

US EPA ARCHIVE DOCUMENT

# Environmental Technology Verification

## Baghouse Filtration Products

Sinoma Science & Technology Co., Ltd.

FT-902 Filtration Media

(Tested July-August 2011)

Prepared by

RTI International



ETS Incorporated



Under a Cooperative Agreement with  
U.S. Environmental Protection Agency



# THE ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM



U.S. Environmental Protection Agency



## ETV Joint Verification Statement

|                         |   |                              |  |
|-------------------------|---|------------------------------|--|
| <b>TECHNOLOGY TYPE:</b> | <b>BAGHOUSE FILTRATION PRODUCTS</b>   |                              |  |
| <b>APPLICATION:</b>     | <b>CONTROL OF PM<sub>2.5</sub> EMISSIONS BY BAGHOUSE FILTRATION PRODUCTS</b>                            |                              |  |
| <b>TECHNOLOGY NAME:</b> | <b>FT-902 Filtration Media</b>  |                              |  |
| <b>COMPANY:</b>         | <b>Sinoma Science &amp; Technology Co., Ltd.</b>  |                              |  |
| <b>ADDRESS:</b>         | <b>No. 99 Tongtian Road</b>   | <b>PHONE: 86-25-87186865</b> |  |
|                         | <b>Jiangjing Science Garden</b>   | <b>FAX: 86-25-87186876</b>   |  |
|                         | <b>Nanjing, Jiangsu, China</b>  |                              |  |
| <b>WEB SITE:</b>        | <a href="http://www.sinomatech.com/html-en/index.html">http://www.sinomatech.com/html-en/index.html</a> |                              |  |
| <b>E-MAIL:</b>          | <a href="mailto:juxiaohui@gmail.com">juxiaohui@gmail.com</a>  |                              |  |

The U.S. Environmental Protection Agency (EPA) 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 accelerating the acceptance and use of improved and cost-effective technologies. The ETV Program 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.

The ETV Program works in partnership with recognized standards and testing organizations; stakeholder groups, which consist of buyers, vendor organizations, permittees, and other interested parties; and with the full participation of individual technology developers. The program evaluates the performance of innovative 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 (QA) protocols to ensure that data of known and adequate quality are generated and that the results are defensible.

The Air Pollution Control Technology Center (APCT Center) is operated by RTI International\* (RTI), in cooperation with EPA's National Risk Management Research Laboratory (NRMRL). The APCT Center evaluates the performance of baghouse filtration products (BFPs) used primarily to control PM<sub>2.5</sub> emissions (i.e., particles 2.5 µm and smaller in aerodynamic diameter). This verification statement summarizes the test results for Sinoma Science & Technology Co., Ltd.'s (SSTCL's) FT-902 filtration media.

## VERIFICATION TEST DESCRIPTION

All tests were performed in accordance with the APCT Center *Generic Verification Protocol for Baghouse Filtration Products*, available at [http://www.epa.gov/etv/pubs/05\\_vp\\_bfp.pdf](http://www.epa.gov/etv/pubs/05_vp_bfp.pdf). The protocol is based on and describes modifications to the equipment and procedures described in Verein Deutscher Ingenieure (VDI) 3926, Part 2, *Testing of Filter Media for Cleanable Filters under Operational Conditions*, December 1994. The VDI document is available from Beuth Verlag GmbH, 10772 Berlin, Germany. The protocol also includes requirements for quality management and QA, procedures for product selection, auditing of the test laboratories, and the test reporting format.

Outlet particle concentrations from a test fabric were measured with an impactor equipped with appropriate substrates to filter and measure PM<sub>2.5</sub> within the dust flow. Outlet particle concentrations were determined by weighing the mass increase of dust collected in each impactor filter stage and dividing by the gas volumetric flow through the impactor.

Particle size was measured while injecting the test dust into the air upstream of the baghouse filter sample. The test dust was dispersed into the flow using a brush-type dust feeder. The particle size distributions in the air were determined both upstream and downstream of the test filter fabric to provide accurate results for penetration through the test filter of PM<sub>2.5</sub>. All tests were performed using a constant  $18.4 \pm 3.6$  g/dscm ( $8.0 \pm 1.6$  gr/dscf) loading rate, a  $120 \pm 6.0$  m/h ( $6.6 \pm 0.3$  fpm) filtration velocity [identical to gas-to-cloth ratio (G/C\*\*)], and aluminum oxide test dust with a measured mass mean aerodynamic diameter maximum of 1.5 µm (average of three impactor runs). All BFPs are tested in their initial (i.e., clean) condition.

Each of the three test runs consisted of the following segments:

- Conditioning period—10,000 rapid-pulse cleaning cycles
- Recovery period—30 normal-pulse cleaning cycles
- Performance test period—6-hour filter fabric test period with impactor.

