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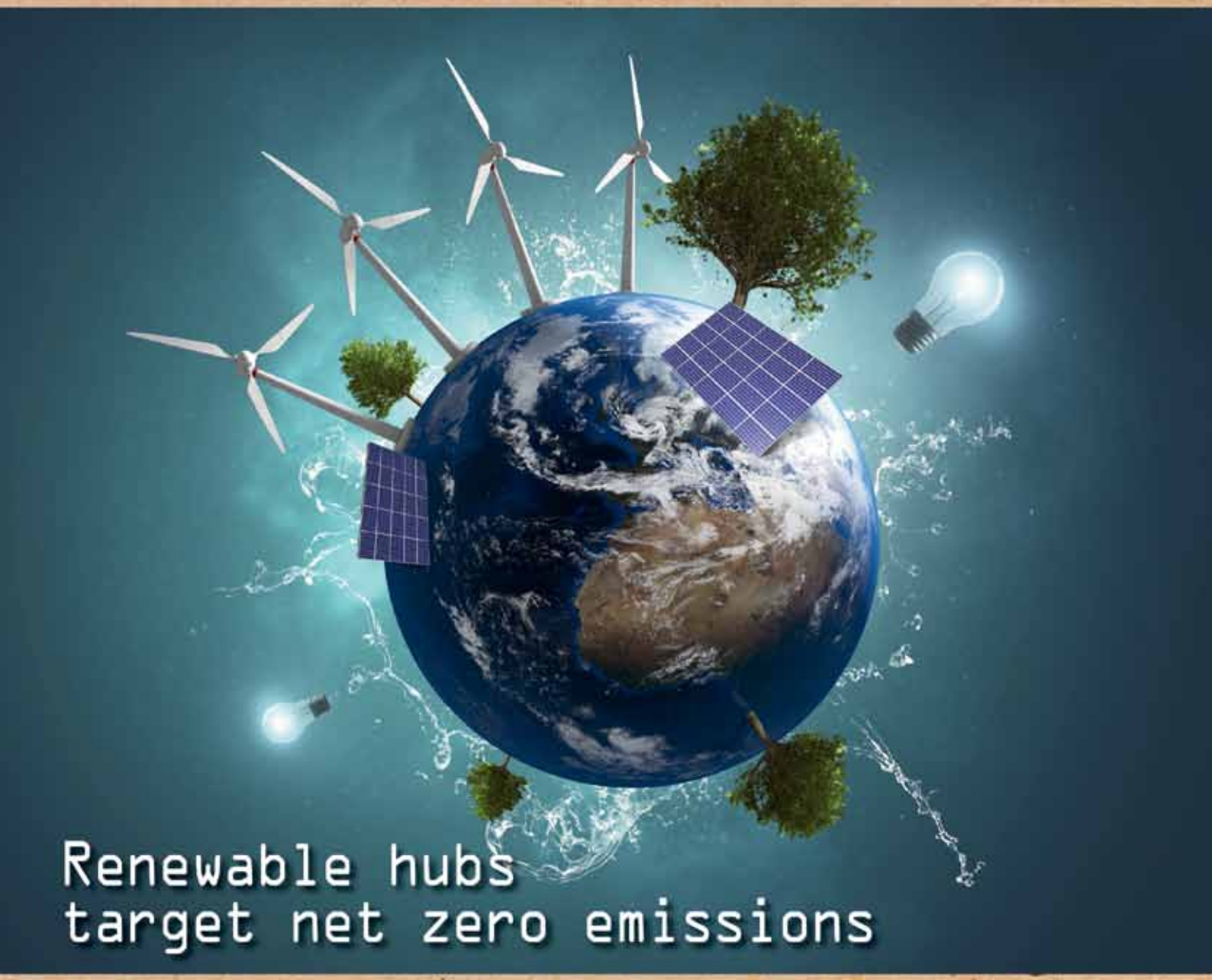

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REGULARS

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WORDS FROM THE EDITOR

Green hydrogen is said to be approaching cost-competitiveness as an alternative for petroleum products for heavy trucking, buses and remote power. According to a recent market study conducted by the CEFC, green hydrogen also has the potential to become commercially viable across further sectors of transportation as early as 2030.

The federal government has certainly increased its focus on hydrogen technology as a means to lower emissions and also boost economic recovery. Through the Advancing Hydrogen Fund, the CEFC now has up to $300 million available to invest in the growth of a competitive Australian hydrogen industry. ARENA has already conditionally approved $103.3 million towards three commercial-scale renewable hydrogen projects, as part of its Renewable Hydrogen Deployment Funding Round.

While most Australian businesses and consumers are keen for a net-zero emissions focus, not everyone is on board with the hydrogen focus (page 8). Some would prefer a stronger focus on renewables as Australians are adopting solar energy faster than anywhere else in the world.

The strong renewable energy adoption is good news for the environment but can also cause headaches for electricity utilities managing peaks and troughs on networks and distribution grids. According to the CEFC report, hydrogen may also play a role in demand shifting, which can help integrate renewables into the grid. Other innovative solutions being developed for grid management include solar hubs where the excess power can be stored and shared with the community. One such project is using smart meters to enable off-peak hot water to utilise the excess solar energy peaks during the day — read about this smart energy solution (page 16) and more in this issue.

Carolyn Jackson

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Designing tech for a sustainable future

Michael Boyle, Managing Director, HP Australia and New Zealand

> **The first step in reducing our volume of e-waste starts by innovating technology with sustainability at the core of our thinking.**

The Australian technology sector is a global leader in many rights. While we've made our mark on the world stage as rapid adopters of new technologies, as innovators and as digital educators, many of us fail to realise that Australia is one of the highest contributors of e-waste globally.

E-waste — or discarded electricals or electronic devices — is currently the world's fastest growing waste stream, accumulating more than 53 million tonnes globally in 2019. Australia accumulates 21.7 kg of this e-waste per capita, surpassing the United States at 21 kg per capita and almost rivalling that of the United Kingdom at 23.9 kg per capita.

Containing non-renewable materials like tin, copper, gold and plastic, e-waste is an unsustainable environmental hazard. With some e-waste unable to be recycled, we see increased reliance on landfills and increased greenhouse gas emissions with the materials needing to be mined, processed, transported and inserted into new devices.

A report on e-waste from the United Nations (UN) in 2019 found that if nothing changes in the management of e-waste globally, the volume of this waste will quickly double across the world.

While the current Australian Government has introduced recycling initiatives like the full waste export ban on plastic, paper, glass and tyres, and invested in key infrastructure to sort process and remanufacture materials, it's clear that the burden of change cannot rest on the public sector alone.

In the technology sector, we have a responsibility to support this change. Our responsibility lies in working with the public sector, shifting some of the momentum behind rapid innovation of products and services to support the evolution of e-waste management in our country.

Innovate with sustainability from the outset

The first step in reducing our volume of e-waste starts by innovating technology with sustainability at the core of our thinking.

By applying rigorous sustainable design principles, we can drive society towards a circular and low-carbon economy, designing out waste by using — and re-using — materials responsibly. This thinking ultimately enables Australian businesses and consumers to also make conscious decisions to invest in the future of our environment.

Across the world, we are already seeing how a focus on sustainability of long-term energy storage can result in rapid innovation. Historically, hydropower dams have been one of the only approaches to manage the seasonal shifts impacting energy collection and storage. However, creations from companies — including Lightsource, which is adding storage to solar developments; Antora Energy, which is building a low-cost thermal battery for grid-scale energy storage; and Google, which is storing renewable energy in molten salt — are challenging these limits by placing sustainability at the core of thinking.

At HP, we have a clear vision for sustainable office and home printing. Not only have we committed to reducing single-use plastic by 75%, we have also created a range of products reducing environmental impact through innovative design and increasing post-consumer recycled content plastic.

Embracing circular business solutions

Not only should tech companies be designing products with sustainability incorporated from the outset, but we should be embracing circular business models from within.

The circular economy is a unique opportunity not only for companies to reduce their environmental impact but is also a significant economic opportunity promising to add $210 billion to Australia's GDP by 2050.

At HP we've recognised the environmental and economic value of the circular economy and expanded our device-as-a-service (DaaS) and managed-print-service (MPS) offerings to deliver better value to customers with reduced environmental impact. Compared with traditional transactional sales, a lifecycle assessment of a notebook PC found that DaaS reduces greenhouse gas emissions by 25%, improves resource efficiency by 28%, decreases ecosystems impacts by 28% and reduces human health impacts by 29%.

These improvements are mainly due to keeping PCs in use for multiple lifecycles, which avoids manufacturing of additional devices and extends the life of high-value materials.

Collaboration is key

Reflecting on e-waste it's clear the technology industry has a role to play in supporting the environment and remedying this problem. But it's also clear that no single organisation can solve this problem alone.

For example, Global car manufacturer Groupe Renault collaborated with the EU LIFE Programme to create ICARRE 95, a project which accelerates closed loop recycling in the car manufacturing industry. Through the cross-sector partnership, Renault collects end-of-life vehicles, dismantles them, shreds and washes the material, and then remanufacturers it back into new vehicles. This initiative was created to reduce waste, increase resource optimisation and reduce the environmental impact of the European automotive industry.

Initiatives like ICARRE 95 are a clear representation of the power of partnership. It is crucial that we come together — as individuals, as public entities and as private organisations — to start meaningful conversations and cross-sector collaborations to drive pace behind the change in how we manage our e-waste.

Key to driving a circular economy is the need for cross-sector collaboration, embracing our economy as an ecosystem of businesses, rather than individual units.

Hydrogen boost

During the 2021–22 Budget announcement in May, the federal government declared that Australia is on the pathway to net zero and that its goal is to get there preferably by 2050. The government also confirmed its commitment to 'gas-fired' recovery from the COVID-19 pandemic, and ARENA announced funding for three hydrogen projects.

ARENA funding announced

The Australian Renewable Energy Agency (ARENA) announced that it has conditionally approved $103.3 million towards three commercial-scale renewable hydrogen projects, as part of its Renewable Hydrogen Deployment Funding Round.

The three successful projects are:

- Engie Renewables Australia Pty Ltd (Engie): ARENA will provide up to $42.5 million towards a 10 MW electrolyser project to produce renewable hydrogen in a consortium with Yara Pilbara Fertilisers at the existing ammonia facility in Karratha, Western Australia.
- ATCO Australia Pty Ltd (ATCO): ARENA will provide up to $28.7 million towards a 10 MW electrolyser forgas blending at ATCO's Clean Energy Innovation Park (CEIP) in Warradarge, Western Australia.
- Australian Gas Networks Limited (AGIG): ARENA will provide up to $32.1 million in funding for a 10 MW electrolyser for gas blending at AGIG's Murray Valley Hydrogen Park in Wodonga, Victoria.

Engie will use renewable hydrogen to produce ammonia at the Yara Pilbara Fertilisers site, while ATCO and AGIG's projects will use renewable energy to produce renewable hydrogen for gas blending into existing natural gas pipelines.

ARENA CEO Darren Miller said renewable hydrogen presents an opportunity to help reduce emissions globally and locally, transform our energy system and create a new export industry for Australia.

"We're excited to have chosen three projects we believe will help kickstart renewable hydrogen production in Australia at a large scale. One of the projects will see clean hydrogen used to make ammonia for export and the other two will blend clean hydrogen into our gas pipelines to help decarbonise our natural gas networks.

"With more than $100 million in funding, we're hoping to build some of the biggest hydrogen electrolysers in the world, with the ultimate goal of bringing down the cost of hydrogen produced using renewable energy and growing our skills and capacity to meet future global demand for hydrogen," he said.

Budget plan hit negative response from some

In the 2021–22 Budget, $1.6 billion was allocated to fund priority technologies, including clean hydrogen and energy storage and $58.6 million to support an expansion of the gas industry.

Global Compact Network Australia Executive Director Kylie Porter said: "We recognise the challenges posed for both government and business in a swift and unplanned transition to clean energy. However, the focus of the Budget allocation towards gas is not a long-term sustainable energy source. Additionally, without effective technologies to reduce emissions, a gas-led recovery will increase Australia's overall greenhouse gas emissions and potentially lead to another wave of stranded assets."

Jeff Olling, Global Chief of Stakeholder Relations at iugis, said he was disappointed with the lack of focus the Budget has given to the renewable energy sector. "It is clear that businesses and consumers are keen to drive a sustainable-led recovery, with our research commissioned by YouGov last year finding business owners feel it's important for them to adopt more sustainable practices to aid economic recovery in Australia following COVID-19. The same research showed one in three consumers are now more concerned about sustainability than pre COVID. This indicates a clear mandate for us to do more to fight climate change; however, we need the government to provide the right investment signals to give confidence and certainty to be able to make investments in a green and digital transition.

"Other jurisdictions are moving at rapid pace to reduce emissions. The EU is considering a 'carbon border adjustment mechanism' to level the playing field for those countries that don't transition to greener infrastructure. This could have trade implications for Australian businesses who seek to trade in Europe. Our counterparts in Germany are also planning a new green financing strategy to incentivise capital towards environmental projects. Add this to commitments to cut emissions by the US and the UK by 2030 and 2035, we are in serious danger of being left behind.

"A gas-led recovery isn't addressing the main issues we have today and has no long-term economic or environmental reason to be investing. We encourage the government to reset our approach towards renewables if we are serious about reducing our carbon emissions."

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Engineering the Future

Airport solar has potential to power cities

Australian airports have the potential to generate enough solar energy to power a regional city, according to a new RMIT University study.

The study found that if large-scale rooftop solar systems were installed at Australia's government-owned airports, they could produce enough electricity to power 136,000 homes.

Previous studies have deemed airports as great solar generators, but the RMIT research goes further by precisely modelling the use of large-scale systems.

The researchers compared electricity generated by residential solar panels in a regional city with the potential green energy production of 21 leased federal airports. They found that if large-scale solar panels were installed at the airports they would generate 10 times more electricity than the city's 17,000 residential panels, while offsetting 151.6 kilotons of greenhouse gases annually.

Researcher Dr Chayn Sun said the analysis showed the value of focusing renewable energy efforts on large centralised rooftop solar systems.

