CERTIFICATION TEST OF PAINT OVERSPRAY ARRESTOR FOLLOWING EPA DRAFT METHOD 319

90-95% DriPak Bag Filter

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Introduction

Under contract with AAF International, the Research Triangle Institute (RTI) evaluated the fractional aerosol filtration efficiency of the 90-95% DriPak Bag Filter paint overspray arrestor. The tests were conducted in accordance with EPA's Method 319: "Determination of Filtration Efficiency for Paint Overspray Arrestors" which was published March 27, 1998 in the Federal Register as part of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Aerospace Manufacturing and Rework Facilities. The NESHAP specifies that Method 319 be used to certify the efficiency of filters for meeting the filtration efficiency requirements of the NESHAP.

Physical Description of Paint Overspray Arrestor

The test arrestor was a single-stage 6-pocket bag filter having nominal dimensions of 24" x 24" x 14". The filter has a metallic 3/4" header. The manufacturer's label affixed to the metallic header identified the filter as "DriPak Extended Surface Filter" and as "90-95% ASHRAE Efficiency". The color of the filter media was yellow.

Test Series

Table 1 outlines the test series. All the tests were performed at a nominal face velocity of 120 feet per minute with the arrestors in their initial (i.e., clean) condition. In accordance with the proposed Method 319, the following series of tests were performed:

- Triplicate tests using a liquid-phase aerosol challenge
- Triplicate tests using a solid-phase aerosol challenge
- "No-filter" control tests (one performed prior to each arrestor test)
- HEPA filter control test.

New arrestors were used for each individual test.

TABLE 1. TEST MATRIX

RTI Test No.	TEST			Challenge Aerosol
	No-Filter	Test Arrestor	HEPA Filter	
042998-6	X			Solid-Phase
042998-7		X		
042998-7	X			
042998-9		X		
042998-10	X			
042998-11		X		
043098-1			X	
043098-2	X			Liquid-Phase
043098-3		X		
043098-4	X			
043098-5		X		
043098-6	X			
043098-7		X		

Test Method

Fractional efficiency was computed from upstream and downstream aerosol concentration measurements performed with a high resolution optical particle counter (Climet Instruments Model 226/8040) covering the particle diameter size range from 0.3 to 10 μm in 15 particle-sizing channels. The efficiency tests were conducted at a nominal face velocity of 120 feet per minute (corresponding to a volumetric flow of 480 cfm) and used polydisperse challenge aerosols of solid-phase potassium chloride and liquid-phase oleic acid. The pressure drop measurements were performed with an inclined manometer at the test air flow. Additional details on the test procedure are provided in Appendix B.

Results

Tables 2 and 3, and the figures which follow, summarize the fractional filtration efficiency measurements for the solid and liquid-phase tests, respectively. Upstream and downstream particle count data for each test are provided in Appendix A.

The pressure drop across each test arrestor at the 120 feet per minute test velocity (480 cfm) is shown in Table 4.

Table 5 summarizes the NESHAP filtration efficiency requirements for two stage (applicable to existing sources) and three stage (applicable to new sources) paint arrestors.

Conclusion

Based on the filtration efficiency results from the Method 319 tests, the 90-95% DriPak Bag Filter meets the Aerospace NESHAP filtration efficiency requirements for both new and existing facilities.

TABLE 2. SUMMARY OF SOLID-PHASE TEST RESULTS

Filtration Efficiency (%) at Indicated Size Range

OPC Channel Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Min. Diam. (um)		0.45	0.59	0.73	0.80	1.02	1.44	1.86	2.28	2.85	3.13	4.25	5.66	7.07	7.77	9.88
Max. Diam. (um)		0.59	0.73	0.80	1.02	1.44	1.86	2.28	2.85	3.13	4.25	5.66	7.07	7.77	9.88	14.10
Geo. Mean Diam (um)		0.52	0.66	0.77	0.90	1.21	1.64	2.06	2.55	2.98	3.65	4.91	6.33	7.41	8.76	11.81
Dry Pack 90-95%																
Run #1	042998-7	82	84	88	91	95	97	99	100	100	100	100	100	100	100	100
Run #2	042998-9	82	85	88	91	95	97	99	99	100	100	100	100	100	100	100
Run #3	042998-1	83	85	89	91	95	97	99	100	100	100	100	100	100	100	100
Average		82	85	89	91	95	97	99	100	100	100	100	100	100	100	100

