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REGULARS

WORDS FROM THE EDITOR

Despite the recent slowing of global greenhouse gas emissions, the latest report from the Intergovernmental Panel on Climate Change (IPCC) warns that immediate action is required to limit global warming to 1.5°C.

Climate resilience is already challenging at current warming levels and we've all seen this play out first-hand with the devastation from the floods in Queensland and NSW. This is why immediate action is necessary to address this serious economic and environmental challenge.

The recently released federal Budget 2022/23 has made an allocation for funding of the circular economy, low-emissions and recycling technology, and disaster recovery. This is positive news; however, many argue that the government is still failing to address the causes of climate change and make plans for large-scale decarbonisation.

Technologies such as widespread electrification using renewables, improved energy efficiency and use of alternative fuels (such as hydrogen) are all available. Many industries are also already working to reduce emissions by using materials more efficiently, reusing and recycling products and minimising waste. Further government policies and action could help enhance and hasten these efforts.

In this issue, we take a look at some of the positive action happening around the country. Read about a smart polymer coating for PVC pipes designed to absorb mercury out of water and hear how Sydney Water is joining forces with Veolia to deliver sustainable and resilient water services. The CEO of ACOR talks about her roadmap to strengthen the circular economy for generations to come and the potential for a circular economy in the battery industry is discussed with the CEO of FBICRC.

Carolyn Jackson

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40 CELEBRATING YEARS

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Let's turbo-charge recycling

with a circular approach to policy

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> **If Australia's federal, state and territory governments were to pursue an integrated strategy and circular policy platform, the benefits would be far-reaching.**

As an integral gear in the circular economy, the recycling industry operates across our homes, businesses, factories and construction sites, generating over $15 billion in value to the Australian economy and employing over 50,000 people nationally. But what could a real strategy and policy platform committed to supporting the circular economy look like in Australia, and how do resource recovery and recycling play their role?

Currently, most government policies focus on the linear environmental risks and benefits of the recycling sector. This narrow lens greatly impedes productivity and diminishes the sector's potential to actively contribute to innovation, technology, employment and manufacturing. If Australia's federal, state and territory governments were to pursue an integrated strategy and circular policy platform, the benefits would be far-reaching.

The Australian Council of Recycling (ACOR) has outlined a set of measurable, deliverable and beneficial initiatives that together form a roadmap to strengthen the circular economy for generations to come.

Our four key policy measures include:

- A national alignment between environmental policies and circular economy principles.
- Support for strong end markets for recycled material.
- Aligning and extending producer responsibility for products brought into the Australian market.
- An education initiative to engage consumers in 'recycling right'.

The federal Budget 2022–23 brought more funding for the resource and recycling sector, and included among other measures an additional $60 million towards the Recycling Modernisation Fund (RMF), now bringing the Fund up to $250 million total. The new funding is earmarked to boost advanced plastic-recycling technology that will tackle hard-to-recycle plastics like bread bags and chip packets.

As the first country in the world to ban the export of waste plastic, it was essential that Australia moved early in prioritising its onshore recycling capacity and the RMF has been essential to this endeavour. But to achieve true integrated circular economy outcomes, funding and policies should be approached much more broadly and require a concerted effort across Australia's manufacturing, technology and innovation sectors and a national alignment between environmental policies and circular economy principles.

Australia should be pursuing another world first — the appointment of a Minister for Resource Recovery and the Circular Economy. It makes perfect policy sense to create a new ministerial role that can work across all these relevant portfolios to drive a whole-of-government approach to circular economy outcomes, including product stewardship, sustainable procurement, resource recovery, recycling and remanufacturing.

Our recyclers are gearing up for a new era of productivity and modernisation. For example, innovative, stronger and cost-effective remanufactured materials are already being developed and used in buildings and private construction across Australia — from major works to home renovations. As the joint largest infrastructure client and major procurer of goods in Australia, our federal, state and territory governments have been slow to deliver on their pledge to prioritise recycled materials in their procurement processes. Now is the time to really make the recycled rubber hit the road!

Governments have a key role to play in not only leading market demand for recycled content but also instilling confidence in the private sector — demonstrating the quality, durability and affordability of Australian recycled and remade materials. Incentives should be offered for the private sector to 'Buy Recycled' and governments should work with industry to set ambitious targets for recycled content by 2030 and 2050. Australia already has some world-leading ventures delivering high-quality remade products, like glass and PET bottles. But more compelling measures are required to evolve end markets for these and other recycled products at the necessary pace.

With unprecedented government and industry investment and overwhelming public support for resource recovery and recycling, now is the time to unleash the full potential of a circular economy through these policy measures. The effort to deliver this kind of whole-of-system approach must be led at a national level and we need to start now by pursuing significant policy action to ensure a thriving circular economy. Big ideas and a whole-of-government approach are needed to close the loop.

Suzanne Toumbourou is the Chief Executive Officer of the Australian Council of Recycling (ACOR). Prior to ACOR, Suzanne was the longstanding Executive Director of the Australian Sustainable Built Environment Council, where she delivered impactful policy outcomes for building sustainability, including advancing the energy performance provisions in Australia's Building Code and informing the priorities of the COAG Energy Council's Trajectory for Low Energy Buildings. With broad experience encompassing federal and state governments, industry and non-profit organisations, she is passionate about leading positive change for people, industry and the environment.

Future charge

How a National Battery Strategy will help lay the groundwork for more sustainable practices across Australia

Shannon O'Rourke, CEO, FBICRC, Future Battery Industries Cooperative Research Centre

The world is racing to decarbonise. Renewable energy generation has doubled since Kyoto, primarily due to intermittent solar and wind generation, which now accounts for one-third of all renewable energy. Battery storage is essential, because it ensures intermittent renewables can provide the affordable, reliable, clean energy we all need.

Batteries are now significantly cheaper. In fact, unit prices have decreased by 88% over the last decade, just like solar, which has seen 82% cost reductions. Advances in battery technology will lower costs even further.

Lower costs, high efficiency and energy density make batteries the preferred technology for electric vehicles, massively outpacing hydrogen fuel cells and becoming increasingly competitive with internal combustion vehicles. Batteries now account for almost half of all new stationary energy storage projects. Batteries are efficient and can store energy anywhere with a low environmental footprint.

As an emerging industry, the battery industry's development has been considered holistically from day one. Advances in re-use and recycling are creating the potential for a circular economy, which is significant for the mining industry, the impacts of which can be reduced by extending the life of, repurposing and recycling battery systems.

Nurturing a local battery industry

By 2050, in a net-zero scenario, the IEA expects batteries to account for 70% of all renewable energy expenditure. Over $830 billion in today's dollars will be spent each year. At present, Australia has a 50% market share in the raw materials, but only receives 0.5% of the total value across the battery value chain. Australia can capture its fair share of the battery market value by investing in manufacturing.

We must reshape global value chains to be more sustainable at world scale. Australia commonly exports spodumene concentrate (6% lithium) for overseas refining, consisting of 94% shipping waste.

Human rights and the ethical and sustainable sourcing of battery materials must ensure that the battery industry does not flourish on the back of modern slavery in vulnerable communities.

Finally, there's recycling. With less than 1% of lithium batteries being recycled, we mine more than we need and miss an opportunity to recycle. We need cheap, clean energy but it can't come at any cost.

Customers are increasingly demanding better transparency and traceability from supply chains. Suppliers are shifting to different battery chemistries to reduce the use of conflict minerals and key industry players are reviewing their supply chain to remove or minimise sustainability risks. We believe international regulation is required to ensure minimum standards are maintained.

Australia has earned an advantage in sustainable mining and manufacturing practices in comparison to other parts of the world and we should leverage that advantage in the global battery marketplace. Consumers can be assured Australian materials and manufactured goods are sourced ethically and sustainably; and have competitive costs, high quality and are produced safely. Australia needs to promote its brand and insist that others are transparently disclosing the provenance of their goods.

The Future Battery Industries Cooperative Research Centre and its participants are researching a blockchain material tracking system that integrates physical isotope and trace element assays to provide supply chain transparency. We are also working with groups like the Australian Battery Stewardship Council and our other participants to develop battery recycling systems that increase awareness and encourage all battery systems to be repurposed or recycled.

Laying the foundations for battery re-use and recycling initiatives

Re-use and recycling will be critical to a sustainable battery industry in the long-term, but will take time to develop because the stock of batteries needs to increase. Grid storage, EV and mining vehicle batteries are expected to crystallise a recycling industry, supported later with consumer batteries and e-waste.

Battery recycling involves de-energising, then dismantling or shredding the battery to recover its constituent materials. Metals are recovered through filtration, gravity separation, pyrometallurgy and hydrometallurgy, while other processes are used to recover electrolytes and graphite.

Lithium-ion batteries have already shown the potential for 90% recovery in recycling processes. As batteries fail or degrade over time, an increasing stream of end-of-life products will become available. If the products are disposed of instead of recycled, this is a lost opportunity to retain critical minerals and to avoid a persistent environmental impact.

In the meantime, steps to support a future industry including reviewing regulatory requirements regarding handling of battery waste, growing the battery stewardship scheme and increasing the use of battery recycling among end users will set Australia up for a future battery re-use and recycling industry.

Why must this start with the development of an ambitious National Battery Strategy and a bi-coastal Australian Battery Institute?

The Australian Government is building a sustainable battery industry in Australia; one with efficient mining, lower carbon, good working conditions, higher environmental standards and a circular economy.

This is a significant, cross-portfolio task, and we believe a National Battery Strategy is required to maximise the impact of government's policy levers. A national strategy would send a strong message, a signal that we recognise the importance of the battery industry and the more sustainable energy options it unlocks.

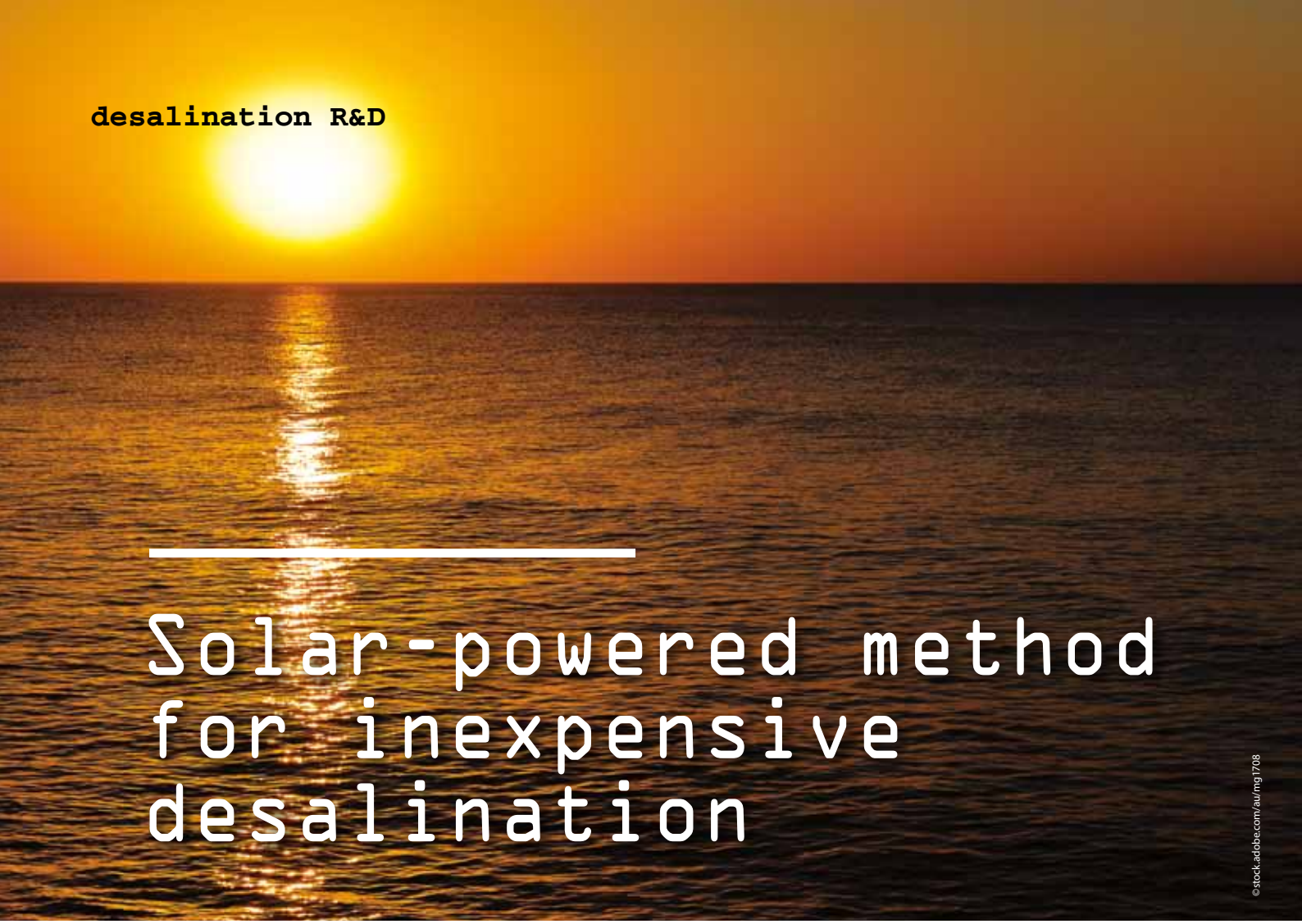
A national strategy would identify and target the areas requiring the greatest investment. We believe an industry attraction fund is necessary to build value-added manufacturing and avoid Australia's resource curse. We need a sustainable economy too. Critical minerals are a manufacturing opportunity.

