Attachment I

Stack Test Data from Hoosick Falls, NY Facility

Adirondack Environmental Services, Inc.

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Project Background

Name of Plant/Owner	Furon
Source Tested	Towers 1, 2, 5, 7 and Lamcal
Location of Source Tested	Hoosick Falls, New York
Type of Process Tested	Manufacturing Process
Type of Testing Performed	EPA Methods 1-4 - Volumetric Flow Rate EPA Method 3 - Oxygen, Carbon Dioxide EPA Method 26A - Hydrogen Fluoride EPA Method 26A - Ammonia EPA Method 18 - Volatile Organics EPA Method 0030 - VOST Ammonium Perfluoro-octanate
Test Dates	May 7-8, 1997 August 4, 1997 September 16-17, 1997
Representative of Furon:	Mr. Kenneth Lenseth
Project Manger	Mr. Robert Anderson
Field Project Manager	Mr. George Bailey

1.0 Introduction

Adirondack Environmental Services, Inc , conducted emissions testing at the Furon facility located in Hoosick Falls, New York Testing was performed on May 7-8, August 4 and September 16-17, 1997 to determine exhaust gas concentrations of particulates, chromium, hydrogen fluoride, ammonia, ammonium perfluoro-octanate and Volatile Organic Compounds from various process sources The purpose of the test program was to identify emission components originating from process exhausts.

2.0 Source Description

The Furon facility is located in Hoosick Falls, New York Six emission points were sampled over several days between May and September The following is a list of the emission points, dates sampled and nominal source descriptions.

Stack Emission Point	Source Description	Dates Sampled
Tower 1 - EPM1	IR Heated, Unabated, 900 CFM, 290 °F	5/7/97
Tower 2 Inlet - EPM9	Indirect Hot Air, Abated with a Fisher Klosterman Cyclonic Water Scrubber, Model MS300, 4500 CFM, 400 °F	5/7/97, 9/17/97
Tower 2 Outlet - EPM9	Indirect Hot Air, Abated with a Fisher Klosterman Cyclonic Water Scrubber, Model MS300, 4500 CFM, 400 °F	5/7/97, 9/17/97
Tower 5 - EPM4	IR Heated, Unabated, 900 CFM, 200°F	9/16/97
Tower 7 - EPM7	IR Heated, Unabated, 760 CFM, 200°F	8/4/97
Lamcal	Gas Fired Laminator	9/16/97

OCT-15-01 02:25PM FROM-SAINT GOBAIN PPL HF + T-776 P.02/06 F-618

3.0 Sampling Methods

All CO_2 and O_2 testing was performed in accordance with EPA RM 3 Exhaust gas volumetric flow rate measurements were performed in accordance with EPA RMs 1 through 4 Particulate testing was performed using RM 5. Chromium testing was accomplished using a modified RM 12 procedure Volatile Organics testing was performed using EPA RM 18 procedures and EPA Method 0030 The Hydrofluoric Acid and Ammonia testing was performed using EPA RM 26A The testing for Ammonium Perfluoro-octanate was accomplished using a modified EPA Method 0030. The following provides more details of these procedures.

3.1 Oxygen (O_2), Carbon Dioxide (CO_2)

The oxygen and cabon dioxide concentration was determined in accordance with EPA RM 3 An ORSAT analyzer is was used to perform testing. The sample gas was collected using a pump and tedlar bag collection system. The O_2 and CO_2 are analyzed by reacting with the chemical reagents in the ORSAT analyzer. The oxygen and carbon dioxide levels are determined and these results subtracted from 100 % to yield the % Nitrogen.

3.2 Particulates and Volumetric Flow Rate Determination

The exhaust gas volumetric flow rate was determined in conjunction with each test run and in accordance with EPA RMs 1 through 4. In accordance with EPA RM 1 measurement criteria, the traverse points for the isokinetically sampled parameters were determined for each test run. Velocity differential, pressure and temperature were measured at each traverse point.