"We can't rely on small residential solar panels to get us to a zero-emission economy, but installing large panels at locations like airports would get us a lot closer," she said.

"We hope our results will help guide energy policy, while informing future research in solar deployment for large buildings. There's so much potential to facilitate national economic development while contributing towards greenhouse gas emission reduction targets."

Dr Sun, a geospatial scientist in RMIT's School of Science, said airports are ideal for solar panels but are not currently being used to their full potential — many Australian airports are without adequate solar systems.

"Airports get good sun exposure because they're not shaded by tall buildings or trees, making them a perfect spot to harness the sun's energy," she said.

"Australia is facing an energy crisis, yet our solar energy resources — such as airport rooftops — are being wasted. Harnessing this power source would avoid 63 kilotons of coal being burned in Australia each year, an important step towards a zero-carbon future."

To conduct the research, published in *The Journal of Building Engineering*, geospatial researchers estimated the solar electricity generated from 17,000 residential solar panels in Bendigo, Victoria, over one year.

Lead author Athenee Teofilo, a Master of Geospatial Science student, then mapped the buildings in every leased federal airport — excluding unsuitable structures like dome and blister-type hangars — and identified 2.61 km^2 of usable rooftop space.

Researchers determined the optimum tilt angle for the solar arrays for each airport, to maximise efficiency.

Perth Airport had most energy-generating potential — placing solar panels there could produce almost twice the solar output of Bendigo, equal to the combined production from Adelaide, Sydney, Moorabbin and Townsville airports.

Even Melbourne Airport alone would outperform Bendigo's annual solar electricity production by almost 12 GWh a year.

Airport buildings less suited to solar panels, like those at Alice Springs and Tennant Creek, could still be useful for ground-mounted solar systems, the study found.

Dr Sun said the research underlined the necessity for energy policies to include a plan for installing solar panels at airports.

"Based on our solar radiation analysis, we know airports with decent solar systems could not only be self-sufficient but would generate enough electricity to send the excess back into the grid," she said. "We mapped airports owned by the federal government, but Australia has more than 150 privately owned airfields, which could also have panels installed.

"Australia receives so much solar radiation — every airport in the country would benefit from having the right type of solar panels installed."

Dr Sun said reflections from the panels would not be a problem, as modern solar arrays absorb rather than reflect sunlight.

The findings could be extended to assess the solar potential of other sites, such as large commercial buildings, warehouses or distribution centres.

HOW CAPTURING BIOGAS CAN REDUCE GREENHOUSE EMISSIONS

Could your business be reducing carbon emissions from fossil fuels through the production and use of biogas? Hydroflux can assist you with identifying and implementing changes in your business to achieve your net zero greenhouse gas emissions target.

Global, national, state and industry bodies are emphasising the criticality of reducing greenhouse gas emissions to minimise the impacts of climate change on our global environment, industries, and lifestyle.

In the examples of meat and dairy producers, provided in the graphs, capturing biogas to replace thermal coal or natural gas as a fuel for a boiler could save over 20,000 tonnes of CO_2 emissions per year. This is the equivalent of taking 9000 cars off the road or the average greenhouse emissions of 2500 to 3000 Australian homes.

Many industries, such as the Meat & Livestock Association of Australia (MLA), and many water utilities have adopted plans to achieve a carbon neutrality target by 2030 (CN30). All states and territories have adopted a net zero emissions target by 2050 (CN50). This typically involves an interim target for 2030. Others, such as the ACT have gone a step further and are targeting carbon neutrality by 2045 (CN45).

Anaerobic treatment of wastewater is a popular and proven method of wastewater treatment in many industries such as meatworks, rendering facilities, piggeries, poultry, dairy processing and others.

Biogas is both a significant source of greenhouse gas (GHG) emissions and energy, and represents a true win-win if captured and used. Capturing and using the gas produced by a digester or covered anaerobic lagoon [CAL] provides unique advantages. The biogas provides an alternative energy source for your plant to reduce the use of fossil fuel.

All fossil fuels add to the carbon emissions ledger as they are removing previously sequestered carbon from its historical underground storage and release carbon into the environment whilst combusted. In addition to that, the mining, drilling and transport of fossil fuels from the source to your door add further to the emissions tally.

In comparison, biogas created by treating your own waste or wastewater is already produced on your premises and can be used to support the energy demands of your business.

Utilising biogas as an alternative energy source for a boiler provides a simple and ready-to-use alternative fuel to reduce or replace your reliance and use of coal or gas to fire your boiler.

The global warming potential of 1x tonne of methane released to the atmosphere is equivalent to 25 tonnes of CO_2 emissions.

This example shows the possible annual CO_2 emissions savings from a plant with a wastewater stream of 10,000 m^3/week and with an average COD loading of 10,000 mg/L, creating approximately 180,000 m^3 of biogas per month. This could typically be achieved with 1x large covered anaerobic lagoon.

Energy created & emissions avoided by using captured methane instead of fossil fuel		
Description	**Unit**	**Value**
Wastewater Flow	kL/wk	10,000
Average Chemical Oxygen Demand (COD)	mg/L	10,000
Annual Energy of Biogas captured	GJ/year	51,518
Methane Global warming potential avoided from CH_4 release	tCO_{2e}	23,198
Total annual CO_2 saved (by replacing coal with captured biogas)	tCO_{2e}	26,237
Total annual CO_2 saved (by replacing natural gas with captured biogas)	tCO_{2e}	21,348

In order to convert the above carbon reduction values to plant sizes, we have created the reference tables displayed. Please Note that wastewater volumes and organic loading rates can be quite different from site to site, depending on the processes and infrastructure used on site. Please refer to your own plant data as a more accurate reference.

Estimated plant size for above plant with 5200 t COD/year		
Assumed COD/head (TBC by site)	**kg COD/head**	**head per week**
Beef abattoir	33	3030
Sheep/lamb abattoir	2.5	40,000
Poultry abattoir	0.06	1,666,667

Comparison to vehicle traffic & homes		
Equivalent of cars from CO_2 emissions saved	No of cars	9134
Equivalent of homes from CO_2 emissions saved	No of homes	2754

Hydroflux can help you to reduce GHG emissions, achieve your targets and improve the sustainability of your business, please give us a call to see how we can best help.

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Global challenges in the water sector

By 2030, we will face a global deficit of 40% of water in an identical climate scenario — or even worse — than the one we are facing now. This trend is due to a combination of three factors — population growth and demographic change, urbanisation and climate change. To put this into context, the world's total population is estimated to grow to 9.7 billion by 2050. At the same time, water consumption is increasing by 2.5% per year faster than the world's population growth.

Energy and sustainability in the water industry

The water sector consumes 4% of electricity worldwide. If you look at one of the biggest operating costs — electricity — the savings potential becomes significant. Reducing energy expenditure will achieve greater synergies.

Organisations such as the Carbon Disclosure Project (CDP) or the World-Wide Fund for Nature (WWF) are demanding that companies demonstrate corporate water management and promote the responsible use of water resources.

When it comes to climate change, 25% more natural resources are currently being used than the Earth can yield at a sustainable rate. We need to create resilient and sustainable water supply for people and industries everywhere. The water sector has a double challenge in the face of climate change. On the one hand, the need to be more efficient by reducing energy consumption and prioritising the use of clean energies. On the other, encouraging a more efficient use of water both in the agricultural and urban sectors through public awareness campaigns or improved leakage management techniques.

The water industry's role in biodiversity and livelihood

Water is required to support biodiversity. Without sufficient and good quality water, stresses on species greatly increases biodiversity losses. In turn, biodiversity is critical to the maintenance of both the quality and quantity of water supplies, and plays a vital — but often under-acknowledged — role in the water cycle. Ecosystems and their biodiversity should not be viewed as consumers of water, but as essential elements of natural infrastructure within water management. Without ecosystems, and the complex biological relationships and processes that they support, the quantity

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and quality of global water resources will become severely compromised. The current paradigm, in which water and biodiversity are managed separately, is obsolete.

Managing this scarce resource

Today, 1.4 billion people worldwide are without access to basic sanitation. Worldwide, 240 million people are without access to an improved water source. Through its Access to Energy program, Schneider Electric invests in water solutions that enable universal access by deploying adapted offers for emerging countries. As an example, the company installed a solution for two wells converting energy from fossil fuel (diesel) which supplies sufficient water for irrigation at the Water Desalination Plant in El-Heiz village, Egypt. The project's main objective was to provide the inhabitants of El-Heiz community with two solar-powered wells to cultivate around 140 Feddans. This will help reduce the company's carbon footprint (CO_2 emission) by almost 38 tons annually.

With over 40,000 installations worldwide, Schneider Electric software can help water companies to intelligently manage water supply and sanitation operations in cities like London, Sydney, Shanghai, Las Vegas or Barcelona, to name a few. There are examples like:

- WaterForce, a New Zealand-based leader in sustainable water solutions, wanted to address the growing demand for water with a sophisticated, but easy-to-use, cloud-based water management solution that leveraged the Industrial Internet of Things (IIoT) to monitor and control geographically isolated assets. Deployment of SCADAfarm, an integrated automation and information management platform built on EcoStruxure and Microsoft Azure technologies, has led to increased visibility of irrigation system performance and status — for both farmers and WaterForce. With more control and visibility into operations, farmers reported up to 50% energy savings in the first season. Remote monitoring means farmers save significant time driving to inspect assets. Additionally, as a solution builder (OEM), WaterForce can now offer additional value-add services such as fault diagnosis and performance benchmarking.
- Shoalhaven Water is a large regional utility on the New South Wales South Coast covering an area of approximately 5000 km^2. Tied to the Shoalhaven City Council, the utility is responsible for the delivery of potable water with the majority from four large water treatment plants in both the north and the south, as well as numerous water reservoirs and dams, water pumping stations, valves and dosing systems. Overall, they treat and distribute approximately 45 million litres of potable water each day. By utilising Schneider Electric's EcoStruxure architecture, Shoalhaven Water mapped out a clear plan to bring quick delivery of Schneider Electric telemetry hardware and SCADA software enhancements to remote sites. This deployment has resulted in improved proactive maintenance capabilities through streamlined reporting and overall reduction in maintenance fees.

Aligned with the United Nations (UN)

Schneider Electric is proud to contribute to the achievement of the 17 UN Sustainable Development Goals, especially (SDG 6) for clean water and sanitation.

Access to water and sanitation are basic human rights and are critical sustainable development challenges. These challenges will only worsen and the impacts on people will only increase as competing demands for clean fresh water (agriculture, households, energy generation, industrial use, ecosystems) are exacerbated by the effects of climate change putting more pressure on water quality and availability.

Concretely, the company addresses this challenge by prioritising water efficiency across operations by installing best practice technologies for water conservation. Schneider Electric is helping its customers drive their efficiencies across the entire water cycle, better manage their assets, as well as reducing their capital and operational costs.

Clean drinking water will be more scarce and limited in the coming years. We must balance all of society's water needs while ensuring the poorest people don't get left behind. It is absolutely critical that we raise awareness to achieve both conservation and efficient consumption of our most precious resource now, before it is too late.

Schneider Electric

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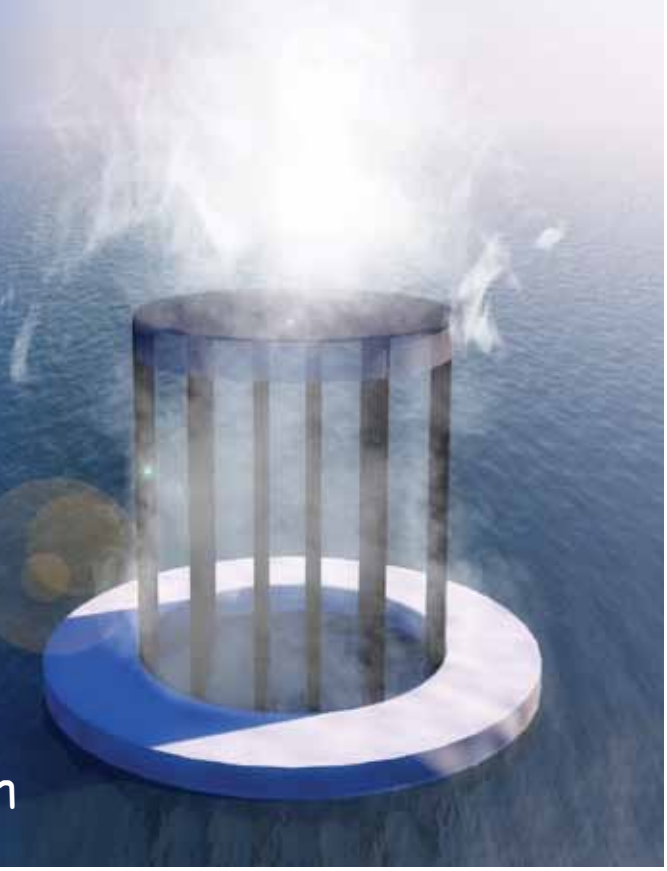
Fresh drinking water from bulk water – a solar evaporator solution



Researchers at the University of South Australia's (UniSA) Future Industries Institute have developed a promising new process that could deliver safe drinking water to millions of vulnerable people using low-cost sustainable materials and sunlight.

The team led by Associate Professor Haolan Xu has refined a technique to derive fresh water from sea water, brackish water or contaminated water through solar evaporation — delivering enough daily fresh drinking water for a family of four from just one square metre of source water.

"In recent years, there has been a lot of attention on using solar evaporation to create fresh drinking water, but previous techniques have been too inefficient to be practically useful," Dr Xu said.

"We have overcome those inefficiencies, and our technology can now deliver enough fresh water to support many practical needs at a fraction of the cost of existing technologies like reverse osmosis."

At the heart of the system is a highly efficient photothermal structure that sits on the surface of a water source and converts sunlight to heat, focusing energy precisely on the surface to rapidly evaporate the uppermost portion of the liquid.

While other researchers have explored similar technology, previous efforts have been hampered by energy loss, with heat passing into the source water and dissipating into the air above.

"Previously many of the experimental photothermal evaporators were basically two dimensional; they were just a flat surface, and they could lose 10 to 20% of solar energy to the bulk water and the surrounding environment," Dr Xu said.