Establishing an Australian Battery Institute (ABI) will also provide specialised training and technology development, as well as commercialisation infrastructure, to ensure these new, even more sustainable technologies are realised. The ABI will also play a key role in training new parts of the workforce, and upskilling others to become part of these too.

Australia needs look no further than batteries for a sustainable, nation-building opportunity that leans into the clean energy transition. We truly can be a clean energy superpower, blessed with the mineral resources, and the renewable resources to succeed.

Australia has everything right here and with the right vision and ambition can build an industry that will truly make the world a more sustainable place.

Shannon O'Rourke was appointed as CEO of the Future Battery Industries Cooperative Research Centre (FBICRC) in November 2021. He is a seasoned executive with 25 years' experience in the energy sector including senior management roles with Woodside, Chevron and industrial research with Rio Tinto.



Solar-powered method for inexpensive desalination

There has been plenty of research into finding ways to desalinate seawater or brackish water with solar, but many have run into expensive problems with fouling of equipment caused by salt build-up.

Now, a team of researchers at MIT and in China has come up with a solution to the problem of salt accumulation — and in the process developed a desalination system that is claimed to be both more efficient and less expensive than previous solar desalination methods. The process could also be used to treat contaminated wastewater or to generate steam for sterilising medical instruments, all without requiring any power source other than sunlight itself.

Researchers test two identical outdoor experimental set-ups placed next to each other. Image courtesy of Lenan Zhang, Xiangyu Li, Evelyn Wang, et al.

The findings are described in the journal *Nature Communications*, in a paper by MIT graduate student Lenan Zhang, postdoc Xiangyu Li, professor of mechanical engineering Evelyn Wang and four others.

"There have been a lot of demonstrations of really high-performing, salt-rejecting, solar-based evaporation designs of various devices," Wang said. "The challenge has been the salt fouling issue, that people haven't really addressed. So, we see these very attractive performance numbers, but they're often limited because of longevity. Over time, things will foul."

Many attempts at solar desalination systems rely on a wick to draw the saline water through the device, but these wicks are vulnerable to salt accumulation and can be difficult to clean. Therefore, the researchers focused on developing a wick-free system instead.

The result is a layered system, with dark material at the top to absorb the sun's heat, then a thin layer of water above a perforated layer of material, sitting atop a deep reservoir of the salty water such as a tank or a pond.

After careful calculations and experiments, the researchers determined the optimal size for the holes drilled through the perforated material, which in their tests was made of polyurethane. At 2.5 mm across, these holes can be easily made using commonly available waterjets.

The holes are large enough to allow for a natural convective circulation between the warmer upper layer of water and the colder reservoir below. That circulation naturally draws the salt from the thin layer above down into the much larger body of water below, where it becomes well diluted and no longer a problem.

"It allows us to achieve high performance and yet also prevent this salt accumulation," said Wang, who is the Ford Professor of Engineering and head of the Department of Mechanical Engineering.

Li said that the advantages of this system are "both the high performance and the reliable operation, especially under extreme conditions, where we can actually work with near-saturation saline water.

"Many attempts at solar desalination systems rely on a wick to draw the saline water through the device, but these wicks are vulnerable to salt accumulation ... the researchers focused on developing a wickfree system instead.

And that means it's also very useful for wastewater treatment."

He adds that much work on such solar-powered desalination has focused on novel materials. "But in our case, we use really low-cost, almost household materials." The key was analysing and understanding the convective flow that drives this entirely passive system, he said.

"People say you always need new materials, expensive ones, or complicated structures or wicking structures to do that. And this is, I believe, the first one that does this without wicking structures."

This new approach "provides a promising and efficient path for desalination of high-salinity solutions, and could be a game changer in solar water desalination", said Hadi Ghasemi, a professor of chemical and biomolecular engineering at the University of Houston, who was not associated with this work. "Further work is required for assessment of this concept in large settings and in long runs," he added.

Just as hot air rises and cold air falls, Zhang explained, natural convection drives the desalination process in this device. In the confined water layer near the top, "the evaporation happens at the very top interface. Because of the salt, the density of water at the very top interface is higher, and the bottom water has lower density. So, this is an original driving force for this natural convection because the higher density at the top drives the salty liquid to go down." The water evaporated from the top of the system can then be collected on a condensing surface, providing pure fresh water.

The rejection of salt to the water below could also cause heat to be lost in the process, so preventing that required careful engineering, including making the perforated layer out of highly insulating material to keep the heat concentrated above. The solar heating at the top is accomplished through a simple layer of black paint.

So far, the team has proven the concept using small benchtop devices, so the next step will be starting to scale up to devices that could have practical applications.

The necessary work to translate this lab-scale proof of concept into workable commercial devices, and to improve the overall water production rate, should be possible within a few years, Zhang concluded.

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A 'greener' way to clean wastewater treatment filters

Membrane filters don't require much energy to purify water, making them popular for wastewater treatment. However, to keep the filters in good condition, they're commonly cleaned with strong chemicals which can sometimes destroy the membranes in the process. Now, researchers reporting in *ACS Applied Materials & Interfaces* have developed reusable nanoparticle catalysts that incorporate glucose to help efficiently break down contaminants inside these filters without damaging them.

Typically, dirty wastewater filters are unclogged with strong acids, bases or oxidants. Chlorine-containing oxidants such as bleach can break down the most stubborn organic debris but they also damage polyamide membranes, which are in most commercial nanofiltration systems, and they produce toxic by-products. A milder alternative to bleach is hydrogen peroxide, but it decomposes contaminants slowly.

Previously, scientists have combined hydrogen peroxide with iron oxide to form hydroxyl radicals that improve hydrogen peroxide's efficiency in a process known as the Fenton reaction. Yet in order for the Fenton reaction to clean filters, extra hydrogen peroxide and acid are needed, increasing financial and environmental costs.

One way to avoid these additional chemicals is to use the enzyme glucose oxidase, which simultaneously forms hydrogen peroxide and gluconic acid from glucose and oxygen. So, Jianquan Luo and colleagues wanted to combine glucose oxidase and iron oxide nanoparticles into a system that catalyses the Fenton-based breakdown of contaminants, creating an efficient and delicate cleaning system for membrane filters.

First, the researchers compared the removal of organic contaminants from polyamide filters by the glucose oxidase enzyme and iron oxide nanoparticles to other cleaning methods, including the traditional Fenton reaction. They found this approach was superior at breaking down the common contaminants bisphenol A and methylene blue, while also preserving more of the membrane structure.

Encouraged by their initial results, the team combined glucose oxidase and iron oxide into a single nanoparticle, connecting them with an amino bridge.

Finally, they tested the new nanoparticle's ability to clean methylene blue-soaked nanofiltration membranes, which they fouled and cleaned for three cycles. After each cleaning cycle, the nanoparticles were retrieved with a magnet and reused with fresh glucose to activate the catalyst.

The nanoparticles were effective at cleaning the membranes, returning them to 94% of their initial water filtration capacity. Because the nanoparticles don't require strong chemicals and are easily recoverable, the researchers say their new system is a 'greener' and more cost-effective approach for cleaning nanofiltration membranes.

Smart coating in the pipeline

Image credit: Randy Larcombe, Department of Innovation and Skills (SA Government)

Flinders University researchers have developed a smart polymer coating for PVC pipes that is designed to absorb mercury out of the water passing through them. Derived from low-cost chemicals from oil refining and other sources, the coating can also prevent metal corrosion and solvent damage of plastic PVC pipes, as well as preventing acid and water damage of concrete surfaces. Additionally, it is able to be repaired in situ with a simple heating process.

"Made easily from elemental sulfur and dicyclopentadiene (DCPD is a by-product of petroleum refining), this new coating is multi-functional which gives us wide scope to use it in a wide range of useful ways and for longer-lasting industrial products and components," said Flinders University PhD candidate Max Mann, lead author of the study.

"This exciting new area of research extends fundamental chemistry to several practical applications."

The polymer coating having a multi-functional purpose of protecting pipes as well as removing toxic metals from water means it may be usable in a range of different sectors.

"The method for making the coating is safer than methods previously used for related coatings. The team developed a lower temperature process that prevented runaway reactions," added co-author University of Liverpool researcher Dr Bowen Zhang.

When the coating becomes scratched or damaged at all, it can be repaired with the application of heat owing to its structure that allows sulfur bonds to be broken and reformed.

"The unique chemical composition of the smart coating enables protection of substrates, active removal of toxic mercury species from water and oil, and is repairable which ensures its sustainability," said Flinders Professor Justin Chalker, pictured above, from the Institute of Nanoscale Science and Technology at Flinders University.

"The coating is solvent resistant and can also remove mercury from oil and water mixtures, which is of importance to remediation in the petroleum and gas industry."

The paper 'Processes for coating surfaces with a copolymer made from sulfur and dicyclopentadiene' was published as the cover story of *Polymer Chemistry*.

Flinders University

www.flinders.edu.au

Come on a water journey at Ozwater'22 in Brisbane

Ozwater is the Australian Water Association's (AWA) annual international water conference and trade exhibition and the largest in the Southern Hemisphere. This year the conference is being held at the Brisbane Convention and Exhibition Centre from 10 to 12 May.

The theme for Ozwater'22 is Our Water Journey and will explore the journeys and stories of the entire water community. With 2022 being the 60th anniversary year of the Association, this theme is even more important in reflecting on achievements so far and looking ahead to future challenges and opportunities.

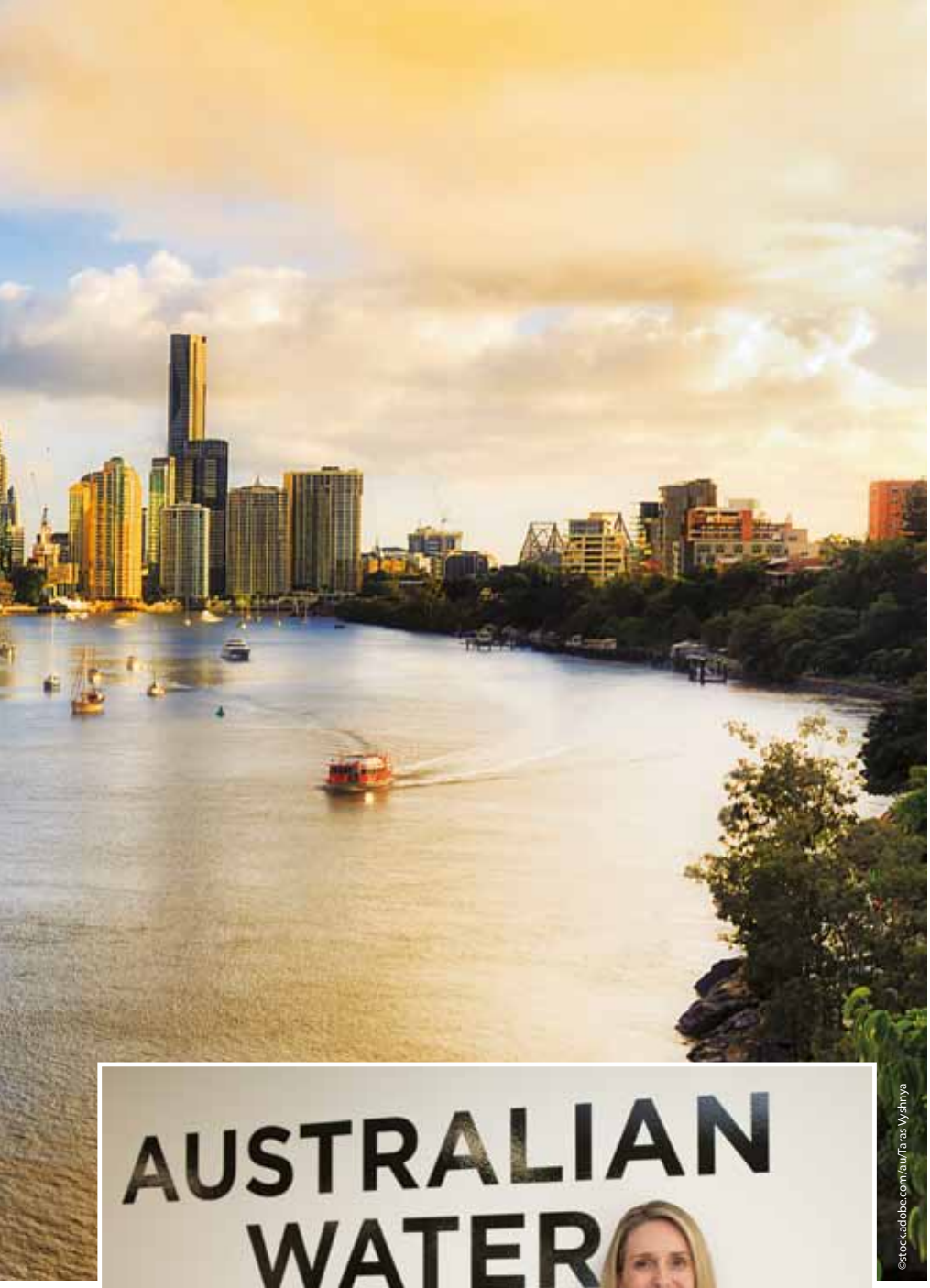
The program will explore First Nations people's knowledge and participation, recognising and valuing the traditional responsibility for land and water of Aboriginal and Torres Strait Islander people. It will explore the building of constructive and positive future partnerships for sustainable water management and how we need to progress engagement with Indigenous Australians and, in turn, how to move beyond this into meaningful actions.

The conference will delve into the unique challenges of the provision of water and sanitation services in rural, remote and regional areas. Water management in these areas also often intersects with agriculture, viticulture, mining and ecosystem services. Given water crosses, boundaries, borders and industries, the section will explore the actions required to ensure a thriving rural, remote and regional Australia.

