

#### SUMMARY

##### Challenge

Reduce energy, maintain quality

##### Solution

Multivariable control of surface aerators

##### Results

Lower energy, more robust control

The entire water industry accounts for almost 3% of the UK's total energy bill. With tighter regulations and consent limits being put in place, higher quality has to be achieved, but as efficiently as possible.

**United Utilities** is the largest operator of clean and wastewater networks in the UK. They were the first water company to pledge carbon reduction in line with government targets.

Activated sludge plants are widely employed in the industry and require high levels of energy for aeration; optimal operation balances load, oxygen demand, and final discharge quality. Loss of sensor data can result in unnecessary over-aeration.

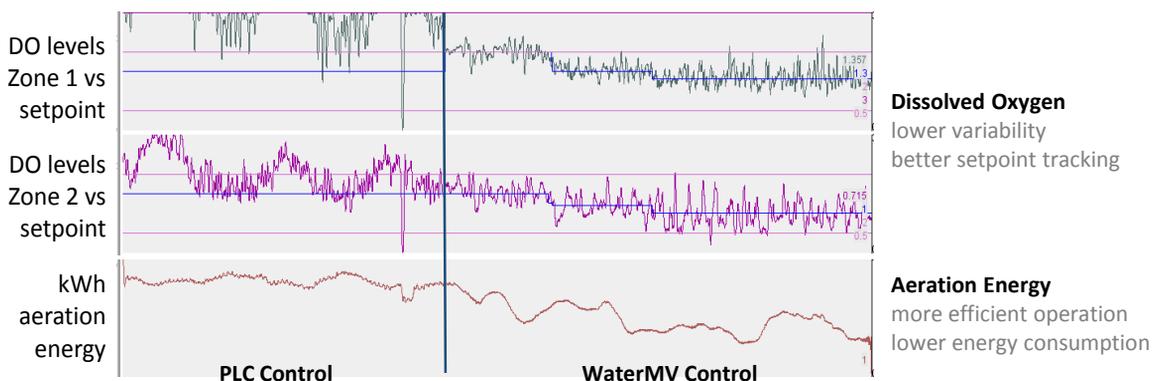
#### PERCEPTIVE SOLUTION

United Utilities' Research & Development team have a track record of looking outside the water industry for solutions to current and future challenges. Perceptive Engineering offered a potential solution to the dilemma of improved control with lower energy. Using historical process data, Perceptive Engineering constructed a robust mathematical model of the plant, able to predict future behaviour and the impact of disturbances on performance. The model is also capable of assessing the quality of signals taken from the plant, determining which are reliable and which should be discounted from future control decisions. The final control scheme is able to reconstruct missing or corrupt data – in real time - enabling optimal operation to be maintained even if some critical signals are lost or the data becomes untrustworthy.

#### RESULTS

This collaborative project was intended as a 'proof of concept' trial, but its success has meant full installation at the **Lancaster Wastewater Treatment Works**. Average energy saving over 12 months has been **26%** when compared with previous best performance, with continuing development offering significantly higher savings and fast return on investment.

United Utilities calculate an annual reduction in equivalent CO2 of more than 250 Tonnes. Plant performance is more tightly controlled, with less operator intervention required to maintain optimal process operation and maintain high levels of final effluent discharge quality.



"The project completed by Perceptive Engineering has successfully shown that significant reductions in electricity consumption can be achieved, through the novel use of statistical monitoring and model-based control."

*Dr. Sarah Needham, Asset Standards and Innovation, United Utilities*