RECOVERY ZONE

FALL 2022

The Next 30 Years

Author: Chief Operator North Regional WTP, Collier County Water Sewer District

Early in my career as a Plant Operator at Collier County North Regional Water Treatment Plant (NCRWTP) I was sitting in the office with my former Plant Manager. I heard something that at the time, I was torn, but now makes so much sense to me, "when I took over my goal was to replace every piece equipment that is original to the plant and upgrade everything I can so that the plant will run for another 30 years". At the time I assumed he was replacing equipment that still had some useful life still left. I thought he was wasting money that could be spent better elsewhere. Well fast forward 6 years now being the Chief Plant Operator, experiencing firsthand the occasional equipment malfunctions, and weaving through some budgetary obstacles nobody could have planned for after a pandemic, and I now understand just what he meant. It wasn't just to throw money around recklessly. It was because with an aging plant you never know what unforeseen circumstances might arise. At times you might have to delay budgeted projects so that other groups within the division can afford to address situations that are of a higher priority. You might even go through a pandemic where you run into supply issues with increasing demand that contribute to rising cost increases. What my former Plant Manager did was assess what equipment you couldn't produce water without in the event of a failure and replace or refurbish it. He was staying ahead of potential equipment malfunctions which would leave them out of service for an unknown amount of time before they could be replaced. After all, the plant had been operating without a major failure for 30 years and without realizing it then, he was setting my current Plant Manager and myself up for success and a few less headaches as we progressed in our careers. With that little background here is a brief overview of my plant, some of the improvement projects we have completed, and projects we are currently working on that will hopefully allow us to continue operation for the next 30 years.

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Message From Our President

It is an honor to be your new president for the Southeast Desalting Association. Our past president, Karla Berroteran, did an outstanding job leading the membership for the last 2 years. I will strive to continue our excellence and set high goals for our association to achieve. My last four years as a Board of Director utility representative have been a positive and rewarding experience. I plan to apply my SEDA organizational knowledge by enhancing collaboration among operators, consultants, vendors, and young professionals by combining each of our areas of expertise and creating new opportunities for the betterment of membrane treatment technology.

SEDA's mission is to improve our knowledge of all forms of water supplies utilizing membrane treatment technologies and promote education to improve potable water and wastewater treatment processes. This is achieved by offering 6 Membrane Operator Certification Schools and 8 Technical Sessions each year for its members to fulfill the CEU's licensing requirements. I am delighted to announce that the Board of Directors have agreed to update the mission statement by including advanced water treatment processes of wastewater keeping current with Indirect and Direct Potable Reuse trends.

Changes to the Board of Directors that occurred in June include the departure of past President Director Jason Bailey and past Vice President Director Laura Gallindo. Director Bailey held the position of Treasurer and MOC Chair for many years. Director Gallindo, Program Chair, greatly enhanced the association by providing social media platforms for membership engagement. The new incoming Board members are Director Ricardo Avena, Vendor Representative, and Utility Representative Director Allyson Felsburg. They both are already sharing new ideas for the organization's future.

June's 2022 Annual Symposium held at the Marriott Grand Spring Resort in Stuart, Florida was a tremendous success despite the post-pandemic economic uncertainty potentially impacting attendance. The association learned that maintaining outreach efforts during tough economic times requires some moderate risk decision-making. As a result our membership for 2022 has exceeded 900 for the first time! Our new goal of 1,000 members in a few years is possible as more membrane technology is necessary for clean water needs.

Again, I want to say thank you to the Board of Directors, Office Administration and valued members in the organization for their continued encouragement and support. I am confident we will achieve our goals and continue to be an exceptional and unique SEDA in the coming year.

Best regards,
President
Pierre Vignier

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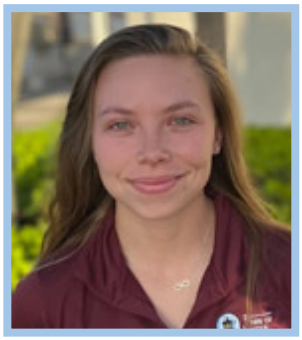

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Collier County commissioned the North Collier Regional Water Treatment Plant (NCRWTP) in 1993. At that time, the NCRWTP had a production capacity of 12 million gallons per day (mgd) utilizing nanofiltration (NF) technology to treat groundwater from the Lower Tamiami Aquifer. In 1999, the NCRWTP was expanded by 8 mgd of finished water installed capacity utilizing low pressure reverse osmosis (RO) technology to treat groundwater from the Lower Hawthorn Aquifer.