Among the most popular conference themes is the exploration of effective asset management, planning and delivery. Critical to providing safe and reliable services at an affordable cost, the theme covers green assets and natural environment management.

In exploring excellence in operations, the conference will look at how the provision of safe and secure water and sanitation is critical to ensure providers efficiently meet the needs of the customers and communities they service. As water management continues to digitise, operations now include digital systems and physical ones.

The conference stream of People & Culture, Diversity, Inclusion & Equity will explore the importance of the people who make up the water community, as a diverse and inclusive workforce is shown to be a more productive one. In recent, challenging times, it has never been more important to ensure the psychological, emotional, intellectual and social wellbeing of others in the water community.



Australian Water Association Chief Executive Officer Corinne Cheeseman

In delivering excellence in customer experience, the conference will engage with the customers who are provided with an essential service every day daily. With so many diverse types of water users who are being serviced and with the continued evolution of expectations from the community, embracing customer experience strategies and technologies will be crucial.

The conference will delve into leadership in governance and progressive regulation and how important this element is in achieving the desired outcomes at customer and organisation levels.

In the theme of Resilience & Water Security, the challenges facing cities, towns and basins the world over will be looked at. Confronting these and taking action on and building resilience to climate change will be integral as we transform the ways we work together.

We have seen first-hand the water community's role in safeguarding community and environmental health, playing a key role in responding to the COVID-19 pandemic. But this belies the less dramatic but undoubtedly beneficial role it has played in providing drinking water and sewerage services to the community and improving the built and natural environment in both Australia and abroad.

The conference will be looking ahead at achieving a circular economy and exploring what actions are underway to minimise waste and make the most of resources. As the linear model of extraction, production, consumption and disposal has ended, we look to the future, as wastewater treatment plants will be resource recovery centres with water, carbon, nutrients and energy recovered and returned to the community.

It will also explore the ongoing threat of climate change and extreme events, discussing success stories from recent droughts, floods and fires and how we can be better prepared for future disasters and mitigate the effects of climate change.

Looking ahead to the communities of the future, it looks at the key role water management plays in achieving sustainable and thriving communities by understanding their needs, involving them in decision-making, improving sustainability and livability, and delivering multiple benefits to those being serviced. The conference will also continue to look at the ideas that think creatively to solve our water challenges.

Over Ozwater's three days, there will be over 130 technical and case study presentations, plus 82 poster pitch presentations across eight streams. There will also be over 200 national and international exhibitors from all aspects of water management. Alongside this are 16 workshops and panels and several site tours of innovative water and wastewater facilities around Brisbane.

In AWA's 60th year, Ozwater continues to be forward-thinking and encouraging, driving a sustainable water future.

Ozwater'22
www.ozwater.org

Pump cuts maintenance costs at Luggage Point WWTP

Utilita Water Solutions (Utilita) is a joint venture between Broadspectrum and Downer Utilities, delivering maintenance services for Queensland Urban Utilities from July 2016 through to July 2021.

Queensland Urban Utilities is one of the largest water distributor-retailers in Australia, supplying drinking water, recycled water and sewerage services to a population of more than 1.4 million across Brisbane, Ipswich, Lockyer Valley, Scenic Rim and Somerset.

Utilita carries out a range of work for Queensland Urban Utilities, including mechanical and electrical maintenance and repairs, water and sewer mains and fittings maintenance, reservoir maintenance and vegetation management.

As part of their client commitment, Utilita likes to implement changes that improve processes and WHS conditions, and reduce downtime. As part of this commitment, David Tolliday, Leading Hand Mechanical with Utilita at the Luggage Point WWTP, wanted to address a continued downtime issue with his digester turnover pumps. Although he had Gorman-Rupp Super T Series pumps on the job, the heavy loading of rags was causing blockages to the pumps twice or three times per day, per pump.

Tolliday met with Darren Jones of Hydro Innovations, distributors of the Gorman-Rupp pumps in Australia, to find a solution. Jones suggested a trial with Gorman-Rupp's new Eradicator solids management system, which was designed to reduce blockages by stringy materials. This system can be retrofitted to Gorman-Rupp Super T or Ultra V Series sewage pumps, so Tolliday was keen to try it. The trial Eradicator retrofit kit was duly installed in late March of 2021.

The results

Jones was keen to find out how the unit was going in the trial and contacted Tolliday late in May. Tolliday reported that the pump with the eradicator fitted had not had a single blockage in that eight-week period, and that he would be ordering upgrade kits for the balance of his digester pumps.

The benefits of the installation

Gorman-Rupp designed the Eradicator to address blockage issues associated with the increased use of wet wipes and their infiltration into the sewage system, ragging issues and industrial issues such as feathers in poultry processing.

The Eradicator works by continuously cleaning the leading edge of impeller vanes, and passing the materials through the pump without impacting performance or interrupting service.

The system is available for all Gorman-Rupp's Super T and Ultra V Series pumps, in sizes from 2″ (50 mm) through to 10″ (250 mm).

Hydro Innovations
www.hydroinnovations.com.au

RADAR LEVEL SENSOR

Level sensors help users monitor their industrial processes. They often make processes more controllable and efficient, but even if they are basically easy to use, the process of selecting the right one for an application can still be difficult.

VEGA now offers one sensor for all applications: VEGAPULS 6X. Selecting the right frequency or determining the DK value of the medium are no longer obstacles, because choosing the right sensor specifications has become easier. The new configurator asks for the type of application and then quickly determines which sensor version is required. The entire procedure now consists of just a few mouse clicks. Of course, an advisory discussion with a VEGA radar specialist is still a good alternative to the configurator. In any case, the result is simplicity for users and a measurement solution that delivers results independently of the media properties, process conditions, vessel shapes and internal installations.

Suitable for industries such as chemical, energy, food, oil and gas and many others, the sensor is equipped with a comprehensive safety concept. Functional safety is ensured as it conforms with all the requirements of Safety Integrity Level. The certified sensor has SIL characteristics and provides the necessary operational safety to minimise risks in safety-related applications. It conforms to IEC 61511, which fulfils the strictest requirements for security of system access and communication control. And its self-diagnosis system continuously monitors the function of the sensor and recognises if it has been impaired in any way, thus contributing to higher plant availability and sensor performance.

It also features a second generation radar chip directly from VEGA, which is characterised by its low energy consumption, high sensitivity, scalable architecture and universal applicability. The radar antenna system and the chip are connected directly to each other, without any cable, for maximum performance.

VEGA Australia Pty Ltd
www.vega.com/au

How much should the water industry trust artificial intelligence?

Chaim Kolominskas, Manager EVS Water, Envirosuite

Deterministic and AI learning approaches should be used together as the industry continues along its journey of digitalisation.

Identification and interpretation of patterns and relationships in the vast amounts of data collected by water utilities has the potential to drive better operating decisions and drive reductions in cost; however, engineers and decision-makers are sceptical of using artificial intelligence (AI) or machine learning (ML) as standalone approaches.

Algorithms are often presented and sold as 'black boxes' that produce non-transparent, unexplainable outcomes and require constant oversight and supervision. Large amounts of clean, historical and granular data are needed to be accurate. More importantly, experienced operators and practitioners in the industry see the lack of connection to the industry itself as a weakness. An ML model on its own does not care about the industry that it is applied to and makes no connection to the accepted physics, chemistry and biology of the process. How should the water industry realise the benefits that AI can deliver, while managing the risks that come with the approach?

Digitalisation is driving change in the water and wastewater treatment sectors, just as it is in other industrial and corporate environments. Water and wastewater treatment plants collect more data than ever before. Control and treatment equipment is increasingly augmented with sensors that collect data to support control of the process.

As engineers and plant managers, we know and trust deterministic models. These models have proven reliable over the years to represent and simulate processes such as chemical reactions in drinking water or industrial wastewater treatment. If the inputs into a process are known, the model can produce a set of outputs that we use to make decisions. It's accepted that best practice models can represent a process accurately enough to be used to understand the implications of changes to the process. However, these approaches are manual and traditionally require substantial technical expertise to drive. Deterministic models are also by their very nature not conducive to forecasting.

The water industry needs to change to meet increasingly stringent operational, regulatory and environmental requirements, as well as the needs of surrounding communities. Understanding the implications of what doing something different would look like is, however, a key challenge still facing water utilities. It is currently difficult to measure or understand the applicability of alternative operating scenarios. Operators and engineers must either live test and see what happens, take part of the plant offline to run tests, or run offline simulations or studies. This is slow and impractical.

Leaders in the sector are looking to alternative options such as digital twin technology as a way of creating a virtual representation of their operations, where changes can be simulated — and implications understood — quickly and with no impact to business-as-usual operations. Automated deterministic models, connected in near real time, are ideal for this purpose, but they are reactive and cannot deliver useful projections on what you should do to avoid an issue.

Hybrid approaches that combine deterministic and AI approaches can overcome the limitations of both methods. Deterministic modelling can be used to represent total process performance, grounded in accepted science of the industry with AI used to drive accurate forecasts and recommendations for short-term actions to improve performance. Keeping personnel involved to oversee and implement recommendations remains important while trust is built in the system.

At Envirosuite, we see the value in both deterministic and AI learning approaches and believe that they should be used together as the industry continues along its journey of digitalisation. As approaches evolve and improve, we look forward to the further opportunities that AI could deliver to the water industry, as long as we keep the humans in the loop.

Envirosuite Operations Pty Ltd

https://envirosuite.com/platforms/water

Could a virus improve the taste of Brisbane's water?

A bacteria-killing virus called a bacteriophage — or phage — could prevent the growth of bacteria on water pipes that produces off-flavours and smells, according to Ipek Kurtböke, an environmental microbiologist from the University of the Sunshine Coast.

A phage is harmless to humans and it's a natural alternative to chemical control, according to the USC Senior Lecturer.

"We can develop bacteriophage biocontrol systems in a laboratory to attack naturally occurring odorous bacteria, and then apply the systems to outdoor cases," she said.

"We have proven in the USC lab that the system can be used to break up sea foam as well as remove geosmin-producing actinomycetes (bacteria) from different surfaces, which are likely contributors to Brisbane's drinking water issues," Dr Kurtböke said.

Actinomycetes are bacteria found in water and soil that assist decomposition of organic materials. However, they can also produce geosmin, which is the musty smell in water and crops.

Dr Kurtböke specialises in the application of phages. Her most recent collaborative research paper identified a system that could control an off-flavour taint in fish aquaculture ponds. Her experience in this field goes back to the 1980s in the United Kingdom, when she was a PhD student at the University of Liverpool, where joint research with London Metropolitan Water was taking place on geosmin-producing actinomycetes.

Wastewater development at Sydney Fish Market

Wastewater treatment specialist Aerofloat Australia has been awarded the contract for the design and build of two wastewater treatment plants for the new Sydney Fish Market development at Blackwattle Bay. Coordinated by Multiplex and Planet Plumbing, the project required one treatment plant to treat wastewater from fish processing, and a second treatment plant to treat wastewater from the food court.

Aerofloat worked closely with the Multiplex architectural team, Planet Plumbing and the Harris Page Consultants to create a customised robust wastewater treatment solution that fitted within the limited space available beneath the entrance stairs.

"We are proud to be collaborating on what is a world-class facility committed to water re-use," said Michael Anderson, General Manager, Aerofloat. "As a company passionate about providing leading technology that is sustainable and environmentally friendly, working with the Sydney Fish Market is a terrific opportunity."

Aerofloat is designing and building the two wastewater treatment plants. The first plant will treat wastewater from various areas of fish processing. Aerofloat's system will consist of a balance tank, screening, reaction tanks, DAF (Dissolved Air Flotation) and a sludge tank. The plant will remove suspended solids, fats, oils and grease from the food processing wastewater. The treated effluent from Aerofloat's system will then run to a biological wastewater treatment plant (MBR — Membrane Bio Reactor) supplied by Aquacell, where it will be treated to a level suitable for water reuse, allowing it to be sent back to the fish processing department. This has been designed to ensure an ecologically and financially sustainable outcome for Sydney Fish Markets.

The second system is a trade waste treatment system for the Sydney Fish Market's food court. Wastewater from the food court will flow through a balance tank, followed by screening, a reaction tank and a DAF, to remove fats, oils and grease. The process is designed to ensure compliant effluent for Sydney Water sewer discharge.

The wastewater treatment system is scheduled to commence install in late 2022, with commissioning to commence in 2023.

Aerofloat (Australia) Pty Ltd

www.aerofloat.com.au

Innovative partnership brings life to future of water

Sydney Water Managing Director Roch Cheroux and Richard Kirkman, CEO and Managing Director of Veolia, at the signing of the partnership.

In a landmark partnership, Sydney Water is joining forces with Veolia to explore innovation opportunities aimed at developing a robust circular economy to help deliver sustainable and resilient water services for the growing city.

Aligning the strategic priorities across two industry leaders will see a focus on securing the future of water supply by ensuring new and existing operations become energy self-sufficient, reach carbon neutrality and support the development of emerging technologies.

The collaboration is a step forward for both organisations in supporting the New South Wales Government's ambition to halve the state's carbon emissions by 2030, and federal targets to achieve carbon neutrality by 2050.

Managing Director for Sydney Water Roch Cheroux said Sydney Water is shifting focus to the future and innovation is a key area of growth to help establish more resourceful ways to provide sustainable water services.

"This initiative is a fantastic example of how market leaders can unite and utilise each other's expertise and skill to deliver innovative results that will benefit both businesses, the community and customers," he said.

"Both organisations are passionate champions of the circular economy, and with this joint venture we have managed to bring together the necessary people, ideas and innovations to accelerate the path to carbon neutrality, while showcasing best practice for environmental partnerships."

