Designation: D6830 – 02 (Reapproved 2016)

Standard Test Method for Characterizing the Pressure Drop and Filtration Performance of Cleanable Filter Media[1]

This standard is issued under the fixed designation D6830; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method characterizes the operational performance of cleanable filter media under specified laboratory conditions.

1.2 This test method determines the airflow resistance, drag, cleaning requirements, and particulate filtration performance of pulse cleaned filter media.

1.3 This test method determines the comparative performance of cleanable filter media.

1.4 The results obtained from this test method are useful in the design, construction, and selection of filter media.

1.5 The results obtained by this test method should not be used to predict absolute performance of full scale fabric filter (baghouse) facilities, however these results will be useful in selection of proper filter media and identification of recommended operating parameters for these full scale fabric filter facilities.

1.6 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D123 Terminology Relating to Textiles

D461 Test Methods for Felt (Withdrawn 2003)[3]

D737 Test Method for Air Permeability of Textile Fabrics

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

E832 Specification for Laboratory Filter Papers

F740 Definitions of Terms Relating to Filtration (Withdrawn 2002)[3]

2.2 *Other Standards:*

Draft Generic Verification Protocol for Baghouse Filtration Products[4]

Standard Operating Procedures for Verification Testing of Baghouse Filtration Products Using LTG/FEMA Test Apparatus, Draft, December[5]

VDI 3926, Part 2 Testing of Filter Media for Cleanable Filters under Operational Conditions[6]

3. Terminology

3.1 *Definitions*—For definitions of other terms used in this test method, refer to Terminologies D123, D1356, and F740, as well as 11.1 of this test method.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *fabric conditioning period*—the period during which the fabric specimen is conditioned within the test apparatus by subjecting it to 10 000 rapid compressed air cleaning pulses at 3-5 seconds between pulses. During the conditioning period the specimen is subjected to test method specifications for dust and gas flow rates.

3.2.2 *fabric recovery period*—time period following the conditioning period during which the fabric is allowed to recover from rapid pulsing. The fabric recovery period requires 30 filtration cycles under normal filtration cycles. During the recovery period the fabric is subjected to test method specifications for dust and gas flow rates.

[1] This test method is under the jurisdiction of ASTM Committee D22 on Air Quality and is the direct responsibility of Subcommittee D22.03 on Ambient Atmospheres and Source Emissions.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Generic Verification Protocol for Baghouse Filtration Products, RTI, Research Triangle Park, NC, September 2001.

[5] Test/QA Plan for the Verification Testing of Baghouse Filtration Products, ETS, Inc., October 2000.

[6] Verein Deutscher Ingenieure (VDI 3926, Part 2), "Testing of Filter Media For Cleanable Filters under Operational Conditions," December, 1994. Available from Beuth Verlag GmbH, 10772 Berlin, Germany.

3.2.3 *filtration velocity*—volumetric is the flow rate per unit face area. Also referred to as gas-to-cloth ratio (G/C), or air-to-cloth ratio (A/C).

3.2.4 *filtration cycle*—a cycle in the filtration process in which the particulate matter is allowed to form a dust cake on the face area of the test specimen with no disturbances from a pulse of compressed air to clean the dust cake from the test specimen. The filtration cycle is the time period between two consecutive cleaning or pulse cycles.

3.2.5 *filtration cycle time*—the duration of time, measured in seconds or minutes, defined by one filtration cycle. Also referred to as time between cleaning cycles, or pulse cycles.

3.2.6 *normal filtration cycle*—a filtration cycle specified for this test method in which the dust cake is allowed to form on the test specimen until a differential pressure of 1000 Pa (4 in. w.g.) is reached. At this point, the test specimen is cleaned by a pulse of compressed air from the clean gas side. After the pulse action is completed the next filtration cycle begins continuing until the pressure differential reaches 1000 Pa, thus initiating the next pulse.

