

iLEC™ TECHNOLOGY

BENEFITS OF USE

Dow

Water Solutions

Dow Water Solutions offers **iLEC™** technology for connecting reverse osmosis (RO) membrane elements for a direct, leak-tight connection that enables higher quality permeate throughout the life of the elements. This Technical Fact Sheet addresses:

- Field data-confirmed benefits
- Benefits of **iLEC** patented technology
- Other membrane element connection methods

Benefits of **iLEC™** Technology

The patented design of **iLEC™** technology consists of a single axially-compressed o-ring seal in combination with a rotational (vs. an axial or radial) mechanical connection (see Figure 1). Interlocking tabs around the periphery of each endcap provide a fixed mechanical connection between elements, compressing the o-ring upon installation and maintaining a tight seal thereafter. The injection-molded endcaps are made from ABS plastic, a material widely used for such parts (see Figure 2).

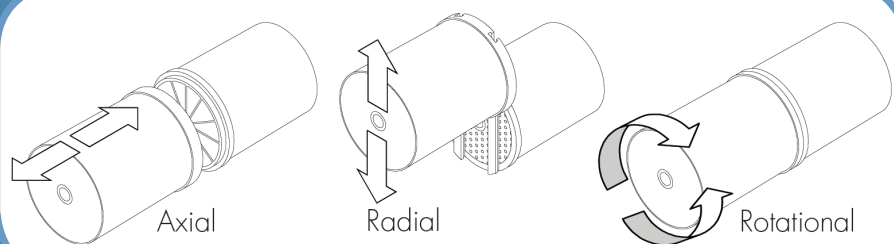


Figure 1. Representative examples of three methods of mechanical interconnection.



Figure 2. Interlocking endcaps with axially-compressed o-ring seal.

FILMTEC™ elements with **iLEC** interlocking endcaps are available globally and offer the following benefits:

- **Reliable and long-term seal integrity** – The single, non-sliding seal reduces the number of potential leak sites and eliminates the abrasion that can damage o-rings in a slip-fit connection. Seals are reliably and evenly compressed upon installation, and the flow-induced compressive loads provide additional sealing force during operation.
- **Leak-tight performance** – The **iLEC** design eliminates the possibility of o-rings being rolled from their grooves or pinched and damaged during operation.
- **Lubricant-free operation** – Omission of o-ring lubricant to preserve permeate quality, such as in ultra-pure water applications, will not compromise sealing performance.
- **Backward compatibility** – Compatibility with existing hardware is maintained. The smooth inner bore located at each end of the permeate collection tube is unchanged, permitting insertion of sliding couplers and existing vessel adapters. The net length of the elements, when connected, remains 40 inches.
- **Immediate feedback** – Four radially deflected tabs on the downstream endcap snap over protrusions on the upstream endcap to provide tactile and audible verification that a leak-tight connection between adjacent elements has been achieved upon installation. Rotational alignment markings on the rim of each endcap provide visual verification.

- **Reduced permeate pressure drop** – Internal couplers and vessel adapters account for more than 70 percent of the permeate-tube pressure drop in some systems. The interlocking endcap design minimizes these restrictions, imposing less permeate backpressure.
- **Robust mechanical design** – Tests have shown that the interlocking endcap connection can withstand almost three times the bending movement imposed by a wet element supported in a cantilever situation during installation (see Figure 3) and does not leak as a result of deflections induced by a sagging pressure vessel (see Figure 4). The endcaps are permanently welded to the permeate collection tubes and will not loosen with rough handling. Accelerated life-cycle testing has demonstrated high durability through repeated installation cycles. The integrity of the connection at high pressure has also been tested, ensuring that the connection withstands feed pressures exceeding maximum element pressures by a factor of two or more.
- **Easy loading and unloading** – Element loading and unloading requires no increase in time or personnel with interlocking endcaps. In addition, the effort required by an individual to connect the elements, one to the next, is equal to or less than that required with other connection methods.

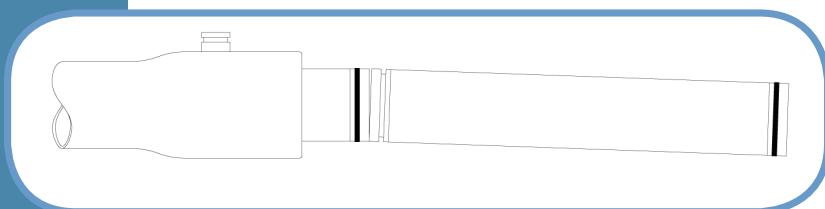


Figure 3. Element temporarily supported in cantilever mode during installation.

