlet (°C)	23	20	34	40	47	53	60	62	67	72	77	80	83	86	90	
Off-gas Tubing (Furn 1) @ glovebox wall (°F)	76	78	84	91	99	102	113	115	123	125	133	131	137	136	143	
FI-21C-1 Inlet (°F)	76	76	77	79	84	86	92	95	100	101	103	105	105	106	109	
FI-21C-1 Outlet (°F)	74	74	76	77	80	81	84	87	88	92	94	94	95	96	97	
TIC-21C-2 Inlet (°C)	30	117	190	265	345	409	488	543	591	640	690	727	757	788	819	
Filter F-21C-2 Inlet (°C)	24	44	58	69	79	88	98	105	110	105	106	107	108	110	112	
Filter F-21C-2 Outlet (°C)	24	25	29	32	35	37	41	44	47	48	48	49	50	51	53	
Filter F-21C-2 Bottom (°C)	23	24	27	31	36	40	45	51	56	61	63	66	68	70	72	
Off-gas Tubing (Furn 2) @ glovebox wall (°F)	77	78	83	85	93	96	102	104	112	109	111	109	112	110	113	
FI-21C-2 Inlet (°F)	76	76	77	79	82	84	86	89	91	91	91	91	90	89	90	
FI-21C-2 Outlet (°F)	74	74	76	77	78	80	81	82	84	84	84	84	83	83	83	
Initial Vacuum Reading PI-21C-1 => 18 in.Hg Initial setting for FI-21C-1 => 30 % and FI-21C-2 => 30 %																

Comments: A furnace were started about 10:07. LEAKS REG NOTED ABOVE PLUMET F-21C-1 AT 12:35

THINK

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TEST PROCEDURE	SLUDGE STABILIZATION TEST PROCEDURE	WHC-SD-CP-TC-032 REV-1 PAGE 17 OF 23
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VACUUM ON ROTAMETER TEST DATA SHEET
Page 2 of 3
Date Test is Started: 2/06/95

Test Engineer: Greg Funsten																
Time	1355	1410	1425	1440	1455	1510	1525	1540	1555	1610	1625	1640	1655	1710	1725	
TIC-21C-1A <small>1400 2-6-95 A.D. N/A</small> (°C)	852	882	910	928	952	965	984	1002	1001	1000	1001	1000	866	790	734	
Filter F-21C-1 Inlet (°C)	226	332	238	241	248	251	258	267	268	267	267	268	248	235	223	
Filter F-21C-1 Outlet (°C)	93	96	100	103	104	108	112	116	119	122	125	126	127	127	126	
Off-gas Tubing (Furn 1) @ glovebox wall (°F)	140	151	148	150	156	156	165	171	171	167	168	167	178	165	186	
FI-21C-1 Inlet (°F)	109	111	112	114	114	115	117	119	120	122	127	128	130	127	129	
FI-21C-1 Outlet (°F) <small>1400 2-6-95 A.D. N/A</small>	98	99	100	99	100	101	101	105	105	102	108	109	109	109	106	
TIC-21C-2A <small>1400 2-6-95 A.D. N/A</small> (°C)	851	882	909	928	952	965	983	1002	1001	1000	1000	1001	875	800	738	
Filter F-21C-2 Inlet (°C)	119	124	129	134	135	134	133	132	132	130	126	126	159	152	145	
Filter F-21C-2 Outlet (°C)	55	57	60	63	65	66	67	68	69	70	71	71	78	82	84	
Filter F-21C-2 Bottom (°C)	74	77	81	85	89	91	94	95	97	98	99	99	104	110	113	
Off-gas Tubing (Furn 2) @ glovebox wall (°F)	113	122	120	125	125	127	128	132	132	133	139	140	142	135	152	
FI-21C-2 Inlet (°F)	92	92	94	95	96	98	98	98	98	97	97	98	110	113	117	
FI-21C-2 Outlet (°F)	84	81	85	86	87	88	87	88	88	87	88	89	91	98	96	
Initial Vacuum Reading FI-21C-1 => 20 in.Hg Initial setting for FI-21C-1 => 38 % and FI-21C-2 => 40 %																

