



## Desalination Plants: YSI Instruments Monitor Flow & Water Quality at Multiple Stages

### Desalination Process

Desalination is the process of removing salt from sea water or brackish river or groundwater to make potable water. The potable water is used for direct human consumption or crop irrigation. The desalination process involves either a thermal distillation process or membrane system such as reverse osmosis.

While the end result of desalination is clean and useful water, there are several aspects of the process which need to be carefully controlled and monitored so as not to negatively impact the environment. It is at these pre- and post-treatment stages where YSI instruments can provide valuable data.

**Feasibility/Design:** The study or research phase where water currents and salinity need to be monitored, measured, and modeled. A YSI water quality sonde, monitoring buoy, and/or SonTek/YSI current meter can reliably provide the required baseline data.

**In-Process:** Outside the plant, a YSI water quality sonde or HydroSam monitoring system can monitor turbidity or salinity levels right before the water is drawn into the plant. With respect to turbidity, drawing water can be timed for periods of lower turbidity in order to reduce the amount of filtration needed inside the plant.

Inside the desalination plant, a YSI water quality sonde and 6500 data display can be used to check the intake, pre-filtered, and/or treated water.

**Effluent/Compliance:** Instruments such as a YSI water quality sonde, EcoNet datalogger, and buoys with telemetry can be used to monitor brine discharge at the outfall in order to maintain compliance.

### Case Studies

As water scarcity creates more demand for water, the desalination industry is expected to grow. Following are several examples of how YSI instruments valuably contribute to the overall effectiveness of desalination operations around the world.

#### Middle East

A private utility in the Middle East has built several plants to meet the growing demands for electricity and water. The utility provides both power and drinking water through a cogeneration process, where the two operations are located adjacent to each



*A desalination plant in the Middle East uses YSI sondes to measure the characteristics of discharge: salinity, dissolved oxygen, temperature, and turbidity.*

other. The dual-purpose facility can then reuse the excess heat from the power plant to run the desalination plant. This shared resource optimizes the overall operation of the utility.

At the end of the generation process, a series of YSI sondes measure salinity and dissolved oxygen of the waste discharge, a concentrated brine. To mitigate potential environmental impacts, the discharge cannot have a salinity level higher than the receiving water, nor can its dissolved oxygen concentration be lower. Elevated temperature and turbidity levels are also concerns. All of these fluctuations can adversely impact the marine organisms near the plant's outfall.

Before release, the utility dilutes the brine with cooling water from the power plant. At the outfall, 12 monitoring stations equipped with YSI 6600 sondes capture data. Using YSI EcoNet, the data is sent in real-time to a secure web site for the plant operators. Emailed alarms help to control the pre-release mixing and maintain compliance.

#### Florida

A desalination plant in eastern Florida uses similar YSI stations to monitor its discharge. Immediately after the plant began operating, a one-year study using YSI 6820 sondes showed that

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the salinity level of the water outside the discharge point did not measurably change.

These results are reassurance that the plant's mixing of concentrated brine with cooling water from an adjacent power station complies with environmental permits. The discharge area also benefits from strong tidal changes, which further flushes the brine with natural water.

YSI sondes continue to feed data into the plant's comprehensive alarm system, which will shut down a part of the facility if monitored levels exceed set levels. A fast response will help avert negative environmental impacts.

### Spain

In Spain, a desalination plant on the Mediterranean Sea provides water for irrigation in the driest parts of the country. A government monitoring program makes certain that this beneficial service is not marred by negative environmental impacts.

The brine waste created during the desalination process needs to be diluted before it is released back into the sea. If it isn't diluted, the concentrated seawater sinks and forms an unfavorable environment for organisms in the benthic layer. The government manages a monitoring station -- equipped with YSI sonde -- at the plant's outfall to measure the salinity concentration of the effluent; this, in turn, helps them assess the effectiveness of the plant's dilution methods.



*YSI sondes measure salinity concentration of effluent at the desalination plant outfall in Spain.*



*YSI 6820 sonde measures salinity concentration of effluent at the desalination plant outfall in Florida.*

### How YSI Serves the Desalination Industry

YSI's patented conductivity sensors monitor a large range of saline environments, and, when calibrated at a single point, will read accurately in 0-70 ppt. This makes YSI instruments easy to maintain and reliable throughout the desalination process.

YSI instruments are used in-process and in remote mixing zones. Instrumentation on a buoy platform can profile mixing miles off shore. Instruments on a fixed structure directly monitor the influent and effluent treatment water. This data can be networked and delivered to plant operators to make decisions about the treatment process and keep in compliance.

### YSI Instruments for Desalination Applications

**6600 V2-4 Multiparameter Sonde:** Measures temperature, conductivity (salinity), pH, dissolved oxygen, turbidity, chlorophyll, blue-green algae and more.

**6820 V2-2 Multiparameter Sonde:** Measures temperature, conductivity (salinity), pH, dissolved oxygen, turbidity, and more.

**600XL Sonde:** Measures temperature, conductivity (salinity) and dissolved oxygen.

\* All sondes equipped with biofouling-resistant wipers and other anti-fouling components.

**Argonaut XR Current Meter:** Measures water velocity/current profiles for stratification and mixing studies in effluent water.

**6500 Process Monitor:** Delivers real-time water quality data to plant's SCADA system for monitoring and control.

**EcoNet Datalogger:** Web-based monitoring network system for aggregating data, reporting, and alarms.

**Buoy with Telemetry:** Delivers power to instruments and delivers remote data back to operations office.