

Virtual *E.coli* Sensor: SAVING DRINKING WATER AND MINIMIZING MICROBIOLOGICAL RISK IN WATER REUSE IN THE FOOD INDUSTRY

CHALLENGE

Catalonia declared a **water scarcity emergency in its most populated areas in April 2024**, imposing severe restrictions on both agriculture (50%) and industry (25%).

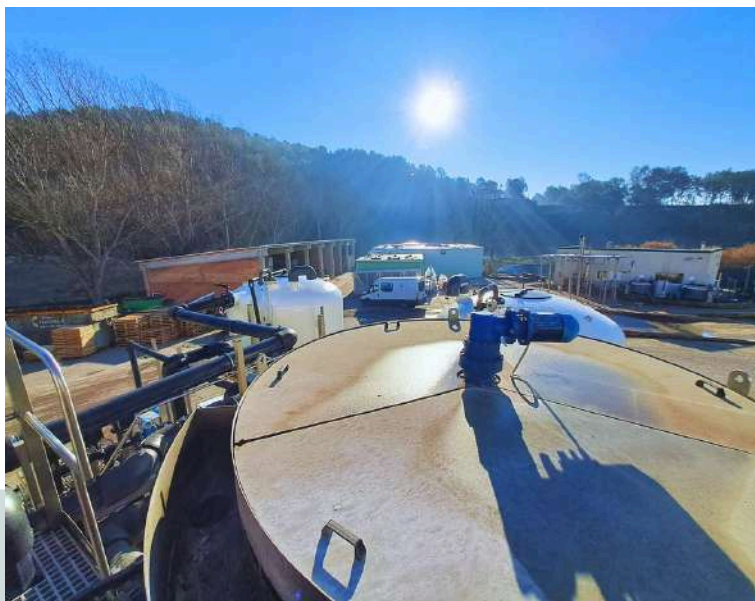
The food industry, especially the meat industry, **is a major water consumer** and, in this context, the reuse of wastewater is a key solution.

It is estimated that 15% (REAQUA project) of potable water use in slaughterhouses could be saved by using reused water for cleaning trucks and pens.

However, the **use of reclaimed water in processes such as truck and pen cleaning in slaughterhouses** requires compliance with **strict microbiological regulations, especially in the control of *Escherichia coli* (*E. coli*)**, in order to obtain the corresponding sanitary authorisation.

Specifically, the slaughterhouse in Avinyó (Catalonia) is **implementing solutions to ensure that the water leaving the treatment plant** meets the established quality requirements and to obtain the corresponding health permit.

To address its concerns about reducing its water footprint, the company is **considering using reclaimed water to clean trucks** as a point of use.



The Avinyó slaughterhouse treatment plant (Catalonia) has started a project in which artificial intelligence combined with the data obtained from different microbiological water sensors developed by Adasa will make it possible to guarantee the quality of the output water for reuse in various cleaning tasks.



Slaughterhouses are facilities that consume a large amount of drinking water. In the case of the facility in the Catalan town of Avinyó, regenerated water is expected to be used shortly.

ADASA'S SOLUTION

Adasa has developed the VECOLI project together with other partners in the sector and has been funded by ACCIÓ (Generalitat de Catalunya).

VECOLI consists of a virtual sensor based on artificial intelligence (AI) that allows continuous and reliable monitoring of the presence of *E. coli* in regenerated water.

The system has been installed at the outlet of the treatment plant of the Avinyó slaughterhouse (Catalonia).

The system integrates:

1. Continuous measurements of physico-chemical parameters (pH, conductivity, REDOX, temperature, dissolved oxygen, absorbance, turbidity, etc.) thanks to the aquaTest-MO measuring equipment developed by Adasa.

2. Periodic microbiological data (*E. coli* and total coliforms, automatically measured every 12 hours with the aquaBio equipment developed by Adasa).

3. Measurement of the microbial activity of the effluent using the Sentry live biological sensor, which reacts in real time to changes in environmental conditions.

4. Training and re-training of the AI model with historical, laboratory and process data, using techniques such as linear regression, polynomial regression, XGBoost and MLP Regressor.