Comments: Readings for Tubing can be off if pipe joined to test material, after assuring
tubing is tight, temps went up considerably (starting at 1725). Tubes re lining time > 5 min to get
good tubing feeling

TEST PROCEDURE	SLUDGE STABILIZATION TEST PROCEDURE	WHC-SD-CP-TC-032 REV-1 PAGE 17 OF 23
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VACUUM ON ROTAMETER TEST DATA SHEET

Page 3 of 3

Date Test is Started: 02/06/95

Test Engineer: Greg Funsten																
Time	02/06/95	1740	1755	1810	1825	1840	1855	1910	1925	1940	1955	2010	2025	2040	2055	2110
TIC-21C-1A	MLO 2-6-95 A.D. N/A	659	619	577	533	479	460	428	396	375	360	339	320	300	280	267
60 Filter F-21C-1 Inlet	(°C)	213	206	198	187	173	165	156	149	143	137	131	125	119	115	
5 Filter F-21C-1 Outlet	(°C)	125	126	125	123	120	120	117	114	111	109	105	102	99	95	93
Off-gas Tubing (Furn 1) @ glovebox wall	(°F)	190	185	184	188	188	185	184	181	182	179	172	167	165	160	160
FI-21C-1 Inlet	(°F)	131	134	135	134	134	139	140	140	136	136	137	133	128	128	127
FI-21C-1 Outlet	(°F)	109	110	115	118	119	120	120	120	119	116	115	113	112	111	111
TIC-21C-2B	MLO 2-6-95 A.D. N/A	679	642	603	562	511	495	465	435	412	395	371	352	329	307	292
4 Filter F-21C-2 Inlet	(°C)	136	135	126	121	113	111	107	102	98	96	92	89	85	81	80
3 Filter F-21C-2 Outlet	(°C)	86	86	86	86	86	85	84	83	82	81	80	79	77	75	74
2 Filter F-21C-2 Bottom	(°C)	114	114	114	113	110	109	107	105	103	101	99	96	94	91	89
Off-gas Tubing (Furn 2) @ glovebox wall	(°F)	158	156	156	153	153	152	154	153	150	147	146	144	139	137	136
FI-21C-2 Inlet	(°F)	121	121	121	122	122	120	121	120	121	120	119	117	116	116	114
FI-21C-2 Outlet	(°F)	104	105	105	105	105	105	105	105	105	104	104	103	103	102	100
Initial Vacuum Reading PI-21C-1 => 20 in.Hg Initial setting for FI-21C-1 => 40 % and FI-21C-2 => 38 %																

Comments

TEST PROCEDURE

SLUDGE STABILIZATION TEST PROCEDURE

WHC-SD-CP-TC-032

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LOWER DWELL TEMPERATURE TEST DATA SHEET

