



Membrane CareSM Program

Products and Services for Membrane Systems

LENNTECH
WATER TREATMENT SOLUTIONS

Water Technologies

SIEMENS



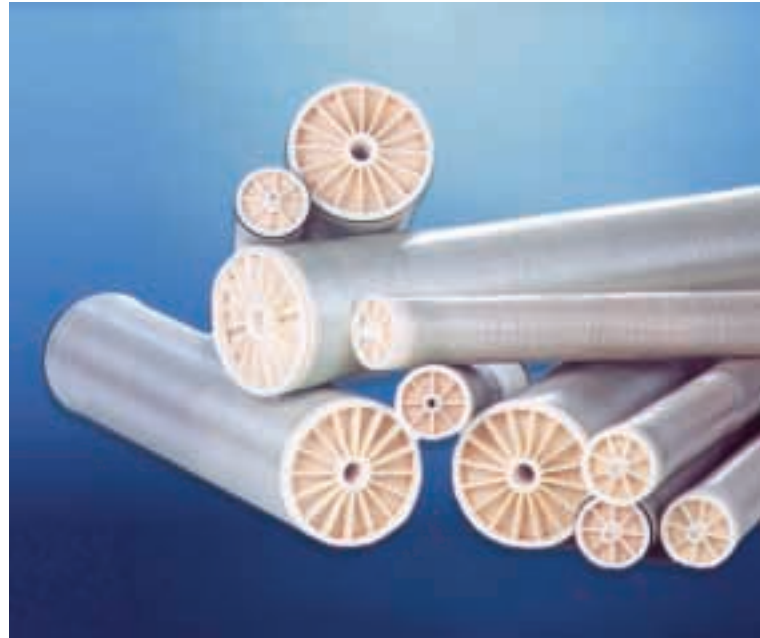
A Complete Care Program for Your Membrane System

Siemens Water Technologies is a leader in providing solutions for high-purity water applications. We offer a wide-range of membrane purification systems featuring proven technologies such as Reverse Osmosis (RO), Ultrafiltration (UF), Microfiltration (MF) and Nanofiltration (NF). We design, build, install, operate and service these systems. With responsibility for operating and servicing over 1,000 RO systems and 50,000+ membranes, Siemens has the expertise and technical-know how to ensure you get the most from your membrane system investment.

The Membrane CareSM Program from Siemens is a comprehensive program designed to provide customers with the products and support services necessary to maintain membrane systems for peak performance and long-term operation. The program includes the sale of replacement membranes, parts and cleaning chemicals, as well as support services such as on-site/off-site membrane cleaning, analytical testing, system optimization analysis and preventative maintenance contracts. This program provides the right combination of products and services to help save time, remain on budget and ensure your membrane system provides continuous, reliable water quality. Siemens offers complete support at every phase throughout the life of your system.

Membrane CareSM Program offers customers:

- Large inventory of stocked membranes from the leading manufacturers
- Same day shipment of stocked membranes
- RO accessories and cleaning chemicals
- Regional membrane distribution/cleaning centers
- On-site and off-site membrane cleaning services
- Membrane Center of Excellence - extensive analytical and laboratory testing
- Proprietary, Performance Evaluation Program - data analysis, normalization and technical system evaluation
- Service and preventative maintenance contracts
- Personnel training and start-up services
- Mobile RO systems for temporary or long-term water requirements
- 24-hour customer service telephone staff
- Trained, technical support telephone staff
- Over 85 sales and service branches throughout North America and Canada



Consumables and Replacement Parts

Siemens helps ensure that your membrane system continues to perform by providing access to our large inventory of replacement membranes, common wear-and-tear parts and membrane cleaning chemicals. We maintain inventory of these critical components at our regional distribution centers so we can respond to your needs quickly and efficiently, often shipping these items within 24 hours of order receipt.

Replacement Membranes and Spare Parts

Siemens supplies replacement membranes and has relationships with all of the major membrane manufacturers. For our customer's convenience, we inventory FILMTEC® and Hydranautics® membranes at our regional distribution facilities. This enables us to meet short lead times, and thereby minimizes system downtime.

In addition to membrane elements, we also stock many wear-and-tear, maintenance and spare inventory items. Retrofitting your RO system to use different membranes may require permeate tube adaptors, specific pressure vessel endcap adaptors or both. Siemens has extensive experience retrofitting different RO systems and carries

most adaptors and interconnectors to allow for smooth membrane change out with minimum risk and downtime. Pressure gauges, valves, pressure vessel components and many other RO system parts from most major manufacturers are available from Siemens at competitive prices.