A Type "s" pitot tube was used for measuring stack gas velocity and a Type "k" thermocouple was used for measuring gas temperature as described in EPA RM 2. Exhaust gas concentrations of O_2 and carbon dioxide (CO_2) were determined using EPA RM 3A procedures Exhaust gas moisture concentrations were determined in conjunction with EPA RM 5 procedures. A measured volume of stack gas was drawn through a condenser system. The net increase in the weight of the condenser system (impinger train and drying rube) was recorded as the volume of water collected (1 gram = 1 ml) This data was used to determine exhaust gas, dry and wet molecular weight, which was used in calculating the stack gas volumetric flow rate as actual cubic feet per minute (ACFM) and dry standard cubic feet per minute (DSCFM). Volumetric flow rate determinations are required for the calculation of mass emission rates in units of pounds per hour (lb/hr) Further detailed descriptions of the sampling procedures can be found in Appendix C.

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3.0 Sampling Methods, continued

3.3 Ammonia and Hydrofluoric Acid

Gaseous and particulate pollutants are withdrawn isokinetically from the source and sampled through a heated probe and filter assembly and finally condensed into impingers The filter collects particulate matter including halide salts. The gaseous sample continues into two impingers containing an acidic collection media and two impingers containing a basic media. The acidic and alkaline absorbing solutions collect the gaseous hydrogen halides and halogens, respectively. The filter and the impinger solutions are each analyzed for hydrofluoric acid and ammonia. The hydrofluoric acid is analyzed via Ion Chromatography and the ammonia is analyzed by an automated colorimetric procedure. The results of these tests are summarized in Appendix E

3.4 Ammonium Perfluoro-octanate

Gaseous pollutants are withdrawn at a rate of approximately 1 liter/min from the source and sampled through a glass-lined probe and a Volatile Organics Sampling Train (VOST). The gas stream is cooled by passing through a condenser at 20 °C and then collected on two sorbent resin traps. The sorbent resin traps used for this compound contained silica gel. The silica gel sorbent tubes are desorbed using methanol and this extract is then analyzed by Gas Chromatography with a Flame Ionizing Detector (GC-FID) The results of this test are summarized in Appendix E.

3.5 Chromium

Sampling for this parameter was accomplished using a modified EPA Method 12. Gaseous and particulate pollutants are withdrawn isokinetically from the source and sampled through a heated probe and filter assembly and finally condensed into impingers. The filter collects particulate matter. The gaseous sample continues into two impingers containing 0 1 N Nitric Acid The filter and the impinger solutions are each analyzed for Chromium. The Chromium is analyzed via Inductively Coupled Plasma Emission (ICP). The results of these tests are summarized in Appendix E.

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3.0 Sampling Methods, continued

3.6 Volatile Organics Method 18

Samples are collected by means of drawing stack gases through charcoal tubes using a leak-free vacuum pump. The pump has a calibrated critical orifice giving a constant sampling rate during the testing. The charcoal tubes are eluted using Carbon Disulfide and this is analyzed by a Gas Chromatograph equipped with a Photo-ionizing Detector and a Hall Detector The Hall detector is selective for the chlorinated compounds present. Sample volume collected is corrected to standard conditions for final calculations

3.7 Volatile Organics EPA Method 0030

Samples are collected by means of a Volatile Organics Sampling Train (VOST) This apparatus consists of a glass probe placed in the gas stream, a condenser for water droplets present, suitable sampling media and a leak free vacuum pump The sampling media used for this testing consisted of Poropak The meter coefficient corrects sampling volume based on meter performance Samples collected are thermally desorbed and analyzed by a Gas Chromatograph / Mass Spectrometer (TD/GC/MS). Sample volume collected is corrected to standard conditions for final calculations

3.8 Additional Parameters

Sampling was also performed for Particle Size Distribution by Scanning Electron Microscopy (SEM) and Infrared Spectroscopy for organic constituents. This was only performed for the first set of samples from 5/7/97 and 5/8/97. The results for these tests are summarized in the reports supplied in the Laboratory Reports section of this report (Appendix F).

