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**Cyclone Incinerator
Development Program
for July 1976**

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Issued: September 23, 1976

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MONTHLY PROGRESS REPORT
July 1 through July 30, 1976

INTRODUCTION

Effort continues to determine the parameters for maximizing the operating efficiency of the off-gas system and the venturi scrubber. Results for the month show a decrease in particulate emissions from the system.

Engineering designs are being finalized for enclosures to permit the introduction of radioactive waste into the incinerator and the handling of the resultant ash. Concurrent with these improvements, the cooling system capacity will be increased to handle more heat in the off-gas as a result of continuous operation. Additional cooling capacity will also be required to protect the burning chamber enclosure.

In July, a HEPA filter was installed on the final exhaust to demonstrate that premature loading of the filter would not be a problem when incinerating radioactive waste.

PARTICULATE EMISSIONS BELOW EPA STANDARD

During the month, particulate data were collected for twenty-nine runs. The data obtained are summarized in Table I.

Flue-gases were sampled to determine particle size and concentration at the incinerator chamber outlet, deluge tank outlet and the venturi scrubber outlet. Particulate loading in the off-gas stream averaged 15.4 mg/cf at the incinerator outlet, 8.4 mg/cf at the deluge tank outlet and 1.0 mg/cf at the venturi scrubber outlet. The efficiency of the spray tank and venturi scrubber in removing particles generated by the three types of waste being burned are summarized in Table II and III respectively. The compositions of the three types are shown in Table IV.

The Environmental Protection Agency standard for stack emission of particulates for industrial incinerators of up to 100 pounds per hour capacity, is 0.2 pound per 100 pounds feed (2 g/Kg feed). The addition of the venturi scrubber has reduced the total particulate emissions to 0.88 grams particulate per kilogram of feed at the venturi scrubber outlet.

TABLE I
SUMMARY OF RESULTS FROM INCINERATOR RUNS
FOR JULY 1976

Off Gas Loading (MG/CF)										Spray Tank Efficiency %					Venturi Efficiency %			
Run #	Feed Type	Outlet of Incin.	After Spray Tank	After Venturi	Time of Burn-Minutes	Inlet Air Flow CEM		Feed Wt. -Grams w/o Metal	Grams Part. Per Kilogram Feed After Venturi	Comb. Rate KG/HR	Ash (w/o Metal) Grams	Ash % of Feed	Total Part. Removed	Removal of Part. >1μ	Removal of Part. <1μ	Total Part. Removed	Removal of Part. >1μ	Removal of Part. <1μ
						Start	Avg.											
314	III	8.84	11.95	3.12	13	400	300	5264	2.31	24.3	337	6.4	0	73	0	74	78	74
315	I	18.92	14.37	5.26	19	405	313	5264	5.94	16.6	202	3.8	24	60	10	63	45	66
316	II	14.09	12.36	0.19	14	357	267	5600	0.13	24.0	166	3.0	12	65	1	98	89	99
317	III	7.43	3.45	1.08	20	285	191	5264	0.78	15.8	307	5.8	54	86	19	69	25	77
318	I	11.26	6.01	0.38	18	387	334	5264	0.43	17.6	197	3.7	47	88	16	94	88	94
319	II	13.01	11.32	0.25	16	367	237	5600	0.17	21.0	217	3.9	13	63	1	98	82	99
320	III	12.04	5.90	0.43	22	335	279	5264	0.50	14.4	450	8.5	51	75	25	93	80	97
321	I	8.68	3.34	0.41	40	320	304	5264	0.95	9.4	341	6.5	61	94	19	88	100	87
322	II	13.73	11.47	0.88	18.5	340	279	5600	0.81	18.2	282	5.0	16	65	0	92	70	96
323	III	16.89	5.41	0.76	16	335	243	5264	0.56	19.7	68	96	68	96	11	86	17	93
324	I	23.99	9.71	0.17	16	362	314	5264	0.16	19.7	633	6.0	60	91	17	98	100	98
325	II	19.13	8.84	1.04	13	395	264	5600	0.64	25.8	145	2.6	54	80	38	88	64	93
326	III	28.07	8.63	0.62	13	456	322	5264	0.49	24.3	339	6.4	69	93	32	93	100	92
327	I	23.75	8.20	1.35	14	437	296	5264	1.06	22.6	296	5.6	65	89	39	84	53	90
328	II	14.97	8.84	0.73	13	461	282	5600	0.48	25.8	180	3.2	41	82	15	92	80	93
329	III	17.95	3.28	0.19	14	401	316	5264	0.16	22.6	678	12.9	82	100	23	94	-	97
330	I	11.23	5.32	0.00	16	418	276	5264	0.00	19.7	361	6.9	53	99	0	100	100	100
331	II	14.19	10.33	1.64	14	413	304	5600	1.25	24.0	540	9.6	27	78	0	84	63	88
332	III	16.76	4.05	0.54	15	415	297	5264	0.46	21.0	711	13.5	76	91	30	87	92	84
333	I	10.63	6.22	0.27	15	413	262	5264	0.20	21.0	107	2.0	42	97	0	96	100	96
334	II	14.44	11.38	1.64	19	334	241	5600	1.34	17.7	130	2.3	21	64	0	86	54	92
335	III	10.74	3.75	0.53	18	304	273	5264	0.49	17.6	480	4.6	65	92	5	86	100	83
336	I	14.44	12.02	1.92	19	387	288	5264	2.00	16.6	480	4.6	17	61	0	84	56	89
337	II	15.98	14.15	0.48	17	304	249	5600	0.36	19.8	434	4.0	11	31	6	97	100	96
338	III	9.01	9.01	0.72	15	401	297	5264	0.61	21.1	434	4.0	0	87	0	92	67	94
339	I	12.08	8.19	0.16	17	421	267	5264	0.14	18.6	211	4.0	32	82	0	98	82	100
340	II	29.01	11.17	2.07	15	425	304	5600	1.69	22.4	174	3.1	61	60	62	81	79	83
341	III	15.54	5.31	0.29	14	391	284	5264	0.22	22.6	609	5.8	66	87	46	95	90	96
342	I	20.9	10.81	1.62	15	387	267	5264	1.23	21.1	609	5.8	48	79	22	85	74	88

