

water SOLUTIONS

A NEWS UPDATE FROM U.S. WATER SERVICES/UTILITY CHEMICALS
An Associated Laboratories Company

Vol. I 2006

Reverse Osmosis Units: An Effective Way to Reduce Energy Costs

A local dairy plant was seeking to upgrade its water treatment system. They approached U.S. Water Services to discuss ways to improve water quality and to reduce energy costs. After a complete system review, the installation of a Reverse Osmosis (RO) unit was recommended. As part of the boiler make-up water system, the RO would meet the criteria of improving water quality, and reduce energy costs in the steam plant. The project would also provide a significant return on the plant's investment.

Reverse Osmosis systems are designed to remove dissolved minerals from the water, increasing the level of purity in the make-up water for boiler and cooling systems. (See related article on Page 4.) By reducing the amount of minerals going into a boiler, it is possible to decrease the amount of blowdown from that system, while still maintaining scale free heating surfaces. Boiler blowdown is hot. Reducing the amount of hot water sent to the sewer reduces the BTU loss from the boiler, and results in energy savings due to lower fuel use.



Photo Courtesy of Alcorn Clean Fuels.

A Rate of Return Calculation was figured for the plant's two boilers. By increasing the cycles of concentration to 100 for both boilers the following savings were predicted:

Boiler #1 will experience a fuel savings of 2,225 units/year, which translates into fuel savings of approximately \$15,100/year.

Boiler #2 will experience a fuel savings of 4,599 units/year, which translates into fuel savings of approximately \$31,300/year.

These projected savings justified the purchase of an RO unit. The system is now in the process of being installed. The decision to install an RO system should only be made as the result of a thorough analysis of your plant's water and energy systems. However, for those systems where an RO makes sense, the Return on Investment is often less than two years.

Contact U.S. Water Services today for more information regarding Reverse Osmosis units.

Case Study

One of the most overlooked yet costly issues facing many plants today is the presence of an ineffective water treatment system. This can



often become a financial burden. A mid-western food processing company was experiencing problems with their water system. Facing continued

expenditures, the company decided to have U.S. Water Services design a total water treatment solution for their old system.

By making four major improvements to the water treatment and feedwater systems, the company experienced a dramatic Return on Investment.

Continued on page 6

INSIDE THIS ISSUE:

RO Standards & Best Practices

Food Processing

Engineering Department

Chlorine Dioxide



U.S. Water Services
Utility Chemicals

Complete Water Treatment Solutions
Registered to ISO 9001

New Technology: SpiraSep UltraFiltration Membrane Technology

After replacing the traditional hollow fibers, spiral wound membranes have been used for dissolved solids removal (reverse osmosis) for over thirty years. The spiral format is the most efficient design for membrane filtration. Even though spiral wound technology is mechanically, hydraulically, and economically superior to other technologies, they have lacked the ability to be backwashed, making them unsuitable for suspended solids removal.



Photo Courtesy of Trisep.

Recently a system capable of backwashing was integrated into the spiral wound format. SpiraSep is capable of removing suspended solids. The filters are designed to treat surface water, well water, wastewater, and process streams across various industries.

After replacing the traditional hollow fibers, spiral wound membranes have been used for dissolved solids removal (reverse osmosis) for over thirty years. The spiral format is the most efficient design for membrane filtration. Even though spiral wound technology is mechanically, hydraulically, and economically superior to other technologies, they have lacked the ability to be backwashed, making them unsuitable for suspended solids removal.

Applications

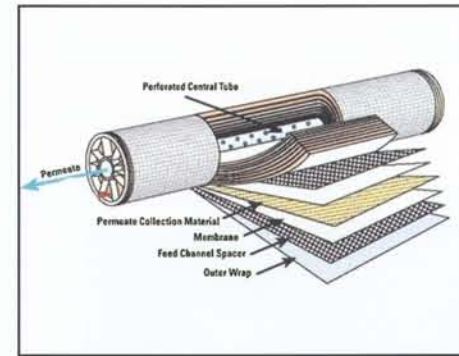
- Ethanol Plants:**
- Source water filtration
 - Methanator effluent
 - Misc mixed streams
- Industry:**
- River Water
 - Shallow wells (under the influence)
 - Phoenix Bio-systems effluent
 - Stillage streams w/o high oil content

The SpiraSep design provides vastly improved performance and is the premium choice over any hollow fiber. All new components are designed for backflushable, immersed, and suspended solids removal service.

