Loading of Pressure Vessels

Preparation & Element Loading

Introduction

This section provides guidelines for loading and unloading FilmTec™ Reverse Osmosis (RO) and Nanofiltration (NF) Elements. For additional loading instructions, contact the individual pressure vessel manufacturer.

Preparation

A schematic diagram of the RO system should be prepared for recording pressure vessel and element locations. It should show the entire piping system for the skid as well. To identify individual element locations, use the FilmTec™ serial numbers written on each label. This diagram will help you keep track of each individual element in the system

The following equipment is recommended:

- Safety shoes
- Safety glasses
- Rubber gloves
- Silicone lubricant (Molykote® 111 Compound recommended)
- Allen wrench
- Clean rags
- Glycerin Hose and water to flush vessel
- Sponge/swab, long stick and rope to clean vessel

1. Load FilmTec™ Elements into the pressure vessels just prior to start-up.
2. Before assembling all components, check the parts list and make sure all items are present and in the right quantities.
3. Carefully remove all dust, dirt, and foreign matter from the pressure vessels before opening.
4. Remove all endcap assemblies and thrust rings (if provided) from all pressure vessels in the train or system.

   Note: There are several manufacturers of pressure vessels used for spiral-wound nanofiltration and reverse osmosis elements. Refer to the manufacturer's drawing for your pressure vessel during removal and installation of endcap assembly.
5. Spray clean water through the open pressure vessels to remove any dust or debris present in the vessels.

   Note: If additional cleaning is required, create a swab large enough to fill the inside diameter of the pressure vessel. Soak the swab in a glycerin/water solution (50 vol%) and move it back and forth through the pressure vessel until the vessel is clean and lubricated.

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Element Loading

1. Install the thrust ring in the concentrate discharge end of the vessel. Consult the manufacturer's drawing for specific information on the thrust ring positioning. This has to be done before the loading of any elements. There is a risk of not installing it properly.
2. You need to verify whether you are installing FilmTec™ Elements with iLEC™ (Interlocking Endcaps) or standard elements which require the use of a supplied interconnect.
3. It's recommended to stage the elements prior to loading and record each serial number by position so that in the future you will know where each element is located inside the pressure vessel.
4. Place the leading end of the first RO or NF element into the feedwater end of the first pressure vessel and slide it in approximately one-half of the element length. ***Note***: Always load NF or RO elements into the feedwater end of the pressure vessel. Verify that the U-cup brine seal is properly seated in the endcap groove of the element such that the brine seal opens in the upstream direction.
5. To load **standard elements**: Lubricate the O-ring seals on the interconnector and the inside of the product water tube with a very thin layer of silicone lubricant. Install the interconnector into the permeate tube of the element. Glycerin may be used but is not recommended. Although glycerin lubricates during the initial installation, it quickly washes out during normal operation. Experience has shown that using a silicone lubricant applied sparingly to the bore of 8-inch elements or the permeate water tube outer sealing surface for 4-inch and 2.5-inch elements maintains the desired lubricity long after the initial start-up. For potable water and food processing applications, the silicone lubricant DuPont Corning® 111 valve lubricant and sealant, which carries both FDA and NSF approval, works quite well.
    a. Apply a thin layer of silicone lubricant to each brine seal. When silicone is applied, as each element is installed and pushed into position, this will act as a lubricant on the inside of the pressure vessel which will remain during the operation of the system making removal much easier.
    b. Lift the next element into position and install the trailing end on the interconnector. Be very careful to hold the next element so that the weight is not supported by the interconnector. Be very careful to hold the next element so that the weight is not supported by the interconnector, and push the element into the pressure vessel until about one-half of the element extends outside the vessel.
6. To load **elements with iLEC™** Interlocking Endcaps: A special tool is recommended which is called a ratcheting band clamp which can be ordered directly from FilmTec. The band clamp has a heavy-duty strap that grips the element securely but will not damage the element outer shell. The band clamp is lightweight, durable, and safe. It will successfully hold the element in place no matter what substance may be on the outer fiberglass shell. Note: iLEC™ elements can be connected to the end plug, one of two ways, one being a special iLEC™ adapter, the other is with a standard PV adapter. It is pressure vessel manufacturer dependant, there are slight differences in each manufacturers endplug so it's essential to make sure when the parts are ordered and prior to installation.
    a. Insert the first element, downstream end first, and push it into the vessel in the same direction as the feedwater flow. Leave enough of the element protruding from the vessel to allow attachment of the ratcheting band clamp. This is a good time to check the condition of the O-ring.
    b. iLEC™ elements with iLEC™ adapters – Attach the downstream iLEC™ adapter to the male side of the first installed (last position) element and apply a very thin layer of silicone lubricant. Begin inserting the element into the vessel leaving enough of the element protruding out for the attachment of the ratcheting band clamp.
    c. Attach the second element, taking care to hold the element horizontally when applying clockwise torque. Rather than gripping the outer shell, apply torque by gripping the spokes on the upstream endcap with one hand, while supporting the element with the other hand. The ratcheting band clamp should be secured to prevent rotation.
    d. After the elements are snapped together, verify that the markings are properly aligned.
    e. By the time the third or fourth element has been installed, the ratcheting band clamp may be unnecessary. The band clamp is only required until friction generated by the installed elements is greater than the force required to snap the elements together.
    f. Push the elements deeper into the vessel. Repeat this process until all of the elements have been installed in the vessel. ***Note***: On iLEC™'s after connecting the last element, install the other iLEC™ adapter to the female end of the element.

    Repeat these steps until all elements are loaded into the pressure vessels. The number of elements loaded into an individual vessel will depend on the length of the elements and the vessel itself. Note: Do not push the elements in too far, if you do, then the end plate may not fit properly, and the elements may have to be reinstalled.

7. Install the downstream endcap assembly on each end of the pressure vessel:
    a Carefully position the downstream endcap assembly in the vessel and push the endcap assembly as a unit squarely into the element and avoid pinching or rolling O-rings. ***Note***: Make sure that the O-rings and product water tube are lubricated.
    b Rotate the endcap assembly to ensure proper alignment with the connecting piping.
    c Replace the hardware, sealing the endcap assembly in place. Refer to the pressure vessel manufacturer's drawing.
8. Push the element stack from the feed end (upstream) towards downstream.
9. After the elements have been installed, it may be necessary to add shims to reduce the amount of space between the face of the lead element and the face of the adapter hub. The vessel adapter internally connects the element product water tube with the permeate port on the pressure vessel. This procedure helps prevent movement and hammering of elements when the system starts and shuts down. Please refer to Shimming Elements (Form No. 45-D01057) for additional detail. Continue these steps for each pressure vessel in the train or system.
10. Install the feed endcap assembly on each of the pressure vessels like the downstream endcap assembly. Close each pressure vessel with the parts from the same vessel. Re-install any piping that was previously removed for element loading.

Have a question? Contact us at:
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