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**ASSESSMENT
OF MANUFACTURERS
CAPABILITY TO MEET
REQUIREMENTS FOR
PARTICULATE CONTROLS
ON UTILITY AND
INDUSTRIAL BOILERS**



**U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711**

ASSESSMENT OF MANUFACTURERS CAPABILITY
TO MEET REQUIREMENTS FOR PARTICULATE
CONTROLS ON UTILITY AND INDUSTRIAL BOILERS

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1.0 INTRODUCTION

To comply with air pollution regulations an adequate supply of air pollution abatement equipment must be available. The Industrial Gas Cleaning Institute (IGCI) under contract to the U.S. Environmental Protection Agency, conducted a survey of equipment manufacturers to determine their ability to supply fabric filters and electrostatic precipitators (ESP's) for use on utility and industrial boilers.

A survey form was sent to 25 fabric filter manufacturers and 18 ESP manufacturers. Information was requested from each manufacturer on the following subjects:

- Applicability of fabric filters or ESP's to boiler type and size range for coal-fired units.
- Guarantees.
- Their capability to design and install various sizes of fabric filters and ESP's.
- Factors which may delay the design, construction, or start-up of fabric filters and ESP's.
- Ways of reducing delay-related problems.

This report summarizes the results of the survey.

Table 1-1 lists the manufacturers responding to the survey and the types of particulate control system offered. The

Table 1-1. MANUFACTURERS RESPONDING TO THE SURVEY AND
TYPE OF PARTICULATE CONTROL SYSTEM OFFERED BY EACH

Manufacturer	Type of control system offered	
	Fabric filter	Electrostatic precipitator
1. Air Correction Division - UOP, Inc.		X
2. American Air Filter Company, Inc.	X	X
3. Apitron Division - American Precision Industries, Inc.	X	
4. Babcock & Wilcox Company		X
5. Belco Pollution Control Corporation	X	X
6. Buffalo Forge Company	X	
7. Carborundum Environmental Systems, Inc.	X	
8. The Ceilcote Company		X
9. C-E Air Preheater Company	X	
10. C-E Walther, Inc.	X	X
11. Environmental Elements Corporation	X	X
12. Envirotech-Buell Emission Control Division	X	X
13. Flakt, Inc.	X	X
14. Fuller Company	X	
15. Industrial Clean Air, Inc.	X	
16. Joy Manufacturing Company Western Precipitation Division	X	X
17. Lear Siegler, Inc.	X	
18. MikroPul Corporation	X	X
19. Peabody Air Resources Equipment Company	X	X
20. Research-Cottrell, Inc.	X	X
21. Standard Havens, Inc.	X	
22. Wheelabrator-Frye, Inc.	X	X
23. Zurn Industries, Inc.	X	

overall response rate from the survey was 77 percent. The majority of the non-responding companies do not manufacture the equipment at the present time.

2.0 MANUFACTURERS' CAPABILITIES

This section includes a summary of the manufacturer's capability to design and install fabric filter and ESP systems.

Each manufacturer of fabric filters and ESP's was asked to estimate the number of systems the company could design and install over a 15-year period, with current and expanded staff (or by more extensive use of subcontractors). Tables 2-1 and 2-2 summarize the information they provided. The majority of the manufacturers said their equipment can be used on new as well as on retrofit installations.

**Table 2-1. PROJECTED NUMBER OF FABRIC FILTERS THAT
MANUFACTURERS CAN DESIGN AND INSTALL OVER A 15-YEAR PERIOD**

Equivalent MW	Number of units designed ^{a,b,c}					
	1978 - 1982		1983 - 1987		1988 - 1992	
	With Present staff	With Expanded staff	With Present staff	With Expanded staff	With Present staff	With Expanded staff
5 MWe ^d	1512	2237	1865	2402	1998	2590
20 MWe ^e	1249	1706	1550	1785	1636	1888
50 MWe ^e	1008	1367	1320	1449	1372	1506
200 MWe ^d	575	749	681	810	706	824
1000 MWe ^f	300	413	394	440	411	444

Equivalent MW	Number of units installed ^{a,b,c}					
	1978 - 1982		1983 - 1987		1988 - 1992	
	With Present staff	With Expanded staff	With Present staff	With Expanded staff	With Present staff	With Expanded staff
5 MWe ^g	1298	1899	1562	1954	1618	2054
20 MWe ^d	1014	1378	1318	1342	1334	1567
50 MWe ^d	830	1097	1200	1315	1274	1458
200 MWe ^d	454	600	660	788	656	782
1000 MWe ^f	243	337	332	366	349	392