Monitoring the influent and effluent water characteristics of the RO system enables you to guarantee the quality of the product water, minimize membrane fouling and reduce pretreatment costs. Siemens offers a wide variety of water quality meters, flow meters and test kits for nearly every application – with many sensors and accessories stocked for quick replacement.

Automatic silt density index monitors greatly reduce the work and wait of testing the plugging nature of RO feed water at a manageable cost. This microprocessor-controlled automatic unit continuously monitors the feed water sidestream to prevent stagnant line conditions and uses standard filters to minimize the cost of usage. Siemens can easily install an automatic silt density monitor to help prevent premature membrane fouling and training your operator takes only minutes.



Membrane elements before and after chemical cleaning.

Quality melt blown, string wound and pleated cartridge filters in many different lengths and micron ratings are stocked in our warehouses and are ready to ship on short notice. Siemens can help select the best suited and cost effective filters to protect your RO system and meet product water requirements.

Cleaning Chemicals

During normal operations, membranes can become fouled by scaling salts, inorganic oxides, colloidal material or biological matter. Fouling involves the entrapment of material in the feed/brine path or deposits on the surface of the membrane. These deposits can accumulate until there is a loss in productivity, an increase in feed pressure requirements, a loss of salt rejection or all three. Siemens also offers services and products to help determine the source of your fouling problem and to make recommendations on the selection and purchase of proper chemical treatment. We work with all the RO chemical manufacturers and will provide the best combination of RO anti-scalants, chemical feed systems and dosing rates to keep your RO system running smoothly. For municipal and beverage applications, Siemens uses NSF-certified treatment chemicals and processes.

We provide technical assistance with membrane cleaning, either on-site using the customer's clean-in-place (CIP) skid or by removing and returning the membranes to one of our membrane cleaning facilities.

RO Fouling Components

Metal Oxides

- Iron
- Manganese
- Aluminum

Scaling Salts

- Calcium Carbonate
- Calcium Sulfate
- Barium Sulfate
- Strontium Sulfate
- Calcium Fluoride
- Silica

Biological

- Organic Slimes
- Bacteria

Colloids (SDI)

- Silica
- Clay
- Silt
- Rust

Organic (TOC)

- Humic Acids and Other Natural Organics
- Coagulants - Floccing Agents
- Incompatible Pretreatment Chemicals



Membrane Support Services

Flexibility plays a significant role in support service programs from Siemens Water Technologies. We offer customer-tailored programs that provide the level and frequency of support needed to stay within your operating budget. Some of the on-site services we offer include operator training, start-up, membrane cleaning and preventative maintenance.

The Siemens Membrane Center of Excellence located in Rockford, Illinois, provides leading edge design, analytical and evaluation services to help maximize your membrane investment and minimize life-cycle costs.

Technician Qualifications

Siemens maintains a formal training and certification program for all field service technicians. The training consists of classroom, on-the-job training and comprehensive testing for each class of technician. Each employee must pass a comprehensive, closed-book exam at the end of the training course. Technicians are trained in system and membrane maintenance for industrial, beverage and municipal systems. They understand the unique differences and operating challenges associated with each of these applications.

Our training and certification program ensures that the technician arriving on-site is qualified and proficient in servicing the systems at our customer's site.

Service Contracts & Preventative Maintenance

The optimal operation and maintenance of your membrane system requires frequent monitoring, documentation and adjustments. A Siemens service contract allows customers to select which services they need, service frequency and billing configurations – all of which can be upgraded at any time. Typical maintenance agreements include warranty extensions, preventative maintenance, emergency repair, parts and expendables replacement.

After equipment selection has been made, Siemens can provide a team of process experts to assist with system installation and start-up. Our factory and field project team will assist in bringing the system on-line, monitoring the process through several production cycles and show operating personnel all the process adjustments necessary to ensure the system's product water is what you expect.



Autopsy Techniques:

- External and internal visual exam with pictures
- As received membrane performance testing – flux, pressure and percent reject
- Bubble testing – physical integrity of the membrane envelope
- Dye Testing – Membrane surface integrity
- Fujiwara test – Chlorine oxidation of polyamide layer
- Metals Analysis
- Digestion – ICP
- SEM EDX
- FTIR spectroscopy
- HPLC-FTI and/or UV spectroscopy
- GCMS spectroscopy
- X-ray fluorescence spectroscopy
- Loss on ignition – organic vs. Inorganic foulant
- Microscopy of membrane surface with pictures
- Coupon testing of membrane surface with or without chemical cleaning evaluation with pictures

Membrane Cleaning

There are two membrane cleaning options to consider – cleaning at your facility (on-site) or at our facility (off-site). You may choose to use your clean-in-place (CIP) skid using standard cleaning procedures. Depending on your needs, we can provide training or on-site labor personnel, along with the necessary cleaning chemicals. Or you may choose off-site cleaning.

