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Let's Solve Water

Case Study
Diffuser Liquid Cleaning Service

Energy-Saving Optimization of Biological Reactor Through Chemical Liquid Cleaning

ALMUNIA DE SAN JUAN, SPAIN

Almunia de San Juan wastewater treatment plant (WWTP) treats between 114 and 280 cubic meters of wastewater per day from its town of the same name in the Huesca province of Spain. The facility is a conventional activated sludge treatment plant, and its biological reactor has a grid of 48 Sanitaire® Silver Series II diffusers installed, with a manual purge system.

The plant is operated by Socamex and the end user is Instituto Aragonés del Agua.

To be competitive in a sector increasingly affected by the cost of energy and raw materials, proper asset maintenance and optimization is a fundamental pillar for any operating company.

At the start of 2021, the plant registered a decrease in air flow, accompanied by an increase in energy consumption by the blowers. Personnel suspected that the diffusers were clogged by calcium carbonate build-up from the water, causing significant head loss in the diffusers.

Membrane fouling was affected by not only the hardness of the water but also factors such as temperature and blower start/stops. All these variables affect the Langelier Index and therefore the degree to which the water will create scale on the diffuser surface.

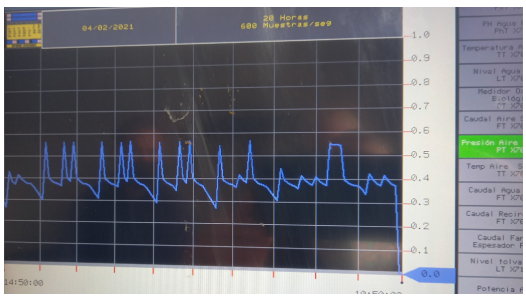
Xylem proposed restoring aeration system efficiency with liquid diffuser cleaning, which uses a nozzle dosing system to introduce acid into the aeration line. This method evenly delivers the cleaning agent to the diffusers and dissolves the salts embedded in the pores of membranes.

Maintaining the aeration cycle

The Almunia de San Juan plant's aeration system maintains a dissolved oxygen (D.O.) level of 1.2 mg/l by regulating the blower frequency between 35 and 48 Hz. The blower automatically stops when D.O. exceeds 1.7 mg/l and starts again when D.O. reaches 0.2 mg/l. Therefore, it is important to optimize the oxygen transfer and the start-up and shut-down of blowers to reduce energy consumption.

Before the cleaning started, the team recorded aeration cycle blower pressures reaching close to 0.56 bar.

CUSTOMER:	Socamex
END USER:	Instituto Aragonés del Agua
LOCATION:	Almunia de San Juan, Spain
APPLICATION:	Wastewater treatment (municipal)
SOLUTION:	Diffuser Liquid Cleaning Service
YEAR:	2021



The blower pressure curve prior to cleaning, reaching up to 0.56 bar.

SANITAIRE
a xylem brand

Convenient cleaning process

Liquid diffuser cleaning is delivered through a proprietary Xylem system and operated at the top of the basin, with the cleaning agent introduced into the air supply pipe via a nozzle.

Once the accessories of the cleaning kit were mounted on the pipe collar, the blower was set to 35 Hz and the dosage of formic acid was introduced, having a pressure of 0.53 bar at the injection point.

After one hour the dosage was complete and the results were evident. The pressure at the inlet pressure gauge was 0.48 bar at 35 Hz, compared to the 0.442 bar pressure required for new diffusers under normal operation.

Pressure reduction, energy savings

Prior to the liquid cleaning process, the pressure at the inlet gauge was 0.53 bar. After one hour, it was 0.48 bar and on the third day after the cleaning, after all the cleaning agent had been consumed, the pressure decreased to 0.47 bar for average flow.

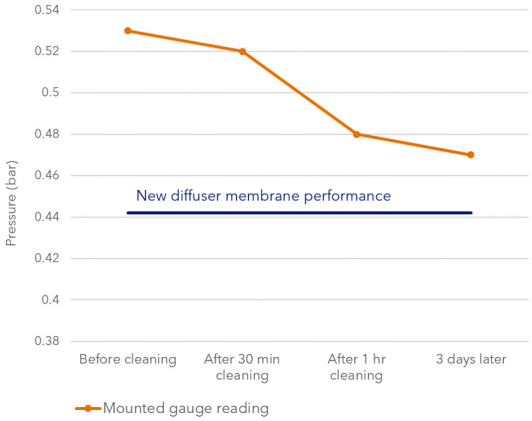
The step from 0.53 to 0.47 bar is nearly a 12% drop in pressure – corresponding with easier transmission of oxygen to the biological reactor. The blowers can therefore operate at lower frequencies while still reaching the D.O. setpoint.

According to starting projections, the pressure required for new diffusers is estimated at 0.442 bar for average flow when measured at the dropleg. The cleaning has therefore been very effective, as there is a pressure loss of only 28 mbar in the membranes and in the pipes to the diffusers.

As a result, energy consumption has decreased from 0.98 kW/m^3 per day to 0.66 kW/m^3 per day in the best of conditions – a 32.6% energy savings. In the worst conditions, the plant still sees a decrease from 1.21 to 0.91 kW/m^3 per day – a 24.7% energy savings.

As aeration can account for as much as 60% of the energy consumption in a WWTP, these savings provide an important operational cost competitive advantage in the face of high energy prices.

The accessories of the cleaning kit were mounted on the pipe collar. A pressure gauge was also installed to monitor the cleaning progress.



Pressure readings before, during, and after chemical cleaning, compared to the performance of a new membrane, demonstrating to what extent the liquid cleaning process returns the membranes to original performance.