

DIALAR NAVIGATOR B.V.

Testing report of the innovative aeration equipment CAVITECH® . WWTP in Spain, May 2024.

09 June 2024

Dear Colleagues!

Our partner, developer of innovative aeration equipment CAVITECH®, shares this report after a week-long testing of the aeration equipment at a customer's site in Spain.

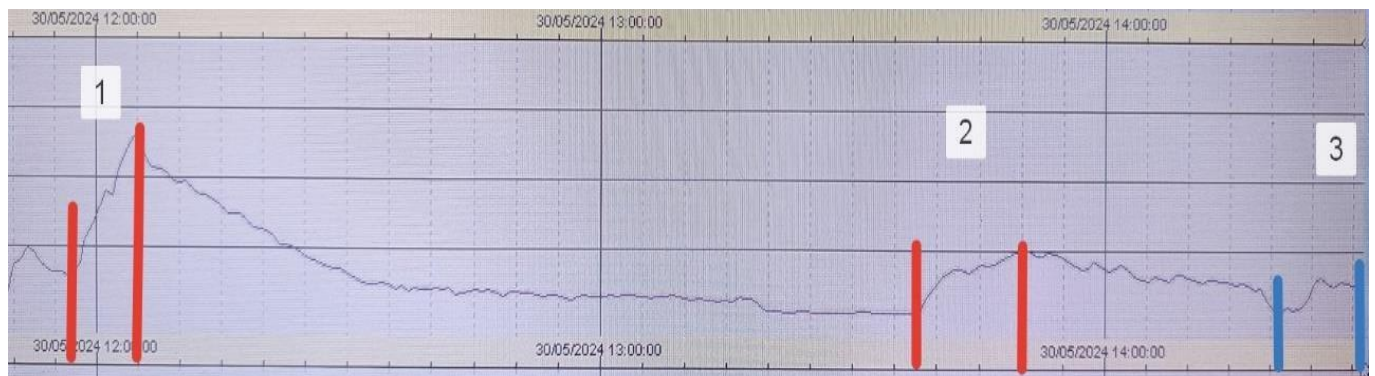
The use of the CAVITECH® aeration equipment at the Spain facility started in 2023 - an original customer's facility was upgraded. Now, based on customer's wishes, the next changes have been made:

1.	Change the design of the aeration unit to eliminate clogging	Done. The new aerator does not have elements perpendicular to the flow
2.	Install the pump in a dry place for inspection and maintenance	Done. The pump is installed on board the aeration tank
3.	Prevent possible clogging in the aeration turbine	Done. The turbine was replaced with a nozzle made of PVC pipe

The new aeration equipment demonstrated a high aeration efficiency.

30-31th May 2024

1. When the CAVITECH aerator and standard turbine operated together in 8 minutes from 11.57 to 12.05, the concentration of free dissolved oxygen increased from 0.40 to 1.24 mg/l. When the standard turbine was operating without turning on CAVITECH during 11.25 to 11.57, the concentration remained in the range of 0.25-0.50 mg/l.
2. During sole CAVITECH aeration operation from 13.37 to 13.50, the concentration of free dissolved oxygen increased from 0.06 to 0.51 mg/l.
3. Aeration of the standard turbine without the CAVITECH module from 14.21 to 14.31 showed an increase from 0.06 to 0.25 mg/l.



Thus, the dynamics of growth of free dissolved oxygen in CAVITECH is 2 times higher than in a standard turbine. Considering the power consumption of CAVITECH 2.7 kWh versus 5.5 for the turbine, the aeration efficiency of CAVITECH is 4 times higher than a standard turbine.

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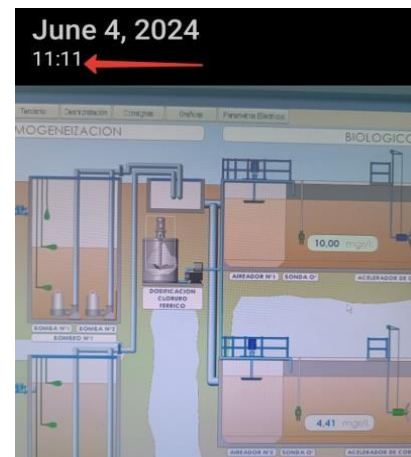
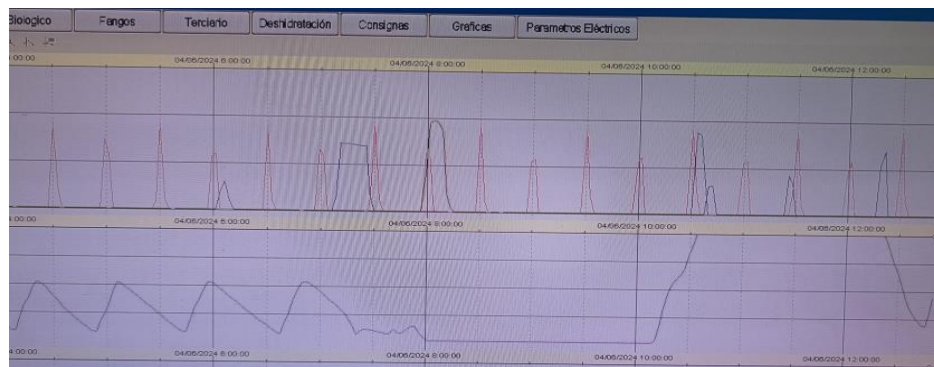
If estimate more long periods of time 30-31 of May, the dynamics of free dissolved oxygen during aeration of turbine and CAVITECH were the same, but CAVITECH has 2 times less energy consumption.



