

## Bacterial Filtration Efficiency (BFE) and Differential Pressure (Delta P) Final Report

Test Article: VQN0185W-3-1  
VQN0185W-3-2  
VQN0185W-3-3  
VQN0185W-3-4  
VQN0185W-3-5  
Study Number: 957829-S01  
Study Received Date: 10 Apr 2017  
Test Procedure(s): Standard Test Protocol (STP) Number: 801-STP0004 Rev 14

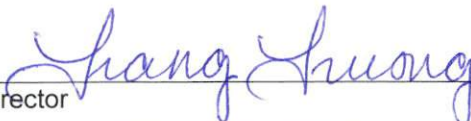
**Summary:** The BFE test is performed to determine the filtration efficiency of test articles by comparing the bacterial control counts upstream of the test article to the bacterial counts downstream. A suspension of *Staphylococcus aureus* was aerosolized using a nebulizer and delivered to the test article at a constant flow rate and fixed air pressure. The challenge delivery was maintained at  $1.7 - 2.7 \times 10^3$  colony forming units (CFU) with a mean particle size (MPS) of  $3.0 \pm 0.3 \mu\text{m}$ . The aerosols were drawn through a six-stage, viable particle, Andersen sampler for collection. This test method complies with ASTM F2101-14 and EN 14683:2014, Annex B.

The Delta P test is performed to determine the breathability of test articles by measuring the differential air pressure on either side of the test article using a manometer, at a constant flow rate. The Delta P test was designed to comply with MIL-M-36954C, Section 4.4.1.2 and complies with EN 14683:2014, Annex C.

All test method acceptance criteria were met. Testing was performed in compliance with US FDA good manufacturing practice (GMP) regulations 21 CFR Parts 210, 211 and 820.

Test Side: Inside  
BFE Test Area:  $\sim 40 \text{ cm}^2$   
BFE Flow Rate: 28.3 Liters per minute (L/min)  
Delta P Flow Rate: 8 L/min  
Conditioning Parameters:  $85 \pm 5\%$  relative humidity (RH) and  $21 \pm 5^\circ\text{C}$  for a minimum of 4 hours  
Test Article Dimensions:  $\sim 175 \text{ mm} \times \sim 155 \text{ mm}$   
Positive Control Average:  $1.9 \times 10^3 \text{ CFU}$   
Negative Monitor Count:  $< 1 \text{ CFU}$   
MPS:  $3.1 \mu\text{m}$

Study Director



Trang T. Truong, B.S.



26 APR 2017  
Study Completion Date



957829-S01

**Results:**

Test Article	Percent BFE (%)	Delta P (mm H <sub>2</sub> O/cm <sup>2</sup> )	Delta P (Pa/cm <sup>2</sup> )
VQN0185W-3-1	99.5	2.6	25.8
VQN0185W-3-2	99.5	2.9	28.7
VQN0185W-3-3	99.2	2.9	28.5
VQN0185W-3-4	99.4	2.5	24.8
VQN0185W-3-5	99.4	2.6	25.4

The filtration efficiency percentages were calculated using the following equation:

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

C = Positive control average

T = Plate count total recovered downstream of the test article

Note: The plate count total is available upon request