Troubleshooting Pressure Vessel Probing Procedure

The following are general recommendations for probing a pressure vessel. Probing a pressure vessel allows you to determine and pinpoint where a specific problem lies within a particular vessel. For questions or additional information, please contact MANN+HUMMEL Water & Fluid Solutions Technical Service.

PROCEDURE

If one pressure vessel shows a significantly higher permeate concentration than the other vessels of the same stage, probing allows you to determine and locate the problem within the pressure vessel while remaining online and without unloading the elements.

To probe a pressure vessel:

1. Insert a plastic tube (approximately 6 mm (¼ inch) in diameter and a length longer than the pressure vessel to be probed) into the permeate tube in order to measure the permeate conductivity at different locations inside the pressure vessel. Push the tube all the way into the pressure vessel. This can be done by either:
    a. Isolating the vessel from its permeate manifolds and use the open permeate port
    b. Removing the opposite end cap's permeate plug
2. When the permeate manifolds remain in place, be sure that permeate from other vessels does not influence the probing results. If the system operates with a permeate backpressure, disconnect the probed vessel from the system permeate to avoid permeate from other vessels from entering.
3. Allow a few minutes for the system to operate at normal operating conditions so that the tubing is thoroughly rinsed and the membrane system is equilibrated.
4. For an RO system, the TDS or conductivity of the permeate sample (from the tubing) can be measured with a hand-held meter. This measurement should reflect the TDS of the permeate being produced by the element at that particular position. For a NF system, a conductivity meter might not be sensitive enough to localize a leakage. Instead, the sulfate concentration in the sample should be measured and recorded.
5. Pull out the tubing 15 cm (6 inches) from the end and measure a new sample at the adaptor/element interface.
6. Pull the tubing out another 20 cm (8 inches) and take another sample.
7. Continue step 6 to obtain a conductivity profile. By sampling every 20 cm (8 inches), every fifth sample should mark the coupling connection between two 40" long elements. Sampling every 20 cm allows for multiple measurements per element plus the checking of all coupler/adapter o-rings for leaks. To easily access desired sampling locations, mark the tube. A normal conductivity profile should show a steady increase in permeate concentration produced at the feed end towards the concentrate end of the pressure vessel. Any deviation from this normal profile demonstrates where a high salt passage problem may be located within the pressure vessel. O-ring problems are usually indicated by a step change in the conductivity profile at coupler/adapter locations. Element leakages are indicated by an increase in the conductivity profile outside of the coupler/adapter locations.

Note: The normal (reference) conductivity profile depends on the location of the probing tube entry and on the flow direction of the permeate out of the probed vessel. The first sample from the feed end of the vessel is the permeate produced at exactly that location. As the tube is pulled out of the vessel, the sample consists of the combined permeate which is produced upstream of the sample location and the permeate produced at that location. The very last sample is the permeate of the entire vessel. If the

pressure vessel is connected to the permeate manifolds and/or the probing tube is inserted from the feed side of the vessel, the reference conductivity profile changes accordingly.

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