"We have developed a technique that not only prevents any loss of solar energy, but actually draws additional energy from the bulk water and surrounding environment, meaning the system operates at 100% efficiency for the solar input and draws up to another 170% energy from the water and environment."

In contrast to the two-dimensional structures used by other researchers, Dr Xu and his team developed a three-dimensional, fin-shaped, heatsink-like evaporator.

Their design shifts surplus heat away from the evaporator's top surfaces (ie, solar evaporation surface), distributing heat to the fin surface for water evaporation, thus cooling the top evaporation surface and realising zero energy loss during solar evaporation.

This heatsink technique means all surfaces of the evaporator remain at a lower temperature than the surrounding water and air, so additional energy flows from the higher-energy external environment into the lower-energy evaporator.

"We are the first researchers in the world to extract energy from the bulk water during solar evaporation and use it for evaporation, and this has helped our process become efficient enough to deliver between 10 and 20 litres of fresh water per square metre per day," Dr Xu said.

In addition to its efficiency, the practicality of the system is enhanced by the fact it is built entirely from simple, everyday materials that are low cost, sustainable and easily obtainable.

"One of the main aims with our research was to deliver for practical applications, so the materials we used were just sourced from the hardware store or supermarket," Dr Xu said.

"The only exception is the photothermal materials, but even there we are using a very simple and cost-effective process, and the real advances we have made are with the system design and energy nexus optimisation, not the materials."

In addition to being easy to construct and easy to deploy, the system is also very easy to maintain, as the design of the photothermal structure prevents salt and other contaminants building up on the evaporator surface.

The system could be suitable for deployment in remote communities that can't afford other options.

In addition to drinking water applications, Dr Xu says his team is currently exploring a range of other uses for the technology, including treating wastewater in industrial operations.

"There are a lot of potential ways to adapt the same technology, so we are really at the beginning of a very exciting journey," he said.

Tweed Shire Council aims for net zero from electricity by 2030

Tweed Shire Council has committed to a two-year program of renewable energy and energy-efficiency works across its facilities.

In April, the council voted unanimously to move to phase two of its Renewable Energy Action Plan — which includes 10 solar projects worth more than $1 million with the aim to achieve net zero emissions from electricity usage by 2030.

There are already solar arrays installed at more than 20 council facilities with phase two set to almost triple the council's current solar capacity to more than 2200 kWp (kilowatts peak). This is expected to save up to $220,000 per year on energy costs.

Solar arrays installed at Aquatic Centre in Murwillumbah.

Solar projects in the second phase of the action plan will take place at:

- Tweed Regional Gallery Banora Point Community Centre
- Tweed Regional Aquatic Centre — Tweed Heads South
- Kingscliff Wastewater Treatment Plant
- Bray Park Water Pump Station
- Bray Park Water Treatment Plant
- Tweed Regional Museum — Records Storage Centre
- Murwillumbah Wastewater Treatment Plant
- Hastings Point Wastewater Treatment Plant
- Uki Water Treatment Plant

Projects at Banora Point Wastewater Treatment Plant and the Tweed Heads Administration Office were deferred from the initial phase of the plan and will also be completed over the next two years.

Mayor of Tweed Shire Chris Cherry said the council was working to respond to the challenges of climate change.

"Through a combination of energy-efficiency works, installation of renewable energy systems, carbon offsets and purchasing renewable energy we are aiming to meet Council's target of reducing electricity-related carbon emissions by 25% by next year (from 2016/17 baseline), 50% by 2025 and to have achieved net zero emissions by 2030," she said.

"The Renewable Energy Action Plan, launched in 2017, is designed to reduce Council's electricity grid use, provide operational cost savings and reduce Council's greenhouse gas emissions."

Other works the council is currently completing to reduce its carbon footprint include:

- replacing 5700 existing streetlights with energy-efficient LED lights;
- replacing 1800 older lights with LED lights at Council's facilities;
- replacing older equipment, such as water pumps, with new, more energy-efficient systems,
- Council also purchases around half of its electricity supply from NSW wind and solar farms after signing a 10-year agreement with energy retailer Flow Power in 2020.

Smart solar power hub heats up

More than 2500 smart meters have been deployed in homes across the Illawarra region of NSW under a plan to link with hot water systems to help manage the increasing number of residential solar PV systems across the electricity network.

The smart hot water program known as Off Peak + is being rolled out by NSW electricity distributor Endeavour Energy, in partnership with Australian and New Zealand metering provider and data intelligence business Intellihub.

The program will replace last-century ripple control technology to manage hot water load control, but also help regulate voltage across the grid — a potential impediment to increasing solar load being exported to the main electricity network.

The smart meter can also be used to dynamically control each hot water system by Endeavour Energy or any of the 10 electricity retailers participating in the program. This means hot water systems can be switched on to soak up solar energy on low-demand days when large amounts are being exported to the electricity grid.

The smart meters have been installed in homes supplied by Endeavour Energy's Albion Park Zone Substation. Data is now flowing from the meters to its network operation centre and further rollouts across homes in Western Sydney and the NSW South Coast are being planned.

Smart meters used to replace last-century technology

The Albion Park Zone Substation was commissioned around 1970 and powers 10,000 homes and businesses. About 25% of homes in the area have rooftop solar panels installed and more than 2500 homes connected to the substation also use electric hot water tank systems for their hot water needs.

A hot water load control unit at the substation sends a signal via the local electricity network to a receiver on customer switchboards, which turns their hot water systems on and off at different times of the night and day — it is known as a ripple control system. The system can only operate as a whole. Individual hot water systems are not operated as individual units.

The customer pays a cheaper tariff for their hot water energy use. In exchange, Endeavour Energy can defer electrical load outside peak times, which helps keep its substation operating within safe levels and defers the need for potentially costly capital upgrades.

This type of system has been in place in NSW since the 1950s. The hot water tanks effectively act as energy storage systems. About 6 MVA of electrical demand is supplied by this hot water load control at the Albion Park Zone Substation. About 85% of Endeavour Energy's zone substations are equipped with these sorts of systems, controlling the hot water supply for about 300,000 customers.

Rather than replace this ageing system with similar technology, Intellihub installed advanced smart meters in switchboards at the customer premises in Albion Park to communicate with each hot water system.

The solar sponge

Intellihub has designed systems to allow Endeavour Energy and any of the participating electricity retailers to turn on the hot water systems for additional time during the middle of the day.

It means retailers can develop virtual power plant-style products. For example, hot water systems can be used as solar batteries, where they are charged during the day when there is an oversupply of electricity in the market due to solar generation.

It means solar generated in the community on local rooftops will be shared and used locally via hot water systems. It will allow electricity retailers to offer innovative new products, with incentives for consumers to take part. The smart meter will also be able to support any future solar PV systems at customer premises.

Data is the key to facilitating increasing residential solar systems

It is hoped the program will facilitate the growing number of solar PV systems being

installed at homes across the country. Here, data is the key ingredient.

Australians are adopting solar energy faster than anywhere else in the world — up to 10 times faster. The number of systems is expected to triple by 2030.

Endeavour Energy expects that as many 35,000 of those systems will be installed in homes connected to its network each year.

At present most electricity distributors do not have visibility of power flows across their low-voltage street network. The increasing saturation of residential solar energy in many parts of Australia means excess energy flowing into the grid can cause problems with voltage regulation.

The networks cannot always see or predict when and where this is happening.

One way to manage this issue is to limit the number or size of solar systems being installed. Not an ideal solution for homeowners wanting to take part in the clean energy transition across the country.

An even harsher measure is to shut the systems down when required, or even cut power to whole areas to prevent damage to the network or maintain a safe supply.

The Off Peak + program offers a smarter alternative for industry, regulators and consumers.

It can provide access to real-time data about the state of the network at the street level and it will allow Endeavour Energy to manage the voltage on the network in a smarter, more dynamic way, to allow more and more solar to connect.

It will also alert them to problems with safety and reliability of supply.

Extending the benefits of smart meter technology

This use of smart meter technology is building on an already impressive tool kit of applications.

We know the technology enables remote connection services, monthly billing and the elimination of estimated bills via remote reading.

But we are now starting to understand a much larger suite of uses to help our shift to renewable energy.

Today, smart meters give insights in real time; optimise the home for solar, batteries and electric vehicles; and enable new services like demand response and virtual power plants and dynamic control of hot water.

They are fast becoming a key enabler of the clean energy transition that opens doors for community and household participation.

Intellihub

www.intellihub.com.au

Recycled wastewater gives koalas a home among the gum trees

Cameron Jackson from Urban Utilities looks after the new koala habitat (pictured with Mayor Tanya Milligan).

A four-hectare blue gum forest planted by Urban Utilities in Queensland's Lockyer Valley is thriving despite a tough start in life — great news for the region's koala population.

Cameron Jackson from Urban Utilities has been nurturing the 1600 native gum trees since they were first planted near the Helidon wastewater treatment plant in 2019.

"Our blue gums are real battlers," Jackson said. "As seedlings they survived Australia's hottest, driest year on record and they've also had to deal with ongoing drought. The trees are now more than two metres tall, which is really exciting.

"They've still got some growing to do but we expect the region's much-loved marsupials will slowly move into the new habitat over the next two to ten years."

Jackson said recycled water was key to the trees' survival, with the forest irrigated with an average of four backyard swimming pools' worth of treated wastewater every day.

"We're giving wastewater generated by the local community a second life by treating it at the nearby Helidon treatment plant before reusing it to water our thriving blue gums," he said. "So, when residents wash their hands, do the laundry or flush their loo — that water could be helping grow a new home among the gum trees for their local koalas."

Koalas are listed as 'vulnerable' in Queensland under the Federal Government *Environmental Protection and Biodiversity Conservation Act 2012*.

Lockyer Valley Regional Council Mayor Tanya Milligan said the council was proud to take part in the project by managing weeds and controlling pests around the koala habitat.

"We know koalas call Helidon home, so we want to protect the current population. We also want to do everything we can to see that population eventually grow," she said. "Koalas can eat up to a kilogram of gum leaves a day so expanding their habitat with forests like this one is essential.

"We're proud to work alongside Urban Utilities to help secure a sustainable future for the region's native wildlife for generations to come."

The blue gum plantation is expected to also attract wallabies, bandicoots and birdlife while also encouraging growth of native grasses and shrubs.

Urban Utilities
www.urbanutilities.com.au

Ice cream-inspired beer launched to support renewable energy

Ben & Jerry's and 4 Pines have joined forces to create a limited release, ice cream-inspired beer to support renewable energy community initiatives.

Brewed at the 4 Pines Brewery in Brookvale and inspired by Ben & Jerry's Chocolate Chip Cookie Dough flavour, this sweet and creamy lactose-infused golden brown nitro beer is a hard pour style.

With energy sourced from solar and wind via a power purchase agreement powering 4 Pines' Brookvale headquarters, the two companies have come together to support a community project with access to solar energy.

Collaborating with Australian community-owned power company Enova Community Energy, Ben & Jerry's and 4 Pines will support a solar installation for a community group. Enova will be seeking expressions of interest from community groups who are interested in receiving funding for solar installations from this partnership.

"Ben & Jerry's has long fought for a renewable energy future, and the partnership with 4 Pines provides a foundation for a sustainable solution with solar panels for the people and the planet — a choc chip cookie dough inspired one which is equally dough-licious and rewarding," said Stephanie Curley, Social Mission Manager, Ben & Jerry's Australia.

The Ben & Jerry's and 4 Pines project will also contribute to Enova's 'revolving community energy fund'. The community group will become a customer of Enova Community Energy. The 'revolving' part of the fund allows Enova to use the energy savings the community group makes from the solar installation to repay the cost of the solar panels to Enova over a period decided when the grant is made. With these repaid funds, Enova can fund more solar projects for other community groups in the future.

"For us, we want to leave the world in a better state than which we found it. As each year goes on, we're working to become a sustainable and community-minded brewery that can make a difference," said Andrew Tweddell, Head Brewer at 4 Pines.

The limited-edition nitro beer will be sold as single cans or in packs of four 330 mL cans or cartons of 24 while stocks last. It will also be available on tap in selected venues, and pouring at this year's GABS Craft Beer & Cider Festival in Sydney, Melbourne and Brisbane.

Battery-powered vehicles
now making inroads into plant equipment

Berin Russell

Plant vehicles are typically heavy duty, being initially drawn on animal power, such as from horses. Since then, we've seen the invention of portable steam-powered engines, which led to internal-combustion engines running on kerosene and ethanol. Today, diesel engines are dominant, but these may soon be a thing of the past as battery-powered electric vehicles have materialised and are quickly becoming increasingly popular.

Following the introduction of Toyota's first mass-produced Hybrid, and Tesla's fully electric cars, we are now seeing an increasing number of mainstream car manufacturers introducing electric vehicles and hybrid cars in their product offerings.

When we think about plant equipment, it's natural to visualise dirty, heavy-duty machinery, running inefficiently and notoriously environmentally damaging. It's no surprise then that electrically powered plant vehicles are emerging, tackling many of these known issues.

Advantages of electric over diesel-run engines:

- There are numerous benefits that a battery-powered vehicle offers. One of the most obvious is that it is much cheaper to run, with less-frequent maintenance required compared with a diesel-powered engine. Some batteries for industrial machines promise zero operating and maintenance costs, eliminating downtime.
- Significantly reduced carbon emissions are much better for the environment. Studies have shown that, on average, electric vehicles emit almost three times less CO_2 than equivalent petrol- or diesel-powered vehicles. Diesel, in particular, when burned, produces many harmful pollutants and emissions.
- Battery-powered engines allow for energy independence as electricity can be a renewable resource. This translates into considerable savings on fuel costs.
- Improved charging systems allow for opportunity to conveniently charge at commercially available charging stations.
- The latest battery-powered machinery, such as the lithium-ion battery system, has developed excellent autonomy. Designed to give machinery maximum uptime and clean, trouble-free operation without the need for frequent charging, some systems will even operate a full shift on one charge.
- Less noise pollution. Quieter than gas or diesel-run vehicles, battery-run plant equipment enables operators to work in built-up areas, even at night-time.
- Significant improvements can be seen in workplace health and safety due to low voltage, with some electric machinery operating at zero risk.
- New 3G systems allow for remote day-to-day control of the vehicle around the world, analysis of the machine's performance for diagnosis, software updates and modifications to the battery settings.

