US ERA ARCHIVE DOCUMENT

## THE ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM





# **ETV Joint Verification Statement**

TECHNOLOGY TYPE: VENTILATION MEDIA AIR FILTER

APPLICATION: FILTRATION EFFICIENCY OF BIOAEROSOLS IN

**HVAC SYSTEMS** 

TECHNOLOGY NAME: Synthetic Minipleat V-Cell, SMV-M13-2424

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The U.S. Environmental Protection Agency (EPA) has created the Environmental Technology Verification (ETV) Program to facilitate the deployment of innovative or improved environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by substantially accelerating the acceptance and use of improved and cost-effective technologies. ETV seeks to achieve this goal by providing high quality, peer-reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies.

ETV works with recognized standards and testing organizations; stakeholder groups which consist of buyers, vendor organizations, permitters, and other interested parties; and with the full participation of individual technology developers. The program evaluates the performance of innovative and improved technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance protocols to ensure that data of known and adequate quality are generated and that the results are defensible.

EPA's National Risk Management Research Laboratory contracted with the Research Triangle Institute (RTI) to establish a homeland-security-related ETV Program for products that clean ventilation air. RTI evaluated the performance of ventilation air filters used in building heating, ventilation and air-conditioning (HVAC) systems. This verification statement provides a summary of the test results for the Aeolus Corporation Synthetic Minipleat V-Cell, SMV-M13-2424 media air filter.

#### **VERIFICATION TEST DESCRIPTION**

All tests were performed in accordance with RTI's "Test/Quality Assurance Project Plan: Biological Testing of General Ventilation Filters," which was approved by EPA. Tests were performed for the following:

- Bioaerosol filtration efficiency tests of the clean and dust-loaded filter. Three bioaerosols were used in the testing:
  - o The spore form of the bacteria *Bacillus atrophaeus* (BG), a gram-positive spore-forming bacteria elliptically shaped with dimensions of 0.7 to 0.8 by 1 to 1.5  $\mu$ m,
  - o Serratia marcescens, a rod-shaped gram-negative bacteria with a size of 0.5 to 0.8 by 0.9 to 2.0  $\mu$ m, and
  - o The bacterial virus (bacteriophage) MS2 dispersed as a micrometer-sized polydisperse aerosol.
- Inert aerosol filtration efficiency tests consisting of an American National Standards
  Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning
  Engineers (ASHRAE) Standard 52.2-1999 type test (0.3 to 10 μm) and extended
  fractional efficiency measurements down to 0.02 μm particle diameter on both clean and
  dust-loaded filter.
- ASHRAE 52.2 test. This test provides filtration efficiency results (average of the minimum composite efficiency) given for three size ranges of particles: E1, 0.3 to 1.0 μm; E2, 1.0 to 3.0 μm; and E3, 3.0 μm to 10 μm.

# **VERIFIED TECHNOLOGY DESCRIPTION**

As shown in Figure 1, the Aeolus Corporation Synthetic Minipleat V-Cell, SMV-M13-2424 media air filter is a V-cell filter with nominal dimensions of 0.61 by 0.61 by 0.31 m (24 by 24 by 12 in.). The filter has a plastic frame, and the filter media color is white and red stripes. The media is polypropylene. There are four V-cells with minipleated media. The Aeolus Corporation part number is SMV-M13-2424.

## VERIFICATION OF PERFORMANCE

Verification testing of the Aeolus Corporation Synthetic Minipleat V-Cell, SMV-M13-2424 media air filter began on September 9, 2003 at the test facilities of RTI and was completed on October 8, 2003. The results for the bioaerosol filtration efficiency tests are presented in Figure 1 Table 1 for the clean and dust-loaded filter. Table 2 presents the results of the ASHRAE 52.2 test. All tests were conducted at an air flow of 0.93 m3/sec (1970 cfm).



Figure 1. Photograph of the Aeolus Corporation Synthetic Minipleat V-Cell, SMV-M13-2424 media filter.

Table 1. Bioaerosol Filtration Results

		Filtration	Filtration	Filtration
	Pressure Drop	Efficiency for	Efficiency for	Efficiency for
	Pa (in. H <sub>2</sub> O)	Removal of	Removal of	Removal of
		B. atrophaeus, %	S. marcescens, %	MS2 phage, %
Clean	77 (0.31)	69	64	73
Dust loaded	348 (1.40)	99	99.5	99

Table 2. Summary of ASHRAE 52.2 Test

	E1 0.3 to 1.0 $\mu$ m,	E2 1.0 to 3.0 μm,	E3 3.0 to 10 μm, %	Minimum Efficiency Reporting Value (MERV)
Aeolus Corporation Synthetic Minipleat V- Cell, SMV-M13-2424	57	85	97	12 at 0.93m <sup>3</sup> /sec (1970 cfm)

The quality assurance officer reviewed the test results and the quality control data and concluded that the data quality objectives given in the approved test/QA plan were attained.

This verification statement addresses two performance measures of media air filters: filtration efficiency and pressure drop. Users of this technology may wish to consider other performance parameters such as service life and cost when selecting a media air filter for bioaerosol control. In accordance with the test/QA plan<sup>1</sup>, this verification statement is applicable to filters manufactured from December 2003 through November 2006.

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ETV-HS

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