

Large WWTP controlled for organic matter removal

MAPOCHO-TREBAL STW (Chile)

Createch360° provides an operational intelligence platform for water and wastewater facilities that supports real-time control and decision making to reduce operational costs, enhancing reliability and achieving quality consent limits.

With over 100 installations worldwide, experience and continuous innovation guarantees high added-value solutions enabling utilities and industrial users to achieve efficiency and facilities performance.

SUMMARY

MAPOCHO-TREBAL STW (Chile)

- Large plant
- 2 biological lines
 - 8 biological reactors/line
- OM removal

Challenge

To **reduce the aeration costs** whilst **ensuring the effluent quality**.

Results

- **100%** quality requirements
- **17%** less energy required for aeration

PLANT CHARACTERISTICS

MAPOCHO-TREBAL serves the Greater Santiago area (> 6M inhabitants), together with La Farfana WWTP. **CREApro®** governs the aeration in both plants.



- **Design Flow:** 760.320 m³/d (3.674.880 P.E.)
- **Average Flow (2018):** 627.288±51.950 m³/d.
- **Biological reactor:**
 - 8 plug-flow+carrousel reactors
 - 8 plug-flow reactors
- **Aeration system:**
 - Mapocho zone: 2 air production centers with 3 HV turbo blowers each. 3 regulation valves/reactor.
 - Trebal zone: 1 air production center with 4 turbocompressors. 4 regulation valves/reactor.
- **Effluent discharge consent:**
 - TSS < 35 mg/L
 - COD < 125 mg O₂/L
 - BOD₅ < 35 mg O₂/L
- **Former aeration control strategy:**
 - Based on pressure and oxygen measurements
 - Fixed pressure set point in the main manifold
 - Stationary DO set-point in the reactors

CONTROL OBJECTIVES

Smoothing the way to transform Greater Santiago's STWs in energy self-sufficient biorefineries by **minimizing energy consumption** for aeration of the biological process **while ensuring effluent quality**.

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IMPLEMENTED SOLUTION

New Instrumentation

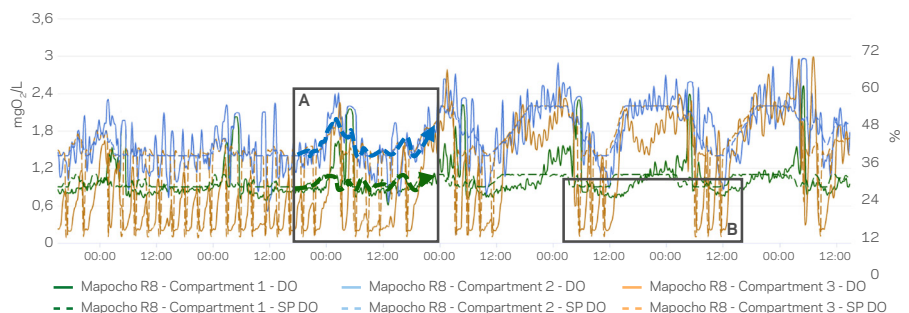
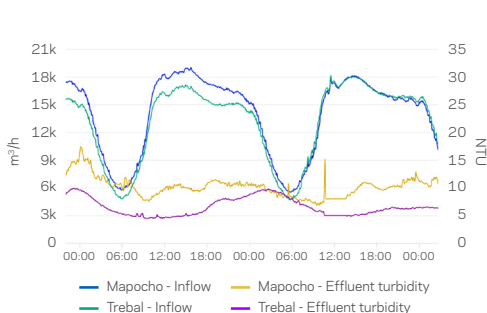
- A turbidity sensor in the secondary clarification effluent of each zone (2 in total). Turbidity sensors have also been installed in each of the 2^{ary} clarifiers of Mapocho zone for bulking detection.

C-CONTROL + MOV-CONTROL: Intelligent control of aeration

The air production and distribution systems are controlled to provide the real-time air demand to the biological process at minimum energy consumption and ensuring optimal organic matter removal.

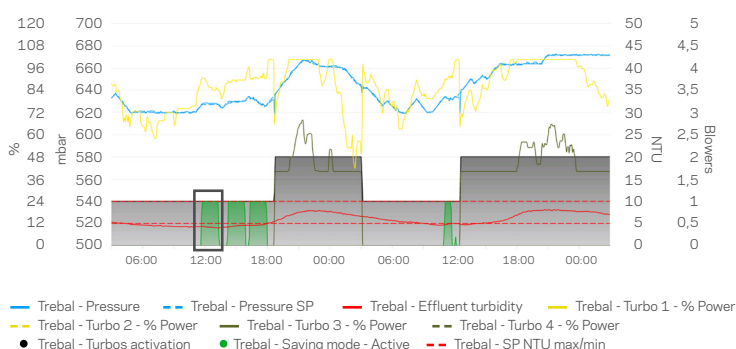
How does it work?

- C-CONTROL** is based on the evolution of effluent turbidity and develops:
 - Independent and dynamic DO set-points in each compartment
 - Aeration/non-aeration (O/A) cycles strategy leading to simultaneous and sequential anoxic phases with variable length
- DO set-points are relaxed when effluent quality is optimal and strengthened when it tends to deteriorate.
- Phase-times of the O/A cycles and number of simultaneous anoxic phases vary according to treated inflow and biological treatment performance.



