COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF AIR QUALITY CONTROL
STAPPA/ALAPCO
SOURCE TEST REPORT
2.5

#122 11/04/86
BR 2.2 #51
4.0

NAME:	Kiski Valley Water Pollution Control Authority, Leechburg, Westmoreland County	
PROCESS/SOURCE TESTED:	Sewage Sludge Incinerator	
TEST NO.	00286A	00286B
TEST DATE:	5/7/86	5/7/86

		Radioactive Materials		
POLLUTANT SAMPLED:	Particulate			
ACTUAL EMISSIONS:	0.01 Gr./DSCF, Corrected to 12% CO_2	Alpha 1.37 Picocuries/ DSCM	131 I 29.37 Picocuries/ DSCM	Uranium 0.285 Microgram/ DSCM
ALLOWABLE EMISSIONS:	0.1 Gr./DSCF, Corrected to 12% CO_2	--	--	--

PENNSYLVANIA
DER

TEST CONDUCTED BY: Jaydeb Pai JPai

REPORT PREPARED BY: Jaydeb Pai

REPORT APPROVED BY: L. B. DeHaven, P.E.
LBDeHaven 7/3/86

COMMONWEALTH OF PENNSYLVANIA
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BUREAU OF AIR QUALITY CONTROL

KISKI VALLEY WATER POLLUTION CONTROL AUTHORITY
LEECHBURG, WESTMORELAND COUNTY

PROCESS DESCRIPTION

The Kiski Valley Water Pollution Control Authority operates a natural gas fired Envirotech BSP multiple hearth Sewage sludge incinerator at its Leechburg facility. This incinerator was designed with seven hearths, with hearths two, three, five and six equipped with two natural gas fired burners each. Test Nos. 00286A and B were conducted on May 7, 1986 in the scrubber exhaust stack of the incinerator.

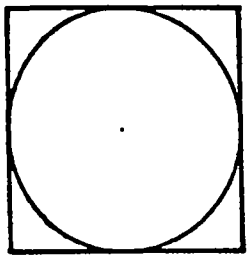
Through a series of preliminary and secondary treatments, the sludge, grease and grit are separated. The sludge is transported to a flocculator where polymers are added for the purposes of chemically breaking down the sludge. The treated sludge is then introduced into the vacuum filters where moisture is drawn off and the resultant filter cake is increased to approximately 18% solids. The concentrated sludge is conveyed to an opening located at the top of the incinerator where it is distributed onto the first hearth through a flap gate feeder. It is then moved by a rotating system of rakes towards an opening along the outside wall of the incinerator where it falls to the second hearth. These rakes are equipped with a cooling air channel to prevent melting at high temperatures. The cooling air is provided by a forced draft fan rated at 3200 SCFM. Approximately 80 to 90% of the air in this totally enclosed system is recirculated onto the sixth hearth of the incinerator where it is reutilized as drying air. The remaining 10 to 20% of the cooling air is exhausted through a warm air exhaust stack. The sludge is then raked towards an opening at the center of the second hearth. This reversal process continues with each hearth until the sludge reaches the seventh hearth where the end product is discharged into the ash hopper. At this point the scrubber effluent water is added to the ash and the resultant slurry is pumped into the settling lagoon. The grease which is stored in a concentrator is burned in the incinerator for an approximate six to eight hour period on an average of once every two weeks. It can be pumped onto either the second or fourth hearth through two inch connectors located along the outside wall. The grits are passed through a hydrogritter and are then stored in a small barrel. When this barrel is nearly filled, the operator empties it onto the incinerator through the same opening where the sludge was introduced.

Combustion air for the burners is provided by means of a forced draft fan rated at 62,500 SCFH. The hot flue gases travel countercurrent to the sludge flow and are drawn through an Arco venturi scrubber and an Arco two stage impingement tray by a Clarage XLR induced draft fan rated at 5334 ACFM. This fan is normally operated with the dampers 20% open. From the fan the flue gases are ducted to the atmosphere through a two foot diameter stack having a discharge point approximately 65 feet above grade.

A process flow diagram is shown in Figure I.

