In my opinion

Game changer for wastewater recycling

Jonathan Clement is an internationally recognised Water Treatment Specialist, specialising in drinking water. He was appointed CEO of PWN Technologies in May 2013. As a testament to his leadership in water treatment he was selected to be Chair of the International Water Association's Global Leading Edge Water Technology Conference and Forum five times between 2003 and 2007.

There are major challenges in converting wastewater to potable drinking water, the first being public perception - an obstacle Australia has yet to tackle convincingly. Secondly, there is a significant technological challenge in removing high levels of contaminants.

To deal with both challenges, a high-level treatment system is required. The treatment that has been generally accepted to date is a combination of multiple treatment technologies. This, in most cases, has included three steps: membrane microfiltration and reverse osmosis followed by advanced oxidation.This multiple-barrier approach is rather costly compared to the treatment of most surface water, which can be achieved with membrane filtration alone.

An international team of experts led by Victoria University, and funded jointly by the Australian Water Recycling Centre of Excellence and PWN Technologies (PWNT), is currently undertaking research to determine if water recycling can be more affordable and sustainable. The novel approach, being trialled for the first time in Australia at Melbourne's Eastern Treatment Plant (ETP), is a single-step treatment that uses a resilient and robust ceramic membrane system developed in the Netherlands by PWNT.

Ceramic membranes, which are known to be very sustainable because they can last 20+ years and are not susceptible to fibre breakage, have until now been considered too expensive for the municipal drinking water market. PWNT's breakthrough has created a new ceramic membrane system that reduces the footprint and material by more than 90% and improves overall efficiency. The key design feature of the CeraMac (advanced ceramic membrane technology) system is that rather than having ceramic membrane modules in individual stainless steel casings, up to 192 ceramic elements can now be housed in a single stainless steel vessel. This reduces the costs of the ceramic membrane system to a level that makes the system cost competitive with polymeric membranes.

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Ozone, an oxidant that destroys microcontaminants, can be applied directly on the membrane. The ozone has a catalytic reaction on the membrane, which keeps the membrane clean. The end result is that the system can work at a very high rate (flux) with very little water loss.

This unusual combination of effects - microcontaminant destruction with simultaneous enhanced membrane operation - could be the key to more economical water re-use for Australia. Preliminary trial results show that the membrane operation is efficient despite the high organic levels.

In Singapore, an 18-month trial of a fully operational demonstration plant treating surface water has produced not just superior treatment outcomes but also savings of up to 40% on comparable polymeric systems.

In Holland, the ceramic membrane technology treats water from the polluted Rhine to drinking water standard at 30% lower cost than comparable polymeric membranes, producing a lower environmental load and consuming considerably less energy. What is at stake in the Australian trials is the feasibility of ceramic membranes in the context of wastewater recycling. Human and industrial wastes and pharmaceuticals present a tough water treatment challenge, hence the interest of a bevy of international researchers.

The high organic content of the ETP secondary wastewater, which presents a potential fouling issue for polymeric membranes, is one type of wastewater where ceramic membranes are expected to outperform alternative applications. To date, the results show that the membrane operation is efficient despite the high organic levels. The ozone stabilises the operation greatly.

When these research results satisfy Australia's regulatory standards for pathogen removal, the technology has the potential to open the door for further investments in re-use by Australian water utilities. An economic assessment of the ETP trial is expected to be completed by mid-2013.

The ETP Project partners are: The Australian Water Recycling Centre of Excellence, Victoria University, PWN Technologies, Black & Veatch, Melbourne Water, South East Water and Water Quality Research Australia.