If done well, as some of the plant vehicle manufacturers are proving, machinery can be 100% electric yet match the performance of other machinery that runs on an internal-combustion engine.

In Australia, many councils are already trialling battery-powered electric plant equipment, such as the Dulevo D.zero street sweepers, for their many clean benefits to the environment, energy efficiency, noise reduction as well as overall savings from maintenance and fuel costs.

We've come a very long way in the development of plant equipment — from horse, to steam and diesel, to electric-powered vehicles. It's fair to say that this is just the beginning, as technological advances will further improve how we can become even more energy efficient and independent in the future. Stay tuned!

Sweepers N Scrubbers
www.sweepersnscrubbers.com.au

PORTABLE MULTIPARAMETER WATER METER

Hanna Instruments' Multiparameter pH/EC/DO Portable Meter with Bluetooth and optical DO technology (HI98494) combines rugged meter design with advanced digital sensors for testing up to 12 different water quality parameters, making it suitable for environmental testing.

Using the fluorescence quenching technology featured in the optical dissolved oxygen sensor, the meter is designed to offer accurate readings over long periods of time without the need for frequent calibrations or warm-up time. Other advantages of the device: no handling of electrolytes or membranes required; not flow-dependent; no consumption of oxygen from the sample; not affected by sunlight.

With the integrated Bluetooth connection, users can quickly transfer data wirelessly to a smart device with the Hanna Lab App.

Tougher by design, the HI98494 features an IP67-rated meter with a strong ABS body and an IP68-rated probe with a stainless steel protective guard.

The HI98494 has a dual-power management system that will automatically switch to the 1.5 AA alkaline batteries when the built-in lithium-ion rechargeable battery is low.

Hanna Instruments Pty Ltd
www.hannainst.com.au

DATA LOGGER

Bestech Australia offers the DCX-22 ECO from Keller — a submersible, battery-powered, autonomous data logger designed for recording pressure and temperature over long periods of up to 10 years. Housed in a 22 mm stainless steel tube, the sensor can be used with a second data logger to act as a barometric pressure sensor to compensate for the influence of barometric pressure in shallow water depths.

The sensor is designed with the latest microprocessor technology to offer high-resolution signals. This feature allows for data linearity and temperature errors to be mathematically compensated. It also offers non-volatile memory storage, which should ensure high data security.

The collected data can be retrieved by firstly recovering the data logger from the deployment point. Then the end cap, which is sealed by two O-rings, is removed to access the serial interface to collect the data. The battery is rechargeable via USB connection with the serial K-114M converter connected to the PC.

The DCX data logger is paired with KOLIBRI software for reading and visualising data as well as conducting analysis such as differential pressure calculation. The sensor can be configured to only collect useful data or record data at shorter intervals. It can also be set to save the installation data and location where the sensor is deployed.

The measurement range is 0.8–1.3 to 0.8–11 bar, with 0.1% typical accuracy.

Bestech Australia Pty Ltd
www.bestech.com.au

THERMAL ENERGY METER

The Series UBT Clamp-on Ultrasonic Thermal Energy Meter is an economical clamp-on ultrasonic heat meter which offers an ultrasonic alternative to the traditional inline thermal energy meters. The series uses temperature sensors for energy measurement and ultrasonic waves, with time differentials for flow measurement.

Product applications include building services, energy management and heat/energy metering for energy management or building services utilising chilled water circuits.

Dwyer Instruments (Aust) Pty Ltd
www.dwyer-inst.com.au

ACT suburb required customised solution for potable water tank

Eductors can be a game changer when it comes to mixing liquids in suspension because they can eliminate the need for mechanical devices. But, finding the right eductor that's suitable for large tanks can be challenging so that's where a bespoke designed and manufactured eductor solution may be required.

The developer of a new residential area in the ACT required custom designed and manufactured eductors to suit the requirements of its 900,000 L potable water reservoir. As part of the design process, the eductors were required to accommodate precise specifications such as:

- water velocity;
- a flange to suit the pipework; and
- capacity to mix liquids in such a large tank.

Tecpro Australia provided the solution — giant cast 316 stainless steel eductors.

The custom-manufactured eductors are mounted to the bottom of the potable water tank. Liquid is cycle pumped into the tank through the inlet of each eductor. 'Veins' located part way down the eductor draw the surrounding liquid, mixing it and distributing it to the tank through the outlet of the eductor to ensure constant circulation.

As there are no moving parts, the eductors are maintenance-free, while the pumps used to fill the reservoir are located outside the tank. Feedback from the client was positive with "everything performing well, looking good and final commissioning underway".

Tecpro Australia solutions are derived from both its range of off-the-shelf products as well as customised designs.

Tecpro Australia
www.tecpro.com.au

A J Bush upgrades wastewater treatment plant

A J Bush & Sons (Manufactures) is one of Australia's largest east coast protein recovery providers, operating rendering and manufacturing plants in NSW and Qld. The plants specialise in processing animal by-products for the meat/butchery industry. The NSW (Riverstone) plant's collection area, in addition to Sydney Metro, ranges from Nowra in the south to Canberra, Dubbo and Bathurst inland and up to Newcastle and Tamworth in the north. The material collected is recycled into products used for livestock, pet food, aquaculture, fertiliser and biofuels.

A J Bush's Riverstone plant has undergone numerous upgrades over the years, aligning with company goals of minimising waste, reducing the risk of pollution (odour) and continuous improvement in providing a safe work environment for employees. As part of this program, Plant Engineer Nick Lawrance contacted Hydro Innovations for advice and assistance in replacing ageing surface (floating) aerators on the plant's wastewater treatment system. Lawrance wanted an aeration system that could be monitored and maintained from the lagoon banks and provide a safe environment that operators could attend to maintenance and keep the aeration system at peak operational efficiency.

Hydro Innovations proposed a Venturi aeration system as an alternative to traditional surface-floating aerators which have always been considered difficult and potentially hazardous to service or maintain. These surface aerators are usually connected to a lagoon bank by cables and generally require operators to 'paddle out' in a small boat to carry out any work.

It was emphasised that by using Venturi aerators, asset owners can minimise WHS risks and reduce maintenance and operating costs when compared with surface (floating) aerators.

Venturi aerators can produce the desired level of mixing and dissolved oxygen with all the equipment located on the banks of lagoons/ponds, not in or on them.

The rendering plant had been operating five floating units and when one of these failed it was decided to install a Venturi aeration system to trial the effectiveness and operation of the system.

After just a month of operation, significant results had been achieved especially in the reduction of surface scum, maintaining required dissolved oxygen levels, improved operating efficiencies and contributing to lower odour levels.

The other obvious benefit of the newly installed 'bank mounted' Venturi aeration system is the ability to quickly, safely and easily inspect the system or make any adjustments to the operation of the equipment if required, ensuring a safer working environment for operators.

Lawrance is pleased with the results and is considering replacing the balance of the old system to bank-mounted Venturi Aerators.

What is a Venturi aerator?

A Venturi aerator is a device used to mix and aerate tanks, ponds and lagoons; it uses Bernoulli's principle, whereby a low pressure area is created by an accelerated fluid.

The Venturi aerator is used in conjunction with a self-priming pump.

The pump draws water from the source and pumps it into the Venturi aerator.

Within the aerator, there is an 'acceleration zone' where the pumped fluid is accelerated, creating a low pressure area within the 'aspirating zone'.

Here, it draws in atmospheric air at the rate of 2.2 times the rate of the fluid being pumped.

The air and water then passes into the 'mixing and oxidation zone' where the wastewater and air are mixed under pressure.

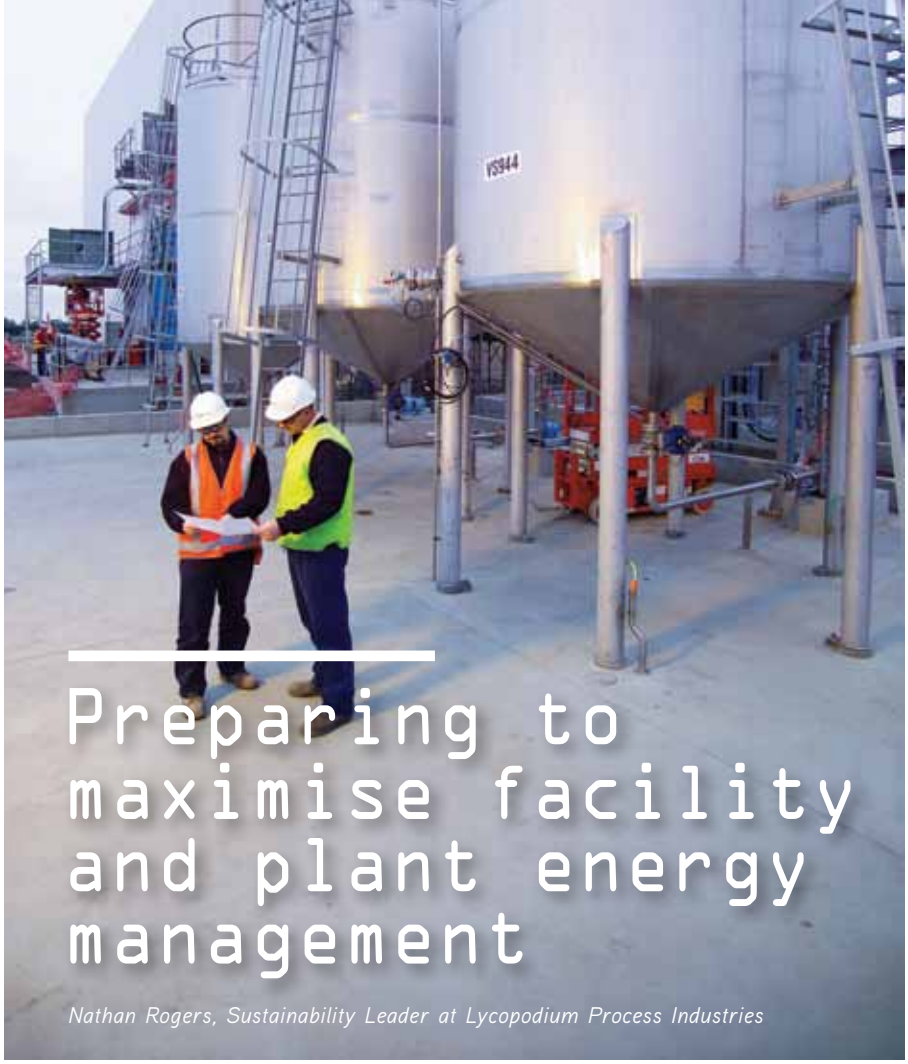
The turbulent mixing facilitates the removal of substances with weak Henry's constants such as CO_2 and VOCs.

It also oxidises sulfur-containing molecules such as hydrogen sulfide and mercaptans for effective odour and corrosion control, as well as reducing the size of organic molecules.

The fluid, saturated with dissolved oxygen, is then pumped back into the source.

Because of the nature of the system (using a self-priming pump), mixing and destratification is controlled by the positioning of the suction and discharge of the pump. Water can therefore be drawn from anywhere and at any depth of the tank or lagoon, and can be discharged anywhere at any depth.

Hydro Innovations
www.hydroinnovations.com.au



Preparing to maximise facility and plant energy management

Nathan Rogers, Sustainability Leader at Lycopodium Process Industries

I reflected recently that it's impossible to expect industrial facility operators to remain fully acquainted with cutting-edge energy efficiency developments. It is perhaps more accurate to describe this expectation as unfair, rather than impossible. It's unfair to expect that an operator will have the time, the data, the tools, the knowledge, the budget and the trusted suppliers to assess every possible energy alternative — whilst also conducting their day job of keeping the facility running efficiently and effectively.

Let's take a look at the above list in greater detail, as we address how an operator can become energy-management ready, to give themselves and their facility the best chance at energy-efficient operational success.

Time

Always a delicate balance, time in this context means that energy management must be a part of the operator's position description and that they can devote dedicated time to the task. The best way to gain buy-in for adding energy management to the position description is to communicate the benefits of energy management: reinforcing your social licence to operate; sustainability credentials (internally and externally); that it is looked on favourably by regulatory authorities; and the obvious fiscally responsible component of reducing energy costs.

Data

As the old saying goes: if you can't measure it, you can't manage it. This step is vital to performing effective energy management. Ensuring that your facility has sufficient metering and monitoring equipment (and that it is correctly calibrated) will provide a clear picture of how your facility operates. Many modern control and SCADA systems may have data gathering and storage functionality available already.

Tools

All the data in the world will be useless without the capability to interpret and use that data. Do you have the right analytical software tools to easily turn raw data into a readable/understandable form to make the right decisions about where opportunities lie and how significant an opportunity is?

Knowledge

You have the time, the information and the necessary tools — but do you know what to do next? How to draw conclusions from the information you've generated? A web search will uncover courses available for energy managers — try to focus on courses from credible institutions that are endorsed by associations and councils within the energy management industry. These institutions may also be able to provide case studies for your particular facility type, where you can research and make contact with others who have achieved success.

Budget

Similar to the Time section, a financial business case should be presented to management. Beyond that, grant funding is frequently made available at the state and federal level for energy improvement opportunities. Subscribing to these departments' mailing lists will keep you informed of when an opportunity may present itself to gain additional funding for your project.

Trusted suppliers

Again, unless you can contact industry bodies or associations for a trusted list of technology and solution providers you may be hard-pressed to navigate who is genuine and who is not.

Options

Without the support of management, receiving the necessary time and/or budget may prove too difficult for operating personnel to frame appropriately into a planned strategy. In such instances it might make sense to outsource to a consultant with a strict contract in place, ensuring that any upgrades that move to implementation are covered by an energy performance contract. This links the consultant to some or all of the financial risk if the benefits are not realised.