TEST DATA SUMMARY

		PART.	RADIOACTIV
Test No		00286A	00286B
Test Date		05/07/86	05/07/86
No. of Traverse Points/Sampling Points		12/12	12/12
Stack or Duct Area at Sampling Plane (sq ft)	A	3.14	3.14
Barometric Pressure (preliminary traverse) (in. Hg)	Pbp	29.10	29.10
(sample traverse) (in. Hg)	Pbs	29.10	29.10
Condensate Volume (ml)	Vlc	59.0	64.0
Avg. Pressure Drop at Orifice (in. WG)	DH	1.6	2.1
Avg. Meter Temperature (deg F)	Tm	96	106
Volume of Water Vapor Condensed (scf)	Vwc	2.8	3.0
Meter Y-factor	Yf	0.99	0.99
Volume of Gas Sampled (dscf)	Vms	68.9	76.5
Total Sample Time (min)	θ	96.0	96.0
Moisture in Gas Stream (%)	Bws	3.9	3.8
Dry Molecular Wt. (preliminary traverse) (lb/lb-mole)	Mdp	29.40	29.40
(sample traverse) (lb/lb-mole)	Mds	29.40	29.20
Molecular Wt. (preliminary traverse) (lb/lb-mole)	Msp	28.96	28.97
(sample traverse) (lb/lb-mole)	Mss	28.96	28.77
Pitot Tube Coefficient (preliminary traverse)	Cpp	0.812	0.812
(sample traverse)	Cps	0.812	0.814
Average Corrected Velocity (preliminary traverse) (fps)	Vsp	13.5	13.5
(sample traverse) (fps)	Vss	13.8	15.1
Stack Static Pressure (in. WG)	Pg	-0.03	-0.03
Average Stack Temperature (preliminary traverse) (deg F)	Tsp	104	104
(sample traverse) (deg F)	Tss	106	108
Volumetric Flow Rate (preliminary traverse) (dscfm)	Qsp	2,200	2,200
(sample traverse) (dscfm)	Qss	2,300	2,500
Sample Nozzle Diameter (in.)	Dn	0.432	0.440
Percent Isokinetic Sampling (%)	I	97.3	95.5
Weight Collected (gm)	Mn	0.0289	See Page 9
Pollutant Concentration (gr/dscf)	Cs	0.006	NA
Allowable Pollutant Concentration (gr/dscf) (corr. to 12% CO_2)		0.1	NA
Pollutant Mass Emission Rate (lb/hr)	E	0.1	NA
Allowable Mass Emission Rate (lb/hr)		NA	NA
Pollutant Concentration (ppm)	C	NA	NA
Allowable Pollutant Concentration (ppm)		NA	NA
Heat Input To Combustion Unit (mm btu/hr)	HI	NA	NA
Pollutant Mass Emission Rate (lb/mm btu)	E'	NA	NA
Allowable Mass Emission Rate (lb/mm btu)		NA	NA



SAMPLING LOCATION INFORMATION

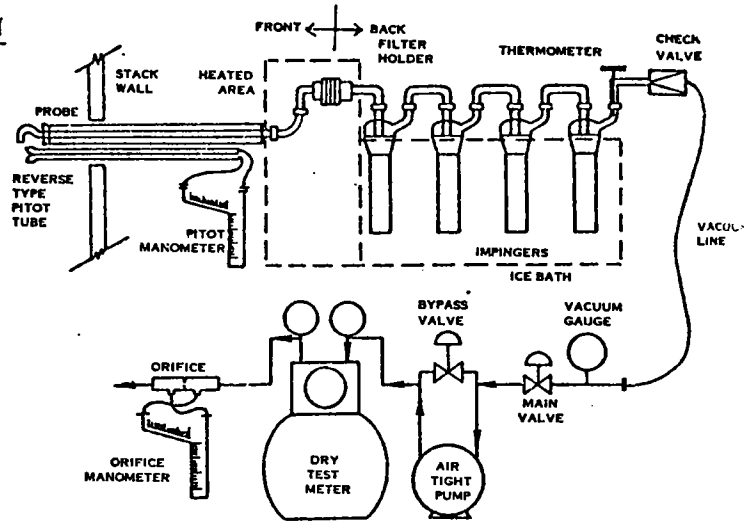
Distance from wall to point (in.):

1. 1 1/16	4. 16 7/8	7.	10.
2. 3 1/2	5. 20 1/2	8.	11.
3. 7 1/8	6. 22 15/16	9.	12.

Flue configuration: 2 FEET I.D. Area: 3.14 sq.ft.
Port location: IN EXHAUST STACK 15 FEET DOWNSTREAM OF THE I.D. FAN
No. of ports: TWO @ 90 DEG.

No. 00286A

SAMPLING TRAIN



Nozzle No. E-2 (Dn = 0.432 in.)

Sample Box No. 526

Probe No. 3-F (Cps = 0.812)

Module No. 504

Impinger Solution: DISTILLED WATER

LABORATORY RESULTS

SAMPLE WEIGHTS (PART.)