Interpolated Efficiency Values (%) for Two-Stage Criteria:

2.60 um (> 10% required):	100
5.00 um (> 50% required):	100
8.10 um (> 90% required):	100

Interpolated Efficiency Values (%) for Three-Stage Criteria:

0.70 um (> 75% required):	86
1.10 um (> 85% required):	93
2.50 um (> 95% required):	99

HEPA Filter Control Test (applicable to both solid and liquid phase conditions)

Run #1	043098-1	99.4	100	100	100	100	100	100	100	100	100	100	100	100	100	100

"No Filter" Control Tests

Penetration For Each Size Range

Run #1	042998-6	0.99	0.99	0.99	1.00	1.01	1.00	1.00	0.99	1.00	1.00	0.99	0.97	0.98	0.97	0.88
Run #2	042998-8	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	1.00	0.99	0.98	0.95	0.94	0.93	0.86
Run #3	042998-1	1.00	1.00	1.00	1.01	1.00	1.00	1.01	1.01	1.01	1.01	1.02	1.01	0.99	0.90	0.88

TABLE 3. SUMMARY OF LIQUID- PHASE TEST RESULTS

Filtration Efficiency (%) at Indicated Size Range

OPC Channel Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Min. Diam. (um)		0.28	0.37	0.47	0.52	0.66	0.94	1.22	1.51	1.88	2.07	2.83	3.77	4.71	5.18	6.60
Max. Diam. (um)		0.37	0.47	0.52	0.66	0.94	1.22	1.51	1.88	2.07	2.83	3.77	4.71	5.18	6.60	9.43
Geo. Mean Diam (um)		0.32	0.418	0.49	0.58	0.78	1.07	1.36	1.68	1.97	2.42	3.26	4.21	4.94	5.85	7.89
Dry Pack 90-95%																
Run #1	043098-3	75	79	83	85	90	95	97	99	100	100	100	100	100	100	100
Run #2	043098-5	75	79	82	85	90	95	97	99	100	100	100	100	100	100	100
Run #3	043098-7	74	77	81	84	89	94	97	99	99	100	100	100	100	100	100
Average		75	78	82	85	90	94	97	99	100	100	100	100	100	100	100

Interpolated Efficiency Values (%) for Two-Stage Criteria:

2.20 um (> 10% required):	100
4.10 um (> 50% required):	100
5.70 um (> 90% required):	100