Whilst it is unfair to expect operators to be across all aspects of energy management, most are intimately aware of the nuances of their facility and in many cases have significant ability to input into an energy assessment process. As such it is important to harness their involvement and knowledge; these tips should help guide them into taking the first steps towards planning for the success of future energy-saving projects.

Lycopodium Process Industries Pty Ltd
www.lycopodium.com/LPI

Eat, pray, repurpose

Laini Bennett

Before launching her food rescue organisation, OzHarvest CEO Ronni Kahn AO had a series of careers that spanned two countries and three decades. Then one day, she discovered her true purpose. In this interview with Laini Bennett*, Kahn provides insights into her journey of self-discovery and her leadership lessons learned.

When OzHarvest CEO Ronni Kahn AO was 23 years old, she was married, living on a kibbutz in Israel and looking for inspiration.

After finishing high school, she had followed her boyfriend to Israel to study for a year. Then, lacking direction, she followed him to the kibbutz. While she enjoyed the lifestyle, Kahn longed for a fulfilling career.

Unsure how to shift the status quo, but seeking a change, she and her sister visited a hair salon. Kahn says she walked into the salon with lanky long hair and walked out looking like she'd put her finger in an electricity socket.

"Whoosh! I had a big afro," she laughs. The flattering new look had a dramatic impact on her confidence.

"Suddenly I walked differently, felt more gracious within myself — and people related to me so differently," Kahn said. Overnight she became visible, and within a few weeks, she had a new role in the kibbutz's accounts department.

While Kahn said the perm is a superficial lesson in self-confidence, her transformation was the beginning of a journey of self-discovery, one that she shares in her recently released biography, *A Repurposed Life*.

From your mouth to my ear

Kahn was born in apartheid South Africa, the youngest of three daughters. Growing up she was shy, afraid to voice her opinions and unable to value her own intellect.

While her parents were loving and supportive, they were also pragmatic. Life dealt them a blow when her architect father was in an accident that left him hospitalised for months, turning her mother from homemaker to breadwinner overnight. As a result, they wanted financial security for their girls, encouraging them into stable, reliable careers like nursery teaching. While her two sisters pursued this path, Kahn wanted to become an artist or an architect like her father. Her parents told her she lacked the talent.

"This is why what we say as a parent or as an adult, what we say as a leader, is so important, because it impacts every single person that listens to you, hears you, watches you," Kahn said. "Your actions and your words need to always be in alignment."

Permission to succeed

After two decades in Israel, Kahn and her family moved to Australia and started over once again. Her ability to build new lives and new careers — in different countries no less — culminated in the strength of character, street smarts and business nous later required to found OzHarvest and develop it into one of Australia's leading food rescue organisations.

Indeed, Kahn's position as OzHarvest CEO is the pinnacle of a series of roles she has held throughout her life, including farming, teaching, sales and retail, floristry, fashion design, interior design and event coordination.

Kahn says that ultimately, she needed to give herself permission to be who she wanted to be. "In a funny way, the perm was one of those triggers," she said.

Finding her purpose

While running her events business in Sydney, Australia, Kahn became increasingly disturbed by the enormous amount of leftover food going to waste. One huge corporate event, in particular, saw entire food stations virtually untouched. She said this was the night that changed everything.

Kahn's first step was to drop the food at local homeless shelters. However, it was a visit to South Africa in November 2003 that crystallised the future for her.

OzHarvest's goal is to stop food going to waste and to deliver to people in need. The OzHarvest team, together with over 3500 volunteers, collects and redistributes quality surplus food from a network of donors, from supermarkets and restaurants, to airlines and hotels.

Kahn, together with pro-bono lawyers, has successfully lobbied to have the law changed in several Australian states, allowing food donors to donate surplus food to charities without fear of liability.

OzHarvest's model includes educational and sustainability programs for vulnerable people and a free supermarket in Sydney that encourages visitors to 'take what you need, give if you can'.

COVID-19 saw increased need in the community. In the past year alone, through its various programs, OzHarvest delivered 38 million meals and diverted more than 10,000 tonnes of food from going to landfill.

The not-for-profit is committed to halving food waste by 2030.

There, she learned that close family friend Selma Browde had been responsible for bringing electricity to Soweto, a black township. The fact that one person could have such a profound impact on so many lives sent a bolt of realisation through Kahn. Suddenly she understood that she, too, could make a difference. She'd found her purpose. A year later, OzHarvest was born.

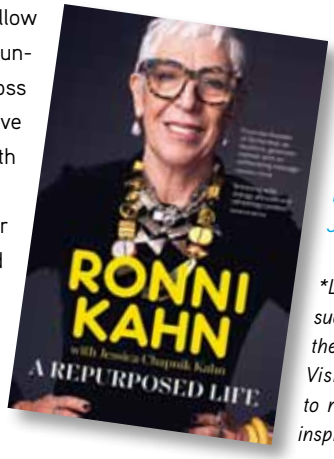
A bright yellow shining light

Approaching 17 years since its foundation, OzHarvest's distinctive yellow vans with their 'Nourish our Country' logo can now be seen across Australia, and sister branches have been established in the UK, South Africa and New Zealand.

Once too shy to voice her own opinions, Kahn is a lead spokesperson on Australia's food waste problem, regularly appearing in the media and in an advisory capacity to the government. She is a keynote speaker all over the world, inspiring people to find their own purpose.

Now a self-described silver vixen, Kahn no longer needs a perm to boost her confidence. Like the food that OzHarvest saves and repurposes, she has found her path and repurposed her life.

"I think we all have an ability to rewrite our story, and we sometimes just need one little success, one trigger, that can shift and change our path. We should never think that because we're on one path that we can never change," Kahn said.



Read about Kahn's life, her many adventures and journey of self-discovery in A Repurposed Life, *by Ronni Kahn with Jessica Chapnik Kahn.*

**Laini Bennett interviews successful career women about their leadership lessons learned. Visit lainibennett.com to read more stories about inspiring women.*

Pollen sponge soaks up water contaminants

Oil spills are difficult to clean up and can result in damage to a marine ecosystem. Now, a promising 'eco-friendly' sponge alternative has been developed from sunflower pollen to help tackle this problem.

A team of scientists led by Nanyang Technological University, Singapore (NTU Singapore) has created a reusable, biodegradable sponge that can soak up oil and other organic solvents from contaminated water sources.

To form the sponge, the NTU team first transformed the pollen grains from sunflowers into a pliable, gel-like material through a chemical process akin to conventional soap-making. The process resulted in the formation of pollen sponges with 3D porous architectures.

To make sure the sponge selectively targets oil and doesn't absorb water, the scientists coated it with a layer of stearic acid (a type of fatty acid found commonly in animal and vegetable fat). This renders the sponge hydrophobic while maintaining its structural integrity.

In lab experiments, the scientist demonstrated that the sponge has the ability to absorb oil contaminants of various densities, such as petrol and motor oil. It was found that the sponge had an absorption capacity in the range of 9.7 to over 29.3 g/g.[1] This is comparable to commercial polypropylene absorbents, which are petroleum derivatives and have an absorption capacity range of 8.1 to 24.6 g/g.

The sponge was also tested for its durability and reusability and it was found that it could be used for at least 10 cycles.

The research team, made up of scientists from NTU Singapore and Sungkyunkwan University in South Korea, believes that these sponges, when scaled up, could be an eco-friendly alternative to the current options.

"Using a material that is found abundantly in nature also makes the sponge affordable, biodegradable and eco-friendly." said Professor Cho Nam-Joon from the NTU School of Materials Science and Engineering, who led the study.

The findings from the research were published in *Advanced Functional Materials* in March.

1. g/g is a unit of measurement for absorption capacity. It refers to how many grams of contaminant can adhere to per gram of the material that absorbs.

Vertical renewables in Melbourne

Beulah's Paragon tower in Melbourne's CBD will be home to one of the largest vertical solar panel systems in Australia.

b.energy was appointed to design, construct, operate and maintain the 128 panels installed on the core walls of the tower, which are set to outperform similar developments in terms of emissions reduction, cost reduction and green energy sustainability.

The 42 kW system spanning 158 m^2 is vertically installed on the core walls of the tower and comprises 128 Trina Solar HoneyBlack 325 W monocrystalline modules to generate c30 MWh. It was designed to make efficient use of the latent building lift core and fluid dampening tanks options amidst constrained rooftop building services space.

Beulah Executive Director Adelene Teh said this addition to the luxury tower is important to ensure that Beulah continues its journey towards sustainable developments with reduced carbon footprints.

"We are so proud to offer Melburnians a remarkable new tower with a landscape of social spaces that introduce sophisticated design to Melbourne living and entertainment," said Teh.

"Paragon offers sophisticated living that residents can feel good about, with the implementation of a stellar solar system that means their lifestyle will have a low impact on the environment."

The utilisation of the tower's vacant space is not only innovative but is also an attractive value-add that differentiates the tower's embedded renewables offering which, in turn, is an enticing cost saving to prospective residents, the OC and the developer.

b.energy Chairman James Dunstan said, "The combination of a painted lift core and stylish HoneyBlack modules have not only markedly complemented the building design aesthetics, but will assist in reducing common property electricity costs.

"Whilst electricity production would generally be closer to c56 MWh for flat or degree-mounted systems, generating c30 MWh far exceeds the renewables that could otherwise be achieved on the constrained rooftop," he said.

Due to be home to 227 residences, Paragon is scheduled for completion within the next month.

b.energy
www.benergy.net.au

WHY IS WORKPLACE RECYCLING SO HARD TO GET RIGHT?

In Australia, every year over 20 million tonnes of waste goes to landfill from the commercial and industrial sector according to the National Waste Report 2020. The report also shows that while recycling rates are increasing so is the volume of waste produced overall. So it really comes as no surprise that recycling and sustainable business practices have become a social requirement for being in business and remaining competitive. However, recycling is at best imperfect and confusing, particularly when it comes to the workplace.

While most of us recycle at home, in the workplace people can become disengaged and thoughtless as they hustle through their workday surviving on caffeine and lunch from the deli next door. In an office where individuals aren't required to take out the rubbish at the end of the day, it can be hard to see the cumulative impact of individual decisions. Or worse, ineffective systems that make it simple for users to place all of their waste into a general waste bin such as desk bins.

Workplace recycling is further complicated by the industry as a whole; we have a long way to go in the way we design products and their packaging, standardising the collection and making it widely available.

Take soft plastics, for example. This is a material that businesses produce in large quantities from bubble wrap, food and other packaging — it begins to add up. Most large-scale waste management organisations don't collect it as it's not a profitable waste stream. Issues such as these make it difficult or near impossible for organisations to impact their workplace waste beyond the common recyclables. Should it be the organisation's responsibility to tackle industry-level issues?

Yes and no. As a business we have the responsibility to procure thoughtfully, purchasing with confidence that there is an end of life solution where possible. The good news is that there are already pioneers out there who are tackling many of the hard to recycle materials.

Recycle Smart, for example, operates across Sydney with organisations and households to collect hard to recycle materials including e-waste, soft plastics, textiles and other miscellaneous items from books to CDs.

It can seem so simple at times, but it takes an investment in getting the infrastructure set up and an ongoing commitment to review and adjust to meet the needs of your space.

Method worked with McConnel Dowell, a partner on the Western Program Alliance (WPA) Level Crossing, to implement a 5-stream Method Recycling System complete with custom signage. They dedicated a project manager to ensure that the recycling system was not only effective but a turn-key solution that they could use at their other sites.

To achieve this they knew it was important to consider the waste management supply chain and how to set up their system to ensure that the materials maintained their quality during recycling.

Going this extra mile to ensure extra waste streams can be recycled was initially a challenge. However, once they knew how the waste processing facilities needed waste and recycling to be separated, they were able to confidently establish additional bins for segregating materials that would otherwise be 'comingled' or 'landfilled'.

The results really spoke for themselves. Within the first week of rolling out a 5-bin system, their waste to landfill was reduced by approximately 80%. In particular, the customised signage above the bins, education and encouragement around recycling has exceeded expectations. The intuitive system of recycling bin stations has reduced contamination rates to an incredible 2%.

Keeping your team engaged

Method's beautiful recycling system brings recycling and waste out into the open to make users more conscious of their waste. Further, by creating stations out of the 60 and 20L bins you can create consistency across your spaces to help make recycling an unconscious habit.

Better yet, Method's award-winning bins are made to last from Polypropylene, including 50–70% recycled materials and are fully recyclable at the end of their life.

If you're looking to get your workplace waste sorted (pun intended) the Method team would love to work with you: methodrecycling.com.

Method Recycling Australia Pty Ltd
www.methodrecycling.com

method
methodrecycling.com

Improving waterway health

Established by aquatic ecology experts from the University of Melbourne, Bio2Lab is at the forefront of environmental monitoring in Australia. Harnessing the latest IoT and sensor technology, integrated with its own analytics platforms, Bio2Lab specialises in detecting, monitoring and identifying harmful pollutants in waterways.

Combining their expertise with M2M Connectivity, as their lead technology partner, has recently seen them achieve a breakthrough — helping Environment Protection Authority (EPA) Victoria tackle pollutants impacting Merlynston Creek, which connects to the Yarra River.

Challenge

For the past 15 years, pollutants including oils, nutrients and heavy metals have been dumped or spilt into a stormwater system in Melbourne's northern suburbs — making its way into Merlynston Creek, which flows through suburbs including Campbellfield and Broadmeadows. EPA Victoria has closely monitored water quality as part of its response to incidents and investigations, using traditional testing methods; however, this data is often spatially limited, and intermittent, as it requires manual sample collection and analysis at laboratories. Through the manual collection of water samples, EPA officers were able to confirm the presence of pollutants, but without real-time data they could not accurately establish patterns which might pinpoint potential sources.

Solution

In 2020, EPA engaged Bio2Lab with a view to developing a real-time monitoring solution as part of a trial project. To create a system which could perform in such a harsh environment, Bio2Lab contacted IoT connectivity experts M2M Connectivity.

Working together, Bio2Lab and M2M identified a suite of hardware which would aid the accurate detection of pollutants, survive being submerged in the creek, but also enable data to be captured and wirelessly transmitted back to EPA at regular intervals.