The combination of ultra-low TMP and highly effective air scour minimizes fouling, allowing a high flux which lowers both capital and operations/maintenance costs.

Immersed/suction based operations require ultra low TMP (transmembrane pressure), lowering operations/maintenance costs.

Structural design resolves integrity (breakage) problems common to hollow fibers.



Key features of Spiral Structural Integrity

SpiraSep membranes are not required to and do not provide any structural integrity. The membrane support fabric and spiral configuration supply all structural integrity.

Hollow fibers must perform a dual role, acting as both a filter and providing structural integrity as well. This, in turn, prevents fiber abrasion or potting problems.

Key Features of Spiral Feed Channel

Discrete feed chemicals effectively and efficiently allow direct and controlled feedwater to the membrane surface, create turbulence, and enable superior fouling control. This prevents plugging in service and releases solids during backwash.

Evaluating Applications

- Each application varies in feedwater, suspended solids, composition and concentration.
- Use the project info and evaluation form for assistance w/ qualifying applications.
- Fill out the form with your U.S. Water Services Representative.

Pilot testing is required on most projects

- Prevent misapplication.
- Realize optimum tech and economic performance of the technology.



Photo Courtesy of Trisep.

Call U.S. Water Services today!
1-866-663-7632

Chlorine Dioxide: An Economical Biocide Solution

Chlorine Dioxide (CLO₂) is an effective biocide that has several advantages over conventional oxidizing biocides. Like all oxidizers, it kills bacteria by burning through the cell wall, which means that microbes cannot develop a resistance to it. One of the principle advantages of Chlorine Dioxide is that it kills bacteria at a lower dosage than other oxidizing biocides such as chlorine and bleach. As a result, it is less corrosive to the metal in the system. In addition, CLO₂ can be more economical to use in many applications due to its ability to function at concentrations as low as 0.1 ppm over a wide pH range.

It is less likely to form TriHaloMethane (TTHM) than chlorine and bleach. These compounds are highly regulated by the Environmental Protection Agency (EPA). Depending on the water being treated, or the point of plant discharge this can be a real issue for a customer, limiting the use of chlorine or result

in expensive de-chlorination chemical feed. Chlorine Dioxide's primary by-products are chlorine and chlorate, both of which break-down to sodium chloride. This makes chlorine dioxide one of the most eco-friendly biocides on the market. Chlorine Dioxide has been found to be useful in various industries such as:



- Pulp & Paper Mills
- Food Processing
- Municipal Water
- Commercial/Industrial
- Ethanol Production

Chlorine Dioxide generators have been around for years. However, they

used to require the careful feed of three potentially dangerous chemicals. The new electro-chemical units have advanced greatly in terms of safety and ease of operation. There are a couple of patented processes to generate Chlorine Dioxide on-site using salts, water, and electricity. This virtually eliminates all transportation, storage, and handling of hazardous materials. In addition, smaller generators are being made for use in industries that never considered CLO₂ before. U.S. Water Services is currently working with a brewery exploring the possibility of an installation of a Chlorine Dioxide generator for bottle washing and pasteurizer disinfection.

Once made, Chlorine Dioxide does not last long, which makes it impossible to bottle and sell like most chemicals on the market. Therefore, it must be made on-site. Initial capital costs can be high, but its effectiveness and environmental advantages can greatly increase your Return on Investment.

Food Processing: Diverse Solutions for a Diverse Industry

For an industry as diverse as food processing, there must be a water treatment system designed to match the needs of an individual company's ever changing production needs.