## VERIFIED TECHNOLOGY DESCRIPTION

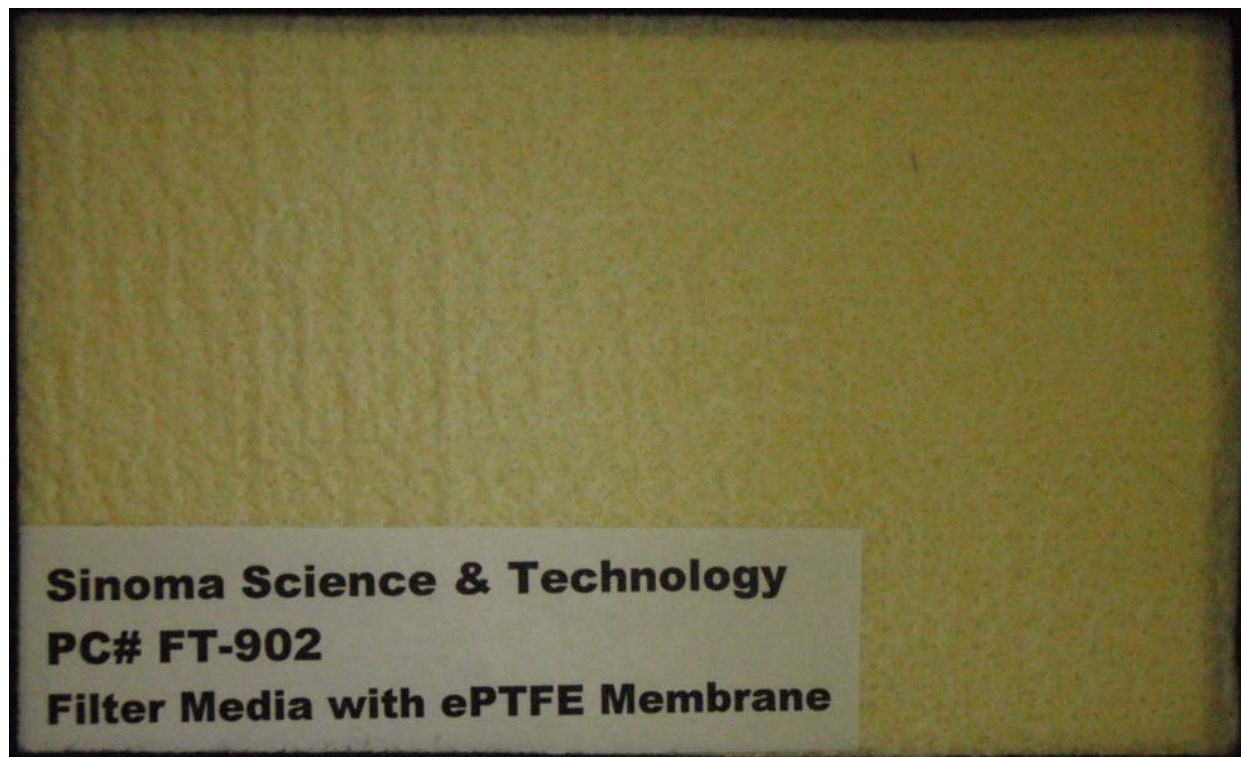
Baghouses are air pollution control devices used to control particulate emissions from stationary sources and are among the technologies evaluated by the APCT Center. Baghouses and their accompanying filter media have long been one of the leading particulate control techniques for industrial sources. Increasing emphasis on higher removal efficiencies has helped the baghouse to be continually more competitive when compared to the other generic PM control devices to the point where it is now the control option of choice for most industrial applications. The development of new and improved filter media has further enhanced baghouse capability to control fine PM over an expanded range of industrial applications.

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\* RTI International is a trade name of Research Triangle Institute.

\*\* Filtration velocity and gas-to-cloth ratio are used interchangeably and are defined as the gas flow rate divided by the surface area of the cloth.

SSTCL provided the following information about their product. The FT-902 is a needle felt filter media with a polytetrafluoroethylene (PTFE) membrane. **Figure 1** is a photograph of the fabric. Sample material was received as nine 46 x 91 cm (18 x 36 in.) swatches marked with the manufacturer's model number, year and month of manufacture, and cake side. Three of the swatches were selected at random for preparing three test specimens 150 mm (5.9 in.) in diameter.



**Figure 1. Photograph of SSTCL's FT-902 filtration media**

## **VERIFICATION OF PERFORMANCE**

Verification testing of the SSTCL FT-902 filtration media was performed during the period of July 29 – August 4, 2011, for standard test conditions at the test facility of ETS Incorporated, 1401 Municipal Road NW, Roanoke, VA 24012. Test conditions are listed in **Table 1**. The overall test results summarized in **Table 2** represent the averages of three individual tests.

The APCT Center quality manager has reviewed the test results and the quality control (QC) data and has concluded that the data quality objectives given in the generic verification protocol and test/QA plan have been attained.

