AQUABIO: ADVANCED MICROBIOLOGICAL CONTROL SYSTEM FOR THE RECOVERY OF REUSED WATER ON THE COSTA BRAVA (CATALONIA)

CHALLENGE

Consorci Costa Brava (CCB) is a public water company created in 1971 by the **27 coastal municipalities of the province of Girona**, in northeastern Spain, to provide services and manage infrastructures related to the **complete water cycle**, **including drinking water supply**, **wastewater treatment** and the production and supply of reclaimed water to cover non-potable demands.

One of the CCB's activities is the regeneration of treated effluents with the aim of obtaining reused water and meeting the demand for reclaimed water for environmental purposes such as the recharge of aquifers and uses such as agricultural, golf course and garden irrigation and the supply of municipal networks with adequate safety conditions.







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To do so, it uses **14 facilities of different typology** that treated 3.3 million m3/year in 2015, with a maximum in 2010, 6.4 million m3/year.

The resident population in the area is estimated at 250,000 inhabitants. However, the population suffers a seasonal increase in summer due to tourist activities and can reach over one million people.

For this reason, it is necessary to take this peak period into account when designing the facilities in order to provide adequate services.

The **Castell-Platja d'Aro WWTP (Catalonia) has been producing reclaimed water** since 1989. In the summer of 2015 it reached a record high of maximum reclaimed water production, 400m3/h, due to a dry spring and a heat wave. It has also gained a large number of users, almost at the limit of the current production capacity.

In this scenario, it must face the following challenges:

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



ADASA'S SOLUTION

In the context of the European project **R3Water**, **'Demonstration of innovative solutions for Reuse of water**, **Recovery of valuables and Resource efficiency in urban wastewater treatment**', **aquaBio** was tested in two different phases and locations of the Castell-Platja d'Aro WWTP.

The first was at the inlet of the tertiary treatment with the aim of measuring the efficiency of the system and adjusting the UV and disinfectant dosage (after the sand filter and before the UV and disinfectant).

The second was implemented in July 2016 at the outlet of the tertiary treatment to check online the concentration of E. coli and total coliforms, so that the sanitary quality of the reclaimed water could be ensured for its subsequent use: irrigation of crop areas and a golf course.

Otherwise, there would be an **early warning of the malfunctioning of the water treatment plant**.

This was in response to another of the European Union's objectives: to **increase the rate of water reuse**, ensuring the health of citizens, the protection of the environment and the promotion of safe water reuse practices.

The Castell - Platja d'Aro WWTP treatment line consists of primary treatment, secondary treatment with conventional activated sludge and tertiary treatment for water regeneration.

The **water reclamation plant is designed for a flow rate of 15,000 m3/day**, which means that only part of the water from the secondary decanter is subsequently treated for reuse.

aquaBio, an **automatic**, **on-line**, **continuous microbiological measuring device** designed, manufactured, developed and maintained by Adasa, automatically determines the presence of *E. coli* (*Escherichia coli*) and total coliforms in water.

E. coli is a **bacterium widely used in international regulations** as a key indicator of faecal contamination as its presence warns of a potential health risk.

The colour and fluorescence appear as soon as the specific substrate is metabolised and the time of appearance is inversely proportional to the initial concentration of *E. coli* and total coliforms.

aquaBio has the ETV verification which guarantees through the accreditation of an independent body that the data provided are reliable.

In this way, informed monitoring decisions can be made with **aquaBio** with complete confidence.

It is a fully automated operation that **improves the performance of the water reclamation plant (WRP) in real time**, as well as providing safe reclaimed water.

The implementation of an **aquaBio** in a WWTP provides the following benefits:

- Saves energy and reagent consumption.
- Provides alerts in case of malfunctioning of the water reclamation plant.
- Improves the control of the disinfection system.
- Increases the efficiency of the reclaimed water production process, avoiding overdose of disinfection chemicals and excessive consumption of UV energy.
- Guarantees the production of reclaimed water suitable for each target.

The measuring principle is based on **DST® (Defined Substrate Technology)** and a detection system to measure fluorescence and absorbance.

E. coli and total coliforms are **key parameters to determine the potential uses of reclaimed water** from tertiary treatment of a WWTP.

This requirement drives up sampling and laboratory costs, **making EWS a more cost-effective and efficient solutio**n.

In addition, it provides a result **within 3 hours for high concentrations and within 12 hours** ensures the total absence of bacteria.

Case Study



RESULT

The project has demonstrated the real value of **aquaBio** for improving the efficiency of the Castell- Platja d'Aro WWTP, as well as for generating **early warnings that guarantee the production of safe reclaimed water** and, consequently, its suitability for use.

Furthermore, it has been shown that **measuring and knowing the concentration of microorganisms helps operators to improve the efficiency of reclaimed water production** prior to disinfection treatment, as it avoids overdosing of disinfection chemicals and excessive consumption of UV energy.

After collecting the data from the contrasts, the correlation between the measurements was determined, **showing in both cases a high correlation coefficient** as can be seen in the following graphs:





Measured concentrations of E. coli and total coliforms for 2 validation periods, given that during summer they are 2 orders of magnitude higher than during winter.

Finally, sterile water samples were introduced into the **aquaBio** operation to ensure that there was no cross-contamination between samples.



Correlations between laboratory data and aquaBio for total coliforms.



Correlations between laboratory data and aquaBio for E. coli.

Having previously measured a sample with a high concentration, the results obtained were O, which showed that the samples were completely independent of each other, as expected.

In a second phase of the project **aquaBio** was installed at the outlet of the tertiary treatment. During this period, the presence or absence of *E. coli* was monitored, checking the results with those of the treatment plant laboratory.

Consorci Costa Brava (CCB)

R3Wate - FP7-ENV-2013.WATER INNO&DEMO-1. This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement. No 619093.

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