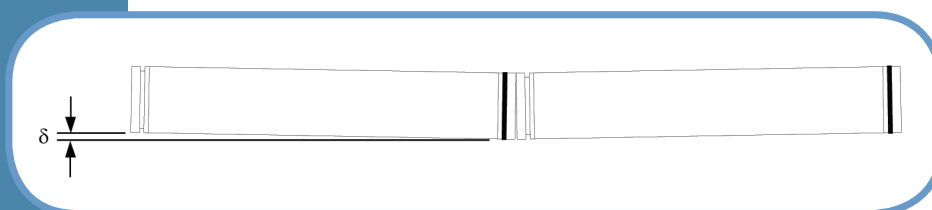


Figure 4. Bending condition imposed upon coupled elements inside a sagging pressure vessel.

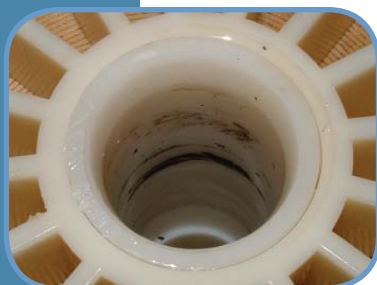


Figure 5. Evidence of o-ring wear inside a product water tube due to insufficient lubrication of the sliding seal.

Other Connection Methods

Other methods of connecting RO membrane elements incorporate a sliding coupler – comprised of a pipe segment with radially compressed o-rings at both ends – that is internally or externally connected to the adjacent product water tubes. This “slip-fit” approach can cause:

- Potential leakage from o-rings pinched, rolled or twisted during element operation
- Leakage from o-rings abraded by the movement of elements inside the pressure vessel (see Figure 5)
- Increased flow resistance caused by the reduced inside diameter of the coupler, resulting in greater energy consumption

System performance over time can be affected and can lead to higher costs or lower quality permeate, regardless of membrane performance.

Field Data Confirm Benefits

Each of the benefits described above has been documented in extensive evaluations. Detailed results from these evaluations are available in the technical paper, "Say 'Good-Bye' to the Weakest Link: Introducing a New Method for Coupling Membrane Elements," available online at www.dowwatersolutions.com/ilec (Form No. 609-00447). The following Case Histories and Project Highlights also are available at www.dowwatersolutions.com/ilec

Case History:

Location: Freising, Germany
Purpose: Stop o-ring leakage and determine the effect of **iLEC™** interlocking encaps on permeate quality and energy consumption
Form No. 609-00467

Case History:

Location: Midwest Utility, USA
Purpose: Evaluate elements with 34-mil feed spacer
Form No. 609-00536

Case History:

Location: Freeport, Texas
Purpose: Evaluate **iLEC** endcaps under severe handling conditions
Form No. 609-00468

Case History:

Location: Canary Island, Spain
Purpose: Evaluate performance of **iLEC** elements
Form No. 609-00466

Project Highlights:

Aracruz Cellulose plant in Brazil
Form No. 609-00629

Shoaiba Barge Seawater RO Plant
Form No. 609-00619

CNAA Boiler Feed Water Plants
Form No. 609-00624

Deco Water Treatment Plant in Terneuzen
Form No. 609-00625

Sugar Cane Biomass Power Generation Plants
Form No. 609-00428

About FilmTec

FilmTec Corporation is a subsidiary of The Dow Chemical Company, and is part of the Dow Water Solutions business unit. Dow Water Solutions is a comprehensive global provider of water and non-water treatment and separations solutions based on a wide range of advanced technologies and services, including:
FILMTEC™ reverse osmosis (RO) and nanofiltration (NF) elements
DOWEX™ ion exchange resins
ADSORBSIA™ GTO™ titanium-based arsenic removal media
DOW™ Ultrafiltration
DOW Electrodeionization (EDI)

For More Information

For more information about **iLEC™** technology, call Dow Water Solutions:
North America: 1-800-447-4369
Latin America: 55-11-5188 9222
Europe: +800-3-694-6367
Asia/Pacific: +800 7776 7776
www.dowwatersolutions.com

NOTICE: No freedom from any patent owned by Seller or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other government enactments. Seller assumes no obligation or liability for the information in this document. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

www.dowwatersolutions.com/ilec



Water Solutions