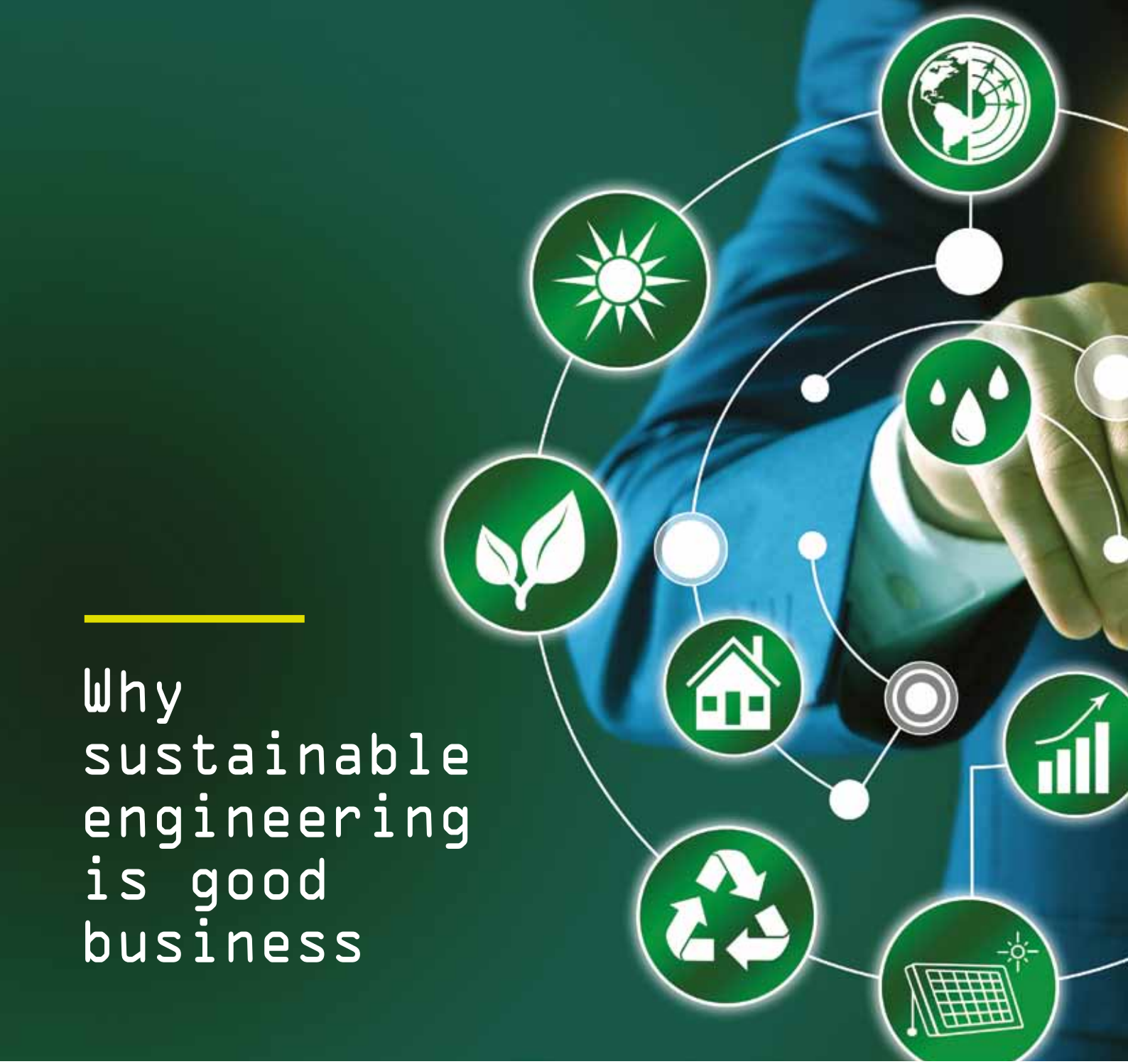
Veolia's Chief Executive Officer and Managing Director Richard Kirkman said by combining industry knowledge and experts from both organisations, the energy and water treatment solutions identified are set to rapidly help protect and preserve the planet.

"This affiliation is a unique approach and sets the standard for social responsibility. By trialling new innovations we're maximising the ability to reach carbon neutrality and energy self-sufficiency sooner," he said.

"Together we will explore opportunities for energy-saving systems, such as water batteries for district cooling, and look to pilot new innovations that optimise recycled water usage for sustainable cities."

The partnership will trial both emerging and proven technologies at Sydney Water/Veolia-operated sites over the next 18 months.

Veolia Australia and New Zealand
www.veolia.com.au



Why sustainable engineering is good business

Sustainable engineering is not just good for the environment, it also improves capital and operational efficiency, which brings financial gains, highlights Amish Sabharwal, Executive Vice President, Engineering Business Unit, AVEVA.

COP26 saw the world's nations come together and make new environmental pledges, including a US–China agreement to boost cooperation in combating climate change, India's pledge to achieve net zero by 2070 and 23 countries committing to phasing out coal.

However, we all know that it will take more than government pledges to keep the global temperature rise below 1.5°C.

Industry has a key role to play in fighting climate change, which is why we're seeing the prioritisation of environmental, social and governance (ESG) goals growing across all sectors, with many organisations making a pledge to achieve net zero by 2040.

Investors now focus on sustainable outcomes

This is, of course, the right thing to do, but it's also becoming a business necessity as investors turn their back on investments that don't support sustainable outcomes. Investment and asset management firm BlackRock, for example, has made commitments to extend funding exclusively to companies that demonstrate progress against their specific ESG initiatives.

Today, moving towards greener capital projects and operations isn't only to gain regulatory approval, it's also needed to secure access to funding. And investors aren't doing this out of the kindness of their heart. They understand that sustainable engineering and operations aren't just ethically commendable, they're good business, too.

Sustainable engineering and operations offer financial gains

There's a growing body of evidence pointing out that higher sustainability performance converts into a better financial performance. An impressive 90% of studies on the topic found

> One of the easiest ways to discover potential sustainability gains is through digital transformation.

that high ESG standards reduced companies' capital costs and that 80% show a positive correlation between stock price performance and good sustainability practices.

One of the easiest ways to discover potential sustainability gains is through digital transformation.

The latest technologies can help you design sustainable plants more quickly, and also build and run them more efficiently as, according to Deloitte, digital transformation can provide a 5–10% reduction in build costs and a 10–20% reduction in operational costs.

Digital transformation also benefits existing brownfield sites by enabling improved decision-making and real-time performance optimisation. Driving both efficiency and sustainability initiatives forward simultaneously, benefits can include reduced energy consumption, waste and emissions.

This is achieved through the use of technologies such as artificial intelligence (AI), process simulation, cloud computing, big data analytics and digital twins to operate assets sustainably by understanding their performance, and predicting future behaviour.

The insights provided can help reduce operational and maintenance costs by approximately 20%; dramatically reduce fuel costs by 28%; significantly improve asset safety, efficiency and reliability; and drive productivity, all by providing fast and accurate data about what is happening across the business.

Sustainability is driving digital transformation

It's understandable then, that a recent AVEVA survey found that 85% of industrial leaders plan to drive sustainability by increasing their investment in digital transformation over the next three years.

Two-thirds of organisations believe the ability to share data sets across teams in real time will have the greatest impact on sustainability, while significant sustainability gains can also come from solutions such as data monitoring. Digital solutions like cloud computing, machine learning, AI and digital twins will be needed to achieve these capabilities.

Take multinational business Henkel, for example. The laundry and homecare giant used an energy monitoring system to analyse and lower energy use by 16% year-on-year, saving it €37m (AU$54m) to date and playing its part to shape a more sustainable future.

Another example of digital transformation's effect on sustainability comes from Covestro, which used process simulation to improve the energy efficiency, and therefore sustainability, of its Germany-based brownfield sites.

"Process simulation can directly determine the optimal energy-efficient process by simulation-based optimisation. When comparing the optimal process with the actual energy consumption directly it reveals the inefficiencies of our processes and opportunities for improvement," said Christian Redepenning, Covestro's Global Technology Expert, at a recent AVEVA webinar on building a sustainable chemical industry.

Then there's Aker Carbon Capture's implementation of a single engineering platform. This helped develop new sustainable processes such as carbon capture by breaking down data silos and increasing engineering and design efficiency. Using integrated engineering and project execution technologies on the cloud, Aker was able to improve collaboration between teams, resulting in increased engineering efficiency which allows them to deliver new carbon capture facilities 50% faster.

"Working in the cloud has meant that our people have been able to engage much more easily across projects and geographies and we've been able to optimise the way we work together," said David Phillips, Head of UK and Investor Relations at Aker Carbon Capture.

"As a company, we're really focused on accelerating the uptake of carbon capture and to do that we need to reduce the cost of the process and end product we'll supply our customers. We've found digital transformation has helped us standardise our processes and improve efficiency, and we've been able to reduce our engineering man hours dramatically."

Sustainability's good for business

As organisations focus on sustainability and look for ways to accelerate their path to net zero, they're discovering more and more that sustainable engineering and operations isn't just good for the environment, but also for their bottom line.

Digital transformation unlocks the performance benefits of advanced technology to gain efficiencies that both improve sustainability and lower costs. Going green will help keep your business in the black.

Aveva Software Australia Pty Ltd

www.aveva.com

Bacteria turns carbon waste into chemicals

Synthetic biologists have engineered bacteria to convert carbon waste into valuable chemicals. The carbon-negative approach could contribute to a net-zero emissions economy. Image credit: Justin Muir

International researchers have selected, engineered and optimised a bacteria strain to break down waste carbon dioxide (CO_2) and make valuable industrial chemicals — acetone and isopropanol (IPA).

The new gas fermentation process developed by researchers at Northwestern University is said to remove greenhouse gases from the atmosphere without using fossil fuels — which are typically needed to generate acetone and IPA. After performing life-cycle analysis, the team found the carbon-negative platform could reduce greenhouse gas emissions by 160% as compared to conventional processes, if widely adopted.

"The accelerating climate crisis, combined with rapid population growth, pose some of the most urgent challenges to humankind, all linked to the unabated release and accumulation of CO_2 across the entire biosphere," said Northwestern's Michael Jewett, co-senior author of the study. He co-led the study with Michael Koepke and Ching Leang, both researchers at LanzaTech.

"By harnessing our capacity to partner with biology to make what is needed, where and when it is needed, on a sustainable and renewable basis, we can begin to take advantage of the available CO_2 to transform the bioeconomy."

Necessary industrial bulk and platform chemicals, acetone and IPA are found nearly everywhere, with a combined global market topping $10 billion. Widely used as a disinfectant and antiseptic, IPA is the basis for one of the two World Health Organization-recommended sanitiser formulas, which are highly effective in killing the SARS-CoV-2 virus. And acetone is a solvent for many plastics and synthetic fibres, thinning polyester resin, cleaning tools and removing nail polish.

While these chemicals are incredibly useful, they are generated from fossil resources, leading to climate-warming CO_2 emissions.

To manufacture these chemicals more sustainably, the researchers developed a new gas fermentation process. They started with Clostridium autoethanogenum, an anaerobic bacterium engineered at LanzaTech. Then, the researchers used synthetic biology tools to reprogram the bacterium to ferment CO_2 to make acetone and IPA.

"These innovations, led by cell-free strategies that guided both strain engineering and optimisation of pathway enzymes, accelerated time to production by more than a year," Jewett said.

The Northwestern and LanzaTech teams believe the developed strains and fermentation process will translate to industrial scale. The approach also could potentially be applied to create streamlined processes for generating other valuable chemicals.

"This discovery is a major step forward in avoiding a climate catastrophe," said Jennifer Holmgren, LanzaTech CEO. "Today, most of our commodity chemicals are derived exclusively from new fossil resources such as oil, natural gas or coal. Acetone and IPA are two examples with a combined global market of $10 billion. The acetone and IPA pathways developed will accelerate the development of other new products by closing the carbon cycle for their use in multiple industries."

The study was supported by the U.S. Department of Energy (DOE) Bioenergy Technologies Office, DOE Office of Science, Biological and Environmental Research Division, Genomic Science, the David and Lucile Packard Foundation and the Camille Dreyfus Teacher-Scholar Program.

Simpler pump system installed at chicken processor

Traditional DAF (dissolved air flotation) pumping systems have so many moving parts. The components include an air compressor, pressure vessel, centrifugal pump and, of course, the controller to get all three components to work harmoniously.

There are many disadvantages of such a complicated system. For one, the pressure vessel requires regular certification and records must be kept. The controller needs monitoring. The maintenance time and cost of the many components can be expensive.

Solution

When one of the largest chicken processors in Australia wanted to eliminate these complications and install a set-and-forget system that requires no controls, it approached Hydro Innovations, which has a combined 80 years of experience in the pump industry.

After consultation, an EDUR LBU 404 C120L with 5.5 kW motor was installed. The EDUR multi-phase pump produces consistent fine micro bubbles suitable for the operation of a DAF tank. The EDUR pump has the unique ability to draw atmospheric air into the suction line, shear it, mix it with the water being drawn from the 'clean' end of the DAF tank, and saturate the air into the water (by pressurising it).

The EDUR pump eliminates the need for a compressor, control system, conventional pump, air saturation vessel (and ongoing certifications). The pressure vessel can be removed or bypassed, or it can be incorporated into the new system.

Results

Because of the simplicity of the system, operators will see an improvement in energy consumption (because they're not running compressors) and lower maintenance costs. There is no pressure vessel to continually certify, no compressor to maintain and no more complicated control system to operate. Just set and forget.

