

Reducing energy costs in the water industry



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Oil prices are increasing again, and there is rising concern about the impact of climate change on the water industry. Reducing energy consumption and the associated carbon usage is therefore a high priority. Yet higher treatment standards currently require the employment of more energy intensive processes. And budget constraints mean that capital expenditure is tight.

There is a solution to this conundrum. Other industries, such as chemicals, have already successfully tackled these issues. We can therefore use the expertise they have gained, and thereby also reduce the operating costs of existing water and wastewater treatment works still further.

The context

Energy costs are becoming an area of major concern for all water companies, driven by the twin drivers of increasing energy costs and the need to reduce the carbon footprint. Perhaps not surprisingly, as the water industry is by far the largest continuous manufacturing process in the UK, it is a major user of energy and consumes about 3% of the UK's total energy use. It also contributes just under 1% of total UK greenhouse gas emissions, and spends around £500 million a year on energy.

The situation is made worse by two factors:

- Firstly, we are running out of time with oil supply. Currently one barrel of oil is discovered for every four consumed. Oil is a finite supply, and as supplies dwindle the price of a barrel of oil, and hence energy costs, will

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rise sharply. The recent spike in oil prices has been a timely reminder of the need to take radical action.

- Secondly, with the drive for ever higher treatment standards and the investment in more energy intensive processes, the water industry's consumption of energy will continue to increase, unless action is taken.

The Climate Change Bill has introduced onerous targets to reduce the UK's CO₂ emissions by at least 26% by 2020 and all greenhouse gas emissions by 80% by 2050. So the water industry faces a huge challenge to reduce energy costs and dramatically reduce carbon emissions.

Energy typically represents 28% of the water industry operating costs, with aeration representing 55% of sewage treatment operational costs and pumping representing 60% of water operating costs (Ref: Environmental Knowledge Network).

What can be done?

The three main ways of reducing energy consumption in water and wastewater treatment are:

- **Water saving** – reducing the amount of water to be treated and pumped. This can be achieved by reducing the demand for water, reducing leakage from the network and by developing point of use supply and treatment e.g. rainwater use for domestic grey water supply.
- **Improved operational efficiency** – getting better at using energy efficiently. For example installing aeration control in wastewater treatment or variable speed drives to improve pumping efficiency.
- **Generation to offset usage** – using waste streams to generate energy. The most obvious example, and one that many water companies are starting to utilise, is producing energy from the biogas available from sludge.

A lot of focus tends to go on novel processes and techniques to improve the efficiency of energy use. The danger is that this can just make an inefficient process slightly less inefficient.

When water and wastewater treatment works have a design life of 60 years or more, there is a natural tendency to assume that nothing can be done to improve operational efficiency, or that this will have already been done. All too often, the focus is on symptoms rather than causes. We try to make a pump a few per cent more efficient, rather than at looking at whether the pump can be eliminated altogether.

It is this sort of radical change that's needed, if the demanding challenges ahead are to be met.

International eChem has a background in the chemical industry, where reducing energy consumption and improving process efficiency has been a way of life for decades. The methodologies that work in that industry are highly applicable to the water sector.

Work that we have done with the UK water companies has shown that significant savings – up to a massive 30% of total operating costs – can be achieved with relatively little, if any, capital cost investment. The secret is to really understand the treatment process and optimise how it is run.



Water companies need to reduce both energy costs and their carbon footprint

Equally important is to use the expertise that exists both within the water companies and the supplier base. International eChem works with the different parties in a team approach, to understand all the different operating costs involved and unlock the savings potential.

There are obstacles and conflicting pressures to be overcome. Traditionally there has been little if any measurement in the wastewater treatment process:

- How many wastewater treatment works still don't measure, let alone control, the quality of their raw material – sewage?
- Do the skills still exist in the water companies to understand how their processes should ideally operate?
- Do process operators clearly know the operating parameters for their plants and pro-actively work to maintain control within the optimum range?
- Has the plant been de-manned, with little or no active process control, just passive alarms and a reactive approach?
- Are process operators motivated to have a real passion to run their processes efficiently and feel ownership for their operation?

Improving the efficiency of water and wastewater treatment processes requires a holistic approach. The fundamental issue is that each stage in the treatment process has an impact on the next. If primary treatment is not working effectively, then the solids loading on aeration can easily be excessive. Making the aeration process more efficient is a good start, and helps maintain consent, but it does not address the fundamental issues.



For further information, visit the International eChem website: www.internationalechem.com

Restoring diffuser efficiency

In modern wastewater treatment works the majority of energy consumed is usually taken by activated sludge plants (ASPs) so it makes sense that every measure is taken to ensure that these plants operate at maximum efficiency at all times.

ABS Wastewater Technology Ltd has introduced a new service to solve the problem of clogged aeration diffusers in activated sludge plants. The ABS Nopon Clean system is a simple procedure carried out by qualified ABS engineers and ensures that all types of diffusers can be kept clean and close to peak performance.

Over time aeration diffusers can become clogged with deposits such as calcium and ferric compounds, which means that the pressure drop across the diffusers increases and the power required by the blowers rises. In addition to this, fewer bubbles are generated and subsequently less oxygen is transferred to the water impairing the ability of the biomass to function properly. The effect of this can be serious, not only will the ASP be using excessive amounts of energy but the treatment process could fail, risking breaches of consent levels.

The ABS Nopon Clean system solves this problem by injecting an 85% concentration of formic acid in mist form into the air dropper pipes which feed the aeration grids. The acid attacks and removes the harmful deposits in the



A grid of ABS Nopon aeration diffusers

system, any residual acid which passes through the diffuser is instantly and totally dissolved in the water so there is absolutely no threat or risk to the biomass. There is no need to drain the aeration basins or remove diffusers so the treatment process is uninterrupted by the cleaning operation.

The results are significant reductions in backpressure, better blower control, lower energy costs, improved oxygen transfer and hence improved overall aeration efficiency. It is also recognised that the lifespan of the aeration diffuser system can be extended through use of the Nopon Clean process. In many cases the cost of the treatment can be recovered from the resultant energy savings in just a few months.

For more information, contact ABS Wastewater Technology Ltd on Tel: 01293 558140, E-mail: info@absgroupuk.com or visit: www.absgroupuk.com