Createch
intelligent control solutions 360°

CASE STUDY

Large STW controlled for organic matter removal

LA FARFANA 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

La Farfana STW (Chile)

- Large plant
- 2 biological lines
  - 16 Plug flow reactors
- OM removal

Challenge

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

Results

- **100%** quality requirements
- **18%** less energy required for aeration

PLANT CHARACTERISTICS

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

- **Design Flow:** 760.320 m^3/d (3.674.880 P.E.)
- **Biological reactor:**
  - Plug-flow configuration
  - 16 units
- **Aeration system:**
  - 6 x 1.600 kW turbo blowers
  - 3-4 regulation valves/reactor
- **Effluent discharge consent:**
  - TSS < 35 mg/L
  - COD < 125 mg O_2/L
  - BOD_5 < 35 mg O_2/L
- **Former aeration 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**, including:

- Intelligent control of **air production and distribution systems**
- Intelligent control of **flushing**
- Prevention of **undesired nitrification**

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IMPLEMENTED SOLUTION

Instrumentation

- Already implemented: pressure sensors and DO probes
- New: multiparametric probes (measuring turbidity, tCOD and sCOD, NO_3^--N and SS) after secondary clarifiers

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

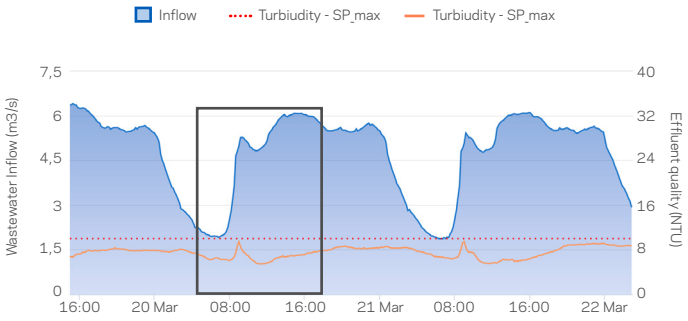
The air production and distribution system is controlled to provide the real-time air demand in the biological process at minimum energy consumption and ensuring optimal organic matter removal.

How does it work?

a) C-CONTROL is based on the on-line values and evolution of effluent tCOD, turbidity and nitrates, and DO in each reactor. The following strategies are implemented:
   - **Independent** and **dynamic DO set-points** in each reactor
   - **Aeration/non-aeration (O/A) cycles strategy** leading to simultaneous and sequential anoxic phases with variable length

b) According to the effluent quality, the control adjusts the **dynamic DO set-point** in each compartment of the reactors. DO objective is relaxed when effluent quality is optimal and strengthened when it tends to deteriorate.

c) The control also adjusts the **phase-times of the O/A cycles** and number of simultaneous anoxic phases according to the inflow treated and the global performance of the whole biological treatment. At low effluent OM, the system applies sequential anoxic phases (in each reactor) to decrease the energy demand.



- C-Control works based on effluent quality objectives (COD, turbidity and NO_3^--N set-points) and wastewater inflow

Figure 1

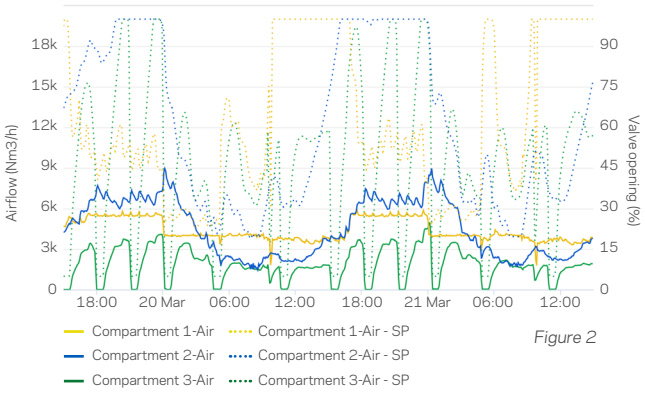


Figure 2

- MOV-control sets valve opening % accordingly to adjust airflow

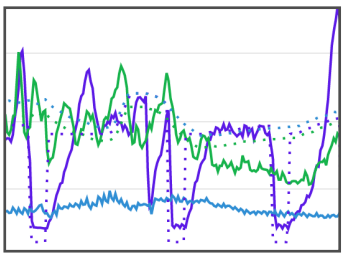


*Figure 3**

- Anoxic phases occurrence and length according to actual performance

Figure 3

- DO set-points are lowered when effluent OM is far from the limit and/or shows a decreasing trend

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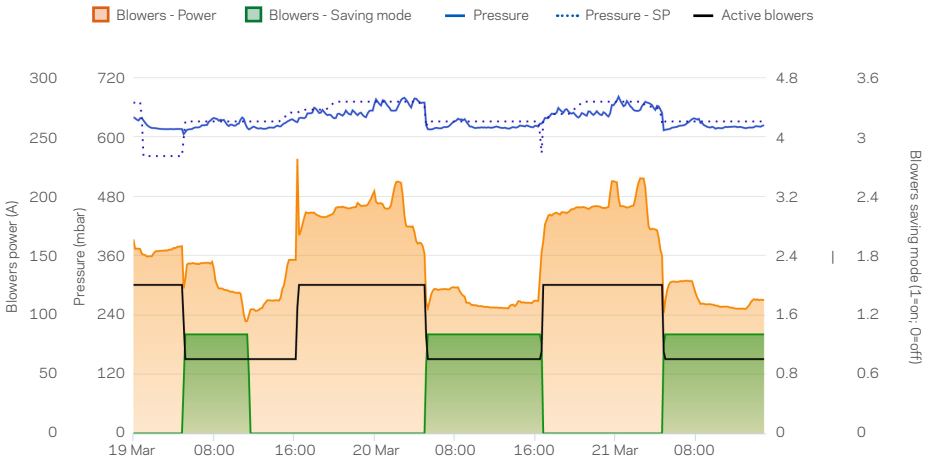
IMPLEMENTED SOLUTION

How does it work?

a) MOV-CONTROL provides a strategy that guarantees oxygen levels by applying **dynamic pressure control** in the main manifold, ensuring the maximum aeration system efficiency in terms of performance and energy consumption.

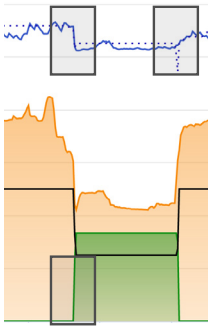
b) **Advanced management of flushing**, which is only applied when a valve has not reached the target range of the opening degree/airflow in 24h.



- MOV-control sets the dynamic pressure set-point to reach the desired air supply and max valves apertures
- Blowers are indirectly controlled by playing with the pressure set-point

Figure 4 - Pressure and power according to process performance and real –time DO demand

Advanced control of blowers: saving mode



- Blowers' saving mode is activated when possible according to inflow, effluent quality and other parameters
- Control sharply decreases the pressure set-point to force the supplementary blower to switch off
- When saving mode ends, pressure is punctually decreased to avoid shock in manifold

RESULTS AND BENEFITS

100%
Fulfilment of water quality

18%
Reduction of the aeration system energy consumption **(15.3 MWh/d)**

100%
Robustness and reliability

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CLIENT CONCLUSIONS

Jordi Fontana
GENERAL MANAGER
EDAM

"The implementation of the intelligent aeration control system in 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 plant), 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 La Farfana or Mapocho-Trebal, the investment in this type of technology presents very short payback periods that make them highly recommended."

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