5. ecoData: platform for real-time visualisation of microbiological risk and generation of automatic alarms in the event of detecting a health risk, allowing the use of water to be blocked if it is unsafe.

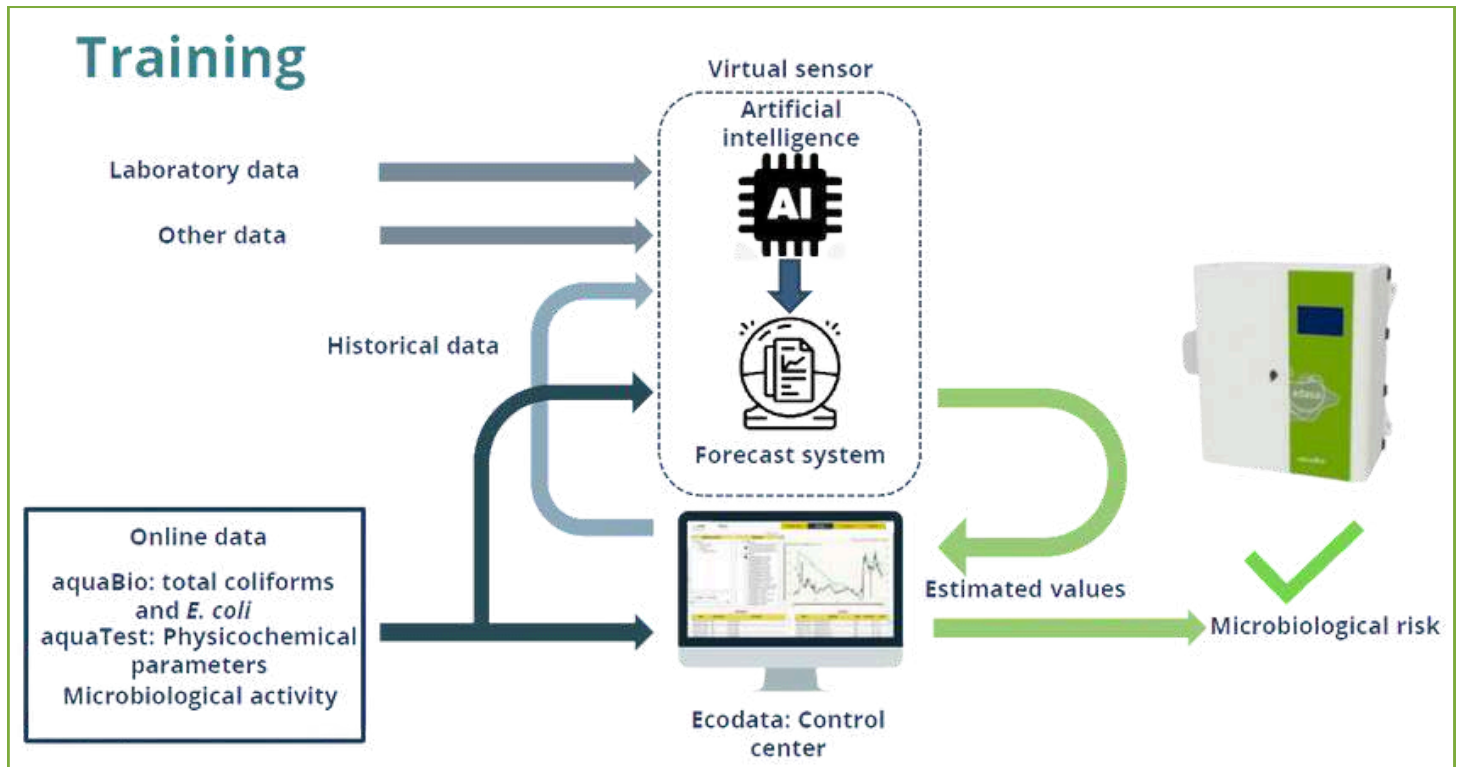


El sistema instalado por Adasa incluye los sensores microbiológicos aquaBio y aquaTest-MO, desarrollados por Adasa.