A loss in production time due to complications in the water system can result in a vast amount of profit loss. U.S. Water Services' ultimate goal is to help maintain the quality of the water system which, in turn, helps maintain the company's reputation.

Frequent system inspections ensure proper care is taken and the system is consistently working at its optimum level. Critical parts of those inspections are the tests performed by your

U.S. Water Services Representative such as steam quality, feed water quality, steam-line treatment, and monitor yield. These tests not only help identify inefficiencies, but they give you an idea of how to continually optimize your water system.



For example, water reclamation and reuse is a crucial cost saving method due to the high levels of water needed to meet federal and state health regulations. Often times water outlets are not utilized and valuable energy in the form of BTUs is lost. U.S. Water Services recognizes this problem and has taken numerous steps to reroute these water sources in order

to save customers a significant amount of money per year. An excellent example would be a food processing company where U.S. Water Services was able to divert the plant's waste-plant effluent stream that normally discharged into the river.



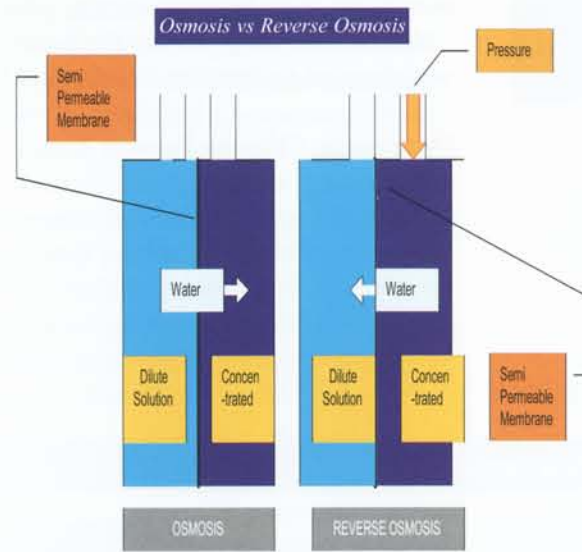
When diverted it was used in the cooling tower system and vacuum pump cooling. This reduced the hydraulic loading on the waste pond by eliminating cooling tower bleed (3,000,000 gallons/year) to the waste plant. It also reduced the need for fresh water out of the ground by 12,000,000 gallons a year, which saved an estimated \$100,000 a year in utility costs.

Reverse Osmosis: Standards and Best Practices

Reverse Osmosis (RO) is a proven technology with new applications for various industries. U.S. Water Services representatives pride themselves on having an extensive knowledge of RO unit installation, operations, troubleshooting, and cleaning procedures. Let's review the standards and best practices for RO units by first reviewing the process of osmosis.

Osmosis: A Natural Occurrence

Osmosis is a natural process that causes water to flow through a semi-permeable membrane from a dilute solution to a more concentrated solution, thus diluting the concentrated solution. At the same time, a measurable pressure is moving water containing dissolved solids from the concentrate to the dilute



water, and is called osmotic pressure. This movement of water across the membrane continues until the system reaches equilibrium on both sides of the membrane.

Reverse Osmosis (RO):

Reverse Osmosis technology involves the application of pressure to the water stream in order to overcome osmotic pressure. When the pressure is increased and applied to the concentrated solution the flow of water is reversed. A portion of the concentrated solution is forced through a very fine membrane to emerge as purified product water leaving impurities too large to pass behind.

Water Treatment Technology: Reverse Osmosis Units

RO units are quickly becoming a standard constituent for the reduction of contaminants and suspended particles within water treatment systems. Common applications of an RO unit include, but is not limited to; ethanol, industrial, boiler feedwater preparation, wastewater treatment, and food processing.

