

Advanced Monitoring Systems for an Efficient Water Reclamation



Consorci Costa Brava

Summary

Since 1989, one of Consorci Costa Brava's activities is the reclamation of treated effluents in order to cover non-potable demands. Reused water must accomplish safety conditions for every particular purpose: environmental uses, aquifer recharge, agricultural irrigation, golf courses and landscape irrigation and municipal reclaimed water networks.

According to European regulations, *E. coli* is a bacteria widely used as a key indicator. For this reason, an advanced online *E. coli* monitoring system has been tested in order to demonstrate their real value in order to improve the efficiency of the water reclaimed plant, as well as show the results achieved as an early warning which ensures safe reclaimed water production and according their fit-for-purpose.

Challenges

- Adapt the disinfection process to changing flow conditions and water quality.
- Adjust the dose of UV light and reagents for optimal disinfection.
- Achieve the objectives of quality of reclaimed water for different uses.
- Reduce the environmental footprint in the production of reclaimed water.



Xavier Tristán

CEO

Consorci Costa Brava (Regional Water Utility). Spain

"The real time monitoring of the disinfection process is a key element for guaranteeing a safe use of reclaimed water. Thanks to the laboratory analysis we validate the correct operation of our water reclamation plants. However, the daily safety is provided by the online measurement systems, which ensure us an optimal and reliable operation."

Benefits

- Savings in energy consumption and reagents.
- Provide early warnings in case of the water reclamation plant malfunctioning.
- Improve the control system disinfection.
- Improve efficiency in the production process of reclaimed water, avoiding overdosing of disinfection chemicals and excess of UV power consumption.
- Ensure safe reclaimed water production.
- Allow the production of fit-for-purpose reclaimed water.

Consorci Costa Brava (CCB) is a Regional Water Authority created in 1971 by the 27 coastal municipalities of Girona's province in NE Spain in order to provide services and manage infrastructures related to the whole water cycle, including the drinking water supply, the wastewater treatment and, also, the production and supply of reclaimed water for covering non-potable demands.

The resident population of the area is estimated in 250,000 inhabitants. However, the population suffers a seasonal increase in summer due to tourism activities and can reach over 1 million people. As a result, the facilities are required to be designed to deliver the adequate services, including this peak period.

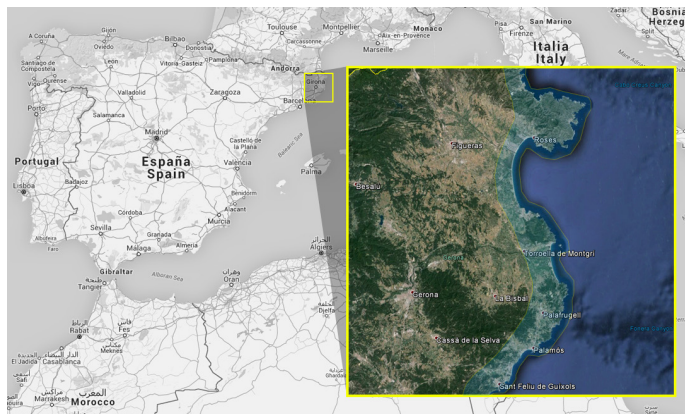


Figure 1. Costa Brava location. Spain.

Since 1989, one of CCB's activities is the reclamation of treated effluents in 14 facilities in order to cover non-potable demands of different kind (3.3 million m³/year in 2015, with a maximum in 2010, 6.4 million m³/year). Reused water must be reclaimed water that has received an additional treatment step beyond secondary settlement, allowing its safe reuse for particular purposes: Environmental uses, aquifer recharge, agricultural irrigation, golf courses and landscape irrigation and municipal reclaimed water networks. As example, the Figure 2 shows the different uses of reclaimed water in Costa Brava during 2015.