Detalle de la instalación de aquaBio y aquaTest

ADASA'S SOLUTION



Specifically, the **variables selected for AI training were the following:** REDOX, DO (dissolved oxygen), TURB (turbidity), COM (absorbance 365 nm), TMP (sample temperature), ABS (absorbance 254 nm), EXTRA (BES probe), COND (conductivity), PH, Tmed (ambient temperature), Prec (precipitation), Hour (time of day) and weekday (day of the week).

The **training and measurement periods** established were:

Training March-May: measurement March-May.

Training March-May: measurement March-July.

Training March-July: measurement March-July.

VECOLI allows slaughterhouses to:

1. To cover the demand. At the same time, drinking water consumption is reduced and the resource is freed up for other industries or uses.

2. Guarantee safety and quality. Ensuring that there is no microbiological risk and giving comfort to health.

3. Resilient in the use of water. Guaranteeing water availability in times of drought and restrictions.



aquaTest-MO measures different microbiological and physico-chemical parameters.

4. Ensuring competitive advantage. Avoiding drops in productivity.

After a first phase of analysis of different variables to know the current state of water quality, the project **has started a new phase of measures after ultrafiltration.**

VECOLI not only guarantees the safety and quality of the reused water, but also **provides confidence to the health authorities** and enables a resilient response to drought episodes.

RESULT

The implementation of the **VECOLI virtual sensor** has **allowed**:

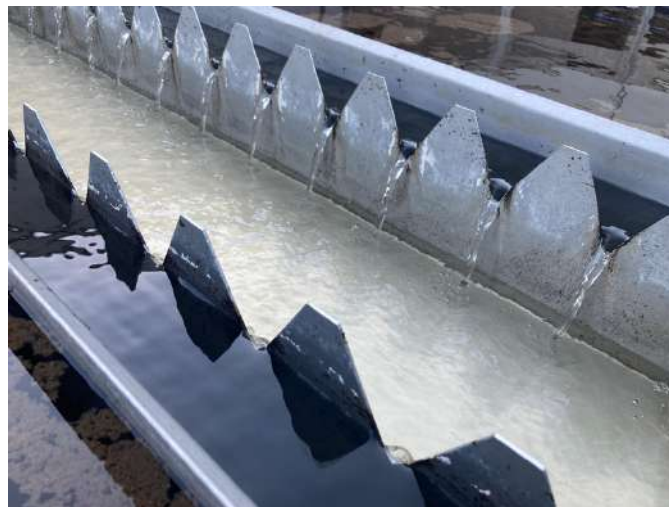
1. **Obtain a very accurate estimate of E. coli concentration** in reclaimed water, with all AI models showing high accuracy and low prediction errors.
2. **Save up to 15% in drinking water consumption in slaughterhouses** by being able to reuse water in cleaning processes without compromising food safety.
3. **Offer a robust system that requires periodic retraining** to adapt to changes in process conditions (e.g. chlorine dosing), ensuring continuous system reliability.
4. **Improve the competitiveness and economic viability** of the Catalan meat sector, especially relevant in a context of prolonged drought.

The **integration of systems such as Adasa's aquaBio and VECOLI** has:

1. **Provided** a solid framework to guarantee water quality.
2. **Enabled** compliance with regulatory requirements.
3. **Covered** the demand for water.
4. **Ensured** safety and quality.
5. **Promoted** widespread adoption of reuse practices.
6. **Increased** resilience to water scarcity.
7. **Contributed** to ensuring the viability of the food sector in Catalonia.

CLIENT

Grupo d'Avinyó is a benchmark in the pork sector in Spain, with more than 3,500 customers in the food channel. Specialized in the production of pork, processed pork products and sausages, it controls the entire process from breeding to marketing and export of the final product. It offers gourmet products, taking care of every detail, and maintains a close and trusting relationship with its customers thanks to the daily commitment of its team.



Thanks to VECOLI, the Avinyó meat processing plant has managed to reduce portable water consumption by 15% and increase the use of reclaimed water with the necessary health guarantees.

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