

Turbidity Monitoring in Sea Water Reverse Osmosis Desalination Plants

Challenge

Climate changes reduced traditional sources of freshwater in many countries, hence desalination processes are becoming more and more important for drinking water production worldwide. The collected raw seawater for the seawater reverse osmosis (SWRO) process must be pretreated before the actual reverse osmosis (RO) step to prevent the RO membranes from clogging and fouling. The fouling potential of the raw seawater varies due to different water characteristics (nutrients, temperature, salinity, pH, oxygen, light, etc.), intake location (depth, closeness to industrial areas/ships), water circulation (streams, waves, tides, etc.) and sea topography (sea depth, benthic zone, etc.). The composition of seawater can also vary significantly depending on the time of day and the current weather

conditions. Therefore, different seawater requires different treatment. **A well-designed pretreatment will increase the RO membranes lifetime and additionally the operator can save energy costs due to lower process pressures during RO operation.**

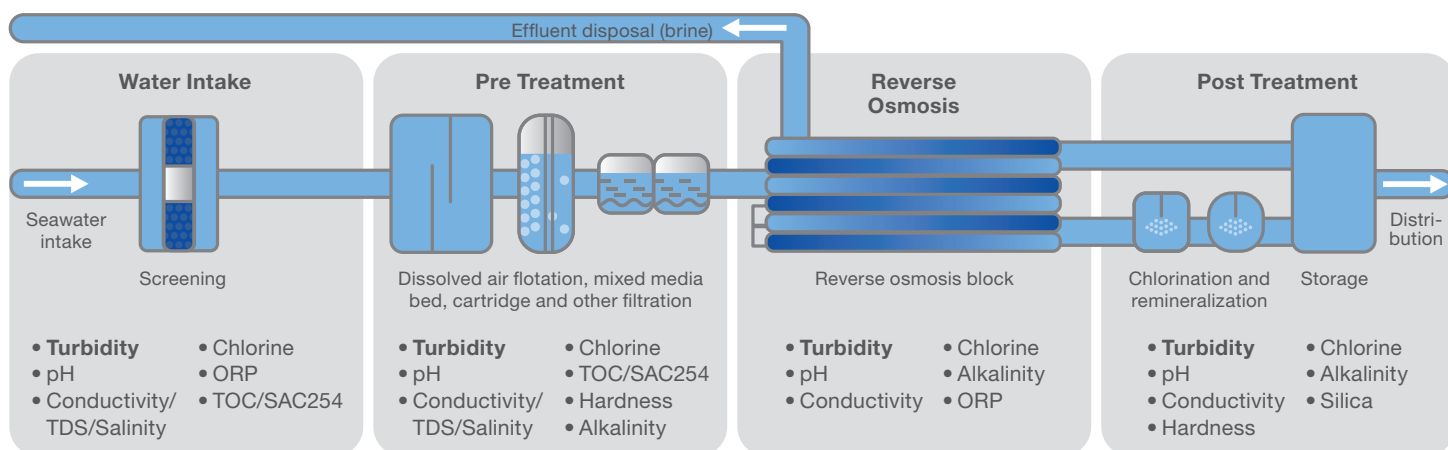
An effective treatment does not only include a proper selection of the treatment itself, but it also includes reliable online monitoring of relevant process parameters to ensure the optimal process conditions. **The required online analyzers for the acquisition of such data need to be very resistant due to the high salinity level of seawater, and the highly corrosive chemicals used during some treatment steps.**

Solution

A very reliable and universal online measurement parameter for most SWRO treatment steps is the turbidity value. The table on the right shows where and how the operator can benefit from measuring the turbidity values with an online analyzer during a treatment process.

