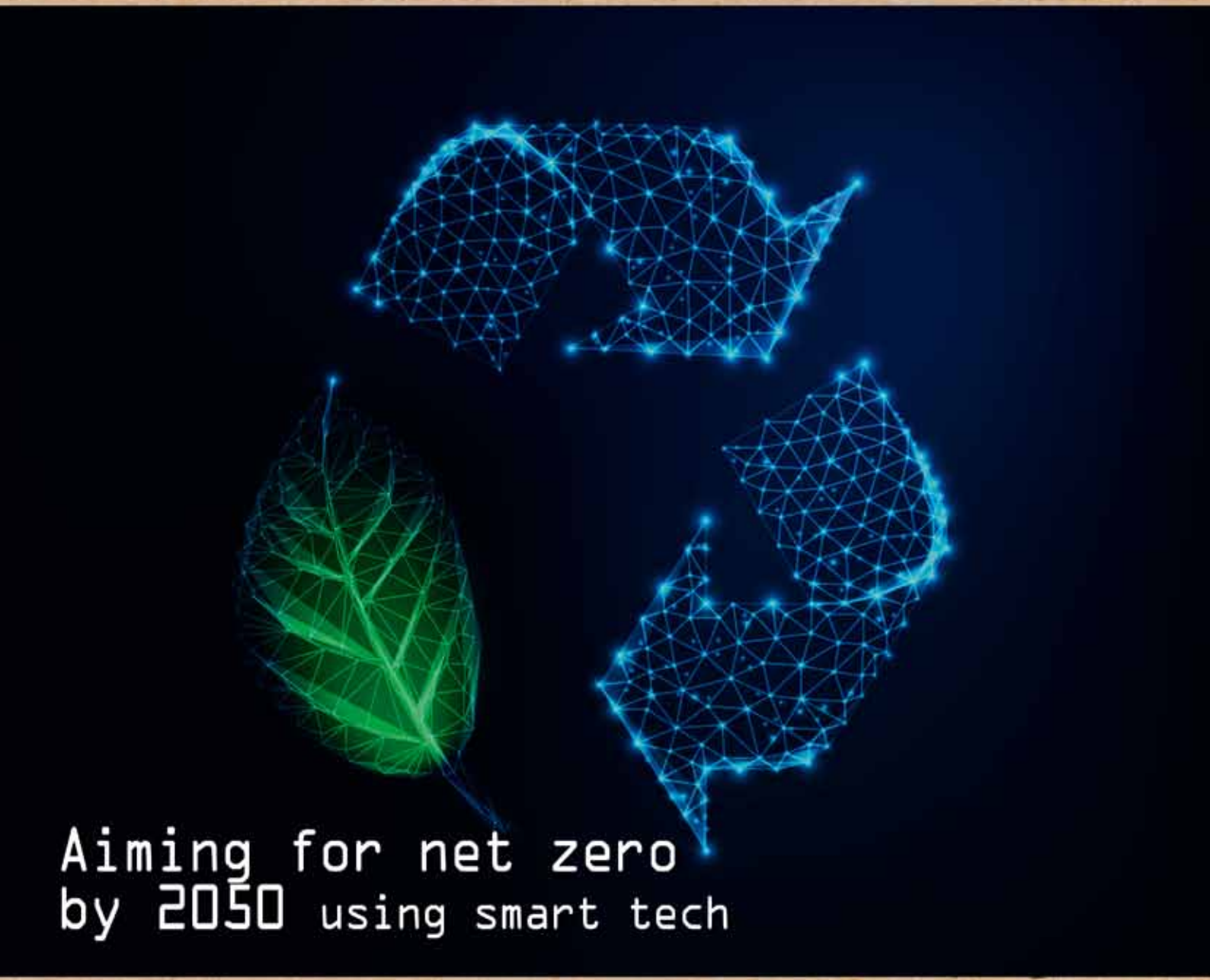
SM

Feb/Mar 2021 Vol.14 No.4
PP100007399

COUNCILS
MANUFACTURING
INDUSTRY
UTILITIES
INFRASTRUCTURE
CONSTRUCTION
RESOURCES

sustainability matters



Aiming for net zero by 2050 using smart tech

Water networks get smart • Pepping up solar • Bio-inspired concrete

SAVE YOUR ENERGY!

