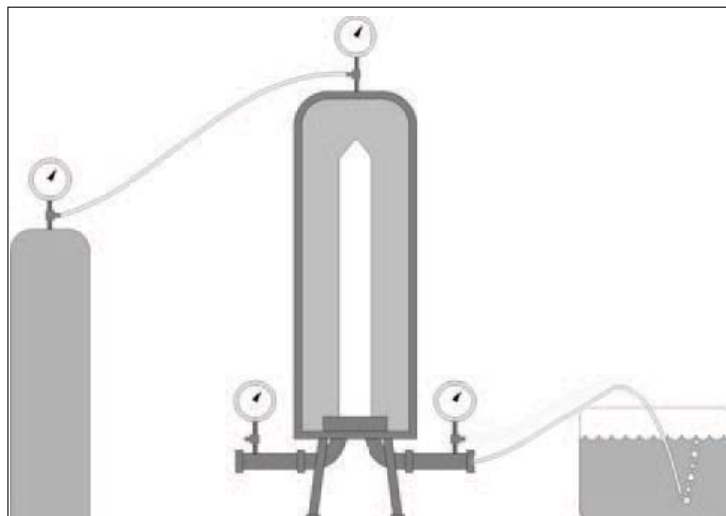


Bubble Point Integrity Test



Introduction

There are 3 major tests used to determine the integrity of a membrane filter: the Bubble Point Test, the Forward Flow or Diffusion Test, and the Pressure Hold Test. All three tests are based on the same physics, the flow of a gas through a liquid-wetted membrane under applied gas pressures. They differ in which part of the flow/pressure spectrum they examine. In this paper, we will focus on the Bubble Point Test.

Background

A bubble point test is a test designed to determine the pressure at which a continuous stream of bubbles is initially seen downstream of a wetted filter under gas pressure. To perform a Bubble Point Test, gas is applied to one side of a wetted filter, with the tubing downstream of the filter submerged in a bucket of water. The filter must be wetted uniformly such that water fills all the voids within the filter media. When gas pressure is applied to one side of the membrane, the test gas will dissolve into the water, to an extent determined by the solubility of the gas in water. Downstream of the filter, the pressure is lower. Therefore the gas in the water on the downstream side is driven out of solution. As the applied upstream gas pressure is increased, the diffusive flow downstream increases proportionally. At some point, the pressure becomes great enough to expel the water from one or more passageways establishing a path for the bulk flow of air. As a result, a steady stream of bubbles should be seen exiting the submerged tubing. The pressure at which this steady stream is noticed is referred to as the bubble point.

Bubble Point Test Procedure

A bubble point integrity test is a procedure which measures the pressure needed to be applied to the upstream side of a filter causing bulk or open pore flow through the largest pores of a wetted filter. The Bubble point measurement is taken by reading the pressure on the gas canister or inlet pressure gauge (they should be the same) when a steady stream of bubbles is observed from the outlet tube into the bucket of water. If this pressure value is the same or above the bubble point value provided for the brand of cartridge being tested, then the cartridge is integral.

Materials Required to Perform Test:

- Compressed air, nitrogen or argon
- Pressure regulator
- Filter, Filter housing
- Hose barbs
- Beaker
- Tubing
- Filter adapters

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Test Method

1. Record the filter part number(s), lot number, and product information. Also include physical observations.
2. Wet the filter to be tested with water by running water through your cartridge in the cartridge housing. Properly vent the housing to make sure it is full of water.
3. To make sure all pores are filled with water, bring the back pressure up to 5psi by slowly closing the outlet valve while your pump is running, for a few seconds.
4. After wetting the filter, drain the water by opening the vents and valves. Then close your inlet valve.
5. Connect the outlet fitting from the compressed air pressure regulator to the upstream side of the test filter. This can be done at the top of the housing or at the bottom inlet valve. Check that the gauge which is connected to the pressure regulator has subdivisions of at least 0.5 psig, and has the capacity to measure up to 100 psig. A digital pressure gauge can also be used.
6. Connect the outlet fitting from the compressed air pressure regulator to the upstream side of the test filter.
7. Connect a piece of flexible tubing from the downstream port of the test filter into a beaker filled with water.
8. Starting from zero pressure, gradually increase the pressure to the test filter using the pressure regulator.
9. Observe the submerged end of the tubing for the production of bubbles as the upstream pressure is slowly increased in 0.5 psig increments. Note the rate that the bubbles appear for the end of the submerged tube.

Handy hint: The inlet pressure can be measured on the bottom inlet side or top of the housing. If you want to find out whether your gauges are working properly, these two gauges should have the same pressure during a filtration.



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BUBBLE POINTS FOR TYPICAL WINE FILTER (AIR AS THE TEST GAS):

FILTER GRADE	WETTING FLUID	MINIMUM BUBBLE POINT
ScottCart Membrane PES 0.45 micron	Water	27.5 psig
ScottCart Membrane PES 0.65 micron	Water	17.4 psig

Test Considerations

1. Ensure that the filter is thoroughly and uniformly wet such that all the pores are filled with water. **Failure to wet the filter may result in premature air flow resulting in false failure.**
2. Diffusive flow of air through the filter will occur at pressures lower than the bubble point. **Ensure that the pressure recorded is in fact the pressure at which a steady stream of bubbles is noted.**
3. If failure occurs, make sure that the filters were properly installed and that the O-rings are not cracked or out of place. Repeat the steps to re-wet the filter cartridge(s), replace the housing cover and retest. Contact Scott Laboratories for further assistance with trouble shooting.