With the pump running at 10 m^3 per hour and circulating approximately 10% of the inflow to the DAF tank, the plant has been running free of maintenance and interference for over four years.

Hydro Innovations

www.hydroinnovations.com.au

Achieving net zero with sustainable e-waste solutions

Reducing, reusing and recycling e-waste for a circular economy

Robert Vinokurov, General Manager, Client Solutions Group, Dell Technologies Australia & New Zealand

Climate change is an economic, social and environmental challenge with increasingly evident consequences, and human-produced greenhouse gas emissions are the primary cause. Methane concentrations have almost doubled in recent years, and in 2021, the highest CO_2 concentration reading in human history was recorded at 416 ppm. E-waste is a big part of the problem — it's responsible for 70% of the toxic chemicals found in landfill. Perhaps more importantly, if we were to recycle the raw materials, we would reduce the need to extract and refine more, thereby avoiding 2.9 tonnes of CO_2 per tonne of products manufactured.

According to 'The Global E-waste Monitor 2020', the world produced a record 53.6 million tonnes of e-waste in 2019. At the current rate, we'll produce 74 million tonnes annually by 2030. The reduce, reuse, recycle slogan that we apply to plastics, homewares and other lifestyle products hasn't been readily applied to our electronics. Only 17.4% of e-waste was recycled in 2019, and our consumption levels show no sign of stopping; major technology companies saw drastic increases in profits in 2020–2021 as the COVID-19 pandemic drove people to embrace a digital lifestyle at work and in their stay-at-home leisure time.

Finding the balance between input and output of greenhouse emissions is a crucial step to reducing the extent of global warming, and e-waste recycling programs can go a long way to achieve this. We could save 23,000 tonnes of CO_2 emissions by recycling just half of the televisions discarded annually. Not to mention the millions of computers, mobile phones and other electronic equipment we send to landfill when they break, or we upgrade to keep up with the evolving digital landscape.

To achieve net zero without sacrificing economic growth and technological innovation, we need to invest in e-waste practices that create a circular and sustainable economy. At Dell Technologies, we've recovered more than 2.5 billion pounds (1.1 billion kg) of used electronics since 2007. But to have a significant positive environmental impact, we're taking a firm, proactive stance in 2022. We've built on our 25+ years of experience in global recycling services to rethink and redesign our approach with a global program — Asset Recovery Services.

The program has launched locally in ANZ and offers businesses the chance to mitigate their impact while maximising value. We manage the pickup logistics of any brand of leased or owned hardware and sanitise the device to ensure data doesn't fall into the wrong hands. The service prioritises reuse where possible — we resell what we can and responsibly recycle what we can't, adhering to strict standards for environmental compliance worldwide.

The Asset Recovery Services program simultaneously reduces e-waste and puts money back in customers' pockets allowing them to fund new technology — it's a win-win situation. Businesses can follow the entire process online through our TechDirect portal, and we offer a comprehensive report of the process. We hope the clear benefits and hands-off nature of the program will encourage more businesses to recycle their e-waste, to create a culture of sustainability within the tech industry and reduce overall greenhouse gas production.

The next 10 years of climate action will determine the world's success against the increasing threat. As we rebuild our lives post-pandemic, we have the opportunity to correct our actions with new solutions and produce real, sustainable change — for a clean, innovative tomorrow.

Dell Technologies

www.delltechnologies.com

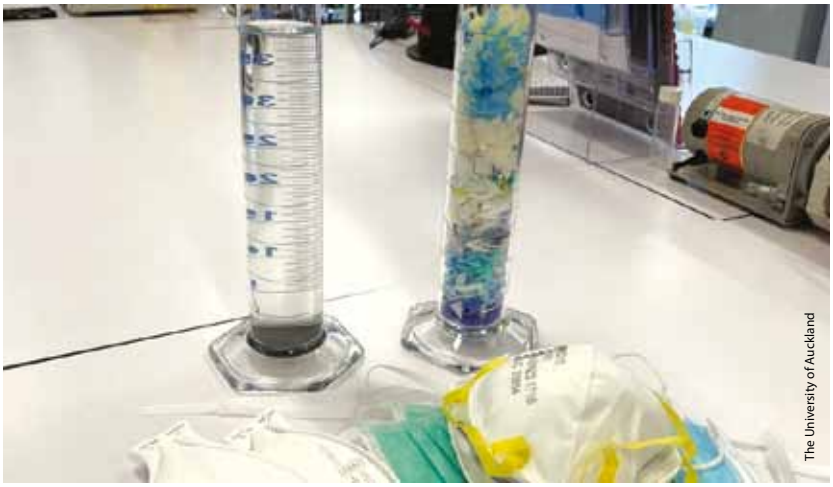
https://www.dell.com/en-au/dt/services/deployment-services/asset-resale-recycling.htm

Circular solution for healthcare waste

A new process developed by engineering researchers from New Zealand and Canada converts personal protective equipment (PPE) waste into harmless by-products — water and vinegar.

Shredded masks, gowns, gloves and plastic safety glasses are put into a machine, then hot, pressurised water and compressed air are applied; and the end products are water and acetic acid.

The PPE-to-liquid process is carried out at a temperature of 300˚C and takes about an hour in a small prototype machine in a laboratory in the faculty. Gaseous by-products from the process are oxygen and low concentrations of carbon dioxide, which can be safely discharged.



The University of Auckland

"This is a clean, chemical-free solution which will be a game changer internationally," said Dr Saied Baroutian, an associate professor in the faculty's Department of Chemical and Materials Engineering at the University of Auckland.

"The technology used is a hydrothermal deconstruction or valorisation process and it destroys the waste completely. The liquid produced in the process is safe, inert and can be reused — the vinegar or acetic acid can be used for disinfecting and the water can be reused for the processing cycle therefore minimising water consumption and helping with sustainability," Baroutian said.

The process was developed in partnership with the Faculty of Medical and Health Sciences and the Universities of Otago and Waterloo (Canada). The research teams are now taking steps to develop the solutions into a larger scale pilot system and, learning from that, will develop a full-scale proof of concept.

"That is the point where we can showcase the technology, ensure the designs will work with the flow of PPE waste and find funding or potential partnerships with commercial organisations so these technologies can be implemented in New Zealand and overseas," Baroutian said.

In terms of cost, the researchers have already completed an economic analysis which shows a large-scale hydrothermal deconstruction system could process PPE waste at a cost comparable to the current practice of autoclaving and landfilling. "And in terms of the environment, the savings on offer are huge," Baroutian said.

Funding for the project has been provided through a $1.3m grant from the NZ Ministry of Business, Innovation and Employment (MBIE) through the COVID-19 Innovation Acceleration Fund and a $46,000 grant from the Medical Assurance Society Foundation.

The upgrade work at the Prince of Wales Bay Sewage Treatment Plant was carried out by Aquatec Maxcon and included a new roof for the main digester.

External heating units upgrade

wastewater treatment

A new sludge heater supplied by HRS Heat Exchangers has formed part of an upgrade to one of Tasmania's most important wastewater treatment plants, ensuring it is fit for purpose for the next 40 years.

TasWater is the water and sewage utility for the island state of Tasmania in Australia. Owned by Tasmania's 29 local councils and the state government, TasWater is responsible for providing drinking water and collecting and treating sewage to the 540,000 people who live across the state. In 2020, TasWater and main contractor Aquatec Maxcon undertook a multimillion-dollar upgrade of the Prince of Wales Bay Sewage Treatment Plant in Hobart.

The Prince of Wales Bay Sewage Treatment Plant is one of the oldest sewage plants in Tasmania and the refurbishments, which included a new roof for the main anaerobic digester, will allow the facility to cope with the growing demand for wastewater treatment in the region. These improvements will ensure its operational suitability until 2060 as part of TasWater's 10-year investment program.

In addition to the new roof, the upgrade included a new control system, new biogas waste flares and an improved heating system, all of which will help to reduce the greenhouse gas emissions associated with the operation of the facility.

As part of the upgrade package, HRS Heat Exchangers supplied Aquatec Maxcon with a corrugated tube heat exchanger to warm the recirculating sludge and maintain optimum operating temperatures in the main digester. As Tasmania is the southernmost and coldest state in Australia, maintaining digester temperature is crucial to efficient operation, particularly in the winter months when there is an increase in heat loss from the liquid sludge nearer the top of the tank.

The HRS DTI Series heat exchanger.

Jim Foley, Project Engineer for Aquatec Maxcon, explained why the company chose HRS to supply the new digester heating unit: "There were a number of heat exchanger suppliers that we could have chosen, but one of the issues we faced was a limit of the space available for the heat exchanger, and the HRS unit had slightly smaller dimensions than some others for the same thermal performance. HRS provided me with a reference and a performance test, [and after that] we were happy to go with the HRS product."

The supplied unit consists of a six-module HRS DTI Series heat exchanger to raise the sludge temperature from 33 to 36°C, with a capacity to process 72,000 litres of sludge every hour using hot water supplied by a separate boiler. To facilitate routine maintenance and cleaning, the heating unit has been installed outside the digester; a design which is rapidly becoming the norm for biogas plants due to the benefits it provides over internal designs.

Despite the challenges of a global pandemic, the heat exchanger, which was manufactured at HRS's factory in Spain, was delivered well ahead of the required installation date. Since operation, the unit has performed according to specification, dealing with a range of feedstocks and sludges, including sewerage sludge and fats and oils from trade wastes.

"As an engineer on a project such as this, you tend to focus on areas where you have problems," Jim added. "I'm happy to say there were no problems with the heat exchanger."

HRS Heat Exchangers Pty Ltd
www.hrs-heatexchangers.com/anz

CST Wastewater Solutions now removes supply chain disruption at water and wastewater plants through local manufacture, commissioning and servicing of vital screening and compacting technology.

LOCAL MANUFACTURE OF WASTEWATER SCREENING TECHNOLOGY

Customers and jobs benefit as wastewater leader CST achieves full local manufacture of screening technology vital to efficiency and sustainability.

Australian municipal and industrial wastewater treatment leader, CST Wastewater Solutions, is now fully manufacturing its rotary drum screen and screw screen/compactors locally to enhance quality and certainty of supply in Australia and New Zealand.

The move to total local production comes as intensifying supply chain issues interrupt, delay and lessen the supply of some vital wastewater treatment technology, which is key to the sustainability and environmental performance of industrial and municipal wastewater treatment plants and key to their overall reliability in delivering services to entire communities.

CST Wastewater Solutions Managing Director Mr Michael Bambridge says the switch to local production also enables his company to offer full stainless-steel products with world-respected standards of Australasian metals engineering, replacing carbon steel components and further improving corrosion resistance in harsh local environments.

Quality leadership

Such testing environments — in which the screens, compactors, and wedgewire and perforated drums are typically used — extend from municipal sewerage, waste management and water supply networks through to broad industrial uses: including food and beverage, red meat and poultry, dairy and primary processing, including paper, agricultural horticultural and mining and resources waste management and process engineering designed to protect the environment against flooding, spills, water table and waterway damage.

"We have been moving progressively to local manufacture for the past two years now, to maintain quality leadership and guarantee reliable supply as COVID has wrought havoc with imports.

"Shortages and erratic supplies have had a knock-on effect right through the wastewater engineering sector, so we took the decision early to give our customers an edge in quality and certainty.

"Not only does local manufacture deliver a more robust and low-maintenance product — and better whole-of-lifecycle value — but it places the customer next to the source of supply for spare parts, future extensions and retrofits to boost performance long-term. This is a very important factor as more and more municipal and industrial organisations don't have the engineering services on-site to totally maintain and to repair equipment without delay if it needs rapid attention.

Mr Bambridge says a very important additional advantage of the move away from cheap imports to local manufacture of superior product is the boost local spending gives to this country's jobs and skills base.

"Everyone benefits — the customer gets a better product and greater certainty of supply; local suppliers — including, tooling, cutting and component makers — get the benefit of the local spend; and more local families get the advantage of more and better jobs.

"Local spending by Australian business makes sense on so many levels. Where the government is concerned, particularly, far greater preferences should be given to local manufacture over cheap imports that don't pay Australian taxes or benefit the local economy.

CST's range of screening equipment now fully designed and fabricated in Australia includes the following:

- Internally fed Rotary Drums — Model RDs
- In-Channel Horizontal Rotary Drum — Model FS
- Screw Screens and associated equipment — Model SF

"If it has taken a COVID crisis to wake us up to the benefits to local manufacturing, then at least some good has been done by this plague that no-one wants," says Mr Bambridge.

CST Wastewater Solutions
www.cstwastewater.com

CST Wastewater Solutions

Circular economy for Western Parkland City

Sydney Water has revealed its plans for a $1 trillion circular economy across the Western Parkland City, with the launch of its white paper, *Unlocking the circular economy in the Western Parkland City*.

Using input from 60 stakeholders from various sectors such as business, industry, government, academia and communities, the paper outlines how Sydney Water will introduce a circular economy with the collaboration of public and private sectors to foster a thriving, modern, liveable city.

"Transitioning to a circular economy ecosystem through thoughtful land-use planning and wider re-use of water, materials and waste will be critical for unlocking sustainable economic growth — but will rely on councils, governments and businesses working together to streamline approvals for technology and other vital investment," said Sydney Water's Managing Director Roch Cheroux.

"Western Sydney has the opportunity to be a global leader in circular economy implementation and with the extent of greenfield development being planned for now we must embrace this opportunity."

The white paper sets out six recommendations in the report to enable the facilitation of the circular economy, including:

1. Setting targets and policies that help create a circular city.
2. Valuing circular economy outcomes in business cases for infrastructure investment.
3. Better collaboration with industry to make it easier to test new solutions and navigate regulatory processes in a timely and cost-effective way.
4. Creation of systems and incentives to connect circular supply chains.
5. Optimising water cycle management for a green, cool and climate-resilient city.
6. Expansion of biofuel production.

