

First Prototype developed



An industrial-scale prototype has been constructed, allowing real time monitoring and quantifying of heterotrophic microorganisms present in the water of hydraulic systems, including subsequent correct dosage and constant optimization of biocide treatment. Depending on the aerobic microorganism concentration the prototype will dose an oxidizing biocide, a non-oxidizing biocide or a mixture of both biocides. Furthermore this prototype counts with a multiparameter sensor that provides information in real time about physico-chemical parameters such as pH, conductivity, turbidity or free chlorine concentration, among others.

The prototype's current components are:

- The *Programmable Logic Controller (PLC)* monitors and manages each constituent of the prototype. It applies power to every constituent of the prototype: recirculating pump, dosage pumps, internal and external sampling electrovalves, etc. Although every step of the process is almost automatic, from the tactile screen it is also possible to control the water flow rates and sampling/dosage protocols.
- *Microbiological Contamination Detector*. It monitors the concentration of microbial contamination. To do so, it measures specific enzymatic activities as an indicator for microbial contamination. The activity is detected by using a fluorescent indicator, based on specific biochemical reactions, added as a substrate to the feeding water sample.
- *Multiparameter Sensor*. Physics and chemical properties of feeding water are determining factors in the chemical treatment. Accordingly, it is crucial to monitor some important parameters like pH or conductivity. In addition to that, correct functioning of Microbiological Contamination Detector is also dependent. It reads and controls up to 5 channels that can be programmed to control pH, Free Chlorine, Turbidity, Temperature and Conductivity.
- *Water sampling points and chemical dosing point selection system*. There are three points of sampling distributed along the hydraulic system. These points are defined in every facility and are potentially problematic, because of common proliferation of contamination due to temperature changes or incorrect homogenization of water, among others. The sampling points are managed by the PLC, distance controlled by an operator, through several electro valves.
- *Structured Circuit*. The prototype contains a structured water circuit through the plant with several functions. In the first part of the coil there are two internal points of sampling, one sample for the Multiparameter Sensor and another sample for the Microbiological Contamination Detector. After the sample collection, the prototype

treats the data automatically in order to select the biocide used and the correct dosage. In the second part of the coil there are two internal points of dosage, slightly separated in order to avoid biocides interaction. An additional internal point of dosage was added later in order to control and adjust pH with an acid addition. This way, along the coil the homogenization between biocides and feeding water is optimal.

- *Biocide deposits with level sensors.* All the chemicals used remain stored out of the prototype and contain level sensors in order to send an alarm when the product level is quite low.
- *Biocides Dosing System.* Biocide dosing pumps control the injection of every biocide to the system. The Biocides Dosing System is able to automatically adjust the pumps in order to change the quantity of biocide dosed and the time required to dosage.



Programmable Logic Controller (PLC)



Structured Circuit

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