Beside turbidity, many other parameters are important to monitor and control the various treatment steps in a SWRO plant. Therefore, to make the picture complete, the illustration below gives you some more details on some other relevant online measurement **parameters like pH, conductivity, ORP, TOC/SAC254, hardness, chlorine, alkalinity and more.** The selection of the measured parameters is depending on the seawater quality, the treatment step itself and on the sequence of the treatments in a SWRO treatment plant. Swan delivers for all listed parameters below online monitoring solutions:

Treatment	Benefit
Seawater intake, screening	Monitor seawater quality and limit warning
Chlorination	Adjust chlorination according to turbidity
Coagulation, flocculation and sedimentation	Monitor and control process (chemical dosing)
Dissolved air flotation	Monitor and control process
MMF, cartridge filtration, MF, UF and NF	Monitor filter performance and control process
Reverse osmosis	Prevent fouling, clogging and control process
Drinking water outlet	Quality control



Value

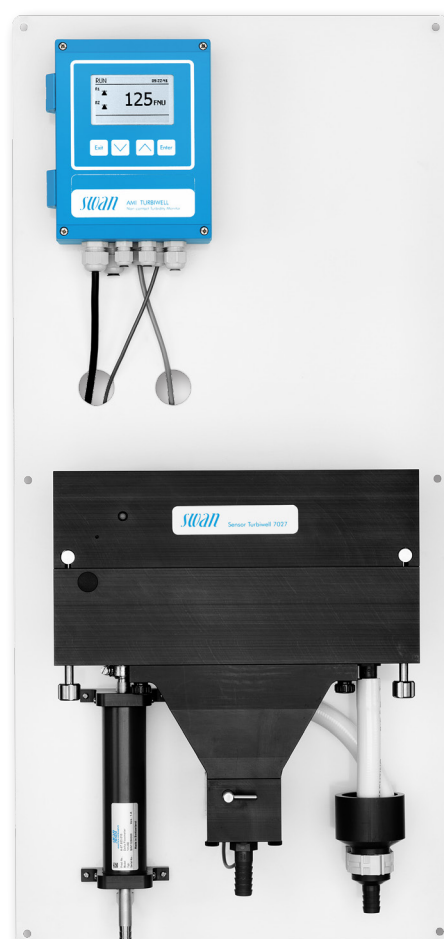
Online turbidity measurement is highly valuable in a SWRO plant due to the following reasons:

- **Performance Monitoring:** Continuous monitoring of turbidity helps assess the effectiveness of pretreatment processes and identify any equipment malfunctions or issues.
- **Membrane Protection:** By monitoring turbidity, operators can proactively prevent membrane fouling and scaling, ensuring the longevity and efficiency of the RO membranes.
- **Product Water Quality:** Turbidity measurement ensures that the treated water meets the required quality standards by detecting the presence of suspended solids and maintaining customer satisfaction.
- **Process Optimization:** Real-time turbidity data enables operators to optimize the SWRO process, adjust pretreatment procedures, and enhance overall process efficiency and energy consumption.

AMI Turbiwell 7027 / AMI Turbiwell W/LED

Swan's AMI Turbiwell is a non-contact nephelometric system for automatic and continuous measurement of turbidity according to ISO 7027 and EPA 180.1

- Thanks to the non-contact set-up the optical windows are not in direct contact with the sample which means:
 - No fouling issues
 - No cleaning of optical windows is required
- The heated optics does avoid condensation which allows a robust and accurate turbidity measurement
- The automated or manual chamber drain of the analyzer provides a very low interference level due to a carry-over effects – this contributes to reliable measurement.
- Samples with mud and sand can be measured.
- The wetted parts are of PETP (non-metallic) and hence suitable to corrosive media like seawater etc.
- Integrated constant head guarantees a constant sample flow into the measuring chamber and it takes care of degassing larger amounts of air in the sampling line.
- Due to the granted light source stability, no drift is observed: calibration-free
- No consumables, no wearing parts, no follow-up costs
- Low sample throughput: less than 20 to 60l/h
- High precision secondary standards for quality assurance
- Separate transmitter and sensor configuration available for remote mounting



AMI Turbiwell