3.2.7 *PM- particulate matter*—also used interchangeably with "dust" when referring to test dust specifications or inlet particulate matter flow rates.

3.2.8 *PM 2.5*—particulate matter nominally 2.5 micrometres and less in equivalent aerodynamic diameter.

3.2.9 *performance test period*—a 120 minute test period following the fabric recovery period (360 minutes minimum for PM 2.5 measurements) during which measurements for particulate emissions, residual pressure drop, number of filtration cycles, and filtration cycle time are monitored and recorded. During the performance test period pulse cleaning is triggered at a differential pressure of 1000 Pa (4 in. w.g.) measured across the test specimen. Gas and dust flows are maintained at test specification flow rates.

3.2.10 *residual pressure drop*—the air flow resistance measured across the test specimen, as measured three seconds after cleaning the test specimen with a pulse of compressed air, Also referred to as residual differential pressure, P, residual delta P, or dP_r, or Δp_r.

4. Summary of Test Method

4.1 A fabric filter sample is challenged with a standard dust (particulate matter) under simulated baghouse conditions at specified rates for air and dust flow.

4.2 The test consists of three test runs. Each run consists of three sequential phases or test periods during which dust and gas flow rates are continuously maintained to test specification.

4.2.1 The test phases are:

4.2.1.1 A conditioning period consisting of 10 000 rapid pulse filtration cycles to simulate long term operation,

4.2.1.2 A 30 normal filtration cycle recovery period to allow the test specimen to recover from rapid pulsing, and

4.2.1.3 A two-hour performance test period, consisting of normal filtration cycles, during which measurements for particulate emissions are determined by gravimetric measurement of the particulate matter which passes through the test specimen.

4.3 PM 2.5 emission determinations can also be conducted by employing a cascade impactor and modifying the clean gas duct of the test apparatus to insure that isokinetic sampling rates through the impactor are maintained.

4.3.1 If measuring for PM 2.5 it is advised that the performance test period be increased from 120 minutes to at least 360 minutes to allow for adequate weight gains on each collection stage of the impactor.

4.4 Initial residual pressure drop, average residual pressure drop, residual pressure drop increase, number of filtration cycles, and average filtration cycle time are monitored and recorded during the performance test period. Table 1 and Table 2 provide test specifications and test conditions respectively. Table 3 provides a listing of results that will be obtained from this test.

5. Significance and Use

5.1 This test method determines the comparative performance of filter media. The results can be used for design, manufacturing, construction and selection of filter media.

5.2 Results obtained by this test method should not be used to predict absolute performance on full scale fabric filter (baghouse) facilities, however these results will be useful in selection of proper filter media and identification of recommended operating parameters for these full scale fabric filter facilities.

5.3 Dust types vary greatly; therefore, the results obtained using the standard dust should not be extrapolated to other dust types.

6. Interferences

6.1 Any variations in the test conditions or test apparatus that may alter the physical properties of the dispersed test dust particles may affect the precision of the test results.

6.1.1 These properties include static charge, cohesion, effective particle size, or any other property that affects the ability of the dust particles to actually reach the surface of the test specimen or that affects the interaction between the dust particles and the filtration surface during the filtration or pulse cleaning process.

6.1.2 The test dust is known to have minor differences in particle size from shipment to shipment and lot number to lot number. It is not fully understood what impact, if any, these deviations have on the test results. With each new shipment and every three months thereafter, the dust particle size should be characterized using the handling, preparation, and testing procedures specified in this test method. In addition the impact of the dust on differential pressure and weight gain values of a reference fabric should be established and testing of the dust and reference fabric should be conducted quarterly thereafter to allow for comparisons with the established values.

6.1.3 Inadequate dispersion of the test dust may affect the precision of test results. Any surface with which the dust contacts after it leaves the feeder should be made in strict accordance with the specification. The use of alternate materials for internal surfaces of the raw and clean gas duct may cause the charge on the dust particles to be altered triboelectrically, which may affect the results.