TRAIN COMPONENT	INSOLUBLE wt.(gm)	SOLUBLE wt.(gm)
Front Half	0.0019	0.0064
Filter #51103	0.0172	
Filter #		
Filter #		
Filter #		
Back Half	0.0034	0.0669*
Subtotals	0.0225	0.0733
Total Less *	0.0289 gm	

CONDENSATE (ml)

IMPINGER NO.	FINAL	INITIAL
1(H2O)	180.0	150.0
2(H2O)	166.0	150.0
3(H2O)	152.0	150.0
4		
5		
Silica Gel	410.0	399.0
TOTAL (Vlc)	59.0 ml	

GAS ANALYSIS

	PRELIM.	SAMPLING
%CO	0.0	0.0
%CO2	5.3	5.3
%O2	13.8	13.8
%N2	80.9	80.9

CONDENSATE VOLUME

$$Vwc = 0.0474 \times Vlc$$

$$Vwc = 0.0474 \times 59.0 = 2.8 \text{ SCF}$$

MOISTURE BY VOLUME

$$Bws = \frac{Vwc}{Vwc + Vms}$$

$$Bws = \frac{2.8}{2.8 + 68.9} = 3.9\%$$

DRY MOLECULAR WEIGHT

$$Md = (\%CO \times 0.28) + (\%CO2 \times 0.44) + (\%O2 \times 0.32) + (\%N2 \times 0.28)$$

$$Mdp = (0.0 \times 0.28) + (5.3 \times 0.44) + (13.8 \times 0.32) + (80.9 \times 0.28) = 29.40$$

$$Mds = (0.0 \times 0.28) + (5.3 \times 0.44) + (13.8 \times 0.32) + (80.9 \times 0.28) = 29.40$$

MOLECULAR WEIGHT

$$Ms = (Bws \times 18.00) + (Md \times (1 - Bws))$$

$$Msp = (0.039 \times 18.00) + (29.40 \times (1 - 0.039)) = 28.96$$

$$Mss = (0.039 \times 18.00) + (29.40 \times (1 - 0.039)) = 28.96$$

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TEST NOS. 00286A&B **PROCESS DATA** **TEST DATE 5/7/86**

Time	Sludge Feed Counter (lb./hr.)	*Stack Temp. (°F)	Venturi Inlet Temp. (°F)	Scrubber Exhaust Temp. (°F)	Scrubber Flow Rate (gpm)	Venturi Pressure (in. H_2O)	I.D. Fan % Open	Shaft Air Return (%)	Grease Temp. (°F)	**CO_2 Reading (%)
10:20 AM	024355	380	160	100	160	18	20	70	1270	7.2
10:35	025333	380	180	80	160	18	20	70	1270	7.2
10:50	--	--	--	--	--	18	20	70	--	--
11:10	027870	400	160	80	160	18	20	70	1300	7.2
11:25	028840	400	170	80	160	18	20	70	1300	7.3
11:40	029761	400	160	80	160	18	20	70	1300	--
11:55	030677	400	165	80	160	18	20	70	1380	--
12:05 PM	031584	400	180	80	160	18	20	70	1420	--
12:20	032840	400	160	80	160	18	20	70	--	--
12:40	034150	400	160	80	155	18	20	70	1380	--
1:00	035299	400	160	80	155	18	20	70	1420	--
1:20	036500	400	160	80	155	18	20	70	1390	7.3
1:44	037485	400	160	80	155	18	20	70	1500	7.3
2:05	038794	400	160	80	155	18	20	70	1400	--
2:25	040070	400	170	80	155	19	20	70	1400	--
2:40	040990	400	160	80	155	18	20	70	1390	--
2:50	041657	400	160	80	155	19	20	70	--	--

* Thermocouple located in the exhaust stack prior to the precooler.
** Fyrite readings obtained in the breeching prior to the precooler.

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TEST NOS. 00286A&B **PROCESS DATA** **TEST DATE 5/7/86**

Time	Hearth Temperatures (°F)							Number of Burners Operating			
	Hearth No. 1	Hearth No. 2	Hearth No. 3	Hearth No. 4	Hearth No. 5	Hearth No. 6	Hearth No. 7	Hearth No. 2	Hearth No. 3	Hearth No. 5	Hearth No. 6
10:20 AM	820	1040	1290	1270	1400	1100	620	2	1	1	1
10:35	820	1040	1290	1270	1400	1080	640	2	1	1	1
10:50	--	--	--	--	--	--	--	2	1	1	1
11:10	820	1060	1320	1300	1400	1080	660	2	1	1	1
11:25	825	1060	1290	1300	1400	1080	660	2	1	1	1
11:40	820	1040	1300	1300	1400	1080	660	2	1	1	1
11:55	815	1050	1480	1460	1400	1080	660	2	1	1	1
12:05 PM	800	1060	1420	1470	1400	1060	660	2	1	1	1
12:20	800	1050	1320	1380	1400	1060	660	2	1	1	1
12:40	800	1050	1320	1380	1400	1070	660	2	1	1	1
1:00	810	1050	1375	1420	1400	1100	660	2	1	1	2
1:20	800	1050	1320	1390	1400	1110	660	2	1	1	2
1:44	800	1050	1440	1500	1400	1120	665	2	1	1	2
2:05	820	1060	1380	1400	1400	1100	660	2	1	1	2
2:25	820	1050	1380	1400	1400	1100	660	2	1	1	2
2:40	820	1040	1380	1390	1400	1100	660	2	1	1	2
2:50	820	1050	1410	1460	1400	1100	660	2	1	1	2