- ^a The number of units is based on the assumption that the total fabric filter resources of each manufacturer is devoted to designing and installing the designated size.
- ^b Quantities shown are for systems which include flange-to-flange equipment.
- ^c The difference between the number of systems designed and the number installed is due to the long lead time for system installation.
- ^d Represents the responses of 18 manufacturers.
- ^e Represents the responses of 19 manufacturers.
- ^f Represents the responses of 15 manufacturers.
- ^g Represents the responses of 17 manufacturers.

Table 2-2. PROJECTED NUMBER OF ELECTROSTATIC PRECIPITATORS THAT MANUFACTURERS CAN DESIGN AND INSTALL OVER A 15-YEAR PERIOD

Equivalent MW	Number of units designed ^{a,b,c}					
	1978 - 1982		1983 - 1987		1988 - 1992	
	With Present staff	With Expanded staff	With Present staff	With Expanded staff	With Present staff	With Expanded staff
5 MWe (400 SCA) ^d	1268	1728	1340	1816	1413	1918
20 MWe (400 SCA) ^e	1097	1396	1157	1474	1220	1558
50 MWe (400 SCA) ^f	856	1110	913	1194	971	1269
200 MWe (400 SCA) ^g	572	726	620	818	669	881
1000 MWe (400 SCA) ^g	333	442	357	499	394	542

Equivalent MW	Number of units installed ^{a,b,c}					
	1978 - 1982		1983 - 1987		1988 - 1992	
	With Present staff	With Expanded staff	With Present staff	With Expanded staff	With Present staff	With Expanded staff
5 MWe (400 SCA) ^d	837	1196	862	1237	933	1293
20 MWe (400 SCA) ^e	795	1048	903	1197	949	1232
50 MWe (400 SCA) ^f	660	844	782	1024	845	1088
200 MWe (400 SCA) ^g	522	649	614	799	654	844
1000 MWe (400 SCA) ^g	266	347	305	423	355	483

- ^a The number of units is based on the assumption that the total electrostatic precipitator resources of each manufacturer is devoted to designing and installing the designated size.
- ^b Quantities shown are for systems which include flange-to-flange equipment.
- ^c The difference between the number of systems designed and the numbers installed is due to the long lead time for system installation.
- ^d Represents the responses of 9 manufacturers.
- ^e Represents the response of 12 manufacturers.
- ^f Represents the response of 14 manufacturers.
- ^g Represents the responses of 13 manufacturers.

3.0 GUARANTEES

Manufacturers were asked to indicate the types of guarantee they offer on fabric filters and ESP's, as well as their conditions and qualifications. Information on guarantees on the following specific items was requested:

- Particulate removal efficiency (or outlet loading)
- Predetermined installation cost
- Performance (availability)
- Other

Tables 3-1 and 3-2 summarize the responses.

Table 3-1. GUARANTEES OFFERED BY MANUFACTURERS OF FABRIC FILTERS

Company ^a	Type of guarantee offered/conditions			
	Particulate outlet emission, gr/scf	Predetermined installation cost	Performance (availability)	Other
1	0.01 ^b	None	None	Filter cloth life
2	0.015, ^b	Fixed price	Yes (conditions not disclosed)	None
3	0.01 ^c	None	None	12 months on bag life
4	0.02-0.03 ^b	None	Only on specific installations	Filter cloth life,
5	0.02 ^b	Only on turnkey projects	None	Filter cloth life, ΔP
6	0.01, ^b compliance with applicable code	Only on turnkey projects	Service and operation contract available	Filter cloth life
7	0.02 ^b	Subject to escalation clause	100% when operated as instructed	None
8	0.01 ^b	Subject to site conditions and schedules	Subject to various clauses	Filter cloth life, 1 to 2 years
9	0.003-0.006, ^b compliance with applicable code	Fixed price contract	No	Standard material and workmanship
10	0.02, ^b for specific conditions and test methods	Subject to specific conditions	Subject to specific conditions	Filter cloth life
11	0.02 ^b	Subject to labor rates and conditions of sale	Based on individual application	Extended warranties
12	0.003 ^b	Subject to escalation clause, unless contract is for rigid time frame	100%	Bag life, power consumption
13	0.02 for 12 months at design conditions	Subject to escalation clause	12 months at design conditions	Filter cloth life
14	0.02-0.07 ^b based on EPA test method	Fixed price	None	None
15	0.01 ^b	Fixed price	Subject to design conditions	ΔP
16	0.03 ^b	Subject to escalation clause	None	ΔP, temperature
17	To meet current local and federal codes ^b	Subject to escalation clause	None	ΔP, bag life
18	None	None	None	None
19	0.005 ^c	Subject to escalation clause	None	ΔP, temperature, power consumption
20	0.01 or less ^b	Subject to specific conditions	Subject to design conditions	Opacity