M2M Connectivity recommended Libelium's Smart Water Ions | Plug & Sense solution meter, which formed the heart of the system acting as an 'electronic nose'. For data transmission, M2M supplied SIMs using 3G and 4G to transmit data back to the online dashboard reporting for EPA in 15-minute intervals. The hardware was then integrated with their online data analytics platform — creating a consistent and clear picture of the water's quality and profile.

The final solution encompassed a network of Libelium sensors stretching 10 km along the creek.

"These are some of the harshest conditions that sensors could be put under — being subjected to everything that comes down the drain — and the hardware provided by M2M Connectivity has proven accurate, durable and reliable," said Steve Marshall, Principal Scientist at Bio2Lab.

Outcomes

EPA has been able to accurately identify numerous chemicals and pollutants present in the creek, including copper, petroleum and ammonia, using the data delivered by the Bio2Lab–M2M Connectivity collaboration.

They have also been able to establish patterns associated with the presence, and absence, of pollutants. For example, spikes in volatile compounds have been detected on specific days of the week and certain chemical profiles have given them insight into the industries which are using them — before they enter the waterway.

Another key outcome for EPA has been its ability to act when harmful pollutants are detected — increasing the speed at which they can respond, notify businesses and inform the community.

Following the success of the trial, Bio2Lab and M2M Connectivity have formed an ongoing partnership focused on applying the best technology to achieve good environmental outcomes for government, industry and the broader community.

"Our partnership with M2M Connectivity has given EPA new tools to understand pollution issues building one of the first real-time IoT sensing system successfully applied to chemically specific sensors in stormwaters in Australia," said Steve Marshall, Principal Scientist at Bio2Lab.

"Working with M2M, we have been able to successfully help the EPA move from being reactive to proactive and given them the data they need to effectively manage the environmental impacts on the creek and plan for its recovery in the future," Marshall added.

M2M Connectivity

www.m2mconnectivity.com.au

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The power of mushrooms
to create healthier waterways

A trial of a fungi-based floating wetlands solution to create healthier, cleaner waterways is underway at the Royal Botanic Gardens in Melbourne.

Affectionately known as 'mushi' (pronounced moo-shi), the three floating wetlands of interlocking triangular-shaped modules have been designed by local engineers, researchers and architects.

Instead of using traditional plastic, this version is based on mycelium — the underground network of fungi — combined with organic matter.*

Above the water, the dense foam-like mushi is planted with native wetland species becoming a habitat for birds and insects, while underneath, the plant roots absorb excess nitrogen and phosphorous. The wetland prototype is the result of a research and design collaboration by studio edwards, Arup and Swinburne University of Technology.

The team has taken the mycelium wetlands from a theoretical concept, shortlisted in the Victorian Design Waste Challenge in 2019, to a living prototype after testing structural options and plant types. They will be monitoring and assessing it over the next three months.

"We were looking for ways to replace plastic in waterways: floating wetlands are a proven technology to help clean water but the traditional way of producing them, using plastic, creates other contamination issues when it inevitably degrades," said Alex Reilly, Environmental Engineer, Arup Melbourne.

"The objective was to find an alternative to plastics using organic matter and waste to produce a product which would become a habitat for wildlife and allow the plants to absorb pollutants in the water.

"Mycelium can be strong, light, resilient, non-toxic and moulded into different shapes. Arup has been developing concepts using mycelium as a building, insulation and acoustic material for several years."

Swinburne researchers Canhui Chen, Daniel Prohasky and research assistant Joshua Salisbury-Carter contributed to the artificial wetland's structural design and fabrication. They investigated the relationship between the geometric design and the buoyancy of the wetland, as well as the material durability of the mycelium composite for outdoor use.

"The final product was prototyped and manufactured at Swinburne ProtoLAB, with the support of Swinburne architecture graduates," Canhui Chen said.

Tim Entwisle, Director & Chief Executive, Royal Botanic Gardens Victoria, said, "I'm always happy to trial environmentally sensitive ways to manage the Gardens, and I look forward to seeing the results.

"This technology could be a good complement to our working wetlands system, which currently harvests stormwater from surrounding streets."

**The floating wetlands use mycelium, the fast-growing 'roots' or, more accurately, the 'feeding body' of fungi — combined with organic matter. The mycelium is from Reishi or Lingshi fungi (*Ganoderma lucidum *group), providing a robust, versatile and sustainable material. The mycelium is set within specially designed moulds and expands as it dries to form the structure of the floating wetland.*

Arup

www.arup.com.au

From barbershop waste to solar cell protection

Professor Hongxia Wang.

QUT researchers have used carbon dots from human hair waste sourced at a Brisbane barbershop to create a kind of 'armour' for solar technology. It has been shown that these carbon nanodots could be used to improve the performance of perovskites solar cells.

The research study, led by Professor Hongxia Wang in collaboration with Associate Professor Prashant Sonar of QUT's Centre for Materials Science, was published in the *Journal of Materials Chemistry A*.

Perovskites solar cells are a relatively new photovoltaic technology but are predicted to be able to create highly efficient solar electricity in coming years. They have already proven to be as effective in power conversion efficiency as the currently available monocrystalline silicon solar cells, but hurdles still to overcome include making the technology cheaper and more stable.

Unlike silicon cells, they are created with a compound that is easily manufactured, and as they are flexible they could be used in applications such as solar-powered clothing, backpacks that charge devices on the go and even tents that could serve as standalone power sources.

The QUT team used the carbon nanodots on perovskite solar cells out of curiosity, as they had previously found that nanostructured carbon materials could be used to improve a cell's performance.

After adding a solution of carbon dots into the process of making the perovskites, Professor Wang's team found the carbon dots forming a wave-like perovskite layer where the perovskite crystals are surrounded by the carbon dots.

"It creates a kind of protective layer, a kind of armour," Professor Wang said.

"It protects the perovskite material from moisture or other environmental factors, which can cause damage to the materials."

The study found that perovskite solar cells covered with the carbon dots had a higher power conversion efficiency and a greater stability than perovskite cells without the carbon dots.

Professor Wang has been researching advanced solar cells for about 20 years and working with perovskite cells since they were invented about a decade ago, with the primary objective of developing cost-effective, stable photovoltaics materials and devices to help solve the energy issue in the world.

LOW-CARBON CONCRETE

Holcim has launched ECOPact, a low-carbon concrete product range which is designed to reduce the embodied carbon of buildings, infrastructure and homes.

Currently, 20% of Australia's annual greenhouse gas emissions derive from construction, with building materials a key contributor.

ECOPact is claimed to reduce embodied carbon by 30 to 60% compared to the Australian National Life Cycle Inventory Database basecase. The range includes the option to achieve carbon neutrality through ECOPactZERO, which uses accredited carbon offsets through Climate Active to reduce embodied carbon by 100%.

ECOPact and ECOPactZERO are designed to make it easy for users to meet evolving tender requirements that stipulate embodied carbon reductions.

Holcim's ViroDecs Environmental Product Declaration (EPD) provides users with the ability to understand the impact of the materials supplied into their projects. EPDs are independently verified and registered documents that communicate transparent and comparable data about the life-cycle environmental impact of products.

Every ECOPact product is supported by an EPD.

Holcim (Australia) Pty Ltd
www.holcim.com.au

CONDUCTIVITY MEASUREMENT DEVICES

Hawker Electronics' conductivity measurement devices range from the E13 heavy-duty single holder — manufactured in alkaline-resistant phenolic for sewage applications with the facility to adjust the electrode internally ±350 mm to allow for summer and winter variances of level — to the small E14 multiholder in polypropylene, suitable for bund leakage detection, dry wells and header tanks.

Borehole electrodes are also available, with water quality approved cable and mini pressure tight electrode holders. Electrodes are available in different materials to suit a wide range of chemical applications. Holder brackets to steady components such as electrode brackets, insulators, nuts and bolts are also available from stock to ensure that installation onsite is speedy.

Hawker Electronics' controllers are unique in their design because of their close switching differential. This allows them to operate in contaminated liquids, such as those containing foam, wet rags and sewage. The controllers employ low-voltage AC in the electrode circuit and are available in AC or DC voltage supplies. ATEX and IECEx approved equipment is also available.

AMS Instrumentation & Calibration Pty Ltd
www.ams-ic.com.au

HORIZONTAL DRUM SCREENS

CST Wastewater Solutions introduced its horizontal in-channel rotary drum screening technology at Ozwater'21 in May.

According to the company, horizontal drum screens have a number of advantages over incline systems, including an efficient engineering concept and thorough detail engineering, which combine to produce low whole-of-life costs when compared with most other screens, with servicing required only every 4–6 years.

CST's Australian-manufactured horizontal drum screens are capable of 5 mm or finer screening on flows up to 2000 L/s. They are suited to municipal inlet works; pre-membrane systems; pulp and paper mills; food and beverage, including abattoirs; manufacturing; tanneries; and a broad range of industrial and municipal applications.

Advantages of horizontal drum design include: 5 mm or finer screening on flows up to 2000 L/s; low fluid head loss at peak flows for increased solids removal efficiency; robust stainless steel construction; simple maintenance — all parts located above wastewater flow; all routine servicing without removing the drum; robust engineering, design and construction; long typical service life of 7–10 years.

Advantages over inclined drums include: lower maintenance and downtime with improved seal and brush replacement cycle times; inclined drums tend to have high levels of recycling back to inlet, which is not suitable for MBR protection — horizontal drum designs avoid this issue; more flexible operation — with inclined systems, the front bearing collects screening and rags, which can foul with the seal and cause early failure; integral lifting screws are located above the wastewater flow for easy maintenance and general housekeeping.

CST Wastewater Solutions
www.cstwastewater.com

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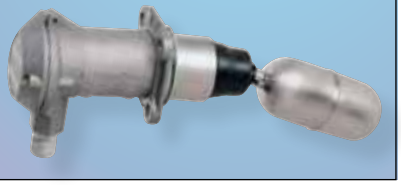

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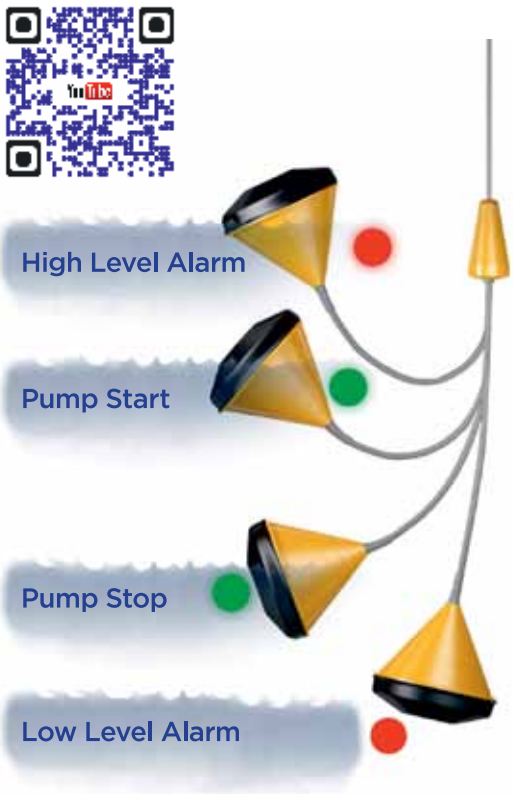

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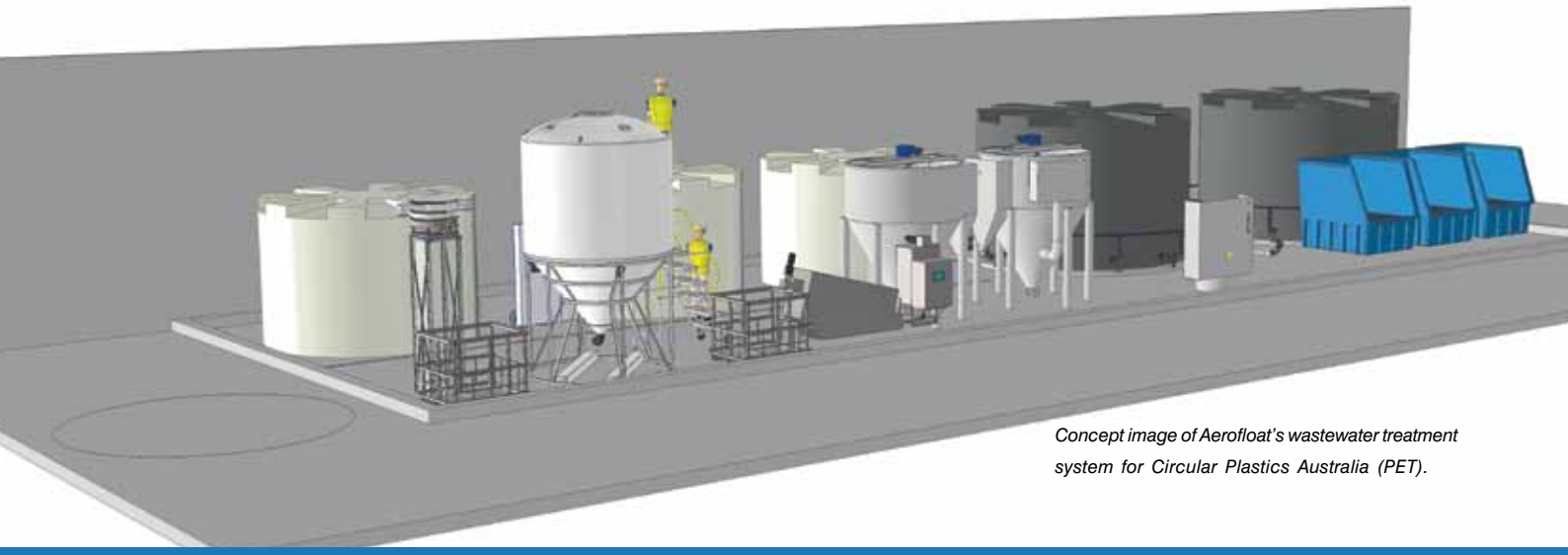


Concept image of Aerofloat's wastewater treatment system for Circular Plastics Australia (PET).