Page 1 of 4

Date Test is Started: 2/07/95 Lower Dwell Temp: 110 °C

Test Engineer: JAC																
Time	AD NA NBA 2/27/95	0830	0845	0900	0915	0930	0945	1000	1015	1030	1045	1100	1115	1130	1145	1200
TIC-21C-1A	(°C)	47	126	122	108	111	110	176	183	173	261	350	419	496	551	591
Filter F-21C-1 Inlet	(°C)	33	59	62	57	58	57	76	87	84	110	130	147	165	179	180
Filter F-21C-1 Outlet	(°C)	31	34	38	40	41	41	48	50	52	55	57	63	72	79	81
Off-gas Tubing (Furn 1) @ glovebox wall	(°F)	82	86	91	93	96	95	107	114	111	109	110	120	129	135	139
FI-21C-1 Inlet	(°F)	77	80	82	85	86	87	90	100	96	95	94	96	97	97	102
FI-21C-1 Outlet	(°F)	75	77	78	80	82	82	86	98	92	85	84	87	87	90	89
TIC-21C-2B	AD NA NBA 2/27/95 (°C)	48	125	122	107	112	109	179	184	173	261	348	410	492	551	590
Filter F-21C-2 Inlet	(°C)	29	45	48	46	47	46	60	60	58	78	90	100	111	118	122
Filter F-21C-2 Outlet	(°C)	29	30	32	34	35	36	39	43	40	44	43	45	51	55	59
Filter F-21C-2 Bottom	(°C)	29	29	31	33	35	36	37	40	42	44	49	53	60	67	73
Off-gas Tubing (Furn 2) @ glovebox wall	(°F)	82	84	88	91	93	94	105	113	109	115	106	108	93	126	131
FI-21C-2 Inlet	(°F)	77	79	81	84	85	86	91	101	96	94	93	93	91	100	107
FI-21C-2 Outlet	(°F)	75	77	78	80	81	82	86	93	93	93	88	85	85	89	91
Initial Vacuum Reading PI-21C-1 => 19 in.Hg Initial setting for FI-21C-1 => 38 % and FI-21C-2 => 38 %																

Comments DEVIATION @ 0850. Program 2 RESTARTED @ 0857. OVERSIGHT TO LARGE, MAY WANT TO SLOW INITIAL RAMP RATE TO 150 °/hr. 0958 BOTH FURNACES WERE HEATING WAS STOPPED BY PRESSING STOP CYCLE WHILE THE CONTROLLER CONTINUED. THE START BUTTONS WERE PRESSED AT 1002. THIS AVERTED A MASSIVE OVERSIGHT AND POTENTIAL DEVIATION ALARM. FI-21C-1 STARTED TO CLIMB @ 1005. FLOW WAS ADJUSTED FROM 54% TO 40% ON FI-21C-1. GREEN SOLUTION APPEARED IN FI-21C-1 @ 1007. @ 10:53 deviation alarm FI-21C-1, Reset on oxide program.

THINK BEFORE YOU DO IN ALL WE DO

TEST PROCEDURE	SLUDGE STABILIZATION TEST PROCEDURE	WMC-SD-CP-TC-032 REV-1 PAGE 18 OF 23
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LOWER DWELL TEMPERATURE TEST DATA SHEET

Page 2 of 4

Date Test is Started: 2/7/95 Lower Dwell Temp: 110 °C

Test Engineer: <i>WBL</i>																	
Time		12:15	12:30	12:45	13:00	13:15	13:30	13:45	14:00	14:30	14:45	15:00	15:15	15:45	16:00	16:30	
TIC-21C-1A <i>NO 1A</i> <i>WBL 2/2/2/2</i> (°C)		643	699	731	760	806	831	853	811	708	753	776	819	863	915	953	
6	Filter F-21C-1 Inlet (°C)	191	204	213	220	233	245	250	133	229	236	233	242	252	264	272	
5	Filter F-21C-1 Outlet (°C)	84	89	93	97	104	109	113	87	120	123	123	123	124	131	136	
Off-gas Tubing (Furn 1) @ glovebox wall (°F)		140	146	146	150	161	163	161	165	163	166	166	162	180	160	197	
FI-21C-1 Inlet (°F)		108	112	115	115	122	118	120	108	115	125	140	146	118	122	150	
FI-21C-1 Outlet (°F)		94	101	94	100	100	101	100	98	100	98	121	121	107	114	107	
TIC-21C-2B <i>NO 2B</i> <i>WBL 2/2/2/2</i> (°C)		639	697	730	758	797	831	851	890	936	950	968	991	1002	1000	897	
4	Filter F-21C-2 Inlet (°C)	128	136	141	145	170	177	181	195	176	174	177	181	177	177	170	
3	Filter F-21C-2 Outlet (°C)	62	66	69	71	82	91	97	109	114	110	110	111	112	113	115	
2	Filter F-21C-2 Bottom (°C)	79	86	93	96	110	120	130	146	166	164	163	165	168	168	170	
Off-gas Tubing (Furn 2) @ glovebox wall (°F)		136	132	134	144	162	178	185	194	200	203	190	184	164	172	174	
FI-21C-2 Inlet (°F)		103	105	115	117	115	120	129	145	154	151	143	159	150	135	140	
FI-21C-2 Outlet (°F)		100	101	103	97	98	97	97	101	111	110	140	136	123	124	115	
Initial Vacuum Reading PI-21C-1 =>		in.Hg		Initial setting for FI-21C-1 =>				%		and FI-21C-2 =>						%	