"Under the recommendations, turning food waste into energy is one of the largest economic opportunities for the Western Parkland City. Systems for collecting, transporting and converting waste into biofuel could be part of the earliest planning stages and built into new homes and surrounding communities," Cheroux said.

Launching the white paper at Parliament House, Minister for Enterprise, Investment and Trade and Minister for Western Sydney, Stuart Ayres MP, outlined his vision for Western Sydney as the centrepiece of global circular economy leadership.

"The NSW Government has demonstrated its commitment to driving circular economy outcomes through NSW Circular and dedicated grant funding announced yesterday. We have a clear direction, and by working together we will create a national and global benchmark for a circular economy in the Western Parkland City," Ayres said.

"Sydney Water is proud to have led this work which presents a joined-up view on what needs to happen if we are serious about the Western Parkland City becoming a global benchmark for a circular economy on the largest scale seen to date in Australia," Cheroux said.

"The circular economy is a trillion-dollar economic opportunity for Australia, and we have the opportunity to become world-class leaders in this field."

Sydney Water Corporation
www.sydneywater.com.au

SELF-SUSTAINED RESERVOIR USES ELECTRO-CHLORINATOR SYSTEM

Logan Water were looking for an innovative approach to maintain water quality at the Round Mountain Reservoir at New Beith in Queensland. In collaboration with WestWater, the result was a state-of-the-art design, implementing the introduction of an electro-chlorination disinfection system, powered off the grid using solar panels in tandem with Tesla smart batteries for back-up on cloudy days.

The Hyprolyser system uses a brine solution to produce a 0.6% concentration of Sodium Hypochlorite on-site. The product is then stored and dosed into the water mains to maintain total chlorine levels in the water supply.

The electro-chlorination process includes two Hyprolyser 2200 electro chlorinators running in series to batch product and store in a 19,000 L HDPE product tank.

Dosing is completed by duty/standby digital dose pumps housed in one self-contained polypropylene dosing cabinet. There is also a bulk brine storage tank of 8000 L capacity, which sits below ground level under a false floor and is filled with salt via a monorail/hopper system capable of delivering salt in 1 ton bags.

What is electrolytic chlorination?

Hyprolyser electrochlorination systems offer a safer, cleaner and more environmentally friendly way to provide chlorine for a wide range of disinfection uses.

Using only salt, water and electricity to produce hypochlorite, each Hyprolyser model offers exactly the same quality of performance and benefits. Whether you are looking to disinfect a spa pool or provide enough chlorine to treat millions of litres of drinking water per day, there's a Hyprolyser system available to perfectly fit your needs.

Why use electrochlorination?

Using salt as the raw material to generate your own supply of hypochlorite offers several advantages. Salt is a widely available commodity used in many commercial and industrial settings and is competitively priced for both small and large users. Compared to commercial chemicals, salt is very safe and easy to store, has an infinite shelf life and requires minimal packaging which can be easily recycled.

Standard

High Capacity

iSEC

Hyprolyser® Models

iSEC	6, 30, 60, 90 g/hr Cl2
Standard	280, 560, 1100, 2200 g/hr Cl2
High Capacity	4250, 8500 g/hr Cl2

On-site generated Sodium Hypochlorite is 0.6% concentration and classified as non-hazardous, unlike commercial Sodium Hypochlorite and chlorine gas. The product does not deteriorate with time or temperature providing stability in the water treatment process.

For further information, contact the specialists
https://www.westwater.com.au/product/electrochlorinator

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CITECT SCADA LIVES ON AS AVEVA PLANT SCADA

For over thirty-five years, Citect delivered innovative, reliable, and flexible SCADA software that enabled companies across the globe to optimize industrial processes, improve situational awareness, and make real-time decisions based on accurate information. Citect is synonymous with excellence in SCADA solutions in the Asia Pacific region. With the combined strength of AVEVA and Schneider Electric Software, Citect SCADA became Plant SCADA to continue its legacy as a reliable, flexible, and high-performance Supervisory Control and Data Acquisition (SCADA) software solution for industrial process customers.

With the launch of AVEVA™ Plant SCADA 2020 R2, Citect SCADA took on a new name and a new role as an integrated part of the AVEVA Operations Control portfolio. Plant SCADA includes upgrades that allow users to access the full value of AVEVA's operations control software, from the edge to the enterprise.

AVEVA Plant SCADA continues to provide secure and safe supervisory control and monitoring of disparate critical infrastructure for industrial processes to increase returns and reduce operating costs, while improving productivity and product quality.

AVEVA Plant SCADA enhances excellent capabilities

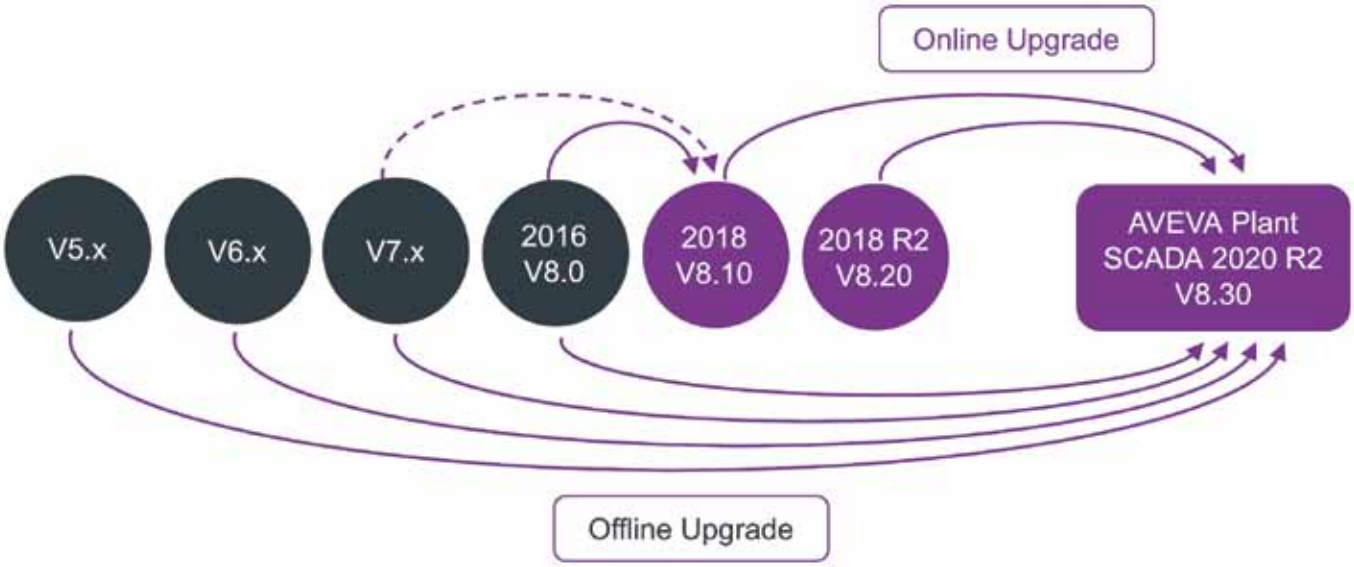
The AVEVA Plant SCADA web client provides a new thin client solution with HTML5 visualization to desktop browsers and mobile devices. The modern graphics editor, new graphics technology like Industrial Graphics, and new web runtime experience are available alongside the legacy graphics tools and high-performance desktop runtime you're already familiar with.

Improved Connectivity (IPv6, OPC-UA Server)

Plant SCADA 2020 R2 IPv6 addresses are supported throughout the configuration, including PC Network Addresses, I/O Devices (for supported drivers), servers and clients. Plant SCADA also supports native OPC-UA server functionality so you can share your plant data throughout your organization on unified data platforms.

Security Enhancements

- Permissions are reduced for Plant SCADA, and support was added for virtual service accounts.
- User groups can restrict access to configuration files (including those on deployment server/client) and Plant SCADA configuration tools.



- Enhanced IT management supports mapping security groups to Windows Domain groups, including security configurations for deployment, support for Domain groups within Local groups, and support for authentication of Windows users through CtAPI (so you don't have to manage local users).
- We extended encryption through ActiveX Web Server connections.

Other Enhancements

We also added the following enhancements to Plant SCADA 2020 R2:

- Determine how you use graphics library items throughout your project (integrated for both legacy graphics and new Industrial Graphics libraries) within Plant SCADA Studio development.
- Persistent GoTo Object dialog settings were added to the graphics editor.
- Display dialogs from the graphics editor on your chosen monitor.
- Hide the 'Add' button in Special Days view of the BACnet Scheduler during the runtime.

More Than a Name Change

The name may have changed to AVEVA Plant SCADA, but everything that made Citect great remains, helping it retain its position as a reliable, flexible, and scalable SCADA solution.

Long-time users of Citect SCADA will find even more capabilities with AVEVA Plant SCADA. That's because AVEVA is committed to investing in the future development of AVEVA Plant SCADA, with a roadmap that focuses technological trends for a SCADA software ready for anything.

Online Upgrade

Online upgrades are available for version 7 and above to AVEVA Plant SCADA 2020 R2 (version 8.3).

Get ready for more

The same team who brought you Citect SCADA are dedicated to the future development of AVEVA Plant SCADA as a world-class industrial software solution, ensuring a seamless transition from one version to the next. With continued R&D and investment — get ready for more features, functionality and releases.

Schneider Electric — AVEVA Select Distributor

Schneider Electric recently announced that they signed on as the first AVEVA Select distributor in the Asia Pacific region.

This agreement gives Schneider Electric access to the full portfolio of AVEVA's leading-edge industrial software solutions. The combined strength of the partnership accelerates your journey to industry 4.0 and helps you meet end-to-end digital transformation requirements with unified platforms for operations.

The AVEVA Select partnership helps Schneider Electric's customers optimise engineering, operations, and asset performance using both proven and cutting-edge technologies like artificial intelligence, industrial IoT, big data, cloud, and hybrid-cloud capabilities.

Bringing together the expertise and leading-edge industrial software of the two companies, the partnership delivers scalable and flexible end-to-end solutions that power your workforce, information and technology capabilities to support the complete industrial lifecycle — on budget and on time.

Joint customers will benefit from proven best practices, finely-honed efficiencies, and extensive sector-specific expertise. With Schneider's strong ecosystem of delivery and technology partners, the new partnership will help you expedite your digital transformation.

Ready to find out more or upgrade to AVEVA Plant SCADA?

AVEVA and Schneider Electric always recommend using the most recent versions of software to mitigate security risks and ensure you have access to all the latest features and capabilities. If you're currently a user of Citect SCADA, now is a fantastic time to consider an update to AVEVA Plant SCADA. If you're new to the solution — contact our team to request a demo to see how AVEVA Plant SCADA can reduce your operating costs and improve productivity and product quality.

Schneider Electric

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UN resolution to beat plastic pollution

On 2 March at the UN Environment Assembly (UNEA-5) in Nairobi, representatives from 175 nations endorsed a resolution to end plastic pollution and develop an international legally binding agreement by 2024. The resolution, titled 'End Plastic Pollution: Towards an internationally legally binding instrument', addresses the full life cycle of plastic, including its production, design and disposal.

An Intergovernmental Negotiating Committee (INC) will now be established, which is expected to create global rules and obligations to address the full life cycle of plastics, setting standards for the design of reusable and recyclable products and materials, and the need for enhanced international collaboration to facilitate access to technology, capacity building, and scientific and technical cooperation.

The legally binding agreement is expected to be completed by 2024 and will be designed to hold nations, businesses and society accountable in eliminating plastic pollution from the environment.

"Today marks a triumph by planet earth over single-use plastics. This is the most significant environmental multilateral deal since the Paris Accord. It is an insurance policy for this generation and future ones, so they may live with plastic and not be doomed by it," said Inger Andersen, Executive Director of the UN Environment Programme (UNEP).

"Let it be clear that the INC's mandate does not grant any stakeholder a two-year pause. In parallel to negotiations over an international binding agreement, UNEP will work with any willing government and business across the value chain to shift away from single-use plastics, as well as to mobilise private finance and remove barriers to investments in research and in a new circular economy," Andersen added.

A shift to a circular economy can reduce the volume of plastics entering oceans by over 80% by 2040; reduce virgin plastic production by 55%; save governments US$70 billion by 2040; reduce greenhouse gas emissions by 25%; and create jobs, according to UNEP.

Plastic pollution in Australia

The Australian Government developed the National Plastics Plan in 2021 to address the plastic pollution problem in Australia and voted in favour of the UN resolution for a legally binding agreement to cover the whole life cycle of plastic by 2024.

