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Unique lagoons offer vision of the future

Anglian Water now has four Aero-Fac low carbon treatment systems in place across its division. John Gillett, managing director of Gurney Environmental, explains the advantages

In 2008 Anglian Water started construction on an unusual and somewhat unique wastewater treatment plant for the village of Sutton St James in the Lincolnshire fens. A first for Anglian Water and, indeed, for any English water company, the WWTP was a significant departure from what had previously been the norm.

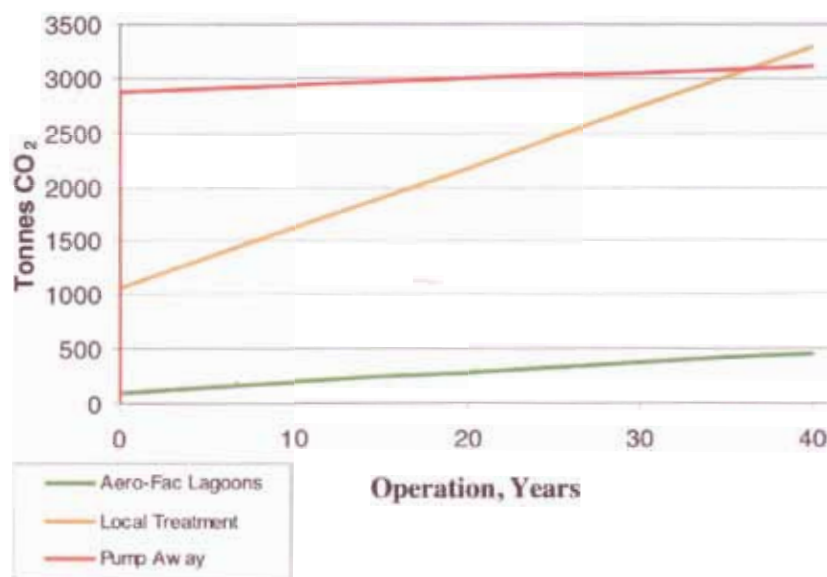
Understandably, the new design was subjected to extensive capital expenditure (CAPEX), operational expenditure (OPEX) and carbon footprint scrutiny by the Anglian Water team. In the end, the Aero-Fac treatment system was chosen as the best solution for their customers at Sutton St James.

At the time, Anglian Water contracts manager John Forkin said: "We are committed to providing environmentally friendly and cost efficient solutions. The Aero-Fac system offers a low carbon footprint solution both for construction and long-term operational costs. The system has no odour during normal operation and the earth banks around the cells give a visual aspect which is in keeping with the rural environment."

In May 2009 when Hilary Benn MP, the former Secretary of State for Environment, Food & Rural Affairs officially opened the Aero-Fac WWTP at Sutton St James he proclaimed, "This is the future" of wastewater treatment. Mr Benn was highly impressed by the odour-free WWTP recognising it had the lowest carbon footprint of all wastewater treatment options considered for the scheme.

Since 2008, Anglian Water has completed three more systems using the same treatment technology. At East Harling, an Aero-Fac primary treatment stage was added to an existing biological filter plant. At Welney/Christchurch a full Aero-Fac WWTP was constructed, and at Saltfleetby St Peter, an Accel-o-Fac WWTP, and even lower energy design, was used.

All four treatment plants incorporate a number of unique benefits, not least of which is a self-digesting sludge process that requires no pre-screening, sedimentation tanks or clarifiers, no sludge removal, dewatering or conditioning, and best of all, no routine sludge disposal and the associated lorry traffic in and out of the works.



Scenario	Construction	Operation (p.a)	Total (over 40 yrs)
Aero-Fac Lagoons	104	9	458
<i>Local Treatment</i>	<i>1057</i>	<i>56</i>	<i>3297</i>
<i>Pump-Away</i>	<i>2874</i>	<i>6</i>	<i>3114</i>

Measured in tonnes CO₂ equivalent

Table 1: Estimate of relative carbon footprints. (Figures reflect Sutton St James scenario and are not necessarily representative of the options in general terms)

The low carbon footprint is a core benefit of the Aero-Fac WWTP, both in construction and long-term operation. A carbon footprint is a conceptual estimation of the works' environmental impact.

With the use of various factor conversions, a carbon footprint can be measured in tonnes of carbon dioxide equivalent. Anglian Water's "risk and value process" considered the carbon footprint of three broad treatment scenarios for Sutton St James.

The figures and trends illustrated in Table 1 are estimates by the Anglian Water energy team and

reflect the specific Sutton St James situation, that of pumping away to a neighbouring catchment with an included upgrade to the receiving network. The carbon footprint estimation considers embodied carbon within the asset, and accounts for an operational carbon requirement per annum over an assumed 40 year life.

The table and chart demonstrate the lagoon system's low embedded and operational carbon footprint. This is primarily through the re-use of onsite materials during construction and low energy consumption. These and additional low



First in England: the Aero-Fac WWTP at Sutton St James

carbon considerations are further outlined below.

The treatment plant at Sutton St James operates for an average energy consumption of about 60kWh/day. Conventional treatment alternatives considered through the risk and value process, were estimated to utilise up to 360kWh/day. The 300kWh/day disparity in energy consumption represents a potential saving of 47 carbon tonnes CO₂ equivalent per annum. Energy saving is promoted both by the very low energy process equipment involved (some of which is wind powered) and by the nature of the aerated facultative system in forming three process layers rather than a

reliance on complete mix as with extended aeration processes.

The energy efficiency of the process is further enhanced by the Aero-Fac system's flexibility in dealing with varied flows and peak loadings through a tailored control philosophy. The system only utilises more energy intensive apparatus with increased loading, and in contrast, can be powered solely by wind power when processing low flows. The facultative biological process when correctly designed does not result in excessive sludge accumulation that requires removal. Sludge is self-digested anaerobically within the primary cell with inert material

accommodated within the basal sludge blanket. Consequently, the system does not necessitate the handling or disposal of sludge or screenings. This eliminates the need for tanker movements; associated high grade access roads; an energy requirement for de-sludging and pre-screening apparatus. The Aero-Fac and Accel-o-Fac wastewater treatment systems operated by Anglian Water exemplify the efforts of water companies to meet the challenges of energy conservation and contribute to the global effort to reduce the impact of climate change and provide a truly sustainable alternative for wastewater treatment.



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