Cat Cay Yacht Club (Bahamas) SWRO System

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In January of 2016, Sea Level Systems was contracted to provide the Cat Cay Yacht Club a complete integrated Seawater Reverse Osmosis (SWRO) system to replace their energy inefficient aging units.

This now commissioned SWRO system consists of three (3) pressure vessels each containing seven (7) membrane elements arranged in a single-stage array. This system produces 72,000 US gallons per day (50 GPM) permeate with a projected TDS of ~ 350 mg/L TDS (at 3 years). This system is designed to operate at a 35% recovery rate, and incorporates an isobaric pressure exchanger energy recovery device to minimize energy consumption and provide the most efficient state of the art design.

The system operates at a trans-membrane (feed to product) pressure of ~ 710 psi (at 3 years) with 36,000 mg/l TDS feedwater, with the remaining portions of the system operating at lower pressures.

The high-pressure RO pump provided is a high efficiency axial piston positive displacement type pump constructed of duplex and super duplex stainless steel for superior corrosion resistance. The pump was chosen for reliability, efficiency, (very) minimal maintenance, and smooth discharge pressure.

To allow for easy and energy efficient flow control, the pump motor is controlled by a Variable Frequency Drive.

For the highest efficiency and unmatched simplicity, the energy recovery device provided in this design is an isobaric pressure exchanger from Danfoss - Model iSave 21.

This device combines the pressure exchanger and the booster pump into one compact unit. The integrated booster pump is a positive displacement type pump based on the vane pump principal, which allows for flow control based on pump speed. The motor also controls the rotation of the pressure exchanger rotor, preventing overflow or overspin conditions, and resulting in a balanced flow control without the need for a high pressure flow meter.

The combination of low energy nanocomposite membrane technology, high efficiency APP high pressure pump, and the efficiency and simplicity of the iSave 21 energy recovery device result in a relatively simple and very energy efficient Seawater Reverse Osmosis System. The energy savings generated by this new system allows for capital recovery in an extremely short period of time when compared to the older units energy consumption.

The design of the Reverse Osmosis unit minimizes corrosion and maintenance problems on downstream process equipment associated with saline waters and harsh environments. All low-pressure piping and structural materials are fabricated from plastics or Fiberglass Reinforced Plastic (FRP). High pressure stainless steel piping is constructed of 2205 duplex stainless steel for superior corrosion resistance. All other ancillary fittings with metallic materials in contact with the water are of 316SS (or better) construction.

The pre- and post-treatment for the system was also supplied by Sea Level Systems. These additional components included the submersible well pump; multi-media filtration; calcite contactors; flush & cleaning system as well as a degasifier and catchment tank. This SWRO complete integrated system was commissioned in August of 2016 and also includes remote monitoring capability.