Raw water from the Tamiami wellfield is pretreated with sulfuric acid and AWC-102 plus scale inhibitor and fed into an inline static mixer upstream of the plants 5-micron cartridge filters that are dedicated to the NF process. The pretreated water is then piped to the individual NF membrane trains. The feed pumps located at each train boosts the water supply pressure from an average of 25 psi to approximately 90-110 psi, providing the driving force to overcome the osmotic pressure. Permeate is collected and piped to the degasifiers for further treatment. The concentrate solution is piped to the plants concentrate wet well then pumped into one of the plants two deep injection wells to a depth of approximately 3,200 feet.

Raw water from the Hawthorne wellfield is pretreated with the same scale inhibitor as the NF process however it is mixed via dilution pump before entering the cartridge filters dedicated to the RO process. As the pretreated water exits the cartridge filters the feed pumps increase pressure of the supply from an average of 40-60 psi to approximately 185-220 psi. Unlike the NF, the RO provides enough discharge pressure for the concentrate to be sent directly down one on the plant's deep injection wells. As the permeate exits each train it enters the plants permeate pipe where it is blended with the permeate from the NF trains.

Following membrane treatment, the pH of the blended permeate is lowered by acid addition and travels to the degasifiers for hydrogen sulfide and carbon dioxide removal. There are four degasifiers that each have a design capacity of 6.5 MGD. Water is dosed with chlorine solution as it leaves the degasifiers and enters the clear well where fluoride and AWC-782 Corrosion Inhibitor are added. Water in the clear well is pumped by a set of transfer pumps installed at the end of the two clear well channels through a static mixer where the final treatment chemicals are added prior to the plants two 6 MG ground storage tanks. Ammonia is added to form chloramines and sodium hydroxide is added for pH control. After the water enters the storage tank it is then eventually pumped out to distribution by our high service pumps.

Our high service pumps and motors were replaced in two separate phases. Phase 1 CPH Engineering designed the replacement of the plants four original high service pumps and motors. The decision was made to install 300-HP GE motors with Peerless vertical turbine pumps. Phase 2 Tetra Tech designed the replacement of the two remaining motors using the existing Afton Vertical Turbine Pumps, installing new U.S. Motors with a greater cooling capacity.

In conjunction with the planned replacement of our aged transfer pumps, it was desired to improve pumping reliability by increasing capacity of the new pumps to allow operating in a 4 duty/2 standby mode. Before replacement, standard operations consisted of using 5 duty and 1 standby 60-HP vertical turbine pump(s) to transfer water from the clearwell to onsite ground storage tanks. Since the pumps did not have the capacity to meet the maximum plant production of 20 MGD with only 4 pumps in operation, the decision was made to install 75-HP vertical turbine pump(s) that each have a capacity of 5.25 MGD. This allows us the ability to provide an excess of 1 MGD above the peak design flow.

As our RO trains aged it was time to make some improvements, such as the reconfiguration of each of the existing RO trains from a 52:18 array (First Stage: Second Stage), with a total of 70 pressure vessels, to a 44:22 array, with a total number of 66 pressure vessels. We also modified all of the RO trains to install an energy recovery device (ERD) designed with an integrated 30-HP motor to reduce the first stage feed pressure requirements and improve the overall performance of the system with respect to energy consumption. The FEDCO ERD's energy savings projection calculated by HDR Engineering (annualized over 20 years) valued at $825,000.

One of our projects that doesn't nearly receive the recognition it deserves was installing a post-permeate acid feed system. We were able to relocate our RO pre-treatment acid feed point into a post-permeate acid feed. This required us to utilize various system and process experts at Jacobs Engineering, Harn RO, American Water Chemicals, and CPH Engineering as this project was to coincide with a planned refurbishment of the facility's NF trains. By optimizing our membranes and scale inhibitor we reduced the total sulfuric acid demand by 42%. What we gained for our investment was a cost saving of $250,000 a year, the complete elimination of pretreatment acid on the reverse osmosis process, and at the time a slight increase in alkalinity due to more precise pH control before degasification.

As mentioned, we also refurbished our NF trains. We reconfigured each of the existing NF trains from a 36:18:7 array (First Stage: Second Stage: Third Stage), with a total of 61 pressure vessels, to a 32:16:8 array, with a total number of 56 pressure vessels. With this setup we were still able to increase recovery from 85% to 90%. We also replaced all the actuators, membranes, pressure vessels, instrumentation, and installed a new interstage booster pump with VFD control. This allows for 90% recovery and saves up to $10,000 a year in operating cost by increasing the 3rd stage feed pressure. One of the most beloved improvements if you ask any of our operators, was the ability to eliminate our clean in place (CIP) Victaulic fittings and hoses and install hard-pipe for the cleaning system at the existing CIP system feed, the concentrate CIP solution return, and all CIP permeate system return points.