^aCompany names are deliberately withheld.

^bThis guarantee is given on new as well as existing units.

^cThis guarantee is given on new units only.

Table 3-2. GUARANTEES OFFERED BY MANUFACTURERS OF
ELECTROSTATIC PRECIPITATORS

Company ^a	Type of guarantee offered/conditions			
	Particulate removal efficiency	Predetermined installation cost	Performance (availability)	Other
A	Up to 99.9% ^b	Subject to escalation clause	None	None
B	Minimum 99%	Subject to government escalation indices	None	ΔP, if required
C	90-99.5% ^b	None	None	Standard workmanship and materials
D	95-99.9% ^c 90-99.9% ^d	Firm bids provided	Yes, based on operating parameters	Material and workmanship
E	99.5% ^b	Yes (conditions not disclosed)	None	ΔP, opacity
F	96-99.8% ^b for 12 months at design conditions	Subject to escalation clause	12 months at design conditions	Opacity
G	Up to 99.9% ^b with a stopper on outlet emissions	For a specified time period	For a specified time	ΔP, power consumption
H	99.9% ^b	For a specified time period	None	ΔP, power consumption, temperature loss
I	99.99% ^b with a stopper on outlet emissions	Subject to craft union rates	None	Material and workmanship
J	99.5-99.9% ^b with specified conditions	Subject to specific conditions	None	None
K	98-99.5% ^b with an outlet stopper	Subject to escalation clause	12 months	ΔP
L	Up to 99.8% ^b	Subject to escalation clause	None	ΔP, power consumption
M	Up to 99.9% with an outlet stopper ^b	Subject to escalation clause	None	ΔP, power consumption, temperature
N	Up to 99.9% ^b	Subject to specific conditions	For a specified time	None

^a Company names are deliberately withheld.

^b This guarantee is given on new as well as existing units.

^c This guarantee is given on new units only.

^d This guarantee is given on existing units only.

4.0 LIMITING ITEM ANALYSIS

Numerous factors affect the design and installation schedules of fabric filters and ESP's and may ultimately affect timely completion of a project as well as its cost. The first part of this section summarizes manufacturers' opinions on possible bottlenecks; the latter part identifies corrective actions to overcome delay-related problems.

4.1 FACTORS WHICH MAY DELAY THE DESIGN, CONSTRUCTION OR START-UP OF FABRIC FILTERS AND ESP'S

Factors cited by manufacturers as contributing to delay in design and installation of the control devices were:

- ° Availability of qualified personnel
- ° Component availability
- ° Coordination between manufacturer, client, and consulting engineers.

Table 4-1 shows the number of respondents within each category.

4.2 ITEMS WHICH MAY OVERCOME DELAY-RELATED PROBLEMS

The manufacturers were asked to recommend action that may be taken by a utility, industry, government, and others to overcome delay-related problems. Of 14 manufacturers responding to this question, the following item was cited by four:

Table 4-1. ITEMS WHICH MAY DELAY THE DESIGN, AND INSTALLATION OF
FABRIC FILTERS AND ESP'S^a

	Personnel	Component	Coordination	Other
No. of manufacturers responding	18	11	5	<ul style="list-style-type: none"> ◦ Government regulations ◦ Material shipment delay ◦ Equipment delays

^a Represents the responses of 23 manufacturers. Some companies manufacture both fabric filters and ESP's.

- Better coordination between manufacturer and customer

Other recommendations included:

- Orderly planning and construction of utilities
- Need for government definition of new emission regulations.
- Avoidance of artificial material shortages.
- Equipment purchase determined by quality, not price.
- Avoidance of changes in design, specifications or operation after the contract has been signed.

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