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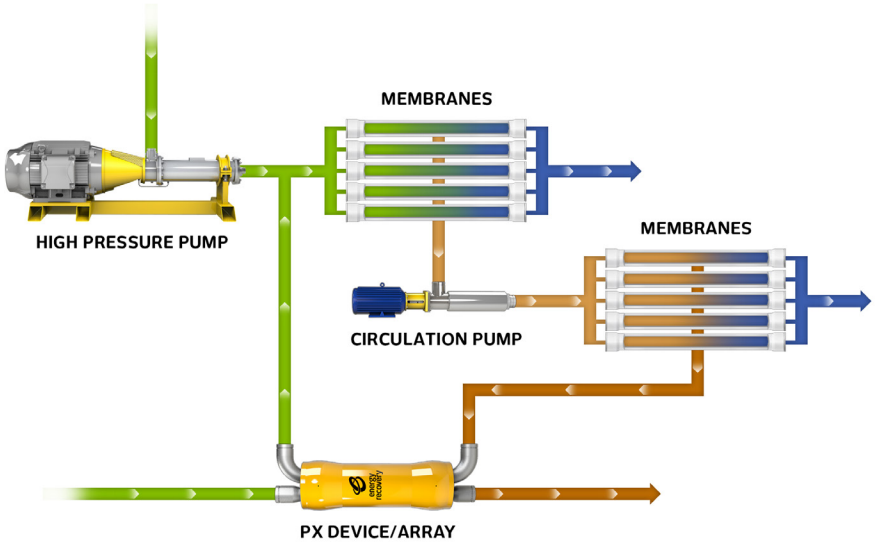
Kimley»Horn

Expect More. Experience Better

The US' First Municipal Installation of a PX® Pressure Exchanger® for BWRO

THE CHALLENGE

Planned BWRO facility facing significant drop-off in water quality



LOCATION

North Point, Florida, USA

PROJECT

North Point, Florida's Southwest Water Treatment Plant

CAPACITY

2.0 MGD

ENERGY SAVINGS

1.7 kWh/KGal* (0.45 kWh/m3)

ESTIMATED SAVINGS

$23,360/year**; $95,000 in capital costs

The City of North Point, Florida built a new brackish water reverse osmosis (BWRO) facility capable of producing 2.0 MGD of potable water by treating raw water from local wells with a Total Dissolved Solids (TDS) level of about 3,500 mg/L. However, the facility needed a flexible design because the conditions are expected to change over time. Nearby wells are degrading and the City anticipates that the raw water quality will degrade over time; historical data predicts salinity could increase by as much as 370% in the first 10 years of operations. The facility has two reverse osmosis (RO) skids, each capable of producing 1.0 MGD, which are designed to expand to produce 2.5 MGD each as demand for water rises. This wide range of operating conditions presented a significant design challenge.

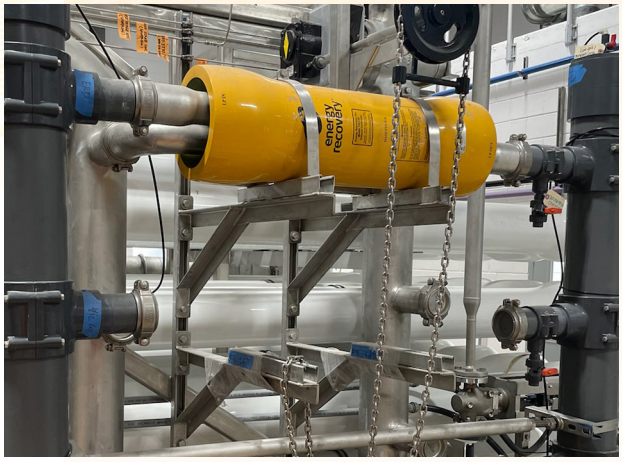


Photo courtesy of Kimley Horn and Associates, Inc.