Pretreatment: Vital for Optimal Performance

Proper pretreatment of the feedwater to an RO system is critical for maintaining optimum performance and maximizing membrane lifetime. Ionic concentrations of specific elements may alter the rate for any given equipment. For that reason,

| RO Cleaner Selection Guide | | | | | | | | | |
|--|---------------|--------------------|-----------------|---------------|--------------------|-----------------|---------------|---------------|---------------|
| | ROC-20 Liquid | ROC-20 Plus Liquid | ROC-21 Granular | ROC-50 Liquid | ROC-50 Plus Liquid | ROC-51 Granular | ROC-60 Liquid | ROC-30/ROC-70 | ROC-40 Liquid |
| Inorganic Salts (i.e. CaCO ₃) | F | F | F | G | E | E | E | E | P |
| Sulfate Scales (i.e. Ca, Ba, Sr) | F | G | G | P | F | F | F | G | P |
| Metal Oxides (i.e. Fe, Mn) | P | F | F | G | G | G | G | E | P |
| Inorganic Colloids (i.e. Silt) | F | G | G | P | F | F | F | F | F |
| Silica | P | F | F | P | P | P | G | E | F |
| Biofilms | F | G | G | P | F | F | F | F | E |
| Organics | G | G | G | P | F | F | F | F | E |
| Feed Rate | 1-5% | 2-10% | 1-5% | 2-10% | 5-20% | 1-5% | 5-20% | 10-20% | 3.5-7% |
| Product Performance Key: E=Excellent F=Fair G=Good P=Poor | | | | | | | | | |

guidelines are developed based on complete ionic water analysis where Silt Density Index (SDI) measurements are less than three for safe operation. By using the U.S. Water Services RO cleaner line the goal of a pretreatment plan is to prevent or minimize problems like scaling, fouling, and membrane degradation.

Chemical Treatment

RO feedwater must be carefully prepared to minimize suspended solids, scaling ions, and microbiological contamination. The feedwater should be chemically treated to help prevent mineral scaling, fouling, and microbio degradation of the membranes.

Proper Maintenance

The removal effectiveness of an RO unit depends on proper installation, the contaminant and its concentration, the membrane selected (Cellulose Acetate (CA) vs. Thin Film Composite (TFC)), and the selected water pressure. The largest operational problem with RO units is the fouling of membranes due to microbio, mineral scale, inorganic salts, metal oxides such as iron, inorganic colloids like silt, and suspended solids.

When properly maintained an RO unit will...

- Dramatically improve water quality.
- Reject 95-97% of incoming solids.
- Greatly aid in the prevention of scale in a boiler program.
- Reduce blowdown and chemical use by allowing increased cycles of concentration.

Fouling of RO membranes can also be dependent on site specific process requirements. Intermittent RO operation can lead to biological fouling, where under-sizing of a unit leads to increased fouling potential and stresses RO efficiency due to pretreatment restrictions or discharge limitations. Fouling can affect an RO system's performance in the following ways...

- Decrease productivity.
- Increase operational costs.
- Increase the pressure drop through the system.
- Increase the potential for additional problems.
- Reduce product purity.

How often should RO membranes be cleaned?

Even with proper chemical treatment, periodic cleanings are needed to maintain equipment integrity and efficiency over an extended period of time. Cleanings need to be customized to the contaminants. The cleaners themselves are usually low pH (acidic) solutions or high pH (alkaline) solutions. Generally the high pH cleaners lend themselves to better removal of silicate, sulfate, biological, and organic contaminations. Low pH cleaners are better suited for inorganic scales and metal oxides. It is common for both to be applied during a cleaning. Higher than normal levels of iron, manganese, silica, slime, or fouling may require a specific adjunct cleaner in lieu of or in addition to normal acid and alkaline cleaner.

If your company has considered adding a new RO unit to their water treatment system or maintaining a previously installed unit, U.S. Water Services highly recommends a complete water analysis and source water evaluation. We can then determine the possible risks to the RO unit and a proper maintenance plan can be made.