with the world's most advanced

COMPRESSED AIR TECHNOLOGY

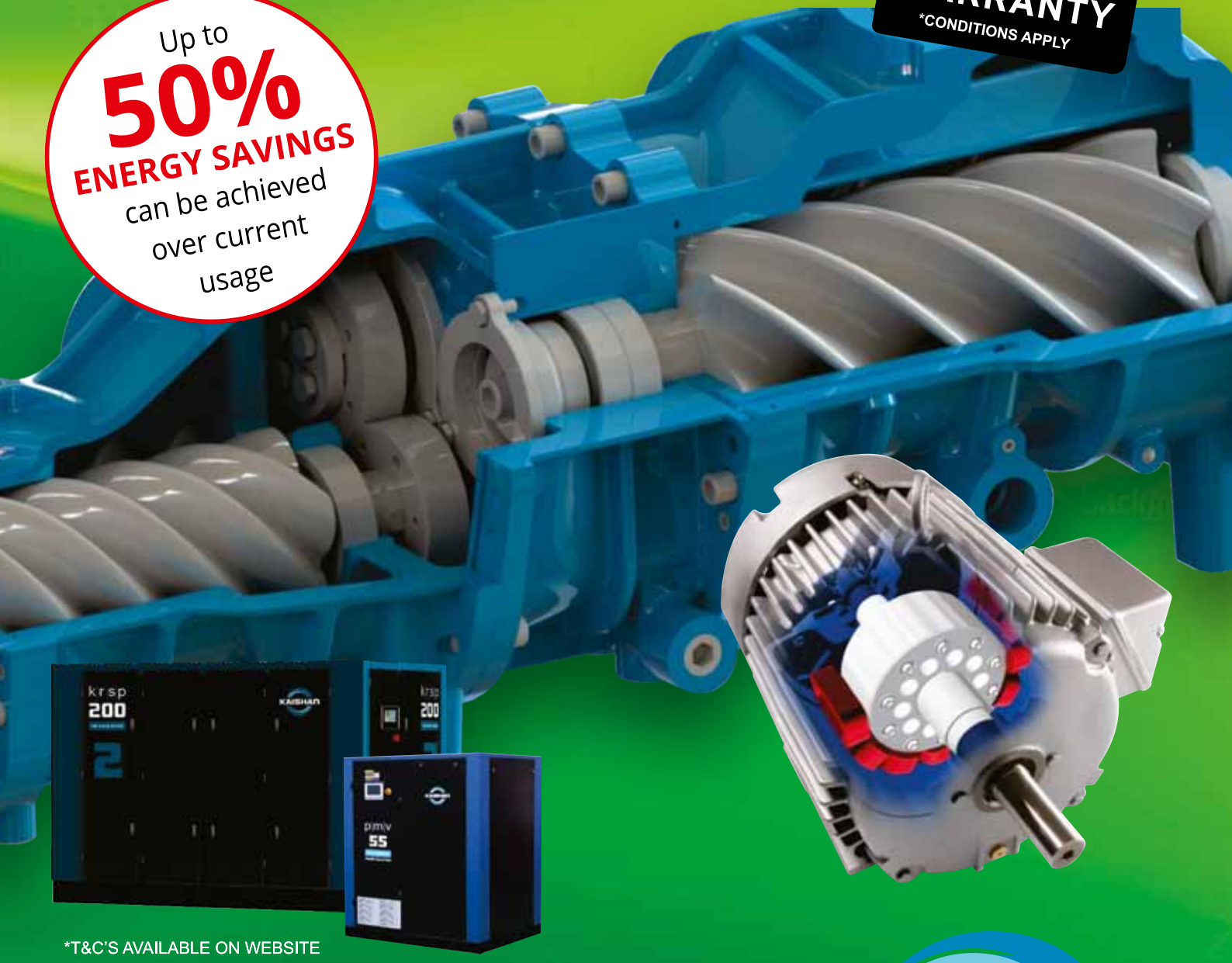
Sustainable, energy efficient compressed air is essential to power the future of Australian industry.
Kaishan Australia supply, service and support a wide range of highly advanced, energy saving, air compressors to match the exacting demands of your industry.

