Troubleshooting
High Solute Passage

The following are general guidelines for troubleshooting TRISEP® elements experiencing high solute passage.

INTRODUCTION

High solute passage at normal permeate flow may be due to different causes including a membrane or element defect, leaking o-rings, membrane oxidation, membrane surface abrasions, permeate backpressure damage or element telescoping.

MEMBRANE OR ELEMENT DEFECT

Explanation & Root Cause

A membrane or element defect is typically noticed at or shortly after start-up. Membrane or element defects can be caused by a variety of things: a weak spot in the membrane itself, a manufacturing or workmanship error or mechanical damage to the element during shipping or loading. When a membrane or element defect is present, often times, both salt passage and permeate flow increases.

Preventative / Corrective Measure

A membrane or element defect may be detected by the probing technique described in **Troubleshooting – Pressure Vessel Probing Procedure** (TSG-T-007). Replace leaking elements and correct the cause for the leakage.

LEAKING O-RING

Explanation & Root Cause

A leaking o-ring is typically noticed at or shortly after start-up. O-rings may leak if rolled or damaged during element loading, exposed to certain chemicals causing them to degrade or if the wrong size o-ring is used.

Preventative / Corrective Measure

Leaking o-rings can be detected by the probing technique. To prevent leaking o-rings, be sure to inspect o-rings of couplers, adapters and end plugs for correct installation and condition. Replace any old and/or damaged o-rings. For replacement o-rings, please contact MANN+HUMMEL Water & Fluid Solutions Technical Service.

Additionally, proper shimming of the elements in a pressure vessel is essential to minimize the wear to the seats, especially during events of water hammer. Refer to **Element Loading Guide – Shimming Elements** (TSG-O-008).

MEMBRANE OXIDATION

Explanation & Root Cause

Membrane oxidation damage usually results in high salt passage in combination with a higher than normal permeate flow. When free chlorine, bromine, ozone or other oxidizing chemicals are present in the feed water, the front end elements are typically more at risk than the others.

Disinfecting when pH and temperature limits are not maintained or when in presence of iron or other transition metals may catalyze the reaction between the disinfectant and membrane surface. Continuous exposure to the combination of iron (or other transition metals) and hydrogen peroxide solutions may eventually damage the membrane.

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Preventative / Corrective Measure

An autopsy of the element and an analysis of the membrane can be used to confirm the damage. This is most frequently done using a Fujiwara (to detect the presence of halogens) or dye test. Unfortunately, no corrective action is possible to restore the membrane. Identify the oxidizing agent and remove it, or utilize pretreatment methods to remove the oxidizing agent before it comes into contact with the membrane. All damaged elements should be replaced.

MEMBRANE SURFACE ABRASION

Explanation & Root Cause

Sharp particles in the feed water may enter the feed channels and scratch the membrane surface. This can lead to an increase in salt passage, primarily in the lead elements.

Preventative/Corrective Measure

Check the incoming water for such particles and inspect the membrane surface with a microscope to detect damage. To ensure that no particles are released from the pump and the high pressure piping, check the system's prefiltration and be sure that the piping has been rinsed out before the start-up. It is also highly recommended to replace damaged membranes.

PERMEATE BACKPRESSURE

Explanation & Root Cause

Permeate backpressure is when the permeate pressure exceeds the feed/concentrate pressure. Such a situation typically causes reverse flow and damages the membrane. As a rule of thumb, when the permeate pressure exceeds the concentrate pressure by more than 5 psi (0.3 bar) at any time, the membrane is subject to the possibility of damage.

When a leaf of an element subjected to permeate backpressure is unrolled, the outer membrane typically exhibits creases parallel to the permeate tube, close to the outer glue line. The membrane may delaminate from the support layer and even form blisters against the feed spacer.

Preventative/Corrective Measure

The damage caused by excessive backpressure can be identified by probing and a leak test and confirmed by a visual inspection during autopsy. Replace damaged elements and correct the cause. Check piping and/or the possibility of including check or atmospheric drain valves to help prevent reverse permeate flow.

TELESCOPING

Explanation & Root Cause

Telescoping is a mechanically damaging effect to the element where the outer diameter of the element protrudes downstream past the permeate tube. Because of the anti-telescoping devices (ATDs), which are part of a standard water purification element, the primary cause of telescoping is the lack of a thrust ring in the pressure vessel. During telescoping, the ATD will be damaged and in severe cases, the glue line and/or the membrane be damaged.

Preventative/Corrective Measure

Although this may be due to excessive pressure drop, telescoping is almost always due to the lack of having a thrust ring installed. Additionally, telescoping almost exclusively affects only the last element in the pressure vessel. If telescoping is evident, replace the damaged element(s), correct the causes and ensure thrust rings are installed.

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