Call U.S. Water Services today to set-up an evaluation time.
1-866-663-7632

Continued from page 1

The four steps are summarized below:

1) The installation of a Reverse Osmosis (RO) system resulted in a 96% improvement in the quality of water fed into the boiler system. This resulted in:

- Reduced amount of water drained from the boiler during blowdown. This saved a calculated total of \$5,281 in water and sewage costs annually.
- Reduced the amount of fuel wasted in blowdown discharge. By decreasing the amount of blowdown, the system wasted less energy, which reduced fuel usage. This saved a calculated \$21,740 in fuel costs annually.
- Maintain acceptable corrosion rates in the condensate system, while complying with the company's requirements regarding the feed of steam-line treatment. Steam-line treatments are not allowed at this facility, so the condensate system was experiencing unacceptable corrosion rates. By removing the majority of alkalinity in the boiler make-up water, the RO system greatly reduced corrosion in the condensate piping.



Photo courtesy of GE Osmonics.

The switch to high purity RO treated make-up water allowed the implementation of an advanced polymer chemistry boiler water treatment. Dramatic improvements in boiler tube cleanliness were evident within six months of making this change. Removing old scale from the heat transfer surfaces will greatly increase boiler efficiency, resulting in tens of thousands of dollars in annual fuel savings.

2) The replacement of a feedwater heater with a Deaerator provided the system with a mechanical removal of over 90% of the oxygen in the feedwater. The chemical oxygen scavenger demand was reduced significantly. In addition, operator handling of all boiler chemicals was eliminated

through implementation of our "EZ Feed chemical delivery and storage system."

3) The entire boiler chemical feed system was automated, including chemical feed, boiler blowdown, and chemical handling. This "state of the art" boiler chemical feed system provides the following benefits...

- Tighter control of boiler blowdown, resulting in improved fuel efficiency.
- Improved boiler chemical feed, with consistent results that will lead to boiler efficiency savings and reduced chemical usage.
- Complete containment of all boiler chemicals. The operators have virtually no contact with the water treatment chemicals. This improves operator safety, and reduces waste with the elimination of chemical drums.



Photo Courtesy of Pulsafeeder.

4) Improved operation and management of the boiler-water treatment program by company maintenance personnel. None of the above improvements would be realized without these efforts. Though systems are automated, they still require attention to ensure correct operation. This includes

- System tested regularly to ensure proper operation.
- Adjustments made to maintain service parameters.
- Conduct preventative maintenance to insure the components of the new feed system are properly cared for.

U.S. Water Services designed a total water treatment plan specifically aimed at the needs of the company. Our exceptional Engineering Department is capable of creating a total water treatment system customized for your company's needs including...

- Feedwater conditioning equipment.
- State-of-the-art chemical & water control automation package.
- Safe and environmentally friendly chemical handling solutions.
- Precise and reliable chemical feed systems.
- Easy and accurate chemical testing kits.

U.S. Water Services Engineering Services: An Untapped Resource?

As an operator, you are responsible for the proper care of your water treatment system. Due to the industry's expeditious rate of growth and technological advances, it is often hard to stay current with the various ranges of options concerning water treatment. When necessary, do you feel confident enough to seek the assistance of an outside source?



At U.S. Water Services, our philosophy is "complete water treatment solutions," and we believe a support network with an emphasis on collaboration is crucial in order to achieve that standard of service. As an operator, your sales representative is the most noticeable contact when you have questions or concerns regarding your water treatment system. What you may be unaware of is, as a customer of U.S. Water

Services, you have access to our entire staff of specialists including our engineering department.

Working along side U.S. Water Services sales representatives our engineering team is responsible for the design, implementation, and programming of all the equipment in the various systems. Once your system is in place, our entire staff will dedicate themselves to providing your company with the products, services, and expertise needed to keep it running at its optimum level. When the need arises, you can count on us for complete technical and customer support.

What does this mean to you as a customer of U.S. Water Services?

- Ease of application
- Peace of mind
- Decreased operational costs
- Increased efficiency

Services: Membrane Reconditioning

Off-site membrane reconditioning is a process which improves membrane performance. As a membrane element fouls, its effectiveness decreases and often to the point where it can no longer be cleaned in the field. Membrane reconditioning was devised as a means to salvage what would otherwise have to be discarded. By using an intensive off-site chemical cleaning process, membrane foulants are removed, resulting in a dramatic improvement in membrane flow rejection rates and pressure differential.