Analytical and Laboratory Testing

Membrane systems are complex systems with components that are linked to each other. Siemens provides process analysis including feedwater and outlet water testing, permeate analysis and particle size analysis. Additionally, we provide a range of non-destructive and destructive testing, as well as complete autopsies on the elements themselves. Membrane analysis assists in identifying the fouling agent(s), proper cleaning techniques and pretreatment methods to prevent or minimize membrane fouling. Autopsies examine the membrane's integrity, performance characteristics and foulants, and help determine the proper cleaning chemicals and procedures to remove the foulants. Customers who choose to have a

membrane autopsy receive a full-color report which details findings and includes recommendations based on the autopsy.

Performance Evaluation Program

An important part of the Siemens service offering is to assist customers achieve maximum performance from their membrane system. Our proprietary, Performance Evaluation Program is a computer-based tool which evaluates current operating conditions. We determine the existing performance of the system from the pretreatment to the effluent, current operational protocols, cleaning techniques, and economic factors. This data is compared to the theoretical by component in our Performance Evaluation Program. This allows us to evaluate the current membranes, system operation parameters and replacement times, based on your economic factors, and make appropriate recommendations.



Off-site Membrane Cleaning

Siemens' off-site membrane cleaning programs vary to meet individual customer needs and budgets. Customers choose the program level based on specific requirements for feedwater analysis, fouling and cleaning chemical determination, pre- and post-element testing and report documentation.

The results of off-site cleaning are dramatically different from on-site cleaning. While conventional on-site cleanings can increase the life of a membrane, the flow rates eventually decline. Figure 1 is an example of the decline of an RO system and the non-recovery to new performance after on-site cleaning.

Off-site cleaning at one of our Membrane Care Centers provides better cleaning, extends membrane life and is

more cost effective than on-site cleanings. Our proprietary equipment and strict cleaning process – air dosage rates, temperature and flow rates – are tightly controlled to ensure optimum cleaning performance and restore RO membranes to or near the original manufacturer's performance specifications. This results in longer intervals between cleanings and/or replacement. The cleaning process does not affect the structural integrity of the membrane, and therefore does not void the manufacturer's warranty.

Figure 2 illustrates the dramatic gains that can be achieved with off-site membrane cleaning vs. on-site cleaning. Note that the off-site cleaning is typically less frequent and the performance loss is less.

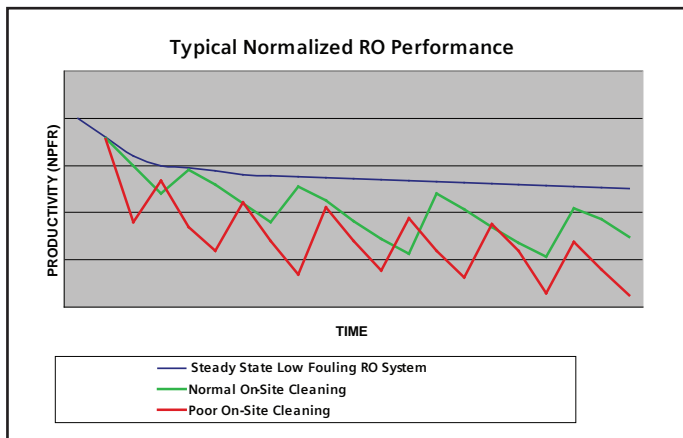


Figure 1

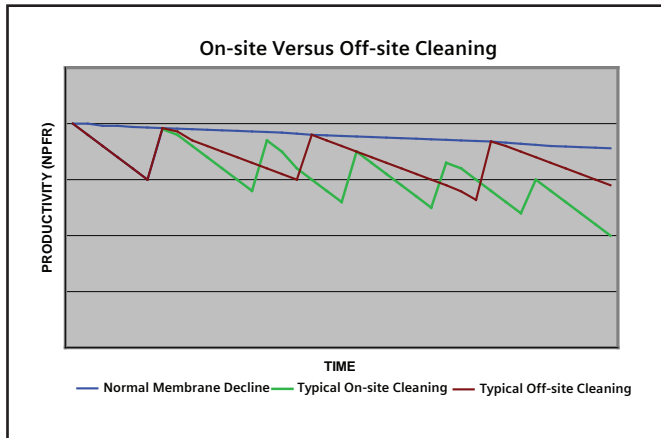
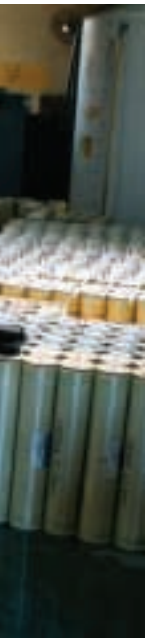


