# Fabric Performance Screening using ASTM/ETV Test Method D6830-02 Conducted for Technical Felts Company

## ETS, INC.

***Pollution Control Consultants Specializing In Testing, Training, Troubleshooting and Testimony***


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ETS CONTRACT NUMBER 08-570-L

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|---|---|
| CLIENT: Technical Felts Company | SITE: N/A |
| CLIENT P.O. NO: Email | FABRIC TYPES: PTFE Felt/PTFE |
| CLIENT CONTACT: Abraham Turkson | BAGHOUSE TYPE: Pulse Jet |
| ETS CONTRACT NO: 08-570-L | PROGRAM: Screening |
| DATE: February 8, 2008 | APPLICATION: N/A |

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## 1.0 INTRODUCTION

ETS, Inc. was retained by the Technical Felts Company. to conduct screening tests on one sample of felt PTFE/PTFE membrane fabric.

## 2.0 TEST PROGRAM

The testing was conducted in the ETS Filtration Performance Test Apparatus to determine the filter sample's performance with respect to the following parameters:

- Outlet particulate emissions (PM 2.5)
- Outlet particulate emissions (total mass)
- Initial residual pressure drop
- Increase in residual pressure drop
- Average residual pressure drop
- Mass weight gain of the filter sample
- Average filtration cycle time
- Number of filtration cycles

## 3.0 TEST PROCEDURE:

Testing was conducted in accordance with ASTM Test Method D6830-02 and with the test specifications and conditions as detailed in the Generic Verification Protocol for Baghouse Filtration Products (BFP) developed by the Air Pollution Control Technology Verification Center (APCTVC) which is part of the U.S. EPA's Environmental Technology Verification (ETV) Program and is operated in partnership between RTI and EPA. The protocol was adapted from the German VDI Method 3926, and modified for ETV and is available at etv.rti.org/apct/pdf/GVP_Revised.pdf. There was one exception to the protocol specification:

- The test program consisted of one run rather than three runs as specified in the protocol.

## 4.0 TEST APPARATUS AND TEST DESCRIPTION:

The test apparatus is shown in Figure 1. The test run consisted of three test phases. To simulate long term operation, the filter sample was first subjected to a conditioning period which consisted of 10,000 rapid pulse cleaning cycles under continuous dust loading. During this period, the time between cleaning cycles is maintained at three seconds. No filter performance parameters are measured during the conditioning period. The conditioning period was immediately followed by a recovery period, which allows the filter sample to recover from the rapid pulsing. The recovery period consisted of 30 normal filtration cycles under continuous dust loading. During a normal filtration cycle, the dust cake is allowed to form on the test filter until a differential pressure of 1,000 Pa (4.0 inch w.g.) is reached. At this point, the test filter is cleaned by a pulse of compressed air. Immediately after pulse cleaning the pressure fluctuates rapidly inside the test duct. Some of the released dust immediately re-deposits on the test filter. The pressure then stabilizes and returns to normal. Thus, the residual pressure drop across the filter is measured three seconds after conclusion of the cleaning pulse. It is monitored and recorded continuously throughout the recovery and

performance test period. The performance test period immediately followed the recovery period for a cumulative total of 10,030 cycles after the test filter was installed in the test apparatus. The performance test period is six hours in duration and during this phase normal filtration cycles and constant dust loading are maintained and recorded. Outlet mass and PM 2.5 dust concentrations are measured using an inertial impactor located downstream of the test filter. The weight gain of each impactor stage substrate is measured to within 0.00001 grams. Test conditions throughout the test were as follows:

- Test dust: Pural NF Alumina (1.5 ± 1.0 micron mass mean diameter)
- Inlet dust feed rate: 100 ±20 grams/hr. (18.4 ± grams/scm)
- Filtration Velocity: 120 ±6 m/hr.
- Gas Temperature: $25^0$ C $\pm 2^0$ C
- Pulse Cleaning Pressure: 75 psi

## 5.0 TEST RESULTS:

The following table summarizes the results measured during the performance test phase of the test run. Detailed information for the conditioning, recovery and performance test phases is provided in Tables I and II.

| PARAMETER | FELT PTFE/PTFE Run 3 |
|---|---|
| PM2.5 Emissions (g/dscm) | ND* |
| Total Mass Emissions (g/dscm) | ND* |
| Initial Residual Pressure Drop (cm w.g.) | 2.64 |
| Residual Pressure Drop Increase (cm w.g.) | 0.12 |
| Average Residual Pressure Drop (cm w.g.) | 2.71 |
| Filter Sample Weight Gain (grams) | 0.13 |
| Average Filtration Cycle Time (seconds) | 439 |
| Number of Filtration Cycles (or Pulses) | 49 |

* The measured value was determined to be below the detection limit of 0.01667 mg/ cm. The detection limit is for a six hour test and based on VDI 3926, October, 2004 p. 19.