**energy savings projected to reach up to 4.2 kWh/kGal (1.1 kWh/m3) under future conditions*

***cost savings projected to reach $211,000/year under future conditions*

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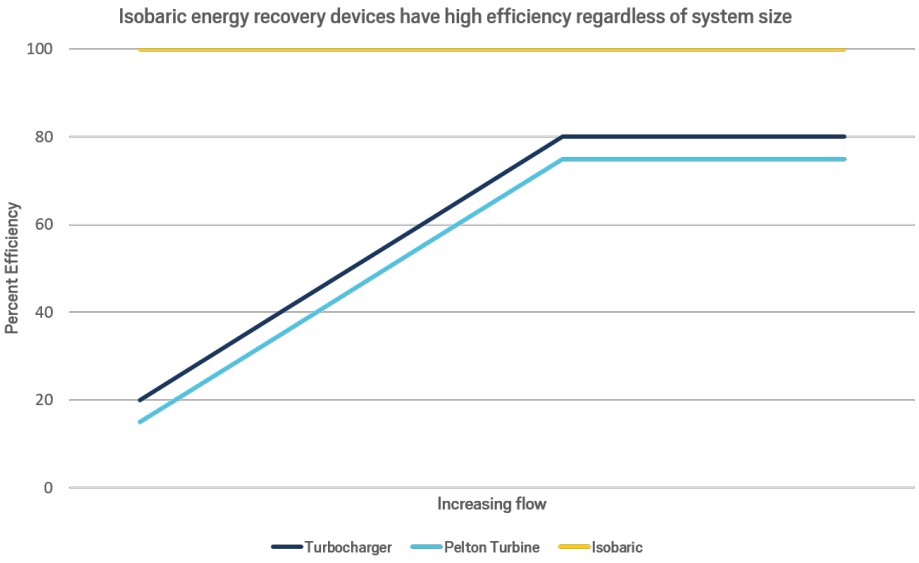
THE INNOVATION SOLUTION

The US' First Installation of a BWRO PX® Pressure Exchanger®

In order to offset the rise in operating costs brought on by increasing production and water salinity, the designers determined that the plant needed energy recovery devices. Traditionally, BWRO facilities employ turbochargers to recover pressure energy from the reject stream. However, because of the expected increase in feed pressure (between 200 to 520 psi) and other operating conditions, a traditional turbocharger would not be able to provide the necessary pressure boost needed under future conditions, so the customer decided to utilize Energy Recovery's PX® Pressure Exchanger® (PX).



THE RESULT

A Forward-Looking Facility with Savings Across the Board

By anticipating the changes in operating conditions, utilizing the PX, and streamlining the design, the facility owner will see operational savings over the PX's 25-year design cycle. Based on current production and salinity levels, the facility is projected to save 1.7 kWh/kGal, which translates into an annual savings of $23,360. As salinity and production increases, those savings could compound significantly over time to as much as 4.2 kWh/kGal and over $211,000 per year.

The new design also reduced the membrane feed pump flow by 20%, which will lead to an estimated reduction in horsepower of at least 33 HP, and $95,000 in reduced capital savings for the pump motor and other components.

TURBOCHARGERS VS. THE PRESSURE EXCHANGER®

Different ERDs for Different Needs

Turbochargers offer a low-cost energy recovery solution that is efficient, reliable, and simple to install. However, their efficiency is heavily dependent on maintaining specific flow and pressure levels; variations can cause significant drops in efficiency. The designers ultimately determined that the PX® is better suited for this facility because of its operational flexibility.

Advantages of the PX:

- **PX is better able to maintain efficiency across a range of conditions than a Turbocharger**
- **PX has a peak efficiency of 98% compared to a mid-80 range for Turbochargers, which is heavily flow dependent**
- **PX can handle a wider operating range; Turbochargers work best when designed for a specific flow rate and pressure**

WELL DEGRADATION

As Water Quality Declines, Costs Increase

The design team needed to build a facility that could adapt to future TDS levels of as much as 13,000 mg/L, a sharp increase from the current TDS of 3,500 mg/L. This presented not only a design challenge, but also a significant jump in energy load and other costs for the facility as well.

Some of the major impacts on the facility include:

- Increasing membrane feed pressures
- Larger horsepower requirements for membrane feed pumps, leading to higher capital costs
- Increasing energy load, leading to higher operational expenses
- More complex materials selection matrices for wetted metal components