3.0 Sampling Methods, continued

3.9 Quality Assurance/Quality Control

All test equipment was calibrated before or during use in the field Interference checks and response time checks were performed on each analyzer (as applicable) and the entire measurement system before field use. In the field, each analyzer and the entire sampling system were calibrated immediately before and following, each test run using EPA Protocol No. 1 gas standards, traceable to National Institute of Standards and Technology (NITS) reference materials. The dry gas meter/orifice module was calibrated before this test program, with a post-test calibration check also performed. Pitots were likewise calibrated before field use and inspected for damage during the test program. Thermometers, thermocouples, and temperature readouts are routinely calibrated upon receipt and immediately following any damage/repair; post-test QA checks of this instrumentation were also performed. Copies of these field calibrations are included in Appendix D. The certifications of the gas standards used during the test program are provided in Appendix G.

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4.0 Results Summary

Table 1
Summary of Average Results
Furon
Hoosick Falls, New York

Emission Point	Particulate (lb/hr)	Hydrogen Fluoride (lb/hr)	Ammonia (lb/hr)	Ammonium Perfluoro-octanate (lb/hr)
Tower 1	0.110			
Tower 2 Inlet	0.041	< 0.003	0.003	< 0.0012
Tower 2 Outlet	0.050	< 0.003	0.001	< 0.0007
Tower 5	0.126	< 0.006	0.081	< 0.0013
Tower 7	0.033	< 0.001	0.0005	< 0.002
Lamcal	0.207	0.004	0.007	< 0.0023

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Appendix E

Field Data and Calculations

Table #

Summary of Particulate Emissions
Furon
Tower 1
5/7/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	0.90
2	79.10	20.90	0.00	1.80
3				
ave.	79.10	20.90	0.00	1.35

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)	Isokin. %
1	1182	2008	16.4	142	92.9
2	1144	1944	16.1	146	93.8
3		0			
ave.	1163	1976	16.3	144	-----

Run	Sample Volume dscf	dscm	Part. Catch mg	Particulate Concentration mg/dscm	grain/dscf
1	35.256	0.998	30.3	30.35	0.013
2	34.409	0.974	19.5	20.01	0.009
3					
ave.	-----	-----	-----	25.18	0.011

Particulate emission rate

lb/hr	g/hr
0.134	60.896946
0.086	38.864853
0.110	49.881

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Particulate Emissions
Furon
Tower 2 Inlet
5/7/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	0.70
2	79.10	20.90	0.00	0.50
3				
ave.	79.10	20.90	0.00	0.60

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. ('F)	Isokin. %
1	2060	3500	69.3	472	96.7
2	2128	3616	71.9	477	97.4
3		0			
ave.	2094	3558	70.6	474	-----

Run	Sample Volume dscf	dscm	Part. Catch mg	Particulate Concentration mg/dscm	grain/dscf
1	46.904	1.328	18.2	13.70	0.006
2	48.834	1.383	16.2	11.71	0.005
3					
ave.	-----	-----	-----	12.71	0.006

Particulate emission rate

lb/hr	g/hr
0.106	47.9225
0.093	42.3247
0.099	45.124

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Particulate Emissions
Furon
Tower 2 Outlet
5/7/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	8.10
2	79.10	20.90	0.00	8.10
3				
ave.	79.10	20.90	0.00	8.10

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. ('F)	Isokin. %
1	1658	2816	18.5	176	92.6
2	1363	2315	16.8	243	110.2
3		0			
ave.	1510	2566	17.7	209	-----

Run	Sample Volume dscf	dscm	Part. Catch mg	Particulate Concentration mg/dscm	grain/dscf
1	35.348	1.001	106.9	106.79	0.047
2	34.592	0.980	100.3	102.38	0.045
3					
ave.	-----	-----	-----	104.59	0.046