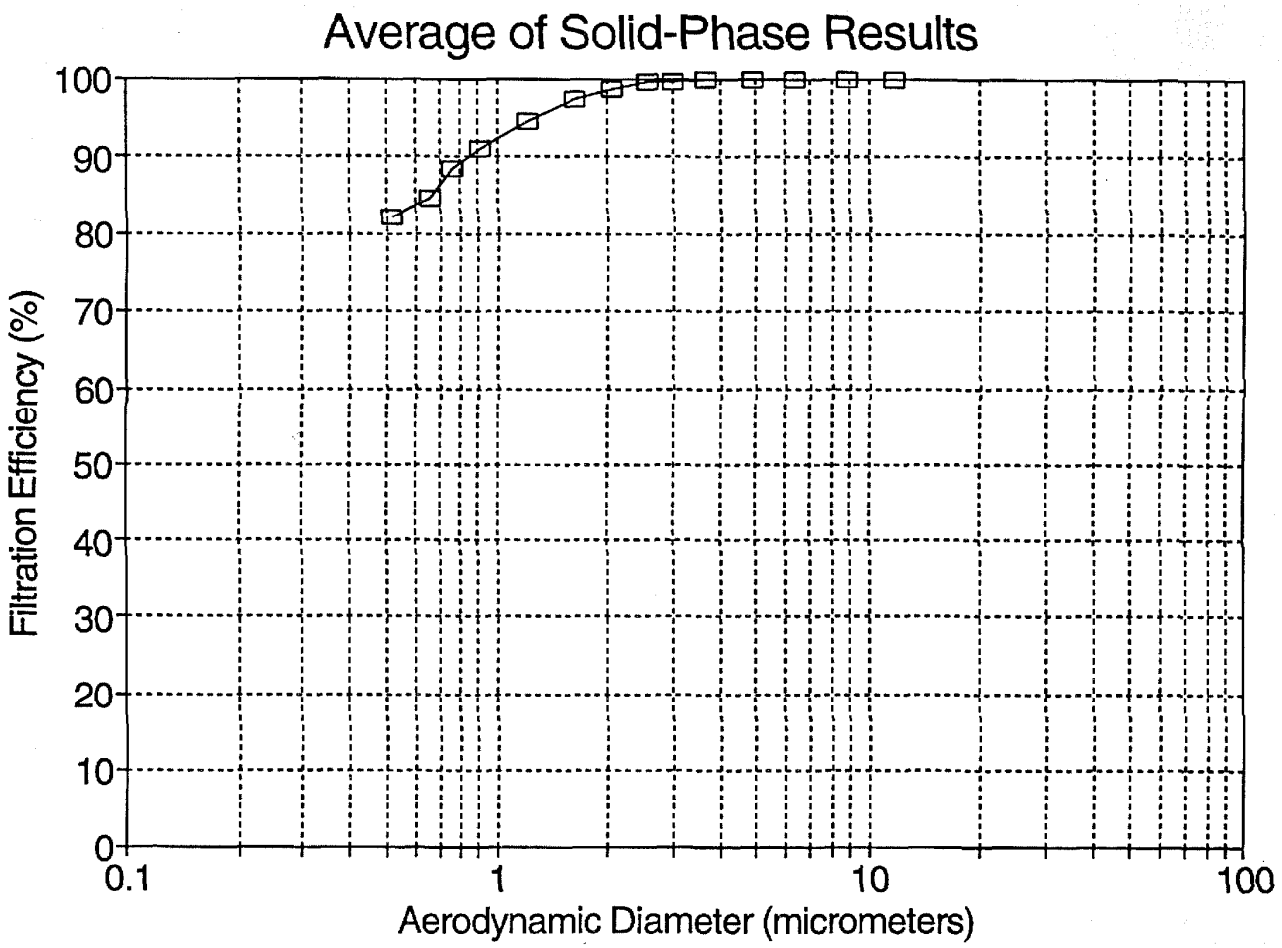
Interpolated Efficiency Values (%) for Three-Stage Criteria:

0.42 um (> 65% required):	78
1.00 um (> 80% required):	93
2.00 um (> 95% required):	100

"No Filter" Control Tests

Penetration For Each Size Range

Run #1	043098-2	1.00	1.00	1.00	1.00	1.00	1.01	1.00	1.00	0.99	1.01	1.02	0.99	1.01	0.92	0.81
Run #2	043098-4	1.01	1.01	1.00	1.01	1.02	1.01	1.01	1.00	1.01	1.02	1.01	0.97	0.95	0.86	0.75
Run #3	043098-6	0.99	0.98	0.99	0.99	0.98	0.99	0.98	0.98	0.98	0.99	0.99	0.93	0.89	0.85	0.72


Average of Solid-Phase Results
Filtration Efficiency (%)
100
90
80
70
60
50
40
30
20
10
0
0.1
1
10
100
Aerodynamic Diameter (micrometers)