TABLE II
EFFICIENCY OF SPRAY TANK
IN REMOVING PARTICULATES

	<u>All Particulates</u> (%)	<u>>1 Micron</u> (%)	<u><1 Micron</u> (%)
Type I Feed	44.9	84.0	12.3
Type II Feed	28.4	65.3	13.7
Type III Feed	53.1	88.0	19.1

TABLE III
EFFICIENCY OF VENTURI SCRUBBER
IN REMOVING PARTICULATES

	<u>All Particulates</u> (%)	<u>>1 Micron</u> (%)	<u><1 Micron</u> (%)
Type I Feed	89.0	79.8	90.8
Type II Feed	90.7	75.7	93.2
Type III Feed	86.9	72.1	88.7

TABLE IV

COMPOSITION OF INCINERATOR FEEDS

	<u>Type I</u> ⁽¹⁾	<u>Type II</u> ⁽¹⁾	<u>Type III</u> ⁽¹⁾
Paper	32	2	48
Plastics			
PVC	9	23	1
Polyethylene	29	9	6
Polypropylene	8	2	-
Rubber	13	3	26
Cloth	3	61	6
Leather	-	-	-
Wood	-	-	7
Metal	6	-	6

(1) Weight %

USE OF A HEPA FILTER TO DETERMINE PARTICULATE LOADING

A HEPA filter was installed in the discharge line beyond the venturi scrubber to ascertain the effectiveness of the scrubber in protecting the filter bank from excessive particulates. Twenty-one runs were made with the filter in the system during July. The measured pressure drop increase was 1.38 inches water gauge at 300 cfm, over this period. Extrapolation of these data indicated that approximately 146 kilograms of feed could be incinerated before a pressure drop of 2 inches water gauge is incurred or 640 kilograms before a pressure drop of 8 inches is incurred.

These figures are pessimistic because use of the filter was initiated at the same time that the venturi scrubber was installed. After the installation was completed, some time was needed to establish parameters to minimize the quantity of particulates leaving the scrubber. Continued use of the filter would not reflect the improvement incorporated into the operation of the scrubber. Therefore, the filter was replaced with a new one to obtain more realistic data. It is anticipated that the new filter will have a much longer life than that which had been projected for the original one. Data obtained to date with the new filter indicate that the particulate loading has decreased compared to that obtained with the original one.

MODIFICATIONS OF INCINERATOR SYSTEM IN SUPPORT OF FUTURE OPERATION

Design work was started this month to improve the following aspects of the incinerator system:

1. Radioactive feed handling.
2. Heat dissipation from the burning chamber enclosure.
3. Increased capacity for off-gas cooling.

These changes will permit the handling of <100 nCi/g combustible waste and the resultant ash. They include an enclosure for the burning chamber, control of contamination during the loading of the burning chamber and a contained ash handling facility. The burning chamber enclosure will require cooling due to its proximity to the burning chamber. Liquid cooling furnished by the incinerator cooling system was chosen as the most effective method because additional liquid cooling capacity will be necessary to maintain the off-gas temperature at current levels during planned continuous feed operations. Therefore, the two changes can be made as one modification of the present cooling system.

PLANNED MILESTONES FOR FY-1976A

Efforts in FY-1976A will primarily consist of preparations for incinerating contaminated waste. (See Milestone Chart attached.)

Milestone A will provide information and, possibly, modifications to the existing incinerator required to enable burning in 30, 55 or 83-gallon drums. Presently, combustibles are stored in all three sizes of drums at various ERDA sites; therefore, it would be advantageous to burn in-situ from any of these drums.

Milestone B will result in written procedures for safely handling drums of contaminated trash before and during incineration and for handling the ash following incineration.

Milestone C will result in enclosures around the burning and ash handling areas to contain radioactive particulates.

CYCLONE INCINERATOR PROJECT

MILESTONE CHART

FY-1976A