Particulate emission rate

lb/hr	g/hr
0.663	300.53
0.522	236.844
0.592	268.687

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Particulate Emissions
Furon
Tower 7
8/4/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.80	0.10	1.29
2	79.10	20.80	0.10	1.51
3				
ave.	79.10	20.80	0.10	1.40

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)	Isokin. %
1	2081	3536	29.5	162	92.9
2	1976	3357	28.2	164	93.9
3					
ave.	2029	3446	28.9	163	-----

Run	Sample Volume dscf	dscm	Part. Catch mg	Particulate Concentration mg/dscm	grain/dscf
1	66.134	1.873	11.0	5.87	0.003
2	63.490	1.798	4.9	2.73	0.001
3					
ave.	-----	-----	-----	4.30	0.002

Particulate emission rate

Run	lb/hr	g/hr
1	0.046	20.7495373
2	0.020	9.14210356
3		
ave.	0.033	14.946

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Ammonia Emissions
Furon
Tower 7
8/4/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.80	0.10	1.29
2	79.10	20.80	0.10	1.51
3				
ave.	79.10	20.80	0.10	1.40

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)	Isokin. %
1	2081	3536	29.5	162	92.9
2	1976	3357	28.2	164	93.9
3					
ave.	2029	3446	28.9	163	-----

Run	Sample Volume dscf	dscm	NH_3 Catch mg	Ammonia Concentration mg/dscm	grain/dscf
1	66.134	1.873	0.136	0.073	0.00003
2	63.490	1.798	0.111	0.062	0.00003
3					
ave.	-----	-----	-----	0.067	0.00003

Particulate emission rate

Run	lb/hr	g/hr
1	0.0006	0.2565
2	0.0005	0.2071
3		
ave.	0.0005	0.2318

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Hydrogen Fluoride Emissions
Furon
Tower 7
8/4/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.80	0.10	1.29
2	79.10	20.80	0.10	1.51
3				
ave.	79.10	20.80	0.10	1.40

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)	Isokin. %
1	2081	3536	29.5	162	92.9
2	1976	3357	28.2	164	93.9
3					
ave.	2029	3446	28.9	163	----

Run	Sample Volume dscf	dscm	HF Catch mg	Hydrogen Fluoride Concentration mg/dscm	grain/dscf
1	66.134	1.873	< 0.211	< 0.113	< 0.000049
2	63.490	1.798	< 0.232	< 0.129	< 0.000056
3					
ave.	-----	-----	-----	< 0.121	< 0.000053

Hydrogen Fluoride emission rate

Run	lb/hr	g/hr
1	< 0.001	< 0.398
2	< 0.001	< 0.433
3		
ave.	< 0.001	< 0.415

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Ammonium Perfluoro-octanate Emissions
Furon
Tower 7
8/4/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	1.29
2	79.10	20.90	0.00	1.51
3				
ave.	79.10	20.90	0.00	1.40

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)
1	2081	3536	29.5	162
2	1976	3357	28.2	164
3				
ave.	2029	3446	28.9	163

Run	Sample Volume dscf	dscm	Total Catch mg	Ammonuim Perfluoro-octanate Concentration mg/dscm	grain/dscf
1	1.321	0.037	< 0.010	< 0.267	< 0.00012
2	1.300	0.037	< 0.010	< 0.272	< 0.00012
3					
ave.	----	----	----	< 0.269	< 0.00012

Ammonium Perfluoro-octanate emission rate

Run	lb/hr	g/hr
1	< 0.002	< 0.945
2	< 0.002	< 0.911
3		
ave.	< 0.002	< 0.928

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Particulate Emissions
Furon
Lamcal
9/16/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	3.20
2	79.10	20.90	0.00	0.00
3				
ave.	79.10	20.90	0.00	1.60

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)	Isokin. %
1	3296	5600	41.9	100	97.6
2	3129	5317	39.7	96	95.2
3					
ave.	3213	5458	40.8	98	-----