- C-Control is based on effluent turbidity and wastewater inflow (feedback and feedforward control)
- **A:** DO set-point is adjusted in real time in response to the actual process performance
- **B:** C-Control applies non-aeration (A) phases in one compartment of each reactor. Occurrence and number of reactors in simultaneous A-phase as well as the A-phase time, vary in real time

- MOV-CONTROL** guarantees DO levels by applying dynamic pressure control in the main manifold, ensuring the maximum aeration system efficiency in terms of performance and energy consumption.
- Intelligent most open valve strategy is used to reach the target airflow in each compartment according to DO set-point



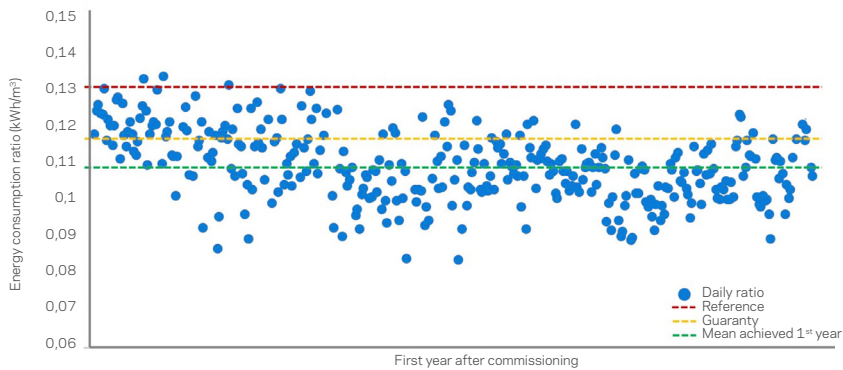
- Air pressure in main manifold and blowers working power are regulated according to process performance and real time DO demand.
- Blowers activation and power is indirectly controlled by playing with the pressure set-point to drive their master control panel.

Advanced control of blowers: saving mode

- The activation of the supplementary blower is inhibited by the control when effluent presents good and stable quality (turbidity).
- This mode prevents short and unnecessary activation of supplementary blowers.

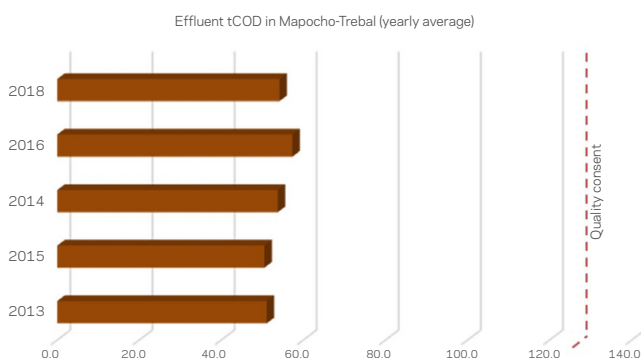
RESULTS AND BENEFITS

The implementation of the CREApro® intelligent control has led to an average energy saving for aeration close to 1.7% (1-year data).



- The reference energy consumption ratio was 0,129 kWh/m³ and has been decreased down to 0,108 kWh/m³.
- The 10%-saving guaranty was largely overpassed.
- The platform immediately started producing savings after commissioning

First priority of the control system remains always the commitment of effluent quality requirements:



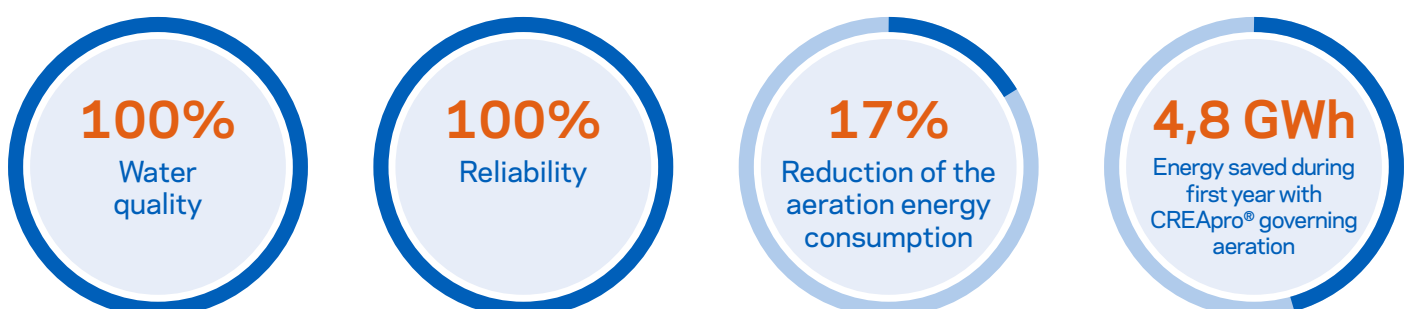
CREApro® intelligent control was capable of producing high energy savings while keeping high effluent quality:

- tCOD: 51±18 mg O₂/L
- TSS: 19±9 mg SS/L

Regardless of the load increase to the plant, CREApro® was able to keep quality at lower energy consumption

	Inflow	CODin	Removal
	m ³ /d	mg/L	kg COD/m ³ d
Previous	539.056	658	342.263
CREApro®	627.288	696	418.528
	↑16%	↑6%	↑22%

During the first year with CREApro® on board, Mapocho-Trebal treated an average flow of 627.288 m³/d, removing around 418.5 Tn COD/d. Take-home outputs:



CASE STUDY

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CLIENT CONCLUSIONS

Jordi Fontana
GENERAL MANAGER
EDAM



"The implementation of the intelligent aeration control system in Mapocho-Trebal and La Farfana, has been advantageous for EDAM not only in terms of a significant saving in energy consumption for aeration (which represents the main energy consumption of the plants), but also for the plant supervision tasks. The intelligent control platform facilitates on-line control of the performance of the biological process as well as the water quality of the effluent.

In large plants such as Mapocho-Trebal and La Farfana, the investment in this type of technology presents very short payback periods that make them highly recommended."