Comments Moisture gone from Retentate @ about furnace Temp of 450 °C. Green residue on sides slight sticking but not bad. 13:55 Furnace / Shutdown due to a diversion alarm. Furnace restarted 14:20. Retentate 2 broke free.

TEST PROCEDURE	SLUDGE STABILIZATION TEST PROCEDURE	WMC-SD-CP-TC-032 REV-1 PAGE 18 OF 23
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LOWER DWELL TEMPERATURE TEST DATA SHEET

Date Test is Started: 2/7/95 Page 3 of 4 Lower Dwell Temp: °C

Test Engineer: Gary Fruston																
Time	1700	1730	1745	1800	1815	1830	1845	1900	1915	1930	1945	2000	2015	2030	2045	
TIC-21C-1A ^{AP AQ} not 2/24/95 (°C)	985	1002	1002	1000	1000	897	803	911	960	523	535	515	488	459	435	
Filter F-21C-1 Inlet (°C)	211	285	285	285	285	271	249	231	220	205	193	188	182	173	169	
Filter F-21C-1 Outlet (°C)	130	143	145	146	147	147	146	143	141	138	135	134	131	127	126	
Off-gas Tubing (Furn 1) @ glovebox wall (°F)	177	190	200	205	207	211	207	208	205	204	196	198	197	196	195	
FI-21C-1 Inlet (°F)	138	147	149	148	150	149	144	148	147	150	151	150	149	148	147	
FI-21C-1 Outlet (°F)	122	123	124	125	127	126	124	128	127	130	131	132	131	130	129	
TIC-21C-2B ^{AP AQ} not 2/24/95 (°C)	757	1068	615	580	543	504	470	432	410	366	345	333	319	301	286	
Filter F-21C-2 Inlet (°C)	158	142	134	131	125	120	114	109	105	100	96	94	91	87	86	
Filter F-21C-2 Outlet (°C)	115	31	32	34	32	29	24	26	26	25	25	25	27	25	26	
Filter F-21C-2 Bottom (°C)	161	58	152	150	145	140	134	129	124	119	115	113	111	107	104	
Off-gas Tubing (Furn 2) @ glovebox wall (°F)	187	190	192	196	195	193	189	181	179	190	177	178	171	169	167	
FI-21C-2 Inlet (°F)	142	150	149	150	149	147	146	142	143	143	141	142	141	140	138	
FI-21C-2 Outlet (°F)	115	26	121	127	127	125	126	125	125	125	121	122	122	123	121	
Initial Vacuum Reading PI-21C-1 => 19 in.Hg Initial setting for FI-21C-1 => 45 % and FI-21C-2 => 43 %																

Comments The 1930 reading was taken 10 min later.

TEST PROCEDURE

SLUDGE STABILIZATION TEST PROCEDURE

WHC-SD-CP-TC-032

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LOWER DWELL TEMPERATURE TEST DATA SHEET

Page 4 of 4

Date Test is Started: 2/17/95 Lower Dwell Temp: °C

Test Engineer:

Time

TIC-21C-2A ~~Wet~~ 2/27/95 (°C)

Filter F-21C-1 Inlet (°C)

Filter F-21C-1 Outlet (°C)

Off-gas Tubing (Furn 1) @ glovebox wall (°F)

FI-21C-1 Inlet (°F)

FI-21C-1 Outlet (°F)

TIC-21C-2B ~~Wet~~ 2/27/95 (°C)

Filter F-21C-2 Inlet (°C)

Filter F-21C-2 Outlet (°C)

Filter F-21C-2 Bottom (°C)