Run	Sample Volume dscf	dscm	Part. Catch mg	Particulate Concentration mg/dscm	grain/dscf
1	45.942	1.301	12.0	9.22	0.0040
2	42.979	1.217	31.2	25.63	0.0112
3					
ave.	-----	-----	-----	17.43	0.0076

Particulate emission rate

Run	lb/hr	g/hr
1	0.114	51.606
2	0.300	136.176
3		
ave.	0.207	93.891

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Ammonia Emissions
Furon
Lamcal
9/16/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	3.20
2	79.10	20.90	0.00	0.00
3				
ave.	79.10	20.90	0.00	1.60

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)	Isokin. %
1	3296	5600	41.9	100	97.6
2	3129	5317	39.7	96	95.2
3					
ave.	3213	5458	40.8	98	-----

Run	Sample Volume dscf	dscm	NH_3 Catch mg	Ammonia Concentration mg/dscm	grain/dscf
1	45.942	1.301	0.27	0.21	0.00009
2	42.979	1.217	1.26	1.04	0.00045
3					
ave.	-----	-----	-----	0.62	0.00027

Ammonia emission rate

Run	lb/hr	g/hr
1	0.003	1.161
2	0.012	5.499
3		
ave.	0.007	3.330

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Hydrogen Fluoride Emissions
Furon
Lamcal
9/16/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	3.20
2	79.10	20.90	0.00	0.00
3				
ave.	79.10	20.90	0.00	1.60

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)	Isokin. %
1	3296	5599	41.9	100	97.6
2	3159	5367	39.7	96	95.2
3					
ave.	3227	5483	40.8	98	-----

Run	Sample Volume dscf	dscm	HF Catch mg	Hydrogen Fluoride Concentration mg/dscm	grain/dscf
1	45.942	1.301	0.540	0.415	0.000181
2	42.979	1.217	0.326	0.268	0.000117
3					
ave.	-----	-----	-----	0.341	0.000149

Hydrogen Fluoride emission rate

Run	lb/hr	g/hr
1	0.005	2.322
2	0.003	1.437
3		
ave.	0.004	1.879

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Ammonium Perfluoro-octanate Emissions
Furon
Lamcal
9/16/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	3.20
2	79.10	20.90	0.00	0.00
3				
ave.	79.10	20.90	0.00	1.60

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)
1	3296	5599	41.9	100
2	3159	5367	39.7	96
3				
ave.	3227	5483	40.8	98

Run	Sample Volume dscf	dscm	Total Catch mg	Ammonium Perfluoro-octanate Concentration mg/dscm	grain/dscf
1	1.915	0.054	< 0.010	< 0.184	< 0.000081
2	1.844	0.052	< 0.010	< 0.191	< 0.000084
3					
ave.	-----	-----	-----	< 0.188	< 0.000082

Ammonium Perfluoro-octanate emission rate

Run	lb/hr	g/hr
1	< 0.0023	< 1.032
2	< 0.0023	< 1.027
3		
ave.	< 0.0023	< 1.029

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Particulate Emissions
Furon
Tower 5
9/16/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	31.20
2	79.10	20.90	0.00	33.80
3				
ave.	79.10	20.90	0.00	32.50

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)	Isokin. %
1	1832	3112	22.9	146	104.5
2	1860	3160	23.6	152	99.0
3					
ave.	1846	3136	23.3	149	-----

Run	Sample Volume dscf	dscm	Part. Catch mg	Particulate Concentration mg/dscm	grain/dscf
1	24.225	0.686	10.1	14.72	0.0064
2	23.313	0.660	14.3	21.66	0.0095
3					
ave.	-----	-----	-----	18.19	0.0079

Particulate emission rate

Run	lb/hr	g/hr
1	0.101	45.783
2	0.151	68.398
3		
ave.	0.126	57.090

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Ammonia Emissions
Furon
Tower 5
9/16/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	31.20
2	79.10	20.90	0.00	33.80
3				
ave.	79.10	20.90	0.00	32.50

