



FINAL REPORT

BACTERIAL FILTRATION EFFICIENCY

PROCEDURE NO. STP0004 REV 02

LABORATORY NO. 489209

PREPARED FOR:

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## BACTERIAL FILTRATION EFFICIENCY

LABORATORY NUMBER:	489209
PROCEDURE NUMBER:	STP0004 REV 02
SAMPLE SOURCE:	Global Safety First, LLC
SAMPLE IDENTIFICATION:	Refer to Tables 1-2 P.O. #NL 081709
DEVIATIONS:	None
SAMPLE RECEIVED DATE:	19 Aug 2009
LAB PHASE START DATE:	22 Sep 2009
LAB PHASE COMPLETION DATE:	22 Oct 2009
REPORT ISSUE DATE:	23 Oct 2009

### INTRODUCTION:

This test procedure was performed to determine the bacterial filtration efficiency (BFE) of various filtration materials, employing a ratio of the bacterial challenge counts to sample effluent counts, to determine percent bacterial filtration efficiency (% BFE). This procedure provided a more severe challenge to most filtration materials than would be expected in normal use and allowed a reproducible bacterial challenge to be delivered to the test samples. This method complies with ASTM F2101.

### ACCEPTANCE CRITERIA:

The BFE control average was  $2200 \pm 500$  colony forming units (CFU). A BFE run with a control average of less than 1700 shall be unacceptable. Challenges greater than 2700, but less than 3000, are, in our experience, valid. Acceptance of runs with control averages exceeding 2700 shall be at sponsor's approval.

The mean particle size (MPS) of the challenge aerosol was maintained at  $3.0 \pm 0.3 \mu\text{m}$ .

The average % BFE for the reference material was within the upper and lower control limits established for the BFE test.

### SAMPLE PREPARATION:

BFE test samples were conditioned for a minimum of 4 hours at  $21 \pm 5^\circ\text{C}$  and  $85 \pm 5\%$  relative humidity prior to testing.

#### TEST PROCEDURE:

A culture of *Staphylococcus aureus* ATCC #6538 was diluted in 1.5% peptone water (PEPW) to produce a challenge titer capable of delivering  $2200 \pm 500$  CFU per test sample. The bacterial culture suspension was pumped through a 'Chicago' nebulizer at a controlled flow rate and fixed air pressure. The constant challenge delivery formed aerosol droplets with a mean particle size (MPS) of approximately  $3 \pm 0.3 \mu\text{m}$ . The aerosol droplets were generated in a glass aerosol chamber and drawn through a six-stage, viable particle, Andersen sampler for collection. The collection flow rate through the test sample and Andersen sampler was maintained at 28.3 Liters per minute (Lpm) (1 cubic foot per minute (CFM)). Test samples, positive controls and reference material received a one minute challenge followed by a one minute vacuum cycle.

A test control (no filter medium in the airstream) and reference material were included after 5-11 test samples. The Andersen sampler, a sieve sampler, impinged the aerosol droplets onto six soybean casein digest agar (SCDA) plates based on the size of each droplet. The agar plates were incubated at  $37 \pm 2^\circ\text{C}$  for  $48 \pm 4$  hours and the colonies formed by each bacteria laden aerosol droplet were counted and converted to probable hit values using the hole conversion chart provided by Andersen. These converted counts were used to determine the average challenge level delivered to the test samples. The distribution ratio of colonies for each of the six agar plates was used to calculate the MPS of the challenge aerosol.

#### RESULTS:

The results are summarized in Tables 1-2. Testing met the acceptance criteria previously stated in this report.

The filtration efficiencies were calculated as a percent difference between test sample runs and the control average using the following equation:

$$\% BFE = \frac{C - T}{C} \times 100$$

Where: C = Average of control values.  
T = Count total for test material.



TABLE 1. Results  
Sample Identification: GSF-FAY30

UNIT NUMBER	PERCENT BFE
1	99.9%
2	99.9%
3	99.2%
4	99.9%
5	99.8%

CONTROL AVERAGE: 2689 CFU

MEAN PARTICLE SIZE: 2.8  $\mu$ m

TABLE 2. Re-Test Results  
Sample Identification: GSF-FAY30

UNIT NUMBER	PERCENT BFE
3	99.6%

CONTROL AVERAGE: 2671 CFU

MEAN PARTICLE SIZE: 2.8  $\mu$ m



Global Safety First, LLC  
Lab Number 489209

Bacterial Filtration Efficiency

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