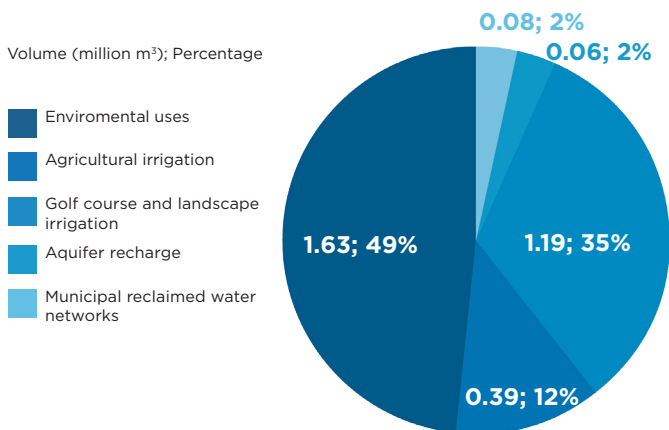


Figure 2. Reclaimed water uses in Costa Brava during 2015.

R3Water, European project for reused water

“Currently many areas face a strong water stress, making water reuse necessary. We aim to demonstrate several solutions to support safe water reuse.”

Funded by the European Commission under the Framework Programme 7, R3Water project was born to demonstrate innovative solutions for Reuse of water, Recovery of valuables and Resource efficiency in urban wastewater treatment.

“Guarantee water quality is crucial for a wealthy society. Currently many areas face a strong water stress, making water reuse necessary. At R3Water project we pursue to demonstrate several solutions to support safe water reuse”, explains Uwe Fortkamp the R3Water project coordinator from IVL Swedish Environmental Research Institute.

E. coli analysis, European regulation requirement

E. coli is a bacteria widely used as an indicator of faecal contamination. Its presence warns of a potential sanitary risk. This aspect is reflected in most of the different european regulations, such as the Directive 2006/7/EC on bathing water quality. The *Escherichia coli* and total coliform are key parameters for determining the potential uses of reclaimed water from the tertiary treatment of a WWTP.

In addition, *E. coli* concentration is an analytical parameter in the water reuse regulations of Cyprus, France, Greece, Italy and Spain. As example, according to the Spanish regulation, a high analysis frequency of *E. coli* (2 or 3 times/week) is required for specific uses. This requirement rises the costs of sampling and lab, making the early warning systems a more profitable and efficient solution. aquaBio analyser was designed in order to face these water challenges.

Online monitoring systems for water reclamation

aquaBio analyser is one of the advanced monitoring solution tested under the scope of R3Water European project. aquaBio determinates the *Escherichia coli* and total coliform in water automatically. The measuring principle is based on the technology of DST® (defined substrate technology), and a detection system for measuring fluorescence and absorbance. Colour and fluorescence appear as soon as the specific substrate is being metabolised.

The *E. coli* and total coliforms determination is based on the correlation between bacteria concentration, and the moment when the fluorescence and / or the colour appear.

This methodology allows achieving results in a short time, whereas the current controls are performed on the laboratory and sometimes a single analysis can take 24 - 96 hours. aquaBio provides a result in 3 - 12 hours, depending on the bacteria concentration. It is a fully automated operation that improves real time water reclamation plant (WRP) operation, as well as provides a safety reclaimed water.

“The *E. coli* automatic monitoring provides results in 3 hours against 24 - 96 hours of the current controls. It really helps to improve the water reclamation plant operation, as well as safety reclaimed water.”



Figure 4. Castell - Platja d'Aro WWTP.



Figure 3. aquaBio, automatic *E. coli* analyser in water.



Figure 5. Castell - Platja d'Aro Water Reclamation Plant.