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)	Isokin. %
1	1832	3112	22.9	146	104.5
2	1860	3160	23.6	152	99.0
3					
ave.	1846	3136	23.3	149	-----

Run	Sample Volume dscf	dscm	NH_3 Catch mg	Ammonia Concentration mg/dscm	grain/dscf
1	24.225	0.686	9.24	13.47	0.0059
2	23.313	0.660	6.67	10.10	0.0044
3					
ave.	-----	-----	-----	11.79	0.0051

Ammonia emission rate

Run	lb/hr	g/hr
1	0.092	41.885
2	0.070	31.903
3		
ave.	0.081	36.894

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Hydrogen Fluoride Emissions
Furon
Tower 5
9/16/97

	Gas Composition, Dry			Moisture
Run	%N2	%O2	%CO2	% Wet
1	79.10	20.90	0.00	31.20
2	79.10	20.90	0.00	33.80
3				
ave.	79.10	20.90	0.00	32.50

	Gas Flow Rate		Gas Velocity	Stack	
Run	dscfm	dscmh	fps	Temp. (°F)	Isokin. %
1	1832	3112	22.9	146	104.5
2	1860	3160	23.6	152	99.0
3					
ave.	1846	3136	23.3	149	-----

	Sample Volume		HF Catch	Hydrogen Fluoride Concentration	
Run	dscf	dscm	mg	mg/dscm	grain/dscf
1	24.225	0.686	< 0.560	< 0.816	< 0.000357
2	23.313	0.660	< 0.560	< 0.848	< 0.000371
3					
ave.	-----	-----	-----	< 0.832	< 0.000364

Hydrogen Fluoride emission rate

Run	lb/hr	g/hr
1	< 0.006	< 2.538
2	< 0.006	< 2.679
3		
ave.	< 0.006	< 2.608

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Ammonium Perfluoro-octanate Emissions
Furon
Tower 5
9/16/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	31.20
2	79.10	20.90	0.00	33.80
3				
ave.	79.10	20.90	0.00	32.50

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)
1	1832	3112	22.9	146
2	1860	3160	23.6	152
3				
ave.	1846	3136	23.3	149

Run	Sample Volume dscf	dscm	Total Catch mg	Ammonium Perfluoro-octanate Concentration mg/dscm	grain/dscf
1	1.824	0.052	< 0.010	< 0.194	< 0.000085
2	1.942	0.055	< 0.010	< 0.182	< 0.000079
3					
ave.	-----	-----	-----	< 0.188	< 0.000082

Ammonium Perfluoro-octanate emission rate

Run	lb/hr	g/hr
1	< 0.0013	< 0.602
2	< 0.0013	< 0.574
3		
ave.	< 0.0013	< 0.588

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Particulate Emissions
Furon
Tower 2 Inlet
9/17/97

	Gas Composition, Dry			Moisture
Run	%N2	%O2	%CO2	% Wet
1	79.10	20.90	0.00	18.70
2	79.10	20.90	0.00	10.30
3				
ave.	79.10	20.90	0.00	14.50

	Gas Flow Rate		Gas Velocity	Stack	
Run	dscfm	dscmh	fps	Temp. (°F)	Isokin. %
1	1524	2589	54.4	516	100.4
2	1538	2613	54.4	511	99.2
3					
ave.	1531	2601	54.4	513	-----

	Sample Volume		Part. Catch	Particulate Concentration	
Run	dscf	dscm	mg	mg/dscm	grain/dscf
1	34.894	0.988	10.1	10.22	0.0045
2	34.790	0.985	4.2	4.26	0.0019
3					
ave.	-----	-----	-----	7.24	0.0032