Off-gas Tubing (Furn 2) @ glovebox wall (°F)

FI-21C-2 Inlet (°F)

FI-21C-2 Outlet (°F)

Initial Vacuum Reading PI-21C-1 => 19 in.Hg

Initial setting for FI-21C-1 => 45 % and FI-21C-2 => 43 %

Comments Number 3 thermocouple has suspect reading

2100 2115 2130 2145 2200 2215 2230 2245 2300

407 387 364 347 328

159 151 147 141 135

121 114 115 112 108

192 185 183 176 178

148 143 142 141 140

127 124 123 122 122

267 253 236 226 213

82 80 79 75 72

32 85 83 81 79

101 98 95 92 89

162 161 161 156 154

134 135 133 132 133

119 118 118 119 119

TEST PROCEDURE	SLUDGE STABILIZATION TEST PROCEDURE	WHL-SD-CP-TC-032 REV-1 PAGE 17 OF 23
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VACUUM ON ROTAMETER TEST DATA SHEET
Page 1 of 3
Date Test is Started: 8/8/95

Test Engineer:																
Time	AD MA WHL WHL	1045	1055	1030	1045	1100	1115	1130	1145	12:00	12:15	12:30	12:45	13:00	13:15	
TIC-21C-1A	(°C)	55	135	206	201	348	428	502	549	599	655	699	731	764	795	
Filter F-21C-1 Inlet	(°C)	40	67	98	122	143	167	189	205	222	257	272	284	294	303	
Filter F-21C-1 Outlet	(°C)	35	30	42	47	53	59	65	71	76	90	99	104	109	114	
Off-gas Tubing (Furn 1) @ glovebox wall	(°F)	84	91	94	97	102	116	121	127	132	150	158	168	174	178	
FI-21C-1 Inlet	(°F)	82	82	87	87	89	93	96	99	104	111	114	122	128	131	
FI-21C-1 Outlet	(°F)	82	80	83	84	84	87	89	91	91	92	92	109	113	113	
TIC-21C-2B WHL WHL	(°C)	44	120	194	271	338	418	491	542	591	645	693	727	760	790	
Filter F-21C-2 Inlet	(°C)	33	63	89	107	134	157	171	184	184	226	238	248	257	265	
Filter F-21C-2 Outlet	(°C)	29	30	33	36	40	45	50	53	55	64	70	76	81	85	
Filter F-21C-2 Bottom	(°C)	29	30	33	37	41	49	56	60	70	79	90	101	110	118	
Off-gas Tubing (Furn 2) @ glovebox wall	(°F)	85	86	90	93	99	108	112	119	129	143	156	165	171	180	
FI-21C-2 Inlet	(°F)	80	81	85	85	90	95	100	103	104	109	120	120	128	138	
FI-21C-2 Outlet	(°F)	79	78	82	82	84	86	86	94	94	92	95	113	116	122	
Initial Vacuum Reading PI-21C-1 => 20 in.Hg		Initial setting for FI-21C-1 => 38 % and FI-21C-2 => 38 %														

Comments: Running two oxide charges on program #3. Insulator have put insulation on horizontal opening in the glovebox. Furnaces both started about 4:45. Furnace 1 had deviation alarm, had to tip the setpoint. *Noticed probe on thermocouple is bent.

THINK ~~WHL~~ IN ALL WE DO

TEST PROCEDURE	SLUDGE STABILIZATION TEST PROCEDURE	WKC-SD-CP-TC-032 REV-1 PAGE 17 OF 23
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VACUUM ON ROTAMETER TEST DATA SHEET

