### CASE STUDY



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 addedvalue solutions enabling utilities and industrial users to achieve efficiency and facilities performance.

# **Big plant for** nutrient removal



# **SUMMARY**

### LODZ STW (Poland)

- Big plant
- 7 biological lines
- Plug flow reactors

ODZ STW - Global view

Nutrient removal

### Challenge

To reduce the aeration costs whilst ensuring the effluent quality.

#### Results

- 100% guality requirements
- 20% reduction of aeration consumption

# **PLANT CHARACTERISTICS**



- Biological reactor: 7 Plug-flow units
- Aeration system: 5 turbo-compressors (630kW/Ut.)
- Air distribution system: 4 regulation valves per reactor
- Effluent discharge consent:
- TN < 10 mg N/L (annual average)
- N-NH<sub>4</sub><sup>+</sup> < 10 mgN/L N-NO<sub>3</sub><sup>-</sup> < 30 mgN/L TSS < 35 mg/L
- COD < 125 mg 0<sub>2</sub>/L - BOD<sub>5</sub> < 15 mg O<sub>2</sub>/L
- TP < 1 mg P/L (annual average)

#### Measurement equipment:

- TOC in the inlet (analyser)
- Dissolved oxygen in bioreactors (4 per lane)
- Ammonium in bioreactors (1 analyser per lane)
- Nitrates in bioreactors (optical)
  - Effluent of bioreactor (1 per lane)
  - Effluent of anoxic zone (1 per lane)
- MLSS in bioreactors (1 per lane)
- Phosphate in bioreactor (1 per lane)
- Turbidity in the effluent (1 per clarifier) - Pressure meter in air distribution pipe
- Waterflow meters (1 per lane)



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# LODZ STW (Poland)

# **IMPLEMENTED SOLUTION**

## MOV-CONTROL & N-CONTROL (Advanced air production & distribution - hybrid strategy for N removal)

### How they work?

These modules are based on **Pressure**, **N-NH<sub>4</sub>**<sup>+</sup>, **N-NO<sub>3</sub>**<sup>-</sup>, **and DO** to optimise:

- a) Pressure levels in air distribution network (Dynamic pressure strategy) to reach set DO levels (MOV strategy; figures 1 and 2)
- b) Advanced turbo-compressors operation according to pressure, effluent quality and blowers energy efficiency (figures 1 and 2)
- c) Nitrification/Denitrification cycles duration according to the individual nitrogen removal rate in each basin, and the global performance of the whole biological treatment (non-complete stops of aeration to guarantee activated sludge suspension, figure 3)
- d) DO levels to reach optimum nitrification rates (Dynamic DO SP strategy; figure 4)
- e) Energy price thanks to implementation of tariff strategy (figure 3), taking into account this variable, and using it to displace energy consumption peaks (effluent quality requirements are based on a 24 hour average value of nitrogen)



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# **IMPLEMENTED SOLUTION**

### iRAS-CONTORL (Advanced control for internal recirculation pumping)

### How it works?

This module is based on **treated flow and N-NO<sub>3</sub>**<sup>-</sup> to:

- a) Provide a strategy that guarantees the minimum internal recirculation flow according to nitrates level in each lane.
- b) Apply dynamic % of internal recirculation (in reference to treated flow) proportional to N-NO<sub>3</sub><sup>-</sup> effluent concentration (as much nitrates in the effluent, as much mixed liquor is pumped), and corrects it depending on the N-NO<sub>3</sub><sup>-</sup> levels in the effluent of the anoxic chamber (Dynamic internal recirculation flow strategy; figures 5 and 6).
- c) Ensure that the minimum required power is used to recycle the maximum Kg of N-NO<sub>3</sub><sup>-</sup> possible.



# LODZ STW (Poland)

# **IMPLEMENTED SOLUTION**

### IDM - Intelligent Data Management

### How it works?

0

12:00

16:00

20:00

25 Feb 04:00 08:00 12:00

Figure 8 - Example ammonium analyser signal

This module takes all key signals used in the control modules to:

- a) Diagnose on-line signal reliability. IDM Continuously check all readings to confer a % reliability to that signal (figures 7 and 8).
- b) Inform the client when a probe is not reading properly. IDM offers a screen to set the standard reading of each type of probe (optical, ion selective, analysers, flowmeters). In case of detecting wrong performance or average low degree of signal quality, the client can discard that probe and:
  - Choose automatically the signal with higher reliability
  - Choose manually a signal (for example the probe of the adjacent lane)
  - Change setting to carry out actuations avoiding the benefits of that reading (waiting to have the affected probe checked)



% signal reliability — N-NO<sub>3</sub><sup>-</sup>
 On-line reading unchanged for more than 1h, so % of signal reliability falls and it is reevaluated.
 Until the reading does not work properly again, reliability does not come back to 100%.

Analyser stops working, and the IDM module informs operators showing the signal quality drops to 0

#### RESULTS 20% 20% 00% 00% Reduction of the Reduction of Fulfilment Robustness aeration system the pumping of water energy and reliability energy quality consumption consumption

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