Particulate emission rate

Run	lb/hr	g/hr
1	0.058	26.446
2	0.025	11.129
3		
ave.	0.041	18.787

Sample Calculations:

gr/dscf = mg/[dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Ammonia Emissions
Furon
Tower 2 Inlet
9/17/97

	Gas Composition, Dry			Moisture
Run	%N2	%O2	%CO2	% Wet
1	79.10	20.90	0.00	18.70
2	79.10	20.90	0.00	10.30
3				
ave.	79.10	20.90	0.00	14.50

	Gas Flow Rate		Gas Velocity	Stack	
Run	dscfm	dscmh	fps	Temp. (°F)	Isokin. %
1	1524	2589	54.4	516	100.4
2	1538	2613	54.4	511	99.2
3					
ave.	1531	2601	54.4	513	-----

	Sample Volume		NH_3 Catch	Ammonia Concentration	
Run	dscf	dscm	mg	mg/dscm	grain/dscf
1	34.894	0.988	0.53	0.54	0.0002
2	34.790	0.985	0.48	0.49	0.0002
3					
ave.	-----	-----	-----	0.51	0.0002

Ammonia emission rate

Run	lb/hr	g/hr
1	0.003	1.388
2	0.003	1.272
3		
ave.	0.003	1.330

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Hydrogen Fluoride Emissions
Furon
Tower 2 Inlet
9/17/97

	Gas Composition, Dry			Moisture
Run	%N2	%O2	%CO2	% Wet
1	79.10	20.90	0.00	18.70
2	79.10	20.90	0.00	10.30
3				
ave.	79.10	20.90	0.00	14.50

	Gas Flow Rate		Gas Velocity	Stack	
Run	dscfm	dscmh	fps	Temp. (°F)	Isokin. %
1	1524	2589	54.4	516	100.4
2	1538	2613	54.4	511	99.2
3					
ave.	1531	2601	54.4	513	-----

	Sample Volume		HF Catch	Hydrogen Fluoride Concentration	
Run	dscf	dscm	mg	mg/dscm	grain/dscf
1	34.894	0.988	< 0.560	< 0.567	< 0.000248
2	34.790	0.985	< 0.560	< 0.568	< 0.000248
3					
ave.	-----	-----	-----	< 0.568	< 0.000248

Hydrogen Fluoride emission rate

Run	lb/hr	g/hr
1	< 0.003	< 1.466
2	< 0.003	< 1.484
3		
ave.	< 0.003	< 1.475

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Ammonium Perfluoro-octanate Emissions
Furon
Tower 2 Inlet
9/17/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	18.70
2	79.10	20.90	0.00	10.30
3				
ave.	79.10	20.90	0.00	14.50

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)
1	1524	2590	54.4	516
2	1538	2613	54.4	511
3				
ave.	1531	2601	54.4	513

Run	Sample Volume dscf	dscm	Total Catch mg	Ammonium Perfluoro-octanate Concentration mg/dscm	grain/dscf
1	1.754	0.050	< 0.010	< 0.201	< 0.000088
2	1.729	0.049	< 0.010	< 0.204	< 0.000089
3					
ave.	-----	-----	-----	< 0.203	< 0.000089

Ammonium Perfluoro-octanate emission rate

Run	lb/hr	g/hr
1	< 0.0011	< 0.521
2	< 0.0012	< 0.533
3		
ave.	< 0.0012	< 0.527

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Particulate Emissions
Furon
Tower 2 Outlet
9/17/97

	Gas Composition, Dry			Moisture
Run	%N2	%O2	%CO2	% Wet
1	79.10	20.90	0.00	8.25
2	79.10	20.90	0.00	7.87
3				
ave.	79.10	20.90	0.00	8.06

	Gas Flow Rate		Gas Velocity	Stack	
Run	dscfm	dscmh	fps	Temp. (°F)	Isokin. %
1	1097	1864	13.5	236	102.3
2	1051	1785	12.6	223	101.8
3					
ave.	1074	1825	13.1	229	----