Page 2 of 3
Date Test is Started: 2/8/95

Test Engineer: <i>AD NA</i>		<i>WKC 2/22/95 14:45</i>															
Time		13:30	13:45	14:00	14:15	14:30	14:45	15:00	15:15	15:30	15:45	16:00	16:15	16:30	16:45		
TIC-21C-1 Inlet (°C)	<i>WKC 2/22/95</i>	855	886	916	932	950	965	980	1003	1000	1000	1000	975	870	735		
Filter F-21C-1 Inlet (°C)		322	332	343	348	353	358	364	370	372	372	374	364	350	307		
Filter F-21C-1 Outlet (°C)		122	126	132	136	139	142	144	140	149	151	154	156	153	153		
Off-gas Tubing (Furn 1) @ glovebox wall (°F)		180	183	198	202	206	209	212	216	218	221	222	190	210	237		
FI-21C-1 Inlet (°F)		139	140	143	144	148	149	150	154	154	158	160	165	162	159		
FI-21C-1 Outlet (°F)		113	109	114	116	119	121	126	129	130	130	130	131	129	137		
TIC-21C-2 Inlet (°C)	<i>WKC 2/22/95</i>	850	882	913	930	947	963	984	1001	1000	1000	1000	959	853	721		
Filter F-21C-2 Inlet (°C)		281	289	296	301	305	309	315	319	321	322	322	317	314	265		
Filter F-21C-2 Outlet (°C)		92	96	100	103	106	108	111	114	117	119	122	124	120	124		
Filter F-21C-2 Bottom (°C)		132	139	147	153	158	162	167	172	177	181	184	188	186	184		
Off-gas Tubing (Furn 2) @ glovebox wall (°F)		190	195	201	206	211	216	217	220	224	230	230	219	218	222		
FI-21C-2 Inlet (°F)		151	154	156	160	160	162	168	166	167	164	165	168	164	175		
FI-21C-2 Outlet (°F)		121	128	132	132	134	136	138	139	138	139	138	135	139	137		
Initial Vacuum Reading PI-21C-1 => <i>15.4</i> in.Hg		Initial setting for FI-21C-1 => <i>15.3</i> % and FI-21C-2 => <i>15.3</i> %															

Comments Noticed temp. in glovebox is lower - more than 17 likely due to the insulation. Glovebox temp. at 57°C.

TEST PROCEDURE	SLUDGE STABILIZATION TEST PROCEDURE	WMC-SD-CP-TC-032 REV-1 PAGE 17 OF 23
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VACUUM ON ROTAMETER TEST DATA SHEET
Page 3 of 3
Date Test is Started: 2/8/95

Test Engineer:															
Time	1715	1745	1815	1945	1915	1945	2015	2045	2115						
TIC-21C-1A <i>AD NA</i> <i>WMA 2/27/95</i> (°C)	653	552	480	410	361	308	278	249	215						
Filter F-21C-1 Inlet (°C)	243	250	225	199	189	170	158	145	124						
Filter F-21C-1 Outlet (°C)	150	142	135	127	124	119	114	107	98						
Off-gas Tubing (Furn 1) @ glovebox wall (°F)	224	216	210	205	199	197	193	195	173						
FI-21C-1 Inlet (°F)	158	149	145	148	139	150	154	142	142						
FI-21C-1 Outlet (°F)	136	136	133	131	136	138	132	135	124						
TIC-21C-2B <i>AD NA</i> <i>WMA 2/27/95</i> (°C)	666	561	496	410	366	313	284	253	219						
Filter F-21C-2 Inlet (°C)	245	216	195	173	164	147	136	125	111						
Filter F-21C-2 Outlet (°C)	122	118	114	108	105	101	97	92	86						
Filter F-21C-2 Bottom (°C)	178	166	155	141	133	124	117	110	99						
Off-gas Tubing (Furn 2) @ glovebox wall (°F)	229	224	214	206	199	197	190	182	172						
FI-21C-2 Inlet (°F)	162	170	157	156	157	155	154	150	146						
FI-21C-2 Outlet (°F)	140	145	143	140	143	142	139	135	129						
Initial Vacuum Reading FI-21C-1 =>		in.Hg		Initial setting for FI-21C-1 =>		% and FI-21C-2 =>									

Comments

TEST PROCEDURE	SLUDGE STABILIZATION TEST PROCEDURE	WHC-SD-CP-TC-032 REV-1 PAGE 18 OF 23
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LOWER DWELL TEMPERATURE TEST DATA SHEET
Page 1 of 2