Castell - Platja d'Aro WWTP Case Study

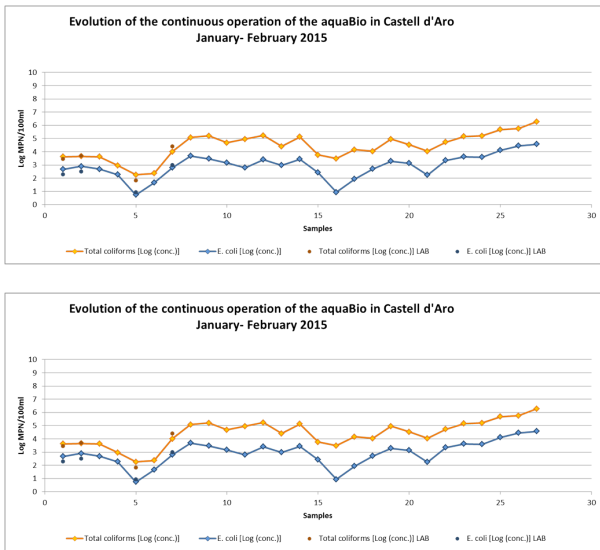
A demonstration of aquaBio analyser in Spain has been implemented, exactly in Castell - Platja d'Aro WWTP placed in Costa Brava area.

The treatment line in Castell - Platja d'Aro WWTP consists on a primary treatment, secondary treatment with conventional activated sludge and a tertiary treatment for water reclamation. The water reclamation plant is designed for a 15,000 m³/day flow, meaning that only part of the water from the secondary clarifier is further treated for reuse. The rest of the effluent is discharged into the Ridaura River and the Mediterranean Sea. Their main uses of the reclaimed water are the agriculture irrigation and golf courses irrigation.

Results

“The *E. coli* online monitoring strategy improves the WRP efficiency and assures the early warning for sanitary safety.”

In the scope of the R3water project, and during the first testing phase, aquaBio has monitored the intake of the inlet of the WRP, after the sand filtration, in order to provide online *E. coli* and total coliforms concentration, which has been useful for improving the plant's efficiency.



The Figure 6 shows the concentrations measured for 2 validation periods. The concentrations during the summertime are 2 orders of magnitude greater than in wintertime, since the higher temperature increases the growing capacity of the microorganisms. The knowledge of the microorganism concentration helps operators to produce efficient reclaimed water, since the concentration before the disinfection treatment avoids overdosing of disinfection chemicals and excess of UV power consumption.

Figure 6. WWTP Castell-Platja d'Aro: microorganisms concentration measured with aquaBio vs laboratory results.