	Sample Volume		Part. Catch	Particulate Concentration	
Run	dscf	dscm	mg	mg/dscm	grain/dscf
1	26.548	0.752	4.8	6.38	0.0028
2	25.287	0.716	13.3	18.57	0.0081
3					
ave.	----	----	----	12.48	0.0055

Particulate emission rate

Run	lb/hr	g/hr
1	0.026	11.894
2	0.073	33.125
3		
ave.	0.050	22.510

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Ammonia Emissions
Furon
Tower 2 Outlet
9/17/97

	Gas Composition, Dry			Moisture
Run	%N2	%O2	%CO2	% Wet
1	79.10	20.90	0.00	8.25
2	79.10	20.90	0.00	7.87
3				
ave.	79.10	20.90	0.00	8.06

	Gas Flow Rate		Gas Velocity	Stack	
Run	dscfm	dscmh	fps	Temp. (°F)	Isokin. %
1	1097	1864	13.5	236	102.3
2	1051	1785	12.6	223	101.8
3					
ave.	1074	1825	13.1	229	----

	Sample Volume		NH_3 Catch	Ammonia Concentration	
Run	dscf	dscm	mg	mg/dscm	grain/dscf
1	26.548	0.752	0.25	0.33	0.0001
2	25.287	0.716	0.17	0.24	0.0001
3					
ave.	----	----	----	0.28	0.0001

Ammonia emission rate

Run	lb/hr	g/hr
1	0.001	0.620
2	0.001	0.423
3		
ave.	0.001	0.521

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Hydrogen Fluoride Emissions
Furon
Tower 2 Outlet
9/17/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	8.25
2	79.10	20.90	0.00	7.87
3				
ave.	79.10	20.90	0.00	8.06

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)	Isokin. %
1	1097	1864	13.5	236	102.3
2	1051	1785	12.6	223	101.8
3					
ave.	1074	1825	13.1	229	-----

Run	Sample Volume dscf	dscm	HF Catch mg	Hydrogen Fluoride Concentration mg/dscm	grain/dscf
1	26.548	0.752	< 0.560	< 0.745	< 0.000325
2	25.287	0.716	< 0.560	< 0.782	< 0.000342
3					
ave.	-----	-----	-----	< 0.763	< 0.000334

Hydrogen Fluoride emission rate

Run	lb/hr	g/hr
1	< 0.003	< 1.388
2	< 0.003	< 1.395
3		
ave.	< 0.003	< 1.391

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)

Table #

Summary of Ammonium Perfluoro-octanate Emissions
Furon
Tower 2 Outlet
9/17/97

Run	Gas Composition, Dry %N2	%O2	%CO2	Moisture % Wet
1	79.10	20.90	0.00	8.25
2	79.10	20.90	0.00	7.87
3				
ave.	79.10	20.90	0.00	8.06

Run	Gas Flow Rate dscfm	dscmh	Gas Velocity fps	Stack Temp. (°F)
1	1097	1864	13.5	236
2	1051	1785	12.6	223
3				
ave.	1074	1825	13.1	229

Run	Sample Volume dscf	dscm	Total Catch mg	Ammonium Perfluoro-octanate Concentration mg/dscm	grain/dscf
1	1.827	0.052	< 0.010	< 0.193	< 0.000084
2	2.049	0.058	< 0.010	< 0.172	< 0.000075
3					
ave.	-----	-----	-----	< 0.183	< 0.000080

Ammonium Perfluoro-octanate emission rate

Run	lb/hr	g/hr
1	< 0.0008	< 0.360
2	< 0.0007	< 0.307
3		
ave.	< 0.0007	< 0.334

Sample Calculations:

gr/dscf = mg/(dscf x 64.8 mg/gr)

mg/dscm(7% O2) = mg/dscm x [13.9/(20.9 - %O2)]

mg/dscm(12% CO2) = mg/dscm x [12/(%CO2)]

lb/hr = (mg x dscfm x 60)/(dscf x 453600)