This verification statement addresses five aspects of filter fabric performance: filter outlet PM<sub>2.5</sub> concentration, filter outlet total mass concentration, pressure drop, filtration cycle time, and mass gain on the filter fabric. Users may wish to consider other performance parameters, such as temperature, service life, and cost when selecting a filter fabric for their application.

**Table 1. Test Conditions for Baghouse Filtration Products  
Brand/Model: SSTCL's FT-902 Filtration Media**

| Test Parameter                 | Value   |
|--------------------------------|---|
| Dust concentration             | 18.4 ± 3.6 g/dscm (8.0 ± 1.6 gr/dscf)           |
| Filtration velocity (G/C)      | 120 ± 6 m/h (6.6 ± 0.3 fpm)                     |
| Pressure loss before cleaning  | 1,000 ± 12 Pa (4 ± 0.05 in. w.g.)               |
| Tank pressure                  | 0.5 ± 0.03 MPa (75 ± 5 psi)                     |
| Valve opening time             | 50 ± 5 ms                                       |
| Air temperature                | 25 ± 2 °C (77 ± 4 °F)                           |
| Relative humidity              | 50 ± 10%  |
| Total raw gas stream flow rate | 5.8 ± 0.3 m <sup>3</sup> /h (3.4 ± 0.2 cfm)     |
| Sample gas stream flow rate    | 1.13 ± 0.06 m <sup>3</sup> /h (0.67 ± 0.03 cfm) |
| Number of cleaning cycles      |   |
| • During conditioning period   | 10,000 cycles                                   |
| • During recovery period       | 30 cycles                                       |
| Performance test duration      | 6 h ± 1 s                                       |

Beginning of table description. Table 1 is titled Test Conditions for Baghouse Filtration Products; the Brand/Model is listed as SSTCL's FT-902 Filtration Media. The table describes the test conditions that are specified in the QA/QC requirements for the test; all conditions were achieved for this test. The table lists the test parameters in one column and their values in the next column. The test parameters include such items as the dust concentration, filtration velocity, flow rates, air temperature and humidity, and the number of cleaning cycles during the test. End of table description.

**Table 2. Baghouse Filtration Product Three-Run Average Test Results  
for SSTCL's FT-902 Filtration Media**

| Verification Parameter  | At Verification Test Conditions         |
|---|---|
| Outlet particle concentration at standard conditions <sup>a</sup> |   |
| PM <sub>2.5</sub> , g/dscm<br>(gr/dscf)                           | <0.0000167 <sup>c</sup><br>(<0.0000073) |
| Total mass, g/dscm <sup>b</sup><br>(gr/dscf)                      | <0.0000167 <sup>c</sup><br>(<0.0000073) |
| Average residual pressure drop (Δ P), cm w.g. (in. w.g.)          | 2.07 (0.81)                             |
| Initial residual Δ P, cm w.g. (in. w.g.)                          | 2.05 (0.81)                             |
| Residual Δ P increase, cm w.g. (in. w.g.)                         | 0.03 (0.01)                             |
| Filtration cycle time, s  | 253                                     |
| Mass gain of test sample filter, g (gr)                           | 0.12 (1.90)                             |
| Number of cleaning cycles   | 85                                      |

<sup>a</sup> Standard conditions: 101.3 kPa (14.7 psia) and 20 °C (68 °F).

<sup>b</sup> Total mass includes the mass of PM<sub>2.5</sub> and larger particles that passed through the fabric.

<sup>c</sup> The measured value was determined to be below the detection limit of 0.0000167 grams per cubic meter. The detection limit is for a 6-hour test and based on VDI 3926.

Beginning of table description. Table 2 is titled Baghouse Filtration Product Three-Run Average Test Results for SSTCL's FT-902 Filtration Media. The table lists the verified test results for this product. The table lists the verification parameters in one column and their values at the verification test conditions in the next column. The verification parameters listed include the outlet particle concentration, the pressure drop characteristics, the filtration cycle time, the mass gain of the test sample, and number of cycles during the test. End of table description.

In accordance with the generic verification protocol, this verification statement is applicable to filter media manufactured between the signature date of the verification statement and 3 years thereafter.

signed by Cynthia Sonich-Mullin      11/29/2011  
Cynthia Sonich-Mullin      Date  
Director  
National Risk Management Research Laboratory  
Office of Research and Development  
United States Environmental Protection Agency

signed by Jason Hill      10/21/2011  
Jason Hill      Date  
Director  
Air Pollution Control Technology Center  
RTI International

**NOTICE:** ETV verifications are based on an evaluation of technology performance under specific, predetermined criteria and the appropriate quality assurance procedures. EPA and RTI make no express or implied warranties as to the performance of the technology and do not certify that a technology will always operate as verified. The end user is solely responsible for complying with any and all applicable federal, state, and local requirements. Mention of commercial product names does not imply endorsement.