



THE CHALLENGE:

A large bottled water company was experiencing reduced flow rates and higher filter usage due to contamination with *Acidovorax Facilis*.

SOLUTION:

Parker performed bacterial challenge testing on PES membrane filters with this specific bacterium to demonstrate that their BEVPOR products are fully retentive.

BENEFITS:

The customer was able to protect their beverage quality during bottling, removing the contamination from *A.Facilis* bacterium, whilst not limiting themselves to the flow rates and throughputs of a tighter 0.1µm membrane.

ELIMINATING THE RISK OF ACIDOVORAX FACILIS CONTAMINATION

A large bottled water company experienced a costly episode of bacterial contamination within their bottling lines – resulting in significant financial impact from discarded or quarantined product and system downtime. Samples sent to micro labs identified the contaminant bacterium as *Acidovorax Facilis*.

A.Facilis is an aerobic bacterium found in the soil – it occurs naturally but is also typically used as a soil additive to improve plant growth. It had found its way into the bottling plant's borehole.

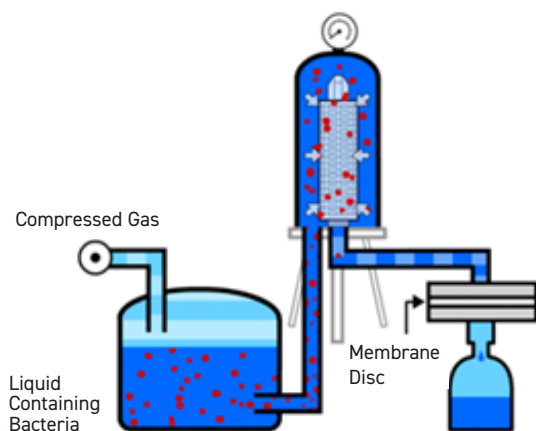
After a system wide sterilization to remove any trace of *A.Facilis*, the bottler was informed that the specific bacteria required a 0.1µm filter for guaranteed removal. This change to their stabilization line resulted in reduced flow rates and higher filter usage. However the risk of another *A.Facilis* contamination was too great a risk.

The Parker Solution

Parker's BEVPOR PES membrane range has validated microbial retention against numerous industry specific spoilage organisms such as *Serratia marcescens*, *Enterococcus faecalis* and *Escherichia coli*. Using the expertise at the Parker Bioscience manufacturing plant, Parker were able to perform bacterial challenge testing on PES membrane filters with *A.Facilis* – thus showing that the Parker BEVPOR product and their available micron range offerings are fully retentive to this specific bacterium.

The bottling plant was able to incorporate 0.2µm filters in their process therefore not limiting themselves to the flow rates and throughputs of a tighter 0.1µm membrane. The validation work showing the BEVPOR 0.2µm's full retention to the specific *A.Facilis* bacterium ensured the protection of beverage quality during bottling, when coupled with a robust HACCP/hygiene regime.

Bacterial Challenge Process



The bacterial challenge test, outlined in ASTM F838-20, is a methodology that is an industry standard for determining a sterilizing grade filter when using the test organism *Brevundimonas diminuta*. A culture of the test organism is passed through a filter element, with the effluent collected onto a downstream membrane capture disc. After an incubation period the disc is inspected for colony forming units – the lack of which indicates no bacterial passthrough and thus a fully retentive filter.

For this work, looking at membrane retention to *A.Facilis*, this specific bacterium was used in place of *B.Diminuta*.

Testing Methodology

A. facilis (Figure 1, Figure 2) was supplied as a freeze-dried culture (NCIMB 9938). The freeze-dried culture was reconstituted into TSB and stored on cryopreservative beads at -40°C. Pre-work showed that inoculation of 10ml TSB with 1 bead resulted in a concentration of ~10⁷ CFU/ml after 48 hours of incubation at 30±2°C. Therefore, 48 hours prior to challenge, a sufficient volume of TSB was inoculated in separate 10ml vials and incubated under these conditions.

In order for the test to be considered valid, the following criteria had to be met; based on ASTM 838 Standard Test Method for Determining Bacterial Retention of Membrane Filters Utilized for Liquid filtration:

- *A.Facilis* challenge level of $\geq 1.0 \times 10^7$ CFU/cm²
- Flow rate of 2-4mL/min/cm²
- Maximum differential pressure of 2barg
- Sterile system



Figure 1:
Colonies *A.facilis* on TSA.



Figure 2:
Gram stain of *A.facilis*.

Test Results

Membrane (µm)	<i>A. facilis</i> retention
0.2	Fully retentive
0.45	Fully retentive
0.5	Single instance of breakthrough
0.65	LRV 7.4
0.8	LRV 3.1
1.2	LRV <3.1

Table 1:
Summary of *A.facilis* retention

The results observed for the BEVPOR PES products show that 0.2 and 0.45µm ratings have full retention to *A.facilis* with more open ratings having a very high level of retention. Using BEVPOR PES 0.2 and 0.45µm, therefore provides a significant level of retention assurance for *A.facilis*.

Integrity Testing to Ensure Product Protection

Parker's liquid PES membrane filters are validated according to the ASTM F838 methodology, ensuring they provide absolute retention values to the desired micron rating. Integrity testing is a key tool to ensure that PES membrane filters are protecting your product from contamination and spoilage. Parker's PES membranes have integrity test values correlated to the liquid bacterial challenge and when used in partnership with the BEVCHECK integrity test units act as a key tool in an effective HACCP regime.