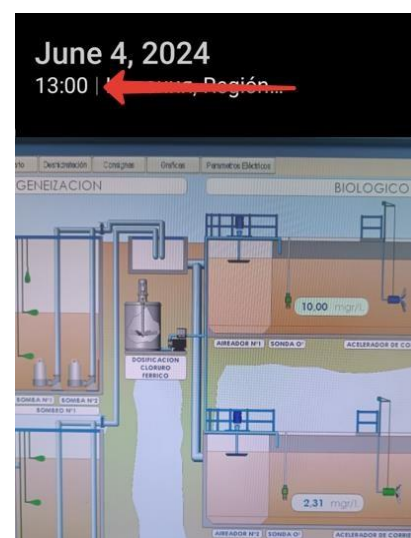
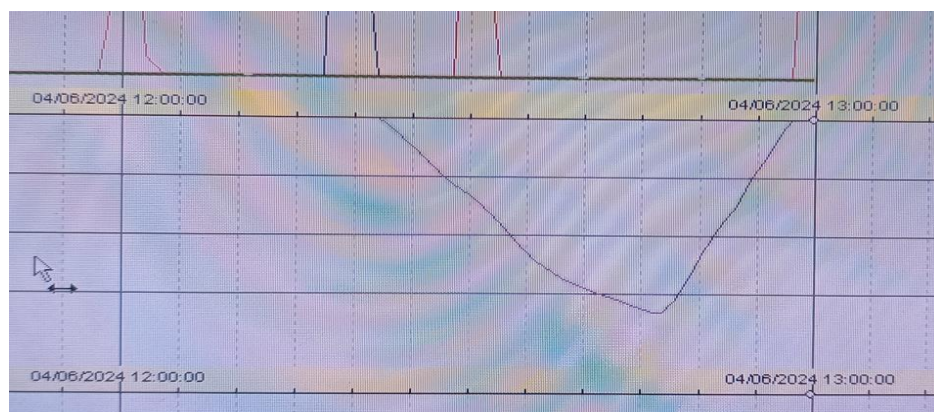
At June, 4 the test was continued. The results of this day are considered as standard.

04th June 2024

The system was launched at 10,15, reached the level of 2,0 mg/l at 10.32, the level of 4,41 at 11.11 and continue growing up to the level of 4,7 when was stopped at 11.30.



The oxygen was left to go down to 0,46 mg/l and started again at 12.47. The level of 2,31 mg/l was reached at 13.00 after 13 min of operation. After this the system was stopped and the EDAR was left.



During the pause between aeration we checked the pump.
The impeller was totally clean.



➤ **Tests for aeration efficiency and resistance from clogging in a standard mode are successfully passed.**

The next target is to finish test for sedimentation. To do this, a periodical way of operation should be insured. Operating the equipment in a constant mode is impractical from the point of view of too high oxygen level and energy efficiency.

➤ **To implement the periodic operation mode, it is necessary to connect the aeration module to the existing control software or to set a timer.**

The next operating modes of the equipment are suggested:

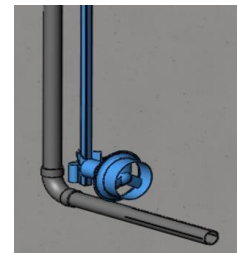
- Periodically 10-15 minutes every hour
- According to the level of oxygen dissolution

➤ **Improvements in the commercial version, an advanced version of the equipment:**

New design and position of aeration nozzle

A design and position of aeration nozzle should be changed.

The angle will be 90 degrees and we'll install it before (behind) mixer. It will raise aeration efficiency for 10-12% and it wouldn't be under pressure of mixer.



More suitable pump

An estimated flowrate and power of the existing pump as too high for this tank. It may be reasonable to replace a commercial version of the existing pump (flowrate 102 m³/h) with a pump of 40-60 m³/hour. It could reduce electricity consumption and increase efficiency.

To calculate the flowrate of the pump in commercial version it is necessary to take in to account:

- Average and maximum inflow of wastewater
- COD, BOD and total nitrogen concentrations
- Activated sludge density

Estimated efficiency of the CAVITECH® could be in 5 times higher than of the existing turbine. It would be also very helpful in the plants with membrane diffusers aeration as it does not require stopping the plant to serve and clean the system.

More information about CAVITECH® see at websites: <https://dialarnavigator.nl/projects/>, <http://cavitech.nl>

Kindest regards

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