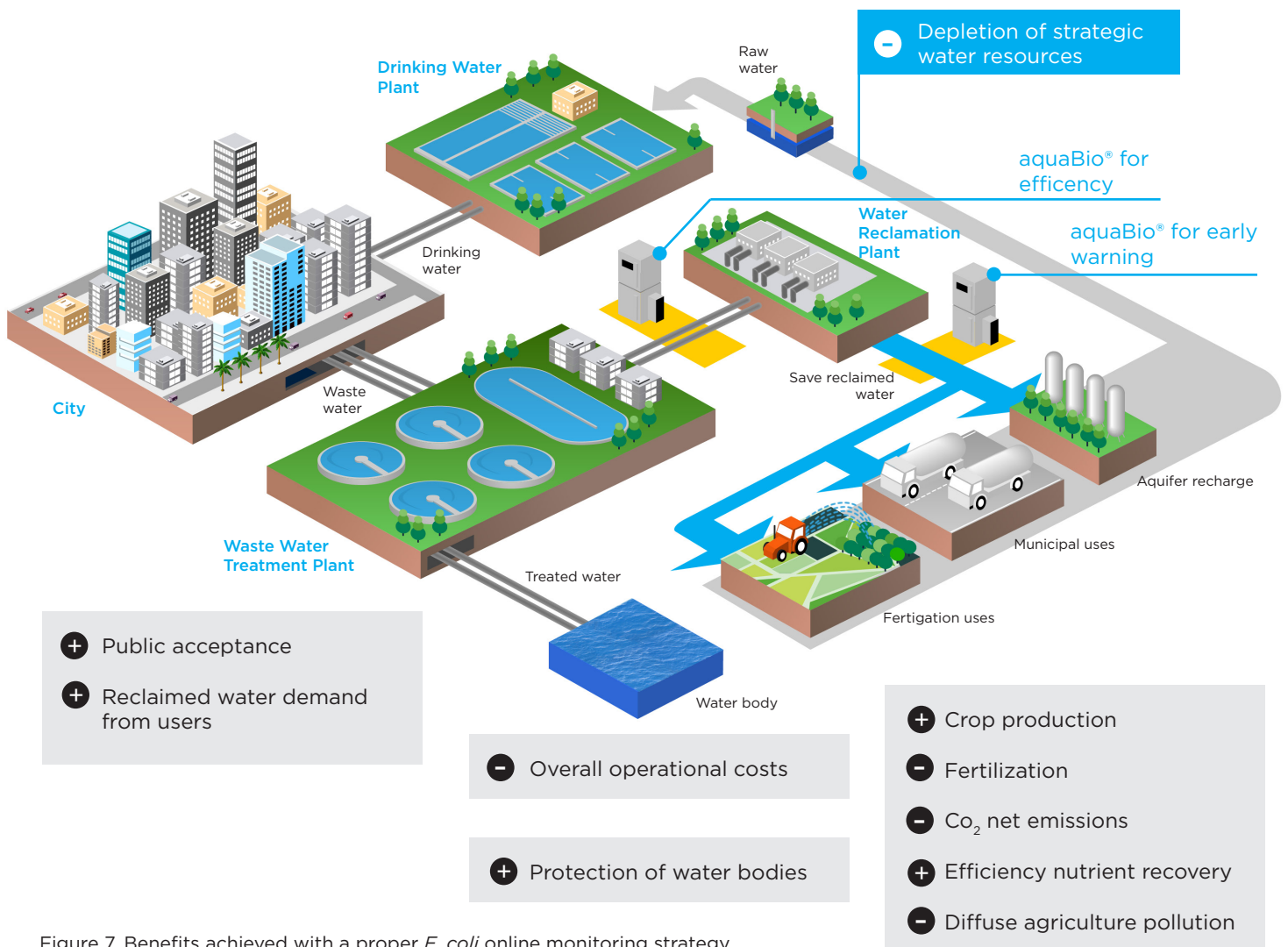


Figure 7. Benefits achieved with a proper *E. coli* online monitoring strategy.

As it was detailed before, the *Escherichia coli* is also a key indicator for defining the potential uses of reclaimed water. One of the upcoming goals of European Union is increasing the water reuse ratio, ensuring the health of the citizens, the protection of the environment, fostering safety water reuses practices.

For this reason, a second testing phase is planned for 2016 by monitoring the outlet of the WRP, and providing an early warning to guarantee the sanitary safety in case of reclamation plant malfunction. We also aim to achieve the objectives of quality of reclaimed water for different end uses, such as aquifer recharge, fertigation, golf courses and landscape irrigation, as well as municipal uses (ie. water for cleaning streets).

Castell – Platja d'Aro WWTP has been producing reclaimed water since 1989. In summer of 2015 it reached the record in peak production of reclaimed water, 400m³/h, because of a dry springtime and a heat wave. They have also gain the number of users, almost at the limit of the current peak production capacity.



Figure 8. Castell - Platja d'Aro WWTP. Aerial view.

About Adasa

Set up in 1988, Adasa is a recognised engineering company that offers advanced water quality monitoring solutions. We understand the needs of water and wastewater applications and have proven capabilities in all facets of design, manufacturing and maintenance of major control systems, communication, monitoring equipment and application software.

Adasa products and solutions can help you to: detect pollution alerts and uncontrolled spills, improve WWTP process efficiency by making treatment decisions based on real time water quality conditions, make informed decisions in water discharges, protect the drinking water treatment plants catchments and understand the dynamic of reservoir, dams and deposits of water, allowing management resolutions depending on end use and demand (fish life, bathing water, drinking water, irrigation...).