This is often a cost effective alternative to membrane element replacement. It can restore quality performance and extend membrane life to even the most severely fouled membrane elements. In fact, reconditioning has been known to double or triple membrane life, saving customers thousands of dollars.

Membrane reconditioning has numerous benefits:

1. Improves membrane performance/life span
2. Reduces system downtime/cleanings
3. Maximizes productivity
4. Reduces or eliminates chemical handling.
5. Significant ROI



Talk to your U.S. Water Services representative for details. 1-866-663-7632

Company News:



Water is one of the most important considerations in food processing. Our expertise extends to helping some of the most well known food producers improve their operations in the areas of boilers, cooling, waste and process treatments. However, our dedication to our customers does not end there.

Plump® and U.S. Water Services are long time partners in the Poultry industry. A Partnership such as this is built on a commitment to provide unparalleled superior customer service.

In recognition of those efforts our company received the World Class Performance in Service and Quality for 2005 from Gold n' Plump®. This is the fourth consecutive year U.S. Water Services has received this award.

Mike Mowbray, Technical Marketing Manager, accepted the award on behalf of U.S. Water Services.



Contact your local representative for more information regarding U.S. Water Service's complete line of Reverse Osmosis cleaners.

U.S. Water Services Preventative Maintenance Plans

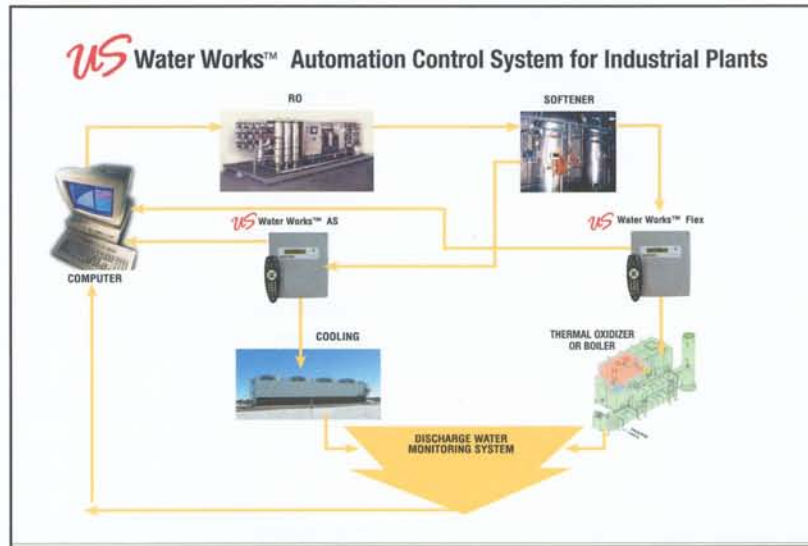
Regardless of the industry served, market, or size of your company, U.S. Water Services is determined to provide you with the most efficient water treatment system combined with the best in customer service.

Whether we are designing a new system or updating a currently existing one, having a U.S. Water Services Preventative Maintenance Plan implemented as a proactive approach to your system, instead of reactive, has the potential to save your company money. This is

accomplished by avoiding production problems before they start. This includes the scheduling of a series

a U.S. Water Works™ automation plan, consisting of data management tools, discharge monitoring, and real-time views of your cooling towers, boilers, pretreatment and water system.

Combined with the on-call service of our sales representatives and engineering staff, U.S. Water Services is able to provide you with the necessary support network to keep your water system running at its maximum efficiency level.



of pre-treatment tests, an analysis of collection sites, or the installation of

Contact your U.S. Water Services representative for more information.

Water Solutions is published periodically and distributed by U.S. Water Services/Utility Chemicals. Copyright © 2003 by U.S. Water Services Inc. and Utility Chemicals Inc. All rights reserved.

www.uswater
services.com



330 South Cleveland Street
Cambridge, MN 55008
ISO-9001 Registered
An Associated Laboratories Company