CLEAN WASH WATER ENSURES SUSTAINABLE OPERATIONS FOR CIRCULAR PLASTICS AUSTRALIA (PET)

Australia is on a mission to solve its plastics waste issues. The first National Plastics Summit in March 2020 brought leaders from government, business and community sectors together to ensure Australia forms a united front to solve the country's plastics waste issues.

Circular Plastics Australia (PET) is leading the charge with the construction of a world-class recycling facility in NSW. The company projects the facility will recycle the equivalent of around one billion 600ml PET plastic bottles annually once operational in 2021. The resulting recycled plastic will be used to produce new bottles as well as food and beverage packaging.

Located in Albury, the Circular Plastics Australia (PET) facility is a joint venture between Asahi Beverages, Pact Group Holdings Ltd and Cleanaway Waste Management Ltd. Australian company Aerofloat was contracted to design and construct the wastewater treatment system for the project to ensure clean, reusable wash water within the plant and a sustainable end-product. The project heralds the third venture that Pact Recycling and Aerofloat have worked on together.

"It's terrific to be working with the team at Pact Recycling again, on what is an incredibly important project for Australia's recycling industry," said Aerofloat's General Manager, Michael Anderson.

Aerofloat's design meets Circular Plastics Australia (PET)'s vision for a sustainable facility that re-uses wash water within the facility, helping to reduce water usage significantly.

Aerofloat's wastewater treatment plant design provides for expansion of the recycling facility in the future. Its patented circular dissolved air flotation unit, the AeroCircDAF, can treat higher flow volumes of wash water if needed as the facility grows. Additionally, its fully automated, intelligent PLC control system can accommodate the integration of additional Aerofloat technology as the business expands.

"Aerofloat's partnership with Circular Plastics Australia (PET) ensures compliant wastewater that can be reused as wash water within the recycling plant, helping to reduce the company's footprint further with significant savings on water usage," said Anderson.

Aerofloat's design ensures a sustainable, long-term solution for Circular Plastics Australia (PET). Clean wastewater from the system is either re-used as wash water within the plastics recycling facility or discharged to sewer. Aerofloat is working closely with the local council to ensure its strict policies and guidelines around managing microplastics in its inland waterways are met.

Circular Plastics Australia (PET) and Pact Group predict an astounding increase from around 30,000 tonnes to 50,000 tonnes of locally-sourced and recycled PET being produced annually in Australia through its Albury operation. It means Australia will rely significantly less on virgin plastics and reduce its annual imported recycled plastics quota. The project also ensures Australia reduces its volume of annual exported plastic waste and will help drive the country towards achieving its 2025 National Packaging Targets.

"The National Plastics Summit of 2020 showed that Australians across all sectors are deeply committed to resolving the country's plastics waste issues. Government, industries and communities alike are working together to ensure we are recognised as world leaders in sustainable plastics recycling within the next five years," said Anderson.

Aerofloat has created sustainable wastewater treatment designs for major plastics recycling businesses across Australia. The Australian, family-owned company has been awarded for its innovative approach to tackling plastics recycling wastewater issues and offers unique, patented designs to ensure economical and environmentally sustainable solutions for the industry.

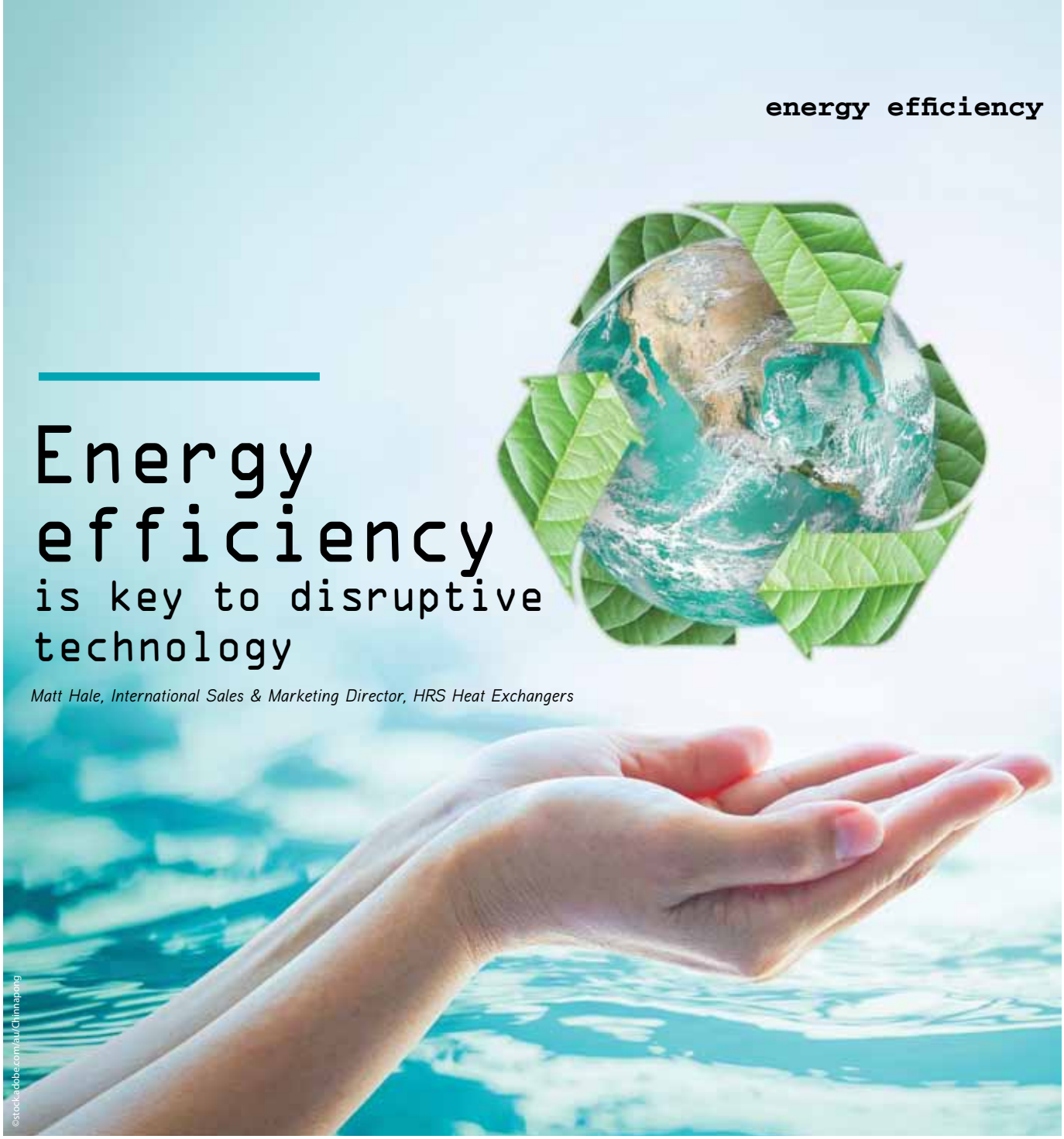
Construction of Circular Plastics Australia (PET) is well underway, with operations expected to commence in December 2021. Contact Aerofloat to discuss your plastics recycling wastewater issues at www.aerofloat.com.au.

Aerofloat
WASTEWATER TREATMENT SPECIALISTS

Aerofloat (Australia) Pty Ltd
www.aerofloat.com.au

Energy efficiency is key to disruptive technology

Matt Hale, International Sales & Marketing Director, HRS Heat Exchangers



The world faces an unprecedented combination of water security and resilience challenges. These challenges include population growth, increasing urbanisation, a decline in traditional sources of water and water scarcity driven by climate change. Globally, the United Nations[1] estimates that some 3.6 billion people (almost half the world's population) currently live in areas that are vulnerable to water scarcity and that almost 2 billion people could suffer water shortages by 2025.

To overcome these challenges, the water sector needs to adopt new technologies and ways of working, many of which may be disruptive when compared to traditional methods of water supply and wastewater treatment. Around the world several disruptive technologies which could have widespread positive impacts in the water industry have been identified, including digital technologies, water re-use, resource recovery and energy self-sufficiency.

Digital technologies and 'digital water'

According to the UK Water Partnership[2], "Digital thinking will impact every aspect of water, from management of sources, treatment technology and efficiency, consumption and customer engagement, through to re-use, collection and recovery of economically and environmentally important resources."

With the 'smart' water market estimated at US$30 billion globally, it is no surprise that exploiting data to improve insight and decision-making and using that insight to improve process and efficiency is a key priority for managers. The monitoring and optimisation of wastewater treatment and sewer and sewage monitoring have both been identified as opportunities where water and sludge treatment technologies can be updated and improved. HRS already offers remote telemetry and digital monitoring of its systems, a feature which is becoming more and more important to clients around the world.

By 2025, about 80% of utilities in large cities of advanced countries and half of the utilities in large cities of developing countries are expected to have water supply systems which incorporate digital water features like advanced metering[3]. Another area of

development is using satellite data to monitor catchments and water distribution systems, and it is reported that such systems can identify leaks as small as 100 mL/min.

However, digital water requires a whole-system approach and will not reach its full potential if only a few isolated smart systems are introduced. To truly delivery savings in water use and energy, water companies must completely digitise their supply chains and wastewater infrastructure, deploying sensors in the field and using electronic flow meters throughout the system, including at a customer level. One of the key potential benefits of increased digitisation in the water sector, as well as reduced water use and improved demand balancing, is reduced energy use through improved efficiency.

Water re-use

Various factors including increasing population, greater environmental demands to preserve and protect water sources, and climate change mean that alternative sources of clean and potable water need to be used. We have already seen increased use of rain capture and brown water re-use for cleaning and toilet flushing in many buildings, but there is increasing interest in treating wastewater streams to make them potable and immediately returning them to the water supply system (direct re-use), rather than returning treated wastewater to the environment through river systems and aquifers (indirect re-use).

Several technologies already exist to enable wastewater to be processed into potable water, and as the economics of water abstraction and availability change, these will become more widespread. To become widely adopted, society will need to accept the idea that suitably treated wastewater is a desirable source of usable potable water — something that will be easier in some societies than others. This is not to say that it cannot be successfully achieved, as has been seen with projects in several US states, as well as Israel and Australia.

Resource recovery

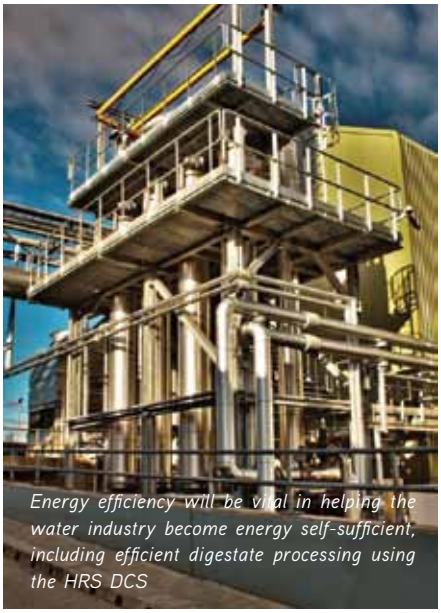
Resource recovery is a key aspect of a true circular economy. Not only are there the economic and environmental benefits from the products themselves, but every cubic metre of recycled or re-used water results in a corresponding reduction in mains water demand and wastewater discharge. There are also benefits in terms of the energy and carbon footprints associated with material recovery when compared with primary extraction and processing, together with further environmental benefits arising from reduced waste disposal impacts.

As far as the wastewater industry is concerned, nutrients such as phosphorus from struvite are one of the prime contenders for nutrient recovery, although as the sector moves towards direct potable water re-use and advance technologies are adopted to remove a wider range of chemical compounds, the number of these which can be recovered and utilised elsewhere will also increase. Other valuable compounds that are beginning to be recovered include ammonia nitrogen and sodium-based products.

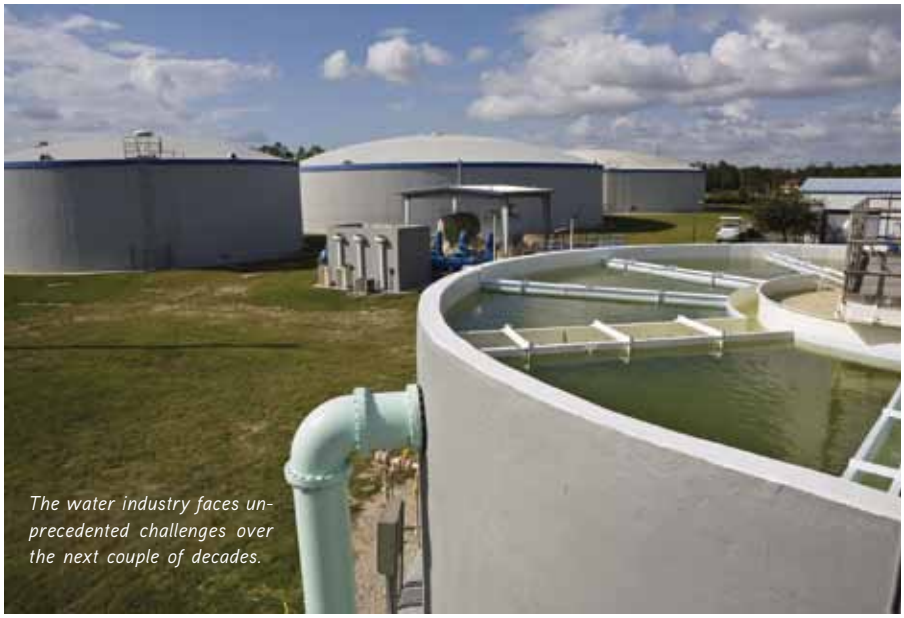
Various established and emerging technologies are used when recovering resources from wastewater, including membrane bioreaction, reverse osmosis, electrolysis, filtration and others. One of the most important processes is evaporation, which is used both to concentrate residues sufficiently to allow their economic extraction, and as part of the water purification process.

