

Ukrainian Fertilizer Producer Saves Water and Reuses Wastewater with GE's Integrated Platform Membrane Solutions

Background

The North Black Sea region in Ukraine is one of the most water scarce locations in the country. It is a place where millions of people live and work and industry is well established including one of the largest Eastern Europe's ammonia fertilizer producers.

Challenge

Built in the middle of the last century, the fertilizer manufacturing plant was supplied by fresh water from the municipal water source and used conventional water treatment based on ion exchange to produce high purity water for boilers and process applications. Conventional biological treatment was also used to treat industrial and residential wastewater.

The rising cost of the fresh water supply and increasing regulations for wastewater discharge into the sea caused the customer to look for alternative sources to meet their water needs.

Solution

GE Water & Process Technologies provided a desalination and water reuse solution to meet the customer's water needs. On GE's recommendation, the customer implemented a new integrated membrane system, combining the industry-leading GE ZeeWeed* ultrafiltration (UF), PRO Series reverse osmosis (RO) (Figure 1) and E-Cell* electrodeionization (EDI) technologies.

The 15,360 m³/day (4 mgd) integrated membrane water treatment system, purifies both seawater and biologically treated water. This system helps the customer to significantly reduce fresh water supply payments and wastewater discharge fees.



Figure 1: PRO Series RO units installed on site

The GE solution uses the existing conventional bio-effluent treatment line and runs a seawater treatment stream in parallel as an alternative to the municipal water source during periods when a higher water demand occurs. Figure 2 shows the process diagram of the system for fertilizer manufacturing plant.

The three primary process steps of the water treatment plant are:

- Pretreatment with GE ZeeWeed UF membranes
- Desalination with GE RO membranes
- Polishing with GE E-Cell EDI stacks.

The wastewater recovery stream includes a GE ZeeWeed UF as pretreatment for the brackish water GE PRO Series RO units.

The seawater stream also includes a GE ZeeWeed UF unit as pretreatment for the GE seawater reverse osmosis (SWRO) unit. Both streams are blended and polished by a second brackish water PRO Series RO unit equipped with low energy (LE) GE membranes. A final polishing step is made with the GE E-Cell EDI technology to pro-



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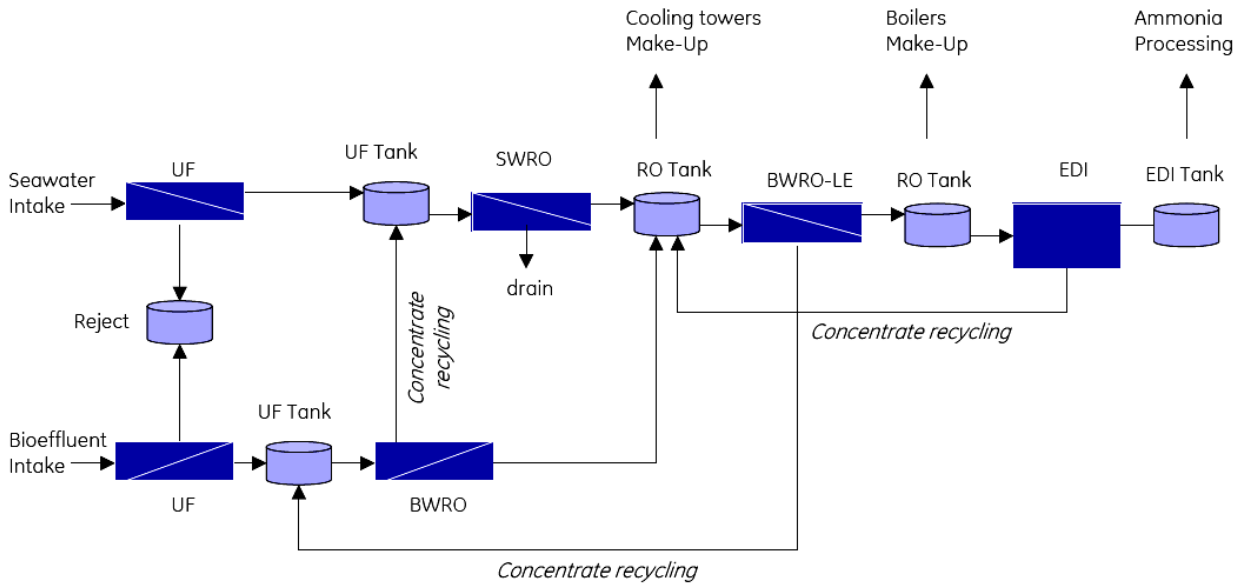


Figure 2: Process Flow Diagram

duce high purity water (up to 16 MOhm/cm, 5 ppb silica). This high-purity water is used to feed the ammonia process stream at 440 m³/hr (116,000 gpm).

In addition to ammonia process water there are two more streams of treated water: the first pass reverse osmosis is producing the cooling towers make-up water (130 m³/hr [34,000 gpm]) and the second pass RO is producing the boilers make-up water (70 m³/hr [18,500 gpm]).

Results

One of the many benefits of the solution is that the customer has one source accountability with GE providing up-to-date desalination technology – RO, pretreatment (UF), post-treatment (EDI), parts and chemicals such as membranes, filters, antiscalants, detergents, etc. They have just one supplier to provide and maintain their system.

Ultrafiltration is increasingly being accepted as the best available technology for RO pretreatment, providing a physical barrier to virtually all suspended particles from the feedwater. This benefits the customer by lowering the RO system cleaning requirements, providing higher flux rates, and extending the RO membrane life. GE's UF units are equipped with submerged ZeeWeed 500 membrane elements with patented GE reinforced membranes.

Using EDI technology compared to the traditional demineralization provides a smaller footprint for

installation, less chemical consumption and reduced EHS issues around handling regeneration chemicals.

The custom solution developed by GE used pre-engineered UF, seawater/brackish water RO and EDI Platforms. The integration pre-engineered systems allowed GE to deliver a large-scale reliable solution in a very short time.

The entire solution helps the fertilizer producer reduce the environmental impact of their water treatment plant. By recycling the concentrate streams, the solution provides total system recovery as high as 75% with wastewater streams only from the SWRO concentrate and UF reject. These wastewater streams also do not contain the added chemicals that the conventional technologies used before did.

The bottom-line benefit is that the GE solution will help the customer to save millions of US dollars by not having to purchase water from the municipal water supply. The investment will pay for itself in 18 months.