## TABLE I

## SUMMARY OF TEST RESULTS (METRIC UNITS)

**TESTING OF BAGHOUSE FILTRATION PRODUCTS**
**TECHNICAL FELTS SUMMARY OF RESULTS AT 2 M/MIN**
**ETS CONTRACT NUMBER: 08-570-L DATE: 2/8/08**

| | |
|---|---|
| RUN ID. | **570-R3** |
| FABRIC DESIGNATION | **PTFE Felt/PTFE** |
| MANUFACTURER | **Technical Felts** |
| DUST FEED | **Pural NF** |
| CONDITIONING PERIOD | |
| Date Started | 2/1/2008 |
| Time Started | 8:29 |
| Time Ended | 16:49 |
| Test Duration (min.) | 500 |
| RECOVERY PERIOD | |
| Date Started | 2/4/2008 |
| Time Started | 7:35 |
| Time Ended | 11:01 |
| Test Duration (min.) | 206 |
| PERFORMANCE TEST PERIOD | |
| Date Started | 2/4/2008 |
| Time Started | 12:30 |
| Time Ended | 18:30 |
| Test Duration (min.) | 360 |
| VERIFICATION TEST RESULTS | |
| Mean Outlet Particle Conc. PM 2.5 (g/dscm) | 0.0000000 |
| Mean Outlet Particle Conc. Total mass (g/dscm) | 0.0000000 |
| Initial Residual Pressure Drop (cm w.g.) | 2.64 |
| Change in Residual Pressure Drop (cm w.g.) | 0.12 |
| Average Residual Pressure Drop (cm w.g.) | 2.71 |
| Mass Gain of Filter Sample (g) | 0.13 |
| Average Filtration Cycle Time (s) | 439 |
| Number of Pulses | 49 |
| RESIDUAL PRESSURE DROP | |
| At Start of: | |
| Conditioning Period (cm w.g.) | 1.15 |
| Recovery Period (cm w.g.) | 2.69 |
| Performance Test Period (cm w.g.) | 2.64 |
| Pulse Pressure (psi) | 75 |
| REMOVAL EFFICIENCY (%) | |
| Dust Conc (g/dscm) | 18.30 |
| PM 2.5 * | 100.00000 |
| Total Mass ** | 100.00000 |

* $\frac{(\text{Dust Concentration} * 0.7735) - \text{PM 2.5 Outlet Concentration}}{\text{Dust Concentration} * 0.7735} * 100$

** $\frac{\text{Dust Concentration} - \text{Total Mass Outlet Concentration}}{\text{Dust Concentration}} * 100$

## TABLE II

## SUMMARY OF TEST RESULTS (ENGLISH UNITS)

**TESTING OF BAGHOUSE FILTRATION PRODUCTS**
**TECHNICAL FELTS SUMMARY OF RESULTS AT 2 M/MIN**
**ETS CONTRACT NUMBER: 08-570-L DATE: 2/8/08**

| | |
|---|---|
| RUN ID. | **570-R3** |
| FABRIC DESIGNATION | **PTFE Felt/PTFE** |
| MANUFACTURER | **Technical Felts** |
| DUST FEED | **Pural NF** |
| CONDITIONING PERIOD | |
| Date Started | 2/1/2008 |
| Time Started | 8:29 |
| Time Ended | 16:49 |
| Test Duration (min.) | 500 |
| RECOVERY PERIOD | |
| Date Started | 2/4/2008 |
| Time Started | 7:35 |
| Time Ended | 11:01 |
| Test Duration (min.) | 206 |
| PERFORMANCE TEST PERIOD | |
| Date Started | 2/4/2008 |
| Time Started | 12:30 |
| Time Ended | 18:30 |
| Test Duration (min.) | 360 |
| VERIFICATION TEST RESULTS | |
| Mean Outlet Particle Conc. PM 2.5 (gr/dscf) | 0.0000000 |
| Mean Outlet Particle Conc. Total mass (gr/dscf) | 0.0000000 |
| Initial Residual Pressure Drop (in. w.g.) | 1.04 |
| Change in Residual Pressure Drop (in. w.g.) | 0.05 |
| Average Residual Pressure Drop (in. w.g.) | 1.07 |
| Mass Gain of Filter Sample (g) | 0.13 |
| Average Filtration Cycle Time (s) | 439 |
| Number of Pulses | 49 |
| RESIDUAL PRESSURE DROP | |
| At Start of: | |
| Conditioning Period (in. w.g.) | 0.45 |
| Recovery Period (in. w.g.) | 1.06 |
| Performance Test Period (in. w.g.) | 1.04 |
| REMOVAL EFFICIENCY (%) | |
| Dust Conc (gr/dscf) | 8.00 |
| PM 2.5 * | 100.00000 |
| Total Mass ** | 100.00000 |

