Bubble Point Testing of Filters

This test is run to find the largest size hole in an element, the hole location and the amount of flow through an element. We have found that even new filters may have holes larger than the acceptable limit for a servocontrol system.

The bubble point test covers the determination of the bubble point for a filter element in accordance with MIL-F-8815 (ASG). The bubble point determination, setup, and procedure provides the necessary environment to discover whether filter elements are performing acceptably. The filter element will be thoroughly cleaned and degreased before bubble point testing to ensure achievement of close reproducible results for all subsequent tests. No special system preparation is required other than the assurance that the storage tank is clean and the feed air is free of oil and vapor. Periodic inspection and replacement of the air filter assures a clean air source. The element is then installed in our bubble point testing machine and the test procedure is completed and documented for the record. The element is submerged in a special fluid of known surface tension and is held parallel to the bottom of the tank and 1/2 inch below the surface. The air pressure within the element is rotated 360 degrees at each pressure increment. The area of greatest porosity is determined by observing the first bubble on the surface of the element, and the manometer reading in inches of water at which this bubble emits from the element (the initial bubble point). This is the initial bubble point.

The objective is to determine the location and size of the largest pore in a filter element. For this purpose, the initial bubble is used. The pressure at which this bubble appears is a function of the surface tension of the fluid used, the wetting of the filter media and the diameter of the largest pore, and is in accordance with the pore is of a uniform diameter.

$$P=2\ S\cos\ø$$

Where S = surface tension of fluid, Cos ø = contact angle between fluid and filter media and r = radius of pore size.

In actual filter media, where the pores are not necessarily circular or uniform in cross section, it is necessary to correlate bubble point to pore size by running tests for the maximum particle passed, using glass beads as the contaminant, and microscopically measuring the size of the largest bead passing through the filter element. For stainless steel mesh bubble tested in our special fluid where both S and ø are constants, the actual relationship follows the form of the theoretical and is found to be:

$$D = \frac{238}{P}$$

Where D = diameter of the largest spherical particle passed in microns P = bubble point in inches of water measured with a manometer.

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