IMPROVED AMMONIUM CONTROL AND ENERGY SAVINGS IN ACTIVATED SLUDGE PLANTS

Thames Water's Beckton STW in East London is one of Europe's largest wastewater plants, treating an average flow of 1,150,000 m3/d.

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It was identified that one section, ASP4, treating 30% of the site's flow had issues, despite the fact that with 7.5 m deep aeration tanks and variable speed aeration blowers this should have been the most efficient plant out of the three ASPs on site.

Initial performance was disappointing and after several investigations the decision was taken to modify the ASP under a "spend to save initiative" as energy costs at the site were in the region of £8M per annum. The project was carried out in 2 distinct phases to address both the process issues and reduce energy consumption.

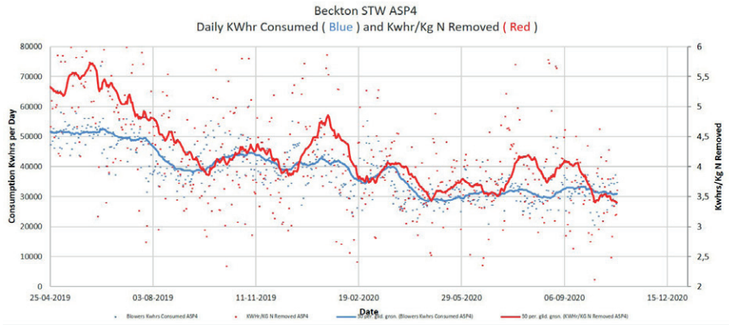
The first phase involved refurbishing or replacing existing air valves and automating a number of others in the aeration lanes, increasing the number of dissolved oxygen (D.O.) measurement and control points along with the associated changes to blower controls supplying air to the plant.

As an extension to the first phase it was discovered that the ASP's anoxic zones were not functioning correctly due to excessive residence times in the pump wet well. At times this was allowing anaerobic conditions to develop in the ASP's anoxic zones promoting foaming. In order to ensure that the anoxic zones functioned correctly these were converted to dual function 'swing zones' which can be either aerated (aerobic) when nitrates are low or just mixed with static mixers (when in anoxic mode) when nitrate concentrations are sufficient.

The project's second phase involved installing HACH's N-RTC, measuring inlet and outlet ammonium concentrations and ensuring that the permit conditions were being met at least cost. After implementation it was found that D.O. levels were controlled more precisely and efficiently as each individual zone has its own motorised air valve and associated D.O. probe. The new valves are better suited to process conditions and to date have been trouble free.

Hach's RTC system responds to incoming ammonium load and Nitrate levels. If insufficient nitrate is available for the anoxic zones to function the zone is aerated to prevent phosphorus release. If high incoming ammonium load is observed (such as during storms) the anoxic zone is switched to an aerated zone irrespective of nitrate levels to ensure that ammonium compliance is within permit conditions.

When sufficient nitrate levels are available and incoming load allows, the swing zone is run in an anoxic state to recover as much bound oxygen as possible therefore saving energy. Hach's RTC system continuously calculates actual and possible nitrification rates. This ensures that when conditions allow, D.O. set points are lowered saving on air and hence energy. During high load periods the D.O. set points are increased to ensure compliance with permit conditions.



The baseline starting point before modifications were implemented was 5.3 kwhr/kg Ammonium removed. Following the completion of both phases and commissioning of the RTC, the ammonium removal rate was improved to 3.8 kwhr/kg representing an overall saving of 28% which equates to savings of approximately £0.5 million per annum and importantly a project payback period of just over 1 year.

Further work is now in progress to initiate the 'sludge age' controller in the RTC. This should allow further energy savings to be achieved anticipated to be 3.5 Kwhr/kg N removed.

The Success of this project is a result of foresight by Thames Water and making sufficient funds available to enable the modifications to be implemented. Additionally, the partnership approach between all stakeholders has allowed the goals to be met.