However, many of the processes involved in resource recovery, and evaporation in particular, can have a high energy requirement, but there are ways to mitigate this and improve the overall energy efficiency of the process. HRS has produced several different evaporation units for use in wastewater treatment and resource recovery, and energy efficiency is a key priority in their design. A typical HRS process might consist of three steps:

1. Evaporation/concentration (using one or more evaporators depending on the materials involved and the level of concentration required) to levels above the saturation point at high temperature.
2. Cooling down of the product to provoke the formation of salt crystals.
3. Further crystallisation in specially designed tanks and separation of the crystals that are formed to allow them to be processed for use. In the third step, a supernatant



Energy efficiency will be vital in helping the water industry become energy self-sufficient, including efficient digestate processing using the HRS DCS



The water industry faces unprecedented challenges over the next couple of decades.

Digestate and sludge pasteurisation is one area where technology, like the HRS Batch Sludge Pasteuriser System, can increase energy efficiency

layer of concentrated solution remains after separation of the crystals. This solution is returned to the second evaporator for concentrating again to above its saturation point.

Fouling is a real concern during these processes and will not only reduce the efficiency of the material recovery, but also reduce the energy efficiency of the overall process. HRS Unicus Series scraped-surface heat exchangers are used to maintain thermal efficiency and remove fouling as it occurs. Coupled with HRS R Series coolers and custom-designed crystallisation tanks, the result is an efficient process which can work continuously without requiring scheduled downtime.

Energy self-sufficiency

Another form of resource recovery is the recovery of energy from wastewater streams. While anaerobic digestion is widely recognised as a water treatment technology around the world, its capacity for energy generation (either using combined heat and power production or to produce sustainable biomethane gas) is less well developed.

Ambitious goals for sustainable development will mean that wastewater treatment plants (WWTPs) will need to achieve net zero carbon balances by 2030. Achieving this will require recovery of the energy contained in the incoming wastewater streams and using this to provide the heat and power necessary for wastewater treatment and solids handling. It has been estimated that at present, most WWTPs can produce 20 to 25% or their own energy requirements in this way[2].

Therefore, increasing energy production at WWTPs will be critical to making the sector self-sufficient in terms of energy. But on its own it is unlikely to be sufficient to meet the net-zero goals. Reduced energy consumption using new and more efficient processes will also be required. Sludge processing and energy efficiency are intrinsically linked. For example, digestate and sludge concentration using equipment such as the HRS DCS is a more efficient and sustainable alternative to traditional drying methods.

The HRS DCS uses evaporation to reduce the overall quantity of digestate or sludge by 60–80%, reducing associated storage requirements and transport costs. The system includes measures to retain the valuable nutrients while the evaporated water can be condensed and re-used. In many cases the captured water is added back to the feedstock making the entire process almost self-sufficient in terms of water use and eliminating liquid discharges from the plant. After concentration, the treated digestate can contain up to 20% dry solids, making it much easier to transport and handle, and as much heat as possible is recaptured and re-used in the process, making it more energy efficient than alternative treatments.

Where sludge or digestate requires pasteurisation — for example, so that it can be used as an agricultural biofertiliser and soil conditioner — the 3 Tank Batch Sludge Pasteuriser System from HRS uses up to 70% less energy than traditional technologies. The system works on a three-tank principle: while one tank is being filled, the second tank holds the digestate above 70°C, at the same time as the third tank is being emptied. Again, heat and energy recovery are maximised to increase the overall process efficiency.

The challenges which the water and wastewater sectors face over the next couple of decades should not be underestimated. Water supplies will need to move from relying on traditional freshwater resources towards a sustainable diversified portfolio, and new novel and disruptive technologies will need to be implemented. However, existing technologies and simple principles (such as maximising efficiency at every opportunity) will also have important roles to play. With a mixture of established and new technologies the water industry is well placed to become more sustainable and a cornerstone of the wider circular economy.

1. Voutchkov, N.: *Disruptive Innovation in the Water Sector*. https://thesolutionsjournal.com/2020/05/14/disruptive-innovation-water-sector/
2. https://www.theukwaterpartnership.org/wp-content/uploads/2019/12/UK-Water-Partnership-Digital-Water.pdf
3. McKinsey Global Institute: *Smart Cities: Digital Solutions for a More Liveable Future*. https://tinyurl.com/y4nexe4t

HRS Heat Exchangers Australia New Zealand
www.hrs-heatexchangers.com/au/

THREE-PHASE STRING INVERTER

FIMER's PVS-10/33-TL three-phase string inverters are designed to meet the increasing demand for flexible solar energy solutions in commercial and industrial sectors.

Extending FIMER's existing string inverter portfolio, the range is available in outputs of 10 to 33 kW, offering high power density and strong energy-harvesting potential. With in-built digital capabilities, the product is designed for simplicity: it is flexible enough to fit anywhere and can be easily installed in new or existing plants to provide lower installation and maintenance costs, the company says.

The inverters feature current monitoring on each string, which can reach up to 1100 VDC input voltage, allowing for longer strings as well as the ability to operate across wide temperature ranges.

For ease of operation, the fuse-free design removes the need for maintenance and onsite interventions, due to fuse faults. For longer plant life, the inverters have optional potential-induced degradation (PID) prevention to secure PV module performance over time.

For installers, the PVS-10/33-TL platforms offer key benefits, including quick installation, easy handling and maintenance, and fast commissioning with FIMER's Installer for Solar Inverters app.

FIMER Australia
www.fimer.com

CONVEYING TECHNOLOGY FOR THE RECYCLING INDUSTRY

REDWAVE has expanded its product portfolio of sensor-based sorting technology to include conveyor belts optimised for use in the recycling sector.

Improvements have been made to the chute connection for feeding onto the sorting machine and also the ease of accessibility, which plays a major role during cleaning and maintenance work, because contamination and blockages are not uncommon in a recycling plant.

For example, removable sheet metal cladding and swivelling floor panels make cleaning easier and minimise the amount of maintenance required. External lubrication points also improve accessibility enormously and offer time savings. Although the conveyor belts are quick and easy to clean and maintain, they naturally comply with the product-specific applicable European directives and are 100% CE compliant.

Another point in the sorting process that should not be underestimated is the issue of dust formation. For this reason, special solutions have been developed by REDWAVE for the belt seals (covers and gutter seals), which are adapted to the respective material that is sorted in the recycling plant.

The conveyor belts themselves are currently installed in REDWAVE systems as troughed belt conveyor, sliding belt conveyor and chain belt conveyor.

A highlight of these conveyors is their modular design. This allows a simple modification of the conveyor belt length afterwards, but also additional equipment (sensors, weighing system, scraper) can be retrofitted easily.

A networked integration of the conveyor belts into the entire sorting system is designed to further improve or optimise the sorting process. This integration takes place through the integration of REDWAVE mate, the intelligent artificial support in the recycling plant.

REDWAVE
www.redwave.com

AUSTRALIAN INSTITUTE OF PACKAGING

Rethink packaging design: use less, use longer and use again

Nerida Kelton MAIP Executive Director – Australian Institute of Packaging (AIP)
Vice President – Sustainability & Save Food – World Packaging Organisation (WPO)

As natural resources are rapidly diminishing, pollution and GHG emissions worsen, oceans and waterways are filling up with packaging waste and integral ecosystems are becoming irreparably damaged, the world has been put on notice that the time for talk is over.

The time has come to rethink the way packaging is designed. This is an exciting time to take bold moves and rethink every aspect of how packaging is designed, used and ultimately provide long-lasting environmental value.

The change is being driven by consumers who want to see circular packaging that has designed out waste, is reusable, incorporates recycled content, is truly recyclable and all unnecessary packaging and problematic materials are eliminated.

This significant societal behaviour shift is a green light for packaging technologists and designers to become even more innovative and creative by the redesign of packaging to be circular and not follow the linear model of 'take-make-dispose'. Packaging technologists and designers can now design out waste at the beginning, to ensure the materials selected can be used repeatedly, are recyclable and regenerate natural systems.

A great place to start is by implementing the Sustainable Packaging Guidelines (SPGs) into their design processes.

SPGs are a central part of the co-regulatory framework established by the National Environment Protection (Used Packaging Materials) Measure 2011 (the NEPM) and the Australian Packaging Covenant (the Covenant). The NEPM and the Covenant state that the SPGs are to assist the design and manufacture of packaging that meets the sometimes-conflicting demands of the market, consumer protection and the environment.

The 10 Sustainable Packaging Principles that make up the SPGs are:

1. Design for recovery
2. Optimise material efficiency
3. Design to reduce product waste
4. Eliminate hazardous materials
5. Use recycled materials
6. Use renewable materials
7. Design to minimise litter
8. Design for transport efficiency
9. Design for accessibility
10. Provide consumer information on sustainability

The goal of the SPGs is to integrate the principles into the right business areas, to achieve the optimal outcomes for packaging functionality, and to collectively work to meet the 2025 National Packaging Targets.

- **100% of all Australia's packaging will be reusable, recyclable or compostable** = SPG Principle 1: Design for recovery (reuse, material recycling or organics recycling).
- **70% of Australia's plastic packaging will be recycled or composted** = SPG Principle 1: Design for recovery (reuse, material recycling or organics recycling).
- **50% average recycled content will be included across all packaging** = SPG Principle 5: Use recycled materials.
- **Problematic and unnecessary single-use plastic packaging will be phased out through design, innovation or introduction of alternatives** = SPG Principle 2: Optimise material efficiency = SPG Principle 7: Design to minimise litter.

The highest priority SPG principles are those included above that support the achievement of the four targets, ie, design for recovery, design for efficiency, using recycled materials, design for efficiency and design to minimise litter.

In other areas of the value chain materials suppliers are working on innovative new materials, simplifying complex material structure. Brands are busy redesigning packaging and highlighting environmental improvements. The recyclers are reviewing and expanding capabilities, while governments are funding new initiatives and the consumers are embracing the changes.

A systemic approach to circular packaging design can deliver significant environmental impact reductions including a lower carbon footprint, feedstock derived from fossil fuels, in the use of virgin materials and packaging waste to landfill.

"It's called the circular economy. It's a new way to design, make, and use things within planetary boundaries. Shifting the system involves everyone and everything: businesses, governments, and individuals; our cities, our products, and our jobs. By designing out waste and pollution, keeping products and materials in use, and regenerating natural systems we can reinvent everything." — Ellen Macarthur Foundation

Consumers look at packaging differently now, so too should packaging technologists and designers. This is an exciting time to be designing packaging and those that design circular packaging will know that they have made a difference for generations to come.

Have fun rethinking your packaging designs and remember use less, use longer and use again.

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Energy Next: a clean energy sector industry event

As New South Wales is gearing up to become a renewable energy superpower, an exciting clean energy event is coming to ICC Sydney on 13–14 July 2021.

Energy Next is a free-to-attend B2B exhibition showcasing the latest clean energy innovation and technologies, which will be held for the first time alongside Clean Energy Council's Australian Clean Energy Summit.

The addition of Energy Next to the Australian Clean Energy Summit is designed to provide a comprehensive clean energy event in NSW and help to generate conversations and connections to improve clean energy generation and adoption in the country.

Brought to NSW by the organisers behind All-Energy Australia, the Energy Next exhibition will provide technical sessions and networking opportunities for those working in the clean energy industry.

"With NSW's exciting plans to shift to renewables, Energy Next's inaugural edition arrives on the industry's calendar at an important time and is well positioned to cater to the NSW clean energy market," said Robby Clark, Portfolio Director at Energy Next. "The event is set to be the destination in NSW for the industry to connect with suppliers face to face, collaborate with peers and learn from industry experts about the latest industry developments. We're proud to be partnering with the Clean Energy Council in delivering an event that can help build the future of NSW's clean energy industry."

The exhibition will feature the latest renewable energy and energy management technologies and solutions from suppliers including: AC Solar Warehouse, Fimer, Italwind, NEXTracker, NHP, Prosun Solar, Shoals Technologies, SMA Australia and Solar Analytics.

Visitors will also have free access to sessions, with expert speakers discussing the latest technical issues and opportunities facing the industry. Topics covered will include: hydrogen energy, electric vehicles, battery storage, digital transformation and much more.

In partnership with the Clean Energy Council, the event will host the Clean Energy Council's Solar Masterclass, a one-stop shop for solar installers to get their fix of expert advice on the big design and installation issues facing the industry. Installers and designers will also be able to earn CPD points and hear the latest updates on standards and compliance issues.

Supported by the NSW Government, Energy Next will be held from **13–14 July 2021 at the ICC Sydney.**
To access the program and register for free, visit **www.energynext.com.au.**

Making a difference in the energy transition

Enlit Australia is taking place 21–22 July at the Melbourne Convention and Exhibition Centre, bringing together the biggest names in Australia's energy industry.

Enlit Australia is the opportunity we have all been waiting for to get together as an industry, network and reconnect over the latest trends, disruptions and market opportunities.

The conference and exhibition vows to light the spark that will fuel the change we need to ensure our industry — and our planet — have the brightest possible future.

The event organisers believe in an equitable energy transition that leaves no-one behind. From corporates to consumers, investors to entrepreneurs, and engineers to activists — Enlit exists to give everyone the ability to seize all of the opportunities that the energy transition has to offer.

Energy is evolving. So are we — so are you. Together we will make a difference.

Anyone interested in attending can register now for a free expo pass, which will allow attendees to hear from more than 80 leading industry speakers, including:

- David Hochschild, Chair of the California Energy Commission
- Karl Rábago, Principal of Rábago Energy
- Lily D'Ambrosio, Victorian Minister for Energy, Environment and Climate Change, and Minister for Solar Homes
- Maia Schweizer, Chief Executive Officer, CleanCo Queensland
- Andrew Bills, Chief Executive Officer, CS Energy
- Anna Collyer, Chair, Australian Energy Market Commission
- Richard Lowe, Executive General Manager Business Growth, TransGrid
- Ramesh Singaram, President and CEO, GE Gas Power Asia Pacific
- Joao Segorbe, Executive General Manager Strategy & Corporate Development, AGL Energy
- Jon Briskin, Executive General Manager, Origin Retail
- Gordon Wymer, Chief Commercial Officer, Snowy Hydro

To register for your FREE expo pass, visit enlit-australia.com.

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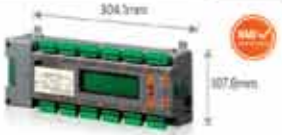

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