We are currently under construction of a hydropneumatics surge control system connected to the high service pump discharge line. A Selection Committee is currently evaluating design services for replacing the plants emergency power generators with tier 4 compliant generators. We believe this will also include a significant building modification by having to expand our room that houses the emergency power generators. We are replacing our bulk chemical storage tanks; the design is completed and we are awaiting shipping for implementation. We are also installing two PLCs dedicated to our chemical pumps and associated instrumentation. This will allow us to minimize electrical surge and eliminate any runs that aren't fiberoptic.

There are always improvements to be made. Once you stop trying to identify innovative ideas and technology, before you know it you will have an outdated facility that hopefully you will have the time to play catch up before it is to late. I absolutely love my job and the people I work with, not only day in and day out, but my colleagues in the industry I might not see every day. It is truly satisfying, and I am grateful they all have the same goal in mind to provide the best quality water… To the next 30 years!

Ask The Experts...

Question:
Can Sulfuric acid or HCl be used with the addition of Citric acid for the control of iron and other scales in a reverse osmosis plant?

Answer:
First and foremost, citric acid is a highly assimilable organic acid – this means that it would act as a carbon source for growth of microorganisms. In the few cases we've come across where citric acid was being dosed continuously into the RO feed, membrane autopsies found severe fungal growths that lead to extreme declines in permeability.

If the water source contains oxygen (surface water, wastewater), has been exposed to oxidizers, or ferric based coagulants have been used, the iron will be in the ferric state and can typically be controlled by dosing antiscalant to a certain extent.

If the water does not contain any dissolved oxygen, most of the iron will be in the Ferrous state. Ferrous ions are extremely soluble and easily controlled by most antiscalants without acid.

However, in many cases, some soluble oxygen will be present. It only takes 0.1 ppm dissolved oxygen to oxidize 0.7 ppm of ferrous ions to the ferric state.

$Fe2+ + 14O2 + H+ = Fe3+ + 12H2O$

When the water source is from a deep aquifer, we assume anaerobic conditions where all iron will be in the ferrous state (as long as the water goes directly to the RO with no holding tanks and no dosing of chlorine or other oxidizers). When the water source is from a surficial aquifer, oxygen may be present and iron can be assumed to be in the ferric state.

Ferric iron can be controlled to a certain extent using antiscalant without pH reduction, but the antiscalant demand becomes significant. Antiscalants have a higher affinity to trivalent metal hydroxides than other surfaces. They will therefore preferentially adsorb to colloidal ferric hydroxide while allowing calcium carbonate and other sparingly soluble salts to precipitate and form scale on the membrane surface. In such cases, very high dosages of antiscalant would be required to control the iron while an excess would be needed to control other scales. In some cases, the required dosage would be so high that antiscalant overdosing may occur. This can usually be addressed by using a lower antiscalant dosage in combination with pH reduction.

Some smaller plants use greensand filters for iron removal and they are very effective so long as they are correctly sized and well maintained; iron concentrations are typically reduced to below 0.1 ppm. But they are a significant capital expense, require a large footprint, and because they require continuous dosing with a strong oxidizer, run a risk of damaging the RO membranes.

Hazen

JAWS

SEDA Symposium Awards

Outstanding Membrane Plant <5 MGD – Bonita Springs

Scholarship Applications Tulsi Shukla

Outstanding Membrane Plant >5 MGD – Lake Worth

President's Recognition Ryan Popko

Vendor of the Year Tetra Tech

Operator of the Year Brittany Maffei

Senior Operator of the Year Chris Kerby

Martin Country Tropical Farms WTP

2022 Annual Symposium

SAVE THE DATE

SEDA Spring Symposium
Opal Grand Resort, Delray Beach FL
June 25th –28th, 2023

Tech Transfer Update

In May 2022, SEDA held three (3) workshops:

1. Well Pumps Maintenance, Chemical Feed Pumps, and Other Electrical Components and Safety

This workshop was taught by William Beach and Dowell Sparks. The workshop was held in Port St. Lucie Water Treatment Facility; and we had 25 participants.

First, William Beach covered the basics of vertical turbine pumps, pumps safety, and troubleshooting. Then, Dowell Sparks covered the basics of chemical feed pumps design, selection, troubleshooting, and safety.

At the end of the workshop, both speakers answered questions related to pumps and other chemical equipment and provided an overview of basic steps for troubleshooting and maintenance. After that, all attendees were taken on a tour of the Port St. Lucie Water Treatment Facility.