Figure 2



Benefits of Off-site Membrane Cleaning

- Increases membrane life
- Costs less than replacement membranes
- Improves membrane reject and flow, reducing post-RO polishing costs
- Reduces direct labor costs
- Reduces power consumption
- Removes discharge of cleaning chemicals, avoiding wastewater issues or plant upsets
- Reduces water consumption and related waste disposal volume caused by fouled membranes
- Eliminates record keeping and storage of cleaning chemicals.

Siemens offers three levels of off-site cleaning services for membranes. Many customers choose the Platinum Level Cleaning Program which provides 100% pre-testing and evaluation to determine fouling characteristics, and "best" cleaning procedure as determined from performance data. Post-testing membranes determines the effectiveness of the cleaning and a printed report interprets the pre- and post-data.

Off-site cleaning provides the advantages of reduced direct labor costs and system downtime. It also reduces the need for storage of hazardous cleaning chemicals on-site. And, since off-site cleaning provides a more effective cleaning of the membranes, customer's realize an

increased membrane performance, longer time between cleanings and increased membrane life. Customers of this service report reductions in operating and membrane life cycle costs.

Optimally, membrane cleaning should be performed as a matter of routine maintenance rather than by necessity. Our experience has shown that cleanup frequency varies from weekly to annually. As a general rule of thumb, we recommend that systems with good feedwater quality and pretreatment require a cleaning once every three to six months as a part of a good maintenance procedure.

Platinum Level Cleaning Program:

- Determination of the proper cleaning chemicals, dosage rates and sequences
- Evaluation of feedwater analysis and operation data prior to fouling
- In-house evaluation and analytical diagnostic testing, as required
- 100% of the elements pre- and post-tested
- Elements bagged, boxed, palletized and (on request) preserved
- Report issued with the membranes

Gold Level Cleaning Program:

- Determination of the proper cleaning chemicals, dosage rates and sequences
- Evaluation of feedwater analysis and operation data prior to fouling
- In-house evaluation and analytical diagnostic testing, as required
- Approximately 10% of the elements pre- and post-tested
- Elements bagged, boxed, palletized and (on request) preserved
- Report issued with the membranes

Silver Level Cleaning Program:

- Standard low pH followed by high pH cleaning procedures
- No pre- and post-testing
- Elements bagged, boxed, palletized and (on request) preserved
- Recommended for high volume quick turnaround applications



Additional Support Services

Customers who partner with Siemens have the confidence of working with leaders in the water treatment industry. Our businesses, which provide engineering and design, manufacturing, customer service and field operations, have unmatched experience in providing solutions to water and wastewater treatment challenges. With the best brands and people in the industry, Siemens has the experience and expertise to identify the right solution for you.

Advantages of partnering with Siemens Water Technologies include:

Local Service Branches

At Siemens, we combine expert technical and operations knowledge with the largest network of trained, field service technicians. Our field support includes trained service personnel with experience in maintaining and operating our own systems as well as equipment provided by other companies. Our technicians provide prompt, courteous service to help customers manage their water treatment system with minimum downtime and maximum use of direct labor and operating budgets.

These service technicians are ready to assist customers from over 85 offices in North America. Local service branches allow us to schedule service and repairs when you need them, not when the airfare is cheaper. In fact, we are positioned to reach over 85% of the North American population in less than a two hour drive.

Inventory Logistics and Support:

Our inventory logistic and technical support program helps multi-facility and multi-national companies reduce on-site inventory levels, minimize system downtime and improve water quality. Siemens evaluates each of the customer's water treatment systems to determine which replacement components and spare parts will be inventoried. We work with the customer to establish basic on-site inventory requirements and arrange for other necessary inventory to remain at one of our regional stocking and distribution facilities. Quick and easy access to standard consumables and critical spare parts allow customers to maintain their systems and productivity with minimum downtime and to reduce their system life cycle costs.



24/7 Customer Service and Technical Support

Peace of mind comes from knowing you can reach Siemens 24 hours a day, 7 days a week. Our customer service department is available to assist with information on parts, place orders, locate a local Siemens service branch or contact a sales representative. If you have technical questions, we have industry experts ready to assist at our toll-free, technical support hotline.

