Research Question

Recycled water is an important climate-independent water resource today, with so-called 'purple pipe' systems commonplace in our major urban centres delivering high quality recycled water for a variety of end uses (Figure 1). At the same time, however, the production of high quality recycled water is both energy- and resource-intensive.

The water industry needs to optimise its water recycling systems for energy and carbon (CO_2) emissions savings, yet no method currently exists by which to achieve this objective. This research will address this issue through the development of a new approach to optimise wastewater treatment and water recycling processes in Australia, ensuring fit-for-purpose recycled water quality at least cost and with lower carbon emissions intensity.

Figure 1: Purple pipe distribution network delivering recycled water to Australia's urban centres.

Methodology

The project will develop and test a new approach for energy benchmarking (Figure 2) and optimising water recycling systems.

This includes:

- Develop a new approach to integrate energy and public health performance aspects into the benchmarking and optimisation of water recycling systems in Australia.
- Develop and refine a suite of energy performance benchmarks for key water recycling processes, potentially integrating public health performance metrics (pathogen log reductions) into energy performance benchmarks.
- Develop an approach for the valuation of capital expenditure savings/offsets from changes to asset management practices relating to energy optimisations (e.g. avoided maintenance and replacement costs and asset depreciation impacts).

Based on an *energy-health nexus* perspective (satisfying public health requirements and energy performance), water recycling process can be optimised to satisfy 'fit-for-purpose' objectives.

This *energy-health* approach will enable water utilities to measure and achieve the right balance between intensity of water treatment (addressing public health protection criteria) and energy cost and asset management implications (economic criteria).

A combination of actions is required for the research, including:

- Analysis of energy savings and operational inefficiencies
- Measuring and monitoring of baseline data to identify performance improvements to establish performance metrics
- An emphasis to be placed on identification and prioritisation of optimisation techniques and processes to establish standards to set 'industry best practice'
- A focus on the process and associated optimisation of equipment. Optimise the process-level performance i.e. UV dose, membrane loading rates, etc., to satisfy energy savings and lower carbon emission intensity.

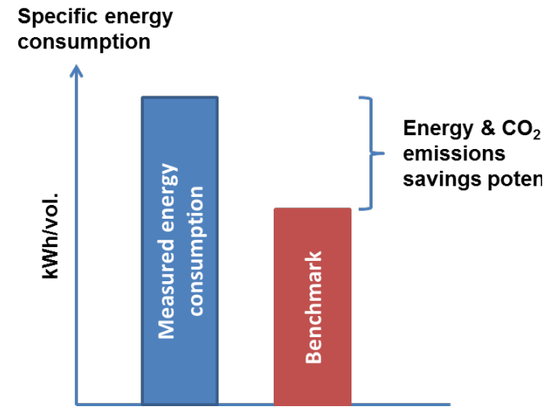

Figure 2: Schematic representation of energy benchmarking approach.

Expected Results

Outputs from this research will provide new information and knowledge to the Australian water industry to enable it to better design and operate water recycling systems for cost-effective, low carbon performance.

Anticipated impacts

The research will help promote energy benchmarking as a tool for energy efficiency in the water sector and will foster low carbon water recycling operations. This will ultimately contribute to more cost-effective, healthier living solutions in our urban precincts.

Optimising energy use performance in water recycling for low carbon precincts

Further information

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