This workshop was sponsored by R.C. Beach & Associates, Inc. and Lutz-Jesco America Corp.

Instructors William Beach (left) and Dowell Sparks (right)

Port St. Lucie Water Plant Tour Grounds

2. Membranes System Normalization and Monitoring Hands-on

This workshop was taught by Julie Nemeth-Harn, Mo Malki, and Kirk Lai. The workshop was held in the Village of Wellington Water Treatment Facility; and we had 29 participants.

First, Julia Nemeth-Harn provided an introduction of the different components in a membrane plant and provided an overview in recordkeeping. Then, Mo Malki covered the theory and principles of normalization and troubleshooting.

Finally, Kirk Lai explained various software used for normalization of data. He divided the attendees into groups to be able to cover the hands-on section, where the participants were able to probe a train vessel, collect conductivity reading and other parameters used in a normalization software.

At the end of the workshop, all attendees were taken on a tour of the Wellington Water Treatment Facility.

This workshop was sponsored by Harn R/O Systems, Inc., American Water Chemicals, Inc., and DuPont Water Solutions.

Wellington Water Plant Training Room

Hands-on Session, Instructor Kirk Lai and students

3. Cleaning School

This workshop was taught by Joshua Utter and Omar Mullah-Saleh.

It was held at the Seminole Hollywood Reservation Facility; and we had 17 participants. The workshop covered troubleshooting for cleaning procedures and chemistry, case studies with cleaning trials and membrane autopsies, and CIP system walkthrough with process and goals of a membrane cleaning.

First, Omar provided a general introduction to cleaning procedures, understanding the CIP system, and data normalization. Then different parameters such as net pressure, temperature, recovery, and feed TDS were analyzed for RO performance and when it's the best time to clean.

Second, Joshua covered different case studies with troubleshooting by membrane autopsies and findings. CIP best practices for organic and biofouling with high pH, followed by CIP for inorganic and organic scaling with low pH were analyzed, along with multi-fouling case studies. The key parameters for a successful cleaning were discussed in detail: temperature, pH, flow rate, time, and cleaning solution. Lastly, the workshop covered CIP instrumentation, cleaning different stages, and safety precautions.

At the end of the workshop, all attendees were taken on a tour of the Seminole Hollywood Water Treatment Plant. During the tour, attendees had hands-on training on CIP volume calculation and instrumentation checking.

This workshop was sponsored by American Water Chemicals, Inc.

Wellington Plant Tour

Call For Presenters!!

The Southeast Desalting Association (SEDA) is developing the program for its 2023 Annual Symposium which will be held June, 2023 at the Opal Grand Resort and Spa, Delray Beach FL.

The program committee has determined that the topics to be presented during the Symposium will be in the following areas, specifically with regard to membrane treatment in drinking water and wastewater applications.

- Reverse Osmosis and Nanofiltration (RO/NF)
- Microfiltration and Ultrafiltration (MF/UF)
- Membrane Bio-Reactors (MBR)
- Source Water Issues and Membrane Pretreatment
- New Membrane Applications and Technologies
- New Facility Case Studies
- Staff Training and Start-Up
- Case Studies - Overcoming Operations Challenges
- Organizational Management
- Regulatory Update – PFAS, Potable Reuse
- Troubleshooting and Cleaning
- Post Treatment & Distribution
- Treatment of Emerging Contaminants (PFAS, Microplastics)
- Process Instrumentation, Monitoring, and Controls
- Managing and Leveraging Operating Data
- Concentrate Disposal Methods and Issues
- Emergency Preparedness and Recovery – Lessons Learned from Hurricanes
- Regulatory and Permitting Issues – Lead, Copper
- Equipment Used in Membrane Treatment
- Direct/Indirect Potable Reuse Applications
- Research and Innovation in Membranes

Please visit our website southeastdesalting.com or contact Michele Miller at admin@southeastdesalting.com or 772-781-7698, with any questions.
On behalf of our program committee, we look forward to receiving your submittals!

Welcome to Our New Members

BRADLEY JEWELL
ORLANDO UTILITIES COMMISSION

DAN DRESSEL
GREENBLU

MARGARET DORGE
CITY OF TARPON SPRINGS

NAVEEN KUMAR REJETI
ASIAN DEVELOPMENT BANK

PATRICK HENDERSON
CITY OF PALM COAST

PAULA CAMPESINO
UNIVERSITY OF CENTRAL FLORIDA

RON TRYGAR
UF TREEO CENTER

STEVEN FERGUSON
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