Emergency/Temporary Mobile Water Treatment Systems

Mobile water treatment systems provide supplemental water to handle short-term water shortages or meet peak demand. We provide temporary water while customers await new water systems to be delivered and installed; while an existing system is shutdown for scheduled maintenance or due to specific regulatory issues. Siemens mobile fleet features state-of-the-art, self-

contained systems in equipment and process configurations to match customer's site and raw water conditions. Systems contain instrumentation and equipment for a fully automatic and monitored operation, and are backed by an inventory of critical components. Installation is minimized with quick hose and simple utility connections, all of which are performed by our skilled installation and service technicians. And with seven regional dispatch and regeneration facilities, we can service and exchange these trailers with rapid response and a quick turnaround. When using our mobile systems, Siemens guarantees the water quality and quantity, while assuming responsibility for the storage, handling and disposal of hazardous chemicals, ensuring a safer work environment.

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The information provided in this brochure contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract.

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WATER TREATMENT SOLUTIONS

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Part number	Equivalent	Part number	Equivalent
W2T387783	SWC5 Max	W2T152670	SW30-2521
W2T477960	SWC6 MAX	W2T199810	SW30-2540
W2T125825	ESNA1-LF	W2T199607	SW30-4021
W2T199809	ESNA1-LF-4040	W2T194352	SW30-4040
W2T500587	ESNA1-LF2-4040	W2T200867	SW30HR LE-400i
W2T531514	ESNA1-LF2-LD	W2T437659	SW30XHR-400i
W2T367447	Hydracap60	W2T404149	SW30ULE-400i
W2T370595	TM710	W2T421247	SW30HR-370/34i
W2T370599	TMG10	W2T150332	TW30HP-4611
W2T431399	TM810,	W2T150333	TW30HP-4641
W2T422471	TM810F	W2T200159	HSRO390FF
W2T370596	TM720-370	W2T158372	HSRO-4040FF
W2T370597	TM720-400	W2T149074	RO-390-FF
W2T534873	TM720-440	W2T149273	RO-4040-FF
W2T370600	TMG20-440	W2T458861	NF270-400
W2T534769	TMG20-400	W2T200328	NF90-400
W2T424263	TM820C-370	W2T183783	LP-2540 Low PRESSURE
W2T436383	TM820C-400,	W2T522516	LC-HR-4040
W2T532955	TM820E-400	W2T523327	LC-LE-4040
W2T332534	TM820F-400	W2T162299	BW30-2540
W2T520035	CPA-4	W2T149272	BW30-4040
W2T332820	CPA5-LD	W2T149076	BW30-365
W2T200166	ESPA1	W2T470004	BW30-400
W2T200170	ESPA2	W2T458858	LE-4040
W2T523273	ESPA2 MAX	W2T184686	BW30-440i
W2T200162	ESPA3	W2T470184	BW30-400/34i
W2T200164	ESPA4	W2T201404	LE-440i
W2T540892	LFC3-LD	W2T194868	LE-400
W2T523468	ESPA2-LD	W2T196175	XLE-440
W2T271318	SWC5-4040	W2T518377	HRLE-440i
W2T533714	SWC5-LD-4040	W2T416077	BW30XFR-400/34i
W2T493556	SWC6-4040	W2T407212	BW30HR-440i
W2T517316	SWC4 Max	W2T537463	XFRLE400-34i
W2T534174	SWC4-LD	W2T189420	SW30XLE-400i
W2T200325	SWC5-LD	W2T199647	SW30HRLE-400
W2T458862	NF270-4040	W2T199614	SW30HR LE-400
W2T200329	NF90-4040	W2T199811	SW30HR-380
W2T457174	NF270-2540	W2T199606	SW30-2514
W2T200327	NF90-2540	W2T186290	TW30-1812-24
W2T473971	GE AG2540FM	W2T186289	TW30-1812-36
W2T153036	GE AG2540C,	W2T186288	TW30-1812-50
W2T180717	GE AG2540TM	W2T186287	TW30-1812-75
W2T366996	GE AG4040C	W2T186286	TW30-1812-100
W2T304226	GE AG4040CM	W2T162299	BW30-2540
W2T186333	GE AG4040FM	W2T127264	BW30-4040
W2T152967	GE AG4040TM	W2T149272	BW30-4040 / INTERCON
W2T184889	GE AG8040F 400	W2T186285	XLE-2540
W2T153386	CPA2-4040	W2T186284	XLE-4021