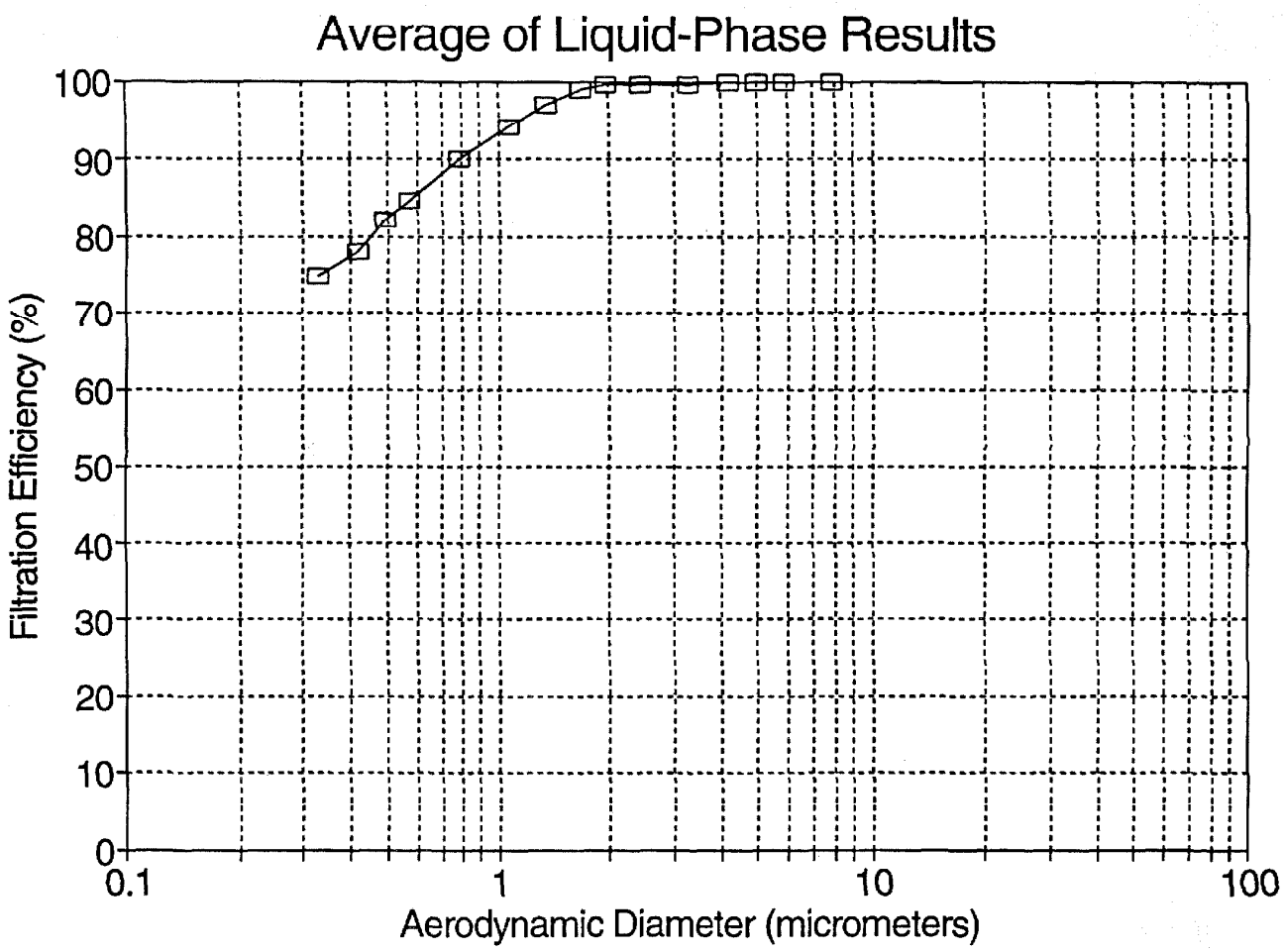

Average of Liquid-Phase Results
Filtration Efficiency (%)
100
90
80
70
60
50
40
30
20
10
0
0.1
1
10
100
Aerodynamic Diameter (micrometers)

TABLE 4

SUMMARY OF PRESSURE DROP MEASUREMENTS

Test No.	Pressure Drop (inch H_2O)
042998-7	0.30
042998-9	0.31
042998-11	0.32
043098-3	0.26
043098-5	0.29
043098-7	0.28

TABLE 5. EPA PROPOSED FILTRATION EFFICIENCY REQUIREMENTS

TABLE 1 OF § 63.745
TWO-STAGE ARRESTOR; LIQUID PHASE CHALLENGE

Filtration efficiency requirement, %	Aerodynamic particle size range, μm
>90	>5.7
>50	>4.1
>10	>2.2

TABLE 2 OF § 63.745
TWO-STAGE ARRESTOR; SOLID PHASE CHALLENGE

Filtration efficiency requirement, %	Aerodynamic particle size range, μm
>90	>8.1
>50	>5.0
>10	>2.6

TABLE 3 OF § 63.745
THREE-STAGE ARRESTOR; LIQUID PHASE CHALLENGE

Filtration efficiency requirement, %	Aerodynamic particle size range, μm
>95	>2.0
>80	>1.0
>65	>0.42

TABLE 4 OF § 63.745
THREE-STAGE ARRESTOR; SOLID PHASE CHALLENGE

Filtration efficiency requirement, %	Aerodynamic particle size range, μm
>95	>2.5
>85	>1.1
>75	>0.70