* $\frac{(\text{Dust Concentration} * 0.7735) - \text{PM 2.5 Outlet Concentration}}{\text{Dust Concentration} * 0.7735} * 100$

** $\frac{\text{Dust Concentration} - \text{Total Mass Outlet Concentration}}{\text{Dust Concentration}} * 100$

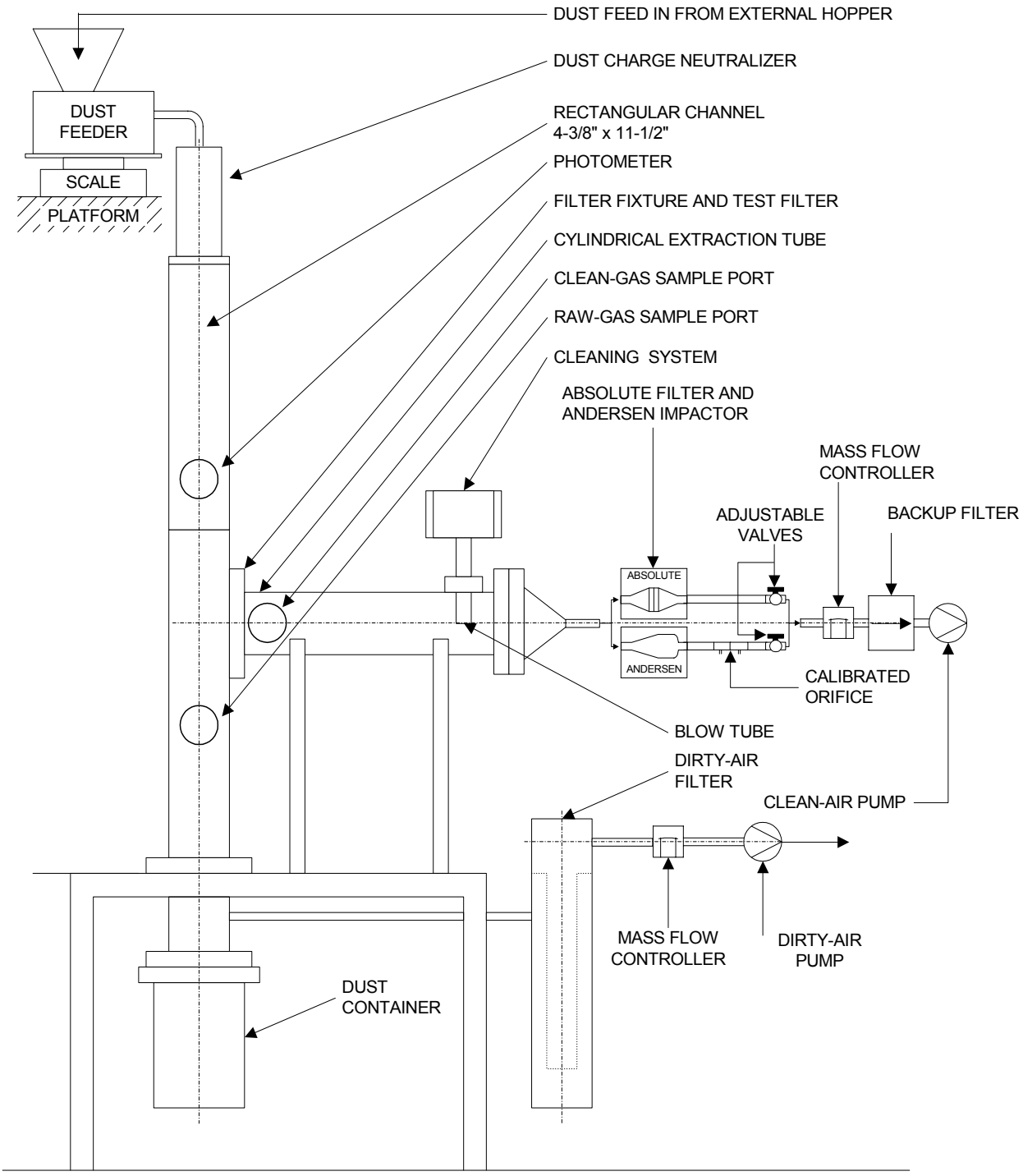


Figure 1 Filtration Performance Test Apparatus

# REPORT CERTIFICATION

This report was prepared under my direct supervision. I have reviewed all details of this report and hereby certify that it is authentic and accurate.

*Signature* _____ *Date* 2-8-08

**Terry G. Williamson**, Manager - Fabric Filtration Laboratory, ETS, Inc.

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I have reviewed all the testing details and results in this report, and confirm that they are authentic and accurate.

*Signature* _____ *Date* 2-8-08

**John D. McKenna, Ph.D.,** Principal, ETS, Inc.