# ID22- SIMOC, A VERSATILE TOOL FOR CONTINUOUS MONITORING OF WATER QUALITY

A. Perán[54], T. Senabre[57], P.A. Miñano[56], A. Belmonte[53], V. Aliaga[58], J.M. Gutiérrez[55]

*Abstract - In the last decade TAXON has developed several systems for continuous monitoring (SIMOC). These tools are tailored to the specific needs and environmental authorizations for each client. Currently the industry in which it is applied is mainly desalination, but can be adapted to the needs of each particular industrial activity.*

*The SIMOC are based on a network of underwater sensors, with measure points located on benthic communities to be protected. The data recorded by the instruments are received in a data server. The server automates the statistics and graphs reports, allow a remote query, and triggers an alert on any situation outside the limits set. All developments are based on different systems and tools of free software (GNU / Linux, Perl, PHP, mySQL, Apache, R, ...).*

*Keywords: Water quality, continuous, remote, monitoring*

## INTRODUCTION

The recent development of seawater desalination, as a palliative to water deficit in the driest Spanish regions, implies the need to control intensively the brine effluent in order to protect sensitive marine benthic communities, mainly protected communities, such as seagrass (Posidonia oceanica), from this industrial activity.

The discharge limits set by the authorities makes mandatory for the facilities to control the physicochemical parameters of land-sea discharges. Proper control of physicochemical characteristics of these discharges is not an easy task. Continuous monitoring of the effluent is a good solution. It allows an immediate correction to the discharge parameters.

Since 2006, one of the TAXON lines of work has been the development of several continuous monitoring systems (SIMOC). Our developments are adapted to each client needs, so that, although currently the sector in which it is applied is mainly desalination, recorded parameters, distribution of sensors and statistical treatment of the data can be adapted to every industrial activity and its effects on relevant communities in each area.

## TECHNICAL DESCRIPTION

Installing Instruments

The installation tasks of a continuous monitoring system for marine salinity depend largely on the infrastructure of each desalination plant as well as the characteristics of the seabed.

We used high density polyethylene plastic protections to ensure the safety of the instruments. The sensors and their protections are fixed to a concrete ballast. Eventually these structures are buried in the seabed so locations of the instruments become fixed.

The alternative chosen for communication with land is an inductive wire connected to each of the instruments which may finish in land or in a communication buoy, depending on the characteristics of the infrastructure where the data server and modems for communication are located.

***Data Integration and Service***

The salinometers are connected in real time to a data server that offers data query through a on-line system. The query reports at least time logs, conductivity, salinity and temperature , but can be modified, if necessary, to report any other sensor incorporated to the system. The server offers not only raw data but it also calculates the basic descriptive statistics, such as maximum and minimum values, percentiles, mean and standard deviation. In addition, it supplies graphical representations.

The data server makes a daily report that is stored by date on a database. These historical reports are available online. In addition to consultations on historical data stored in the database, queries can be performed in real time or framed to a sampling period. There is also the possibility that the system sends these reports by email. When the imposed discharge limits are exceeded, the system could warn the costumer by email and / or SMS.

The data recorded by the instruments are stored separately in each of the instruments, in the database and also regular backups are performed remotely. This triple backup makes the system very robust against any communication error, failure or breakdown and it also ensures that despite any malfunction elsewhere, each instrument is still operating.

Access to data inquiry form would be only to authorized users and using a password. Data access can be configured for point-to-point high security.

***System Maintenance Tasks***

The main feature of these instruments is measuring accuracy, durability and low maintenance. The savings in maintenance, calibrations and repairs will prove the investment on equipment to be good. This system eliminates the need for weekly dives, data download and maintenance. Salinometers only require:

- checking, cleaning and preventive calibration site every four months;
- overhaul with change of expendable materials annually;
- internal review and certified calibration every two years.

## CONCLUSIONS

The SIMOC systems of TAXON have been tested with excellent results in various desalination plants, with different sizes and various environmental situations.

This is a potentially open system; can be enlarged or reduced to fit customer needs, both in number of sensors, and its distance from the spill. For example, they can add to the system as many sensors as required. In addition the sensors can measure different parameters (current meters, nutrient sensors, turbidity, and water quality).

These systems were initially designed for the environmental monitoring of the effluent. However, a suitable design of these systems in relation to the measured parameters and the sensor arrangement can improve the process, for instance in desalination, decreasing the production costs