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Project Summary

Evaluation of Fabric Filter Performance at Ames Solid Waste Recovery System

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EPA conducted a 36-month study to measure air pollution emissions and to evaluate control technologies for waste-as-fuel processes. One of the processes studied was the resource recovery plant operated by the municipal Department of Public Works of Ames, Iowa, which processes municipal solid waste. A fabric filter was used to control dust from the shredders, air density separation (ADS), and conveyor transfer points. The fabric filter has operated successfuly since 1978 with a noticeable reduction in in-plant air dust concentrations.

The major output of the Ames resource recovery plant is refuse-derived fuel (RDF), which is transported to an adjacent power plant for burning and subsequent generation of power.

This Project Summary was developed by EPA's Hazardous Waste Engineering Research Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Background

Particulate concentrations in the inlet and outlet gas streams of the fabric filter operating at the Ames resource recovery facility were tested to determine particulate collection efficiency of the fabric filter and to quantify inlet and outlet particulate concentrations.

Over a 2-day test period, four simultaneous inlet-outlet test runs were completed. Inlet samples were obtained by EPA Method 5. Outlet samples were obtained by simultaneously traversing the "open-air" top of the fabric filter with two high-volume (hi-vol) samplers, along two separate straight traverses. The particulate concentrations found along each outlet traverse were averaged to obtain the outlet particulate concentration for each run.

The full report includes four appendices which give detailed information about the testing. Appendix A provides the specifications of the fabric filter unit. Appendix B discusses the sampling and analytical methodology. Appendix C consists of computerized data calculations for inlet sampling conditions and hand-completed data sheets for outlet sampling. Appendix D describes the quality assurance procedures.

Results

Table 1 summarizes the fabric filter performance. Calculations of average inlet and outlet particulate concentrations were based only on the values from the first three test runs because of a sampling error during Test Run B-4. The outlet concentration measured during Test Run B-4 is reported as an individual value; because there is no corresponding inlet value, it is not used in calculating the efficiency of collection. Excluding Test Run B-4, the average particulate removal efficiency was 97.8 percent.

The results of inlet particulate sampling are shown in Table 2. The results of Test Run B-4 were not considered in the final evaluation because of an unreasonably high moisture content. Excluding Test Run B-4, inlet particulate concentration averaged 446 mg/dry standard m^3, with a range from 259 to 748 mg/dry standard

m^3. The corresponding particulate mass flow rate averaged 32.3 kg/h and ranged from 19.5 to 52.6 kg/h.

The results of outlet particulate sampling are shown in Table 3. Each outlet test run is composed of two sample traverses, right and left. The final evaluation of performance is based on an average of the right and left traverse for each run For all test runs, outlet particulate concentration averaged 11.9 mg/dry standard m^3, with a range from 8.63 to 18.6 mg/dry standard m^3. The average particulate emission rate from the fabric filter was 0 878 kg/h, with a range from 0.588 to 1.36 kg/h.

Conclusions and Recommendations

Results indicate that the fabric filter effectively controls particulates generated by various sources in the Ames resource recovery plant. The fabric filter was tested and evaluated under normal operating conditions; no attempt was made to optimize the operation or collection efficiency of the unit.

Although the data show that the fabric filter at the Ames plant functions effectively, some improvements can be made. Bag shaking, a medium-energy cleaning mechanism, is currently used to remove dust that is prone to bridging and difficult to clean from the bags, and clogged bags remain a problem at the Ames plant Use of a high-energy cleaning mechanism (such as air pulsing) might solve the problem, but such a mechanism must be implemented in the design phase of an installation. This solution might increase power consumption and shorten bag life, but it would decrease maintenance time.

The dust collection hoppers contributed to bag clogging, especially around the perimeter of each section of bags The location of the baghouse requires relatively shallow hopper side angles, which sometimes prevent dust from flowing freely from bags to hopper where the hopper side is very near the bottom of the bag Steeper side angles would alleviate the problem.

Table 1. *Summary of Fabric Filter Performance*

Test Run No.	Inlet Particulate Concentration, mg/dry std. m^3	Outlet Particulate Concentration,[a] mg/dry std m^3	Particulate Removal Efficiency %
B-1	748	11.4	98 5
B-2	259	8.63	96 7
B-3	331	9.16	97.2
B-4	[b]	18.6	[c]
Average	446[d]	9.73[d]	97.8[d]

[a] *Average of two outlet samples per run.*
[b] *Inaccurate value because of sampling error*
[c] *Not calculated because of sampling error*
[d] *Not including Test Run B-4.*

Table 2. *Inlet Particulate Data*[a]

Test Run No	Average Temperature at Inlet, °R	Actual Volume of Gas Sampled, m^3 (ft^3)	Volume of Gas Sampled at Standard Conditions, m^3 (ft^3)	Total Particulate, mg	Particulate Concentration, mg/dry std. m^3
B-1	555	0.984 (34.76)	0.942 (33.3)	704.6	748
B-2	557	1 13 (39.95)	1 06 (37.6)	275.0	259
B-3	557	1.15 (40.46)	1.07 (37 9)	353.9	331
B-4	558	1 09 (38 44)	1.03 (36.4)	731.2	710

[a] *For all test runs, the barometric pressure was 760 0 mm (29.92 in.) Hg, the stack pressure was 766.6 mm (30.18 in.) Hg, and the sampling time was 48 min*

Table 3. *Outlet Particulate Data*[a]

Test Run No [b]	Average ΔH,[c] cm (in) H_2O	Average Temperature at Outlet, °R	Sampling Flow Rate, m^3/min (acfm)	Sampling Time, min	Volume of Gas Sampled at Standard Conditions, m^3 (ft^3)	Total Particulates, mg	Particulate Concentration, mg/dry std. m^3
B-1R	12 7 (5.0)	557	1 07 (37.9)	48	48.7 (1720)	451.4	9.27
B-1L	10.4 (4 1)	557	0.977 (34 5)	40	37.1 (1310)	501.5	13.5
B-2R	16.0 (6.3)	555	1 21 (42.7)	48	55.2 (1950)	362.2	6.56
B-2L	15.5 (6 1)	555	1 19 (41.9)	45	50.7 (1790)	542.5	10.7
B-3R	18 5 (7 3)	550	1 31 (46 4)	48	60 6 (2140)	695.0	11.5
B-3L	21.8 (8 6)	550	1 45 (51 2)	45	62.6 (2210)	426 3	6.81
B-4R	19.1 (7.5)	554	1 33 (47 1)	48	61.2 (2160)	1292.3	21 1
B-4L	23.6 (9 3)	554	1 52 (53 8)	45	65.4 (2310)	1052 5	16.1

[a] *For all test runs, the barometric pressure was 760 0 mm (29.92 in.) Hg.*
[b] *R designates right traverse and L designates left traverse.*
[c] *See Figure 4-1 in the full report*

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***Robert A. Olexsey** and **Michael Black** are the EPA Project Officers (see below).*
The complete report, entitled "Evaluation of Fabric Filter Performance at Ames Solid Waste Recovery System," (Order No. PB 86-110 933/AS; Cost: $9.95, subject to change) will be available only from:
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