RP2017

ENERGY BENCHMARKING FOR EFFICIENT, LOW-CARBON WATER RECYCLING OPERATIONS

Research Question

Wastewater treatment processes are energy intensive and play a significant role in safeguarding public and environmental health. The high energy demand makes current wastewater management practices unsustainable and the optimisation of wastewater treatment plants (WWTP) represents a challenge for water utilities when considering energy costs, and associated greenhouse gas (GHG) emissions.

To reduce energy costs for wastewater treatment operations and also minimise environmental impact from energy-related GHG emissions, the Australian water industry is applying an energy benchmarking method. This approach, however, involves the direct application of European (German) benchmarking methodology to an Australian context, which in many cases is quite different to that in Europe.

This research will address this disparity by developing a new adaptation of the European *energy benchmarking approach* which is suitable for industry to use in the optimisation of wastewater treatment/water recycling processes in Australia.

Figure 1: Aerial view of Christies Beach wastewater treatment plant (Adapted from Google, 2014)

Methodology

The Australian energy benchmarking model is based on a direct application of German methodology. While this approach provides immediate results when directly applied—fast-tracking the process and allowing the water sector to quickly recognize the economic gains associated with energy benchmarking investments—the application of existing European benchmarking approaches should ideally be done with some adaptation in the way that reflects local characteristics. In order to develop a new adaptation of the German method for optimising WWTP processes in Australia, a critical review of the European benchmarking model is first needed. This review of the German model is currently being undertaken, with emphasis on the WWTP characteristics in an Australian context and a focus on the operational procedures and design characteristics of European and Australian industry.

The review is investigating and identify the need for and nature of, adaptations to procedures and processes when applying existing energy European benchmarking models to Australian scenarios. The review also highlights similarities and differences in both practises.

Based on a series of full-scale Australian case studies, the project will also assess process level energy consumption and optimisation potential at WWTPs:

- Treatment level required vs. energy consumption
- Calibration of energy benchmarks (average *Guide* and best performance *Target* values)

Initial Results

Initial investigation of the German model has identified that the energy benchmarks currently used by the Australian water sector were recently updated and need to be adopted by Australian utilities. Interestingly, revised benchmarks do not necessarily target reduced energy consumption (Figure 2) and in some cases, energy benchmarks have (counterintuitively) relaxed.

Australian attempts to standardise energy benchmarking still face significant challenges when considering the regulated effluent quality context of the European models. For example, the review has identified that German benchmarks may not be fully and directly applicable, i.e. due to higher nitrogen loads in Australian wastewater and different wastewater C/N ratio which significant impacts the treatment performance and overall energy efficiency of a WWTP.

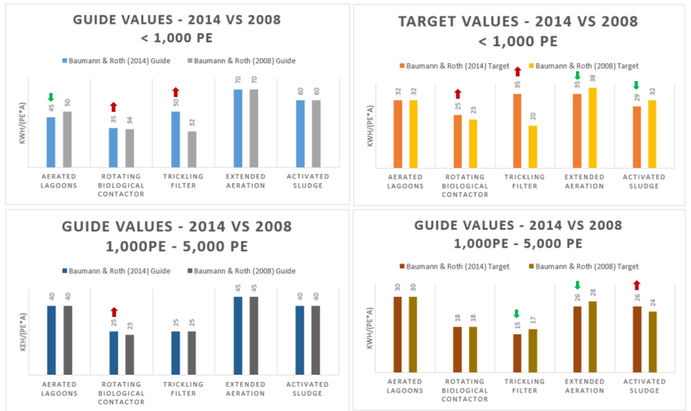

Figure 2: German benchmarking values as per Baumann and Roth 2014 vs Baumann and Roth 2008.

Anticipated impacts

Our research will deliver to the Australian water industry the first ever critique and adaptation of international energy benchmarking methods, currently applied by the sector without fully understanding the origins and applicability of such methods to Australian conditions. Outputs will benefit water sector personnel seeking to minimise energy use and associated GHG emissions.

Key statement

Improving the energy efficiency of urban wastewater treatment for low carbon precincts.

Further information

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