Australia now produces 2.5 million tonnes of plastic waste each year, equating to 100 kg per person. Of this, only 13% of plastic is recovered and 84% is sent to landfill. Around 130,000 tonnes of the plastic we consume leaks into the environment each year.[1]

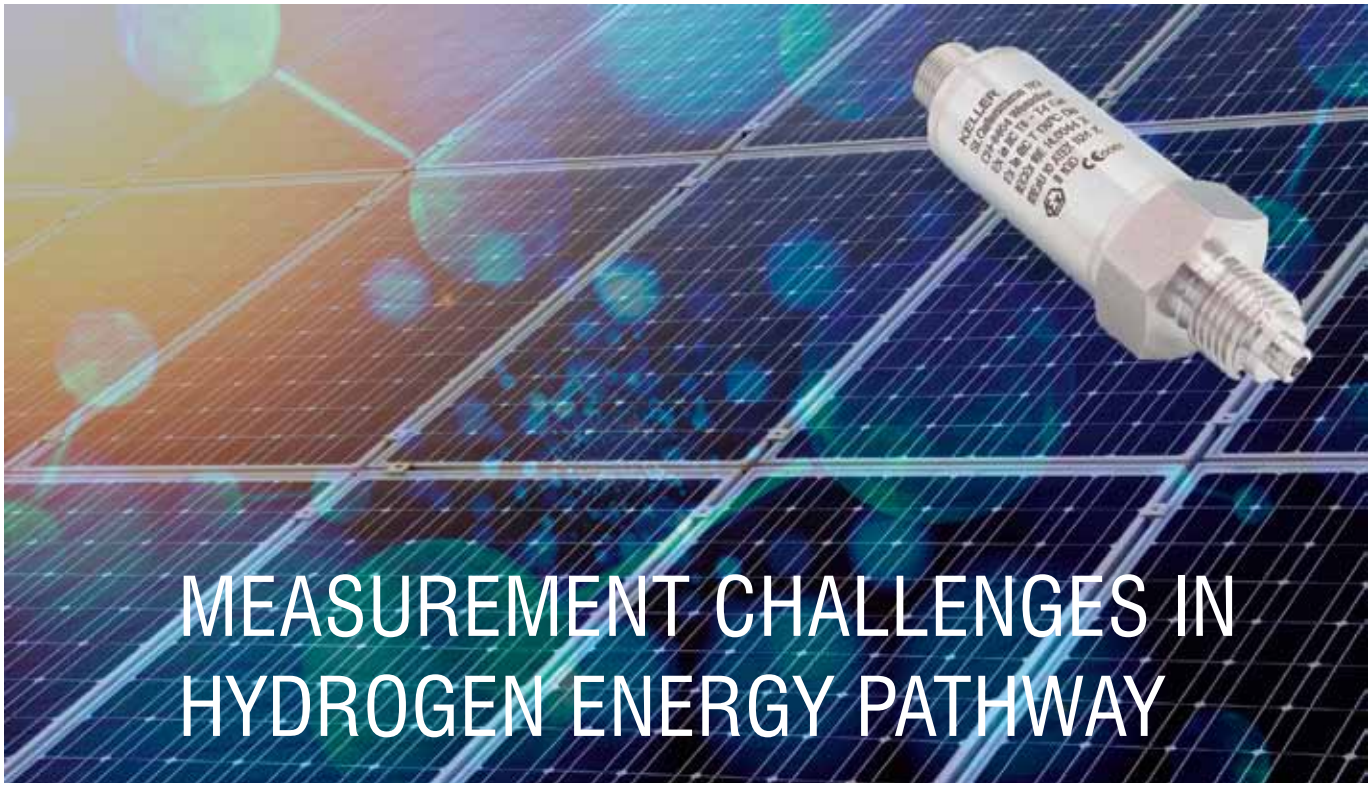
Australian Marine Conservation Society (AMCS) plastic pollution expert Shane Cucow welcomed the agreement and said it would bring benefits to the places in Australia that are prone to plastic pollution from overseas.

"While most of the plastics on our coasts originate in Australia, some of our wildest places like the Gulf of Carpentaria and the Cocos (Keeling) Islands accumulate vast amounts of plastics and lost fishing gear that originate from around the world.

"Monsoonal winds and global ocean currents carry lethal plastic pollution and fishing gear from overseas into these areas with devastating impacts on wildlife. The Gulf is a hugely important feeding and breeding ground for threatened species, including four different types of sawfish and six of the world's seven species of turtle.

"A global agreement to phase out unnecessary plastics worldwide, with financial support to manage plastic pollution in the nations who need it most, would mean less plastic polluting Australia's remote coasts and oceans."

(1) https://www.awe.gov.au/sites/default/files/documents/national-plastics-plan-2021.pdf



MEASUREMENT CHALLENGES IN HYDROGEN ENERGY PATHWAY

Hydrogen is the most common chemical element found in the universe and has a great potential as a clean source of energy. On earth, it exists not in its pure form, but rather as part of other compounds such as water, biomass, fossil fuels or other types of minerals. As a potential energy source, hydrogen contains more than twice as much energy as natural gas, only requires oxygen as an input and produce water as an output. Therefore, hydrogen produces zero greenhouse gas (GHG) emissions as a fuel source.

The problem lies in utilisation of hydrogen as energy source as it can only be used for energy generation when it exists in its pure form. Therefore, hydrogen must be extracted from the materials and compounds listed above, using different extraction processes which may or may not produce GHG emission. If it does, hydrogen is not that clean as a fuel source.

Hydrogen can be colour-coded based on the amount of emission it generates during the extraction process; green, blue, grey or brown hydrogen. The lighter colour indicates the least amount of emission generated, and vice versa. Green hydrogen will play an increasingly significant role in the coming phases of the energy transition but it is an extremely costly process and cannot yet be scaled to commercial-size plants for widespread energy generation. Blue hydrogen pathway generates hydrogen from methane steam reforming process, generating GHGs which are then treated via capture and storage technologies.

Hydrogen extraction needs a massive energy input to run the operation. Therefore, the energy requirement must also come from renewable sources such as solar, wind or hydroelectric power to achieve 100% zero emission. Hydrogen can only be regarded as clean energy source if its production processes do not generate GHG emission.

If clean hydrogen production can be commercialised, transitioning to 100% hydrogen energy pathway is still a challenge due to the issue in safe handling, transporting and storing hydrogen. This is because hydrogen is a very reactive element and can cause hydrogen embrittlement in any materials. Therefore, materials used to construct equipment that come into contact with hydrogen must meet a strict control requirement.

Pressure transmitters are used at every measurement point during production and end-to-end supply chain. In storage tanks, hydrogen must be stored in pressurised tanks kept at certain pressure, either 350 bar or between 700 and 900 bar. The storing pressure will indicate where the hydrogen will be used. Therefore, it is crucial to ensure that the pressure is accurately monitored as measurement errors can cause significant loss to the operators and the customers.

Our oil-filled piezoresistive pressure transmitters can be used for almost all pressure measurement applications due to their accuracy, robustness and reliability. However, they have to be modified with gold-plated diaphragm for hydrogen pressure measurement applications to address the challenge with hydrogen poisoning. The high permeability of hydrogen gases allows it to seep through the stainless-steel diaphragm which will generate erroneous measurement and may damage the sensors beyond repair due to hydrogen-induced cracking mechanism.

The gold-plated diaphragm pressure transmitters are suitable for hydrogen applications as hydrogen diffusivity through gold is far lower compared to stainless steel. The inside of the pressure transmitters is also fully welded and metallically bonded to isolate parts of the transmitters that are in contact with hydrogen from the rest of the systems.

For cleaning and maintenance, oil and grease-free solutions can be used to prevent contamination. The system can also be designed to be intrinsically safe with IECEx certification to suit hydrogen applications.

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ODOUR EMISSIONS TRACKING SYSTEM

Bad odours are more than distressing — they can be toxic. That's why it's critically important for water treatment plants and landfill operations to monitor and mitigate odours before they become a problem.

Odosense is an active odour analysis and public complaint validation system. It works by analysing the chemistry of an odour to identify the concentration of gases such as sulfides, methane and volatile organic compounds.

This real-time chemical analysis of odours means that issues can be identified for preventive maintenance and correction before the odour becomes a nuisance or health hazard. The system also provides a source for complaint validation and can be used to predict odour nuisance in surrounding areas as well as odour emission hotspots.

The Odosense Odour Emissions Tracking System tracks odour emissions every 2 min and continuously relays the information to a central server using a variety of wireless connectivity options. It's easy to retrofit in existing water treatment plants and landfills and comes with the option of using an external or solar power source.

With a 48 h battery backup time, the robust system is built to operate in temperature extremes of -20 to +60°C and can also withstand humidity levels of 0–90%.

In Australia, the Odosense Odour Emissions Tracking System is available from Tecpro Australia.

Tecpro Australia
www.tecpro.com.au

EMERGENCY RESPONSE EQUIPMENT

The trailer-mounted, multipurpose Lampo is designed to speed up and simplify the deployment of emergency response equipment for municipalities, emergency services and contractors.

It is available in seven standard sizes from 11 to 100 kVA, with Gorman-Rupp self-priming electric pumps from 10 to 150 l/s and light tower with LED lamps.

The device enables deployment of multiple pieces of equipment, using only one vehicle. It has a diesel-driven power generator (manufactured by equipment manufacturer, Euromacchine) complete with variable frequency drive (VFD) that powers a lighting tower and a Gorman-Rupp pump.

It is designed to light up a work area while operators set up the self-priming pump or operate numerous electric tools from the power generator.

The VFD allows for soft starting electrical equipment, including the pump, and can vary the speeds of these machines to suit the duty at hand. While all this is happening, the compressor can be driving air nibblers, air-operated nail guns, wrenches or tyre inflators.

The Lampo units also come standard with an air compressor, discharge hose reel, suction hoses and a robust mounted toolbox.

Introducing The Lampo Unit By Euromacchine To Australian Industry from Hydro Innovations on Vimeo.

Hydro Innovations
www.hydroinnovations.com.au

ELEVATE 'GREEN' CREDENTIALS WITH A MASTER OF ENVIRONMENTAL MANAGEMENT AND SUSTAINABILITY

The University of Newcastle's Master of Environmental Management and Sustainability is designed for those seeking to become an environmental sustainability specialist. Sustainability is one of the key drivers of current economic policy, so having an in-depth understanding of how environmental practices intersect with business, government and the community is a highly regarded skill with strong job growth forecasted over the next decade.

The degree has been designed with flexibility in mind. It is available 100% online with some courses also offered face-to-face, and students can choose to study full-time or part-time so they can fit study in around their lifestyle. Students can even design the program around their professional needs with the option to choose to study two of three specialty areas: business management, natural resource management and spatial science.

The degree is available for people from a range of backgrounds and experience. Catering for both suitably qualified graduates from cognate fields and mid-career professionals wishing to gain professional postgraduate qualifications in the field, there are study pathways from 80 to 160 units depending on level of experience. Students can also elect to study at a time that suits them, with multiple intakes per year.

University of Newcastle
www.newcastle.edu.au

ALL THE COMPRESSED AIR YOU NEED… WITH BIG SAVINGS IN COMPRESSOR RUNNING COSTS

Big industry requires enormous amounts of regulated compressed air to operate a variety of applications and the bigger the demand, the bigger the compressor and the higher the energy bills …. until now!

The revolutionary new range of rotary screw compressors from Kaishan can meet required air output whilst utilising innovative Permanent Magnet Variable frequency (PMV) and 2-stage technology to greatly reduce the energy required to generate equal or greater air output than other compressors with larger kW motors. That means getting all the compressed air power you need for now and into the future with up to 50% energy cost savings over conventional compressors with equal or greater output.

From 15 up to 250 kW, these advanced machines utilise systematic optimisation of the airends through permanent magnet drive motors and variable speed drive technology to achieve higher efficiency at all operating speeds plus advanced 2-stage technology generates more air and ensures longer bearing life.

Variable frequency gives operators complete control of air output to meet real time demands from nil to full capacity for a variety of applications with no start up spikes or cost penalties. Other major benefits of these new age compressors are significantly lower noise levels, less bearing wear and lower maintenance requirements and costs.

CUSTOM COMPRESSED AIR SYSTEM DESIGN FOR HIGH EFFICIENCY, OPERATION

In many industrial applications it is vital to select the right type and capacity of compressor to match operator demands. It is also vitally important that new or upgraded systems are designed with the right components and configuration to ensure that the entire system operates at peak efficiency, day in, day out. Minimising pressure drop and the likelihood of air leaks while ensuring ease of access for maintenance through calculated custom design and installation are all important in the set up of an effective, energy efficient compressed air system.

Incorporating the right in-line components including receivers, air filters, dryers, oil/water separators and after coolers is essential in meeting demands for supply of clean, quality air to maximise application requirements.

PROVIDER SERVICE AND SUPPORT IS PARAMOUNT IN MAINTAINING A LONG, EFFICIENT LIFE FOR EVERY COMPRESSED AIR SYSTEM.

The service side of Kaishan Compressors offers a complete support network for their customers and a professional maintenance business servicing the needs of all compressed air system operators, whatever brand or type. Highly experienced mobile technicians provide 24/7 service around Australia and carry a full range of quality parts for fast repairs with minimal downtime to ensure all air compressors are correctly commissioned and maintained to maximum reliability and efficiency.

All Kaishan machines are supported by extended warranties including a lifetime airend warranty on the premium krsp range.

Whether you run a major industry or a specialist workshop, the latest Kaishan compressors offer state of the art, energy saving technologies that can dramatically reduce running costs whilst increasing output.

COMPRESSORS AND SYSTEM COMPONENTS READY TO INSTALL

With an optimistic 2022 industry outlook, Kaishan have stocked up with a wide range of ready to go 'new generation' compressors to assure fast delivery on stocked machines and system installation for minimal lost production and temp air frustrations.

To support the range of world class compressors, Kaishan have also stocked up on system components including air receivers, refrigerated dryers and coalescing filters to provide complete systems and turnkey solutions.

Right around Australia, inventory has been distributed to the Kaishan national network to ensure customers the shortest possible delivery times.

Mark Ferguson, CEO of Kaishan Compressors stated: "The support from our global manufacturing group in overcoming supply issues puts us in a very strong position to cater to growing demand. This is an exciting time for Kaishan Compressors as we now have machines and system components in stock exclusively for Australian industry."

For further information, or a no obligation assessment of your needs and a quotation please call 1300 098 901 or go to www.kaishan.com.au.

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KAISHAN
Engineering the Future

Enzyme plastic recycler receives capital investment

The Clean Energy Finance Corporation (CEFC) is investing $1.1 million in Australian advanced plastic recycling company Samsara Eco to help develop its enzymatic technology that accelerates the bacterial breakdown of plastic.