Date Test is Started: 2/13/95 Lower Dwell Temp: 110 °C

Test Engineer: WSL/EWGS																	
Time	10:15	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00		
TIC-21C-1A (°C)	55	107	108	110	124	179	333	485	617	676	744	845	886		964		
Filter F-21C-1 Inlet (°C)	36	64	66	66	92	93	138	182	225	248	268	290	320		342		
Filter F-21C-1 Outlet (°C)	23	29	34	36	40	45	51	61	74	82	89	98	109		127		
Off-gas Tubing (Furn 1) @ glovebox wall (°F)	76	82	90	94	95	100	109	118	121	129	129	158	171		195		
FI-21C-1 Inlet (°F)	75	77	81	84	85	89	92	96	98	102	111	116	118		140		
FI-21C-1 Outlet (°F)	75	76	78	81	82	84	86	87	91	91	96	104	111		119		
TIC-21C-2B (°C)	52	107	109	110	102	177	322	481	613	673	743	842	884		963		
Filter F-21C-2 Inlet (°C)	38	64	64	65	90	90	130	169	204	218	234	252	289		310		
Filter F-21C-2 Outlet (°C)	23	27	29	31	33	36	39	46	55	59	64	71	80		97		
Filter F-21C-2 Bottom (°C)	23	26	29	31	35	40	46	57	73	82	93	106	117		149		
Off-gas Tubing (Furn 2) @ glovebox wall (°F)	75	82	89	93	96	101	107	114	118	123	129	155	170		192		
FI-21C-2 Inlet (°F)	75	77	81	84	85	87	91	94	95	100	110	115	116		147		
FI-21C-2 Outlet (°F)	75	76	78	81	81	85	86	84	93	91	95	109	112		122		
Initial Vacuum Reading PI-21C-1 =>		in.Hg		Initial setting for FI-21C-1 =>		% and FI-21C-2 =>											

Comments 2 OXALATE CHARGES, POTENTIOMETERS AT 38%

TEST PROCEDURE	SLUDGE STABILIZATION TEST PROCEDURE	WHC-SD-CP-TC-032 REV-1 PAGE 18 OF 23
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LOWER DWELL TEMPERATURE TEST DATA SHEET

Date Test is Started: 2/13/95 Lower Dwell Temp: 110 °C

Test Engineer:		1730	1800	1830	1900	1930	2000	2030	2100	2130	2200	2230	2300
Time	NO DATA												
TIC-21C-1 Inlet (°C)	NO DATA	1001	1000	1000	784	628	523	447	377	329			
Filter F-21C-1 Inlet (°C)		352	353	353	347	291	254	224	201	184			
Filter F-21C-1 Outlet (°C)		131	130	139	167	164	155	146	137	130			
Off-gas Tubing (Furn 1) @ glovebox wall (°F)		200	205	208	255	247	248	240	226	211			
FI-21C-1 Inlet (°F)		142	130	140	167	198	190	186	185	179			
FI-21C-1 Outlet (°F)		121	97	125	140	163	164	158	158	150			
TIC-21C-2 Inlet (°C)	NO DATA	1000	1000	1000	792	636	521	440	368	320			
Filter F-21C-2 Inlet (°C)		320	321	322	305	262	232	205	184	168			
Filter F-21C-2 Outlet (°C)		103	108	113	122	124	122	120	116	111			
Filter F-21C-2 Bottom (°C)		100	108	175	179	170	170	159	149	140			
Off-gas Tubing (Furn 2) @ glovebox wall (°F)		204	190	199	235	243	241	230	210	194			
FI-21C-2 Inlet (°F)		151	150	155	175	189	190	192	176	177			
FI-21C-2 Outlet (°F)		126	122	130	142	154	159	164	156	142			
Initial Vacuum Reading PI-21C-1 =>		in.Hg			Initial setting for FI-21C-1 =>			% and FI-21C-2 =>			%		

Comments