KAISHAN

*LIFETIME AIREND WARRANTY

*CONDITIONS APPLY

Up to **50%** **ENERGY SAVINGS** can be achieved over current usage



*T&C'S AVAILABLE ON WEBSITE

- **ROTARY SCREW SINGLE & 2-STAGE: 18.5 - 400kW**
- **PERMANENT MAGNET VARIABLE FREQUENCY: - 15 - 250kW**
- **COMPACT ROTARY SCREW: 5.5 - 15kW**
- **COMPACT SCROLL: 4.5 - 15kW**
- **PISTON COMPRESSORS: 3 - 15kW**

Plus a full range of parts and system accessories

www.kaishan.com.au **1300 098 901**

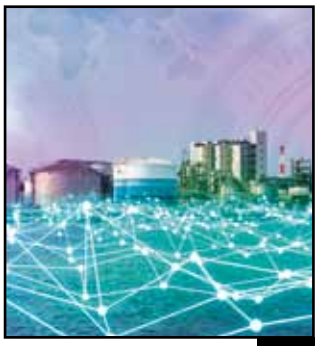
KAISHAN

Engineering the Future

FEB/MAR 2021

CONTENTS

REGULARS



Westwick-Farrow Media is committed to using environmentally responsible print services to produce our publications.

This edition is printed on paper 30% recycled and made up from elemental chlorine free bleached pulp which is PEFC™ certified from sustainably managed sources.

It is delivered in a totally degradable plastic wrapper.

WORDS FROM THE EDITOR

It seems the COVID-19 pandemic has a lot to answer for, but what it has taught us is: when we listen to scientific evidence, use the latest technology and let state and territory leaders manage their areas, we can achieve remarkable results. (At the time of writing, the state of NSW had recorded nearly three weeks of no locally acquired coronavirus cases in the middle of the pandemic.)

Possibly spurred on by the positive environmental actions of the 46th president of the United States, but maybe from our success in the pandemic, Australia now has a plan to meet international climate targets with a hope of maybe even achieving net zero carbon emissions by 2050. Our PM, 'Scomo', said we can even do this without wrecking the economy and driving power prices sky high by using technology that is already available.

"We will meet our global commitments and do what is right for our environment, without taking a wrecking ball to the economy," Australia's Prime Minister Scott Morrison said in February 2021.

"There will be further announcements ahead, but as part of the $3.5 billion Climate Solutions Package, we will invest a further $2 billion in the Climate Solutions Fund."

The Climate Solutions Fund will build on the Emissions Reduction Fund (ERF), which has contracted 193 million tonnes in emission reductions. It is designed to ensure the ERF delivers a further 103 million tonnes in emission reductions to 2030. This will make a key contribution to us meeting our 26% emissions reduction target under the Paris Agreement.

In this issue, we feature further talk about how Australia can seize on the opportunities of green policies — state by state (page 6).

Carolyn Jackson

sm@wfmedia.com.au

wfmedia
connecting industry

Westwick-Farrow Media
A.B.N. 22 152 305 336
www.wfmedia.com.au

Head Office
Unit 7, 6-8 Byfield Street,
(Locked Bag 2226)
North Ryde BC NSW 1670,
AUSTRALIA
Ph: +61 2 9168 2500

If you have any queries regarding our privacy policy please email

privacy@wfmedia.com.au

Editor
Carolyn Jackson
sm@wfmedia.com.au

Editorial Assistant
Jane Allman

Publishing Director / MD
Geoff Hird

Art Director/Production Manager
Julie Wright

Art/Production
Colleen Sam, Veronica King

Circulation
Dianna Alberry, Sue Lavery
circulation@wfmedia.com.au

Copy Control
Mitchie Mullins
copy@wfmedia.com.au

Advertising Sales

Industrial Group Sales Manager
Nicola Fender-Fox
Ph: 0414 703 780
nfender-fox@wfmedia.com.au

Sandra Romanin
Ph: 0414 558 464
sromanin@westwick-farrow.com.au

Tim Thompson
Ph: 0421 623 958
tthompson@wfmedia.com.au

Subscriptions
For unregistered readers price on application.

Printed and bound by Bluestar Print

Print Post Approved PP 100007399
ISSN No. 1834-917X

TOMORROW'S SOLUTIONS

TODAY.

What you think is the end, is just our beginning. At ResourceCo we believe almost all waste can be recovered and re-purposed to protect the earth's limited resources. So, if you have a waste problem, we'll take it away and bring it back as something better.

resourceco.com.au

RESOURCECO

Australia is seizing the opportunities of green policies – state by state

Tim Ash Vie, Director of the Under2 Coalition

> **We are increasingly seeing this form of 'bottom-up' leadership by states and regions across the world — and Australia provides a great example. States and regions have the powers and local knowledge to make things happen on climate.**

While Australia may not have been on the cast list at December's Climate Ambition Summit, there is an increasingly positive sense of climate action taking place here. In large part, this is being driven by Australian states and territories, which are not just taking action on emissions and energy efficiency — often they are leading the world.

Each one now has a target for net zero emissions by 2050; in some cases it has even been enshrined in law. Many are implementing policies that make climate-friendly business proposals much easier to get off the ground and offer an opportunity to create new jobs, rebuild the economy and give the state a competitive advantage for acting early.

We are increasingly seeing this form of 'bottom-up' leadership by states and regions across the world — and Australia provides a great example. States and regions have the powers and local knowledge to make things happen on climate. For places like California and São Paulo, which represent huge economies, this can make a big difference to collective efforts. It can also give inspiration and support for national governments to act where they are struggling.

This was a developing story in 2020, which started with the new leader of Tasmania's state government, Peter Gutwein, announcing he would also take on the role of Minister for Climate Change. The announcement showed that global environmental systems are no longer a backroom topic but very much part of the argument for stronger, resilient and more inclusive societies that work for everyone.

As the year went on, states' responses to COVID-19 gave a new dynamic to the

debate, but one that has been more positive than might be assumed. The Government of Victoria, for example, is investing AU$797 million to help residents cover the cost of their bills and make their homes more energy efficient — saving both emissions and costs. This package is helping to build a fairer and more affordable energy system through programs that provide immediate energy savings to households and small businesses. It is also a key part of the state's transition to clean energy, with funds to replace old wood, electric or gas-fired heaters, seal windows and doors, and upgrade heating, cooling and hot water systems.

In November, the New South Wales Government committed to become a renewable energy superpower. It has put in place plans to replace four out of five of its ageing coal-fired power stations and build Australia's first renewable energy zones in the Central West and New England regions. Ultimately the government aims to cut power prices in New South Wales, so that an average small business saves AU$440 a year and households AU$130 a year. This is in addition to its push for AU$32 billion private investment in regional energy infrastructure and the generation of thousands of new construction jobs in the sector.

And then in December, the South Australian Government launched its Climate Change Action Plan for 2021–2025. This includes 68 actions that build on its leadership in renewable energy to increase investment and jobs in low emissions and climate resilient business over the next five years. The government predicts it could achieve a level of renewable energy that is more than 500% of current local grid demand by 2050 — even exporting energy to others. Schemes have also been created for new photovoltaic and battery storage in Umuwa, a desalination plant on Kangaroo Island and a state-wide rollout of electric vehicle charging infrastructure.

The Under2 Coalition champions state actions such as these, alongside those of all our 220 members, to show that the solutions to climate change already exist and that many are being developed below national level. As we look ahead to a new year, it is these pioneers that can lead the way for others. All countries — including Australia — will need to bring ambitious emissions reduction targets to the next UN climate summit in November. This is the challenge of our times for all governments; they would do well to start by looking at what their states and regions are already doing to make a difference.

Meet 2020's Smart Cities Awards winners

Australia and New Zealand's smart cities leaders accelerated their efforts in 2020, with new technology solutions and innovative projects tackling the challenges of the COVID-19 pandemic head on.

The third annual Smart Cities Awards was presented virtually by Smart Cities Council Australia New Zealand, acknowledging 18 winners across seven categories for their visionary leadership, best practice projects and real-world impact.

"This year's winners have played key roles in the