The investment, made on behalf of the Australian Government, is part of a $6 million capital raising. Samsara has seen investments elsewhere from the CSIRO's Main Sequence and Woolworths venture capital and innovation fund W23.

"Samsara's innovative technology is bringing a welcome solution to the major challenge of plastics recycling. The ability to infinitely recycle plastics is likely to significantly increase recovery rates and reduce the volume of plastics that end up in landfill," said CEFC CEO Ian Learmont.

"Expanding resource efficiency and creating a circular economy can radically improve recycling in Australia and around the world. The potential emissions and landfill benefits are enormous."

Compared to the current mechanical method of plastic recycling that results in millions of tonnes of mixed plastics going to the landfill due to their composition, Samsara's solution involves a novel enzyme that is able to aid the bacterial digestion of plastics decomposing. It can be used with PET, polyurethane and mixed bale plastic.

The final result of the multi-stage process, which was developed with the Australian National University, is monomer pellets that can be turned into new plastic products. The process can be repeated countless times, making it useful for the development of a circular economy.

"The current approach to recycling is simply inefficient and ill-equipped to handle the plastic pollution crisis we are faced with today. If we are serious about changing our ways, we need a new approach to how plastic is made and recycled," said Samsara founder Paul Riley.

"Samsara is that answer. Instead of mining for fossil fuels to create new plastics or relying on current recycling methods which sees only about 9% actually recycled, we can take plastic that already exists and infinitely recycle it.

"The latest round of capital raising brings us one step closer to making infinite recycling a national and global reality."

The CEFC's investment is part of a $100m fund to support clean energy-using innovations for the recycling of waste plastics, paper, glass and tyres.

Clean Energy Finance Corporation
www.cleanenergyfinancecorp.com.au

Greener recycling for PPE waste

Cornell University engineers have come up with a solution to sustainably recycle used surgical masks, plastic face shields, and medical gloves and gowns.

Healthcare facilities around the world are creating about 3.4 kg per person of personal protective equipment (PPE) waste daily through COVID-19-associated services, according to the United Nations Environment Programme. This means one hospital with 300 medical personnel could generate more than a ton of medical garb waste daily. That translates to more than 400 tons of annual medical PPE waste in a single COVID-handling facility, said Fengqi You, professor in energy systems engineering at Cornell University.

You and his doctoral student Xiang Zhao have developed a solution that could help reduce the plasticised medical-protection garb back into its original form — such as chemicals and petroleum — and then recycle it, perhaps into fuels. The method — a medium-temperature reaction called pyrolysis — is said to involve no incineration or landfill use.

The engineers propose collecting PPE waste from hospitals and medical centres, then sending it to pre-processing and decontamination facilities. There, it would be shredded, sterilised and dehydrated to transform it into small particles, then brought to an integrated pyrolysis plant.

In the engineers' model, the medium-temperature pyrolysis (about 649˚C) can deconstruct the plasticised gowns and gloves, which are

derived from petroleum, into chemicals such as ethylene, butane, gasoline, bauxite, propene, propane, diesel, light naphtha and sulfur.

In the paper's energy analysis and environmental lifecycle assessment, the proposed optimal PPE processing system avoids 41.52% of total landfilling and 47.64% of the incineration processes. This method shows an environmental advantage by reducing total greenhouse gas emissions by 35.42% emissions from conventional incineration and energy saving by 43.5% from landfilling, the researchers said.

"This is a viable strategy for disposing of and processing waste PPE," You said. "It is a treatment method with low greenhouse gas emissions, it alleviates fossil fuel emission depletion and it saves a lot of polluting material from landfills."

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Plastic bags see new life as concrete

Over 800,000 soft plastic bags have been converted into a recycled aggregate replacement called Polyrok for use by a Queensland council, with the bags coming from households across the state and schools across the country.

Several tonnes of the plastic bags were provided as part of REDcycle and Goodman Fielder's Wonder Recycling Rewards for Schools program, which involves school children trading Wonder bread bags for sports equipment.

Mackay Regional Council first pour with Polyrok.

The bags were processed into Polyrok, which is a replacement for mineral aggregate that offers thermal and weight benefits in addition to being environmentally friendly. Queensland's first use of the plastic-filled concrete was poured by Mackay Regional Council recently.

"For the first time in our history, we have created a scalable and financially viable solution to dealing with the most problematic post-consumer soft plastic packaging in the world. That should be an exciting prospect for everyone," said Polyrok Strategy Director Mark Jacobsen.

Made by Replas, the Polyrok is integrated into poured concrete like any other aggregate. Polyrok is able to be reclaimed and reused later, in support of a circular economy.

"Polyrok is a great end use for soft plastics that would otherwise go to landfill or end up in our oceans. These three and a half tonnes of Polyrok represent 830,000 plastic bags," Mackay Mayor Greg Williamson said.

"Every bag that our community can collect in programs like this one, and at the REDcycle collection points, means fewer soft plastics go to our Materials Recovery Facility, where they need to be separated out, creating processing delays and increasing our landfill costs."

Cleaning up cities with machine learning, AI

In 2018–19, Australia generated an estimated 27 million tons of waste from the construction and demolition sector — 44% of the total national waste. The sector's contribution to waste has grown by 32% per capita over the previous 13 years.

Now, UNSW Sydney researchers are developing a new suite of design applications that aim to help architects and urban planners optimise their designs for greater sustainability.

"The construction industry produces an enormous amount of waste. 10–15% of all the materials you bring onto a construction site are going straight into the bin," said lead researcher Associate Professor M Hank Haeusler, Director of Computational Design at UNSW's School of Built Environment.

"It's wasteful, it's bad for the environment, and it doesn't align with the United Nations' Sustainable Development Goals [that promote inclusive, safe, resilient and sustainable cities and environmentally responsible construction]," the entrepreneur and designer said.

"We're applying a computational eye to these global problems. As researchers we have a moral responsibility to investigate landfill, pollution, the way different materials contribute to climate change."

The design applications use machine learning to reduce construction waste and urban heat and minimise embedded carbon footprint of buildings.

They aim to help minimise the environmental footprint of buildings by assisting built environment professionals in making more sustainable decisions around size, scale and materials, said A/Prof Haeusler, who works at the intersection of digital technologies, architecture and design. His expertise lies in computational design, including AI and machine learning, digital and robotic fabrication, virtual and augmented reality sensor technologies and smart cities.

Australian cities are experiencing unprecedented levels of overheating. Urban overheating arises from human activity such as waste heat from industry, cars and cooling, building with heat-absorbing materials and rapid urbanisation, and adversely affects health, energy and the economy.

Machine learning can interrogate vast sets of fine-grain data in real time to analyse and evaluate alternatives, A/Prof Haeusler said. In a design context, it can identify efficiencies and promote sustainable practices — in this case, reducing the heat and waste produced.

"[Within the UNSW heat reduction app,] you design your street and then a computer program does the calculation in the background [based on intelligence learned from its data sets. Then it tells you,] it looks like here, at this intersection, it will get hot because of the physics that shape urban heat islands."

The designer can then adjust the building height, put in green spaces and shade, change the road width and adjust other variables to improve the building's environmental footprint.

Similarly, the UNSW waste reduction app calculates the materials required for your design and allows you to adjust its size and scale to reduce waste offcuts. Its calculations are populated with data from public hardware sites, like Bunnings.

A/Prof Haeusler is also working with architecture studio COX Architecture to develop research projects and promote educational opportunities for students. Giraffe Technology started as one such project, and is now an SME working on a digital architectural and property development application.

The one-time startup, funded by Atlassian's Startmate accelerator program, grew out of a series of research projects aimed at making local (council) development data sets more accessible and facilitating feasibility studies for the city of Western Sydney. Giraffe Technology is like a map of the world on a browser primed for architects, he says, which means anyone with access to the internet can use it. It taps into GIS mapping to populate streets, buildings and vegetation.

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Founder and CEO
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$45 million recycling plant opens in Albury–Wodonga

A $45 million PET (polyethylene terephthalate) recycling plant, capable of processing one billion plastic bottles each year, has opened in Albury–Wodonga.

The facility is a joint venture partnership between Pact Group, Cleanaway Waste Management, Asahi Beverages and new partner Coca-Cola Europacific Partners (CCEP), trading as Circular Plastics Australia (PET).

Cleanaway will provide the plastic to be recycled through its collection and sorting network, Pact will operate the facility and provide technical and packaging expertise, and Asahi Beverages, CCEP and Pact will buy the recycled plastic from the facility to use in their packaging. While competitors in the beverage market, CCEP and Asahi Beverages have come together for this joint venture to deliver a significant increase in the volume of PET plastics recycled in Australia.

About 30,000 tonnes of PET will be recycled each year and will become recycled raw material to produce new beverage bottles plus other food and beverage packaging in Australia, contributing to closing the loop on recycling.

Federal Minister for the Environment Sussan Ley, NSW Minister for Environment and Heritage James Griffin and Mayor of Albury City Cr Kylie King officially opened the facility, located at the Nexus Precinct, 10 km north of Albury–Wodonga's CBD in NSW.

Minister Ley said the Circular Plastics Australia joint venture was born out of Australia's first ever national plastics summit.

"Pact Group made a $500 million commitment at our first national plastic summit in 2020 and they, along with their JV partners Cleanaway, Asahi Beverages and Coca-Cola Europacific Partners, have made that a reality today. This demonstrates commitment to our national packaging targets when the supply chain and government work together," Ley said.

Pact's Managing Director and CEO, Sanjay Dayal, said the project is a "game changer for Australia's plastic recycling industry. We are proud to be part of a sustainable solution to divert plastic waste from landfill and ensure we are recycling and manufacturing our drink bottles and food packaging here in Australia without the need to import plastic material from overseas."

Cleanaway's Chief Financial Officer, Paul Binfield, said the bottle-to-bottle plastic recycling facility brings the circular economy onshore to Australia, giving everyone a chance to participate in making a sustainable future possible by recycling their bottles and buying beverages in recycled plastic packaging. "Together with our partners, Cleanaway is working on a network of plastics recycling facilities integrated with our leading collection and sorting infrastructure to provide our customers with the most sustainable and circular solution for their plastic recycling."

Asahi Beverages' Group CEO, Robert Iervasi, said Asahi Beverages already has a large beverage manufacturing plant in Albury, and that "we are excited to expand our presence, helping create more local jobs and helping lead the acceleration of Australia's circular economy. Our consumers told us they wanted more recycled bottles, and together we have worked out a way to do that that will make a real impact."

Coca-Cola Europacific Partner's Vice President and General Manager Australia, Pacific and Indonesia, Peter West, said CCEP with its partners is working towards creating a closed loop for their bottles where they are used, collected and given another life. This plant, and the future Victorian plant, will complete this loop, help to solve the national rPET shortage and create new jobs for Australian workers, said West.

Recycled material for major road projects in Brisbane

Concrete recycled from Brisbane buildings has formed the base for the $12.35m road upgrade in the city. Rino Recycling has provided 96% of the recycled materials used in the upgrades of Cedar Road and Macarthur Avenue at Northshore.

Images: Photographer Peter Wallis

The project is managed by BMD for the Department of State Development, Infrastructure, Local Government and Planning and has involved upgrading key roads within Northshore Hamilton from the existing industrial accesses into thoroughfares that now service the residential, retail, commercial and recreational precinct.

Rino Recycling's General Manager Daniel Blaser said the project was an excellent example of how recycled material from across the city can be used for major projects, rather than heading straight to landfill.

"State-of-the-art recycling of commercial building materials into a whole range of base materials absolutely should be the foundations of Brisbane's next chapter of development. This is the future of development, utilising material that has been used before, to start again," he said.

"The story only gets better when we share where the materials have come from; it invokes a sense of nostalgia, knowing that certain roads have a history. The base for Cedar Road, for example, comes from concrete out of the Mater Hospital, stands from Ballymore and the Bulimba Barracks.

"Additional concrete, brick and concrete washout came from the BP Refinery, Cross River Rail and Windsor Holden while fill has come from recycled material from the Port of Brisbane, Brisbane City Council buildings and a wide range of smaller buildings across the city. For the project to date, Rino has provided some 23,000 tonnes of the total 23,800 tonnes required."

Blaser said Queensland had very low recycling recovery rates compared to the southern states, which have had landfill levies in place for much longer and as a result had much more mature recycling industries. "There is much room for improvement, development and smart management and investment, and Rino is taking a leadership position. Rino has recently gained certification to supply recycled material for road construction with the Department of Main Roads," he said.

"The recycling and resource recovery industry is being recognised as key 'infrastructure' and will be pivotal in growing the circular economy of the future. It is our responsibility to ensure the environmental sustainability and safety of business is a priority."

Brooke Walters Project Manager EDQ Innovation Team; Daniel Blaser General Manager Rino; Michael Bucknell Project Director Urban Development for EDQ; and Todd Pepper Director Rino.

Recyclable waste management — a recap

Historically and without the intervention of subsidies, the cost of collecting and sorting recyclable waste in Australia has been significantly higher than sending it to landfill. Following the 2009 National Waste Policy agreement between all Australian environment ministers, state governments have been implementing various strategies to increase waste remediation and recycling. The waste levy underpins the Queensland Waste Strategy, seeking to reduce waste disposed through landfill from 55% to 10% by 2050, with 75% recycling rates across all waste types. The Queensland Government has committed to reinvesting over 70% of the levy in waste and recycling initiatives. The Queensland levy applies to 38 of the 77 local government areas or 90% of Queensland's population with waste generated inside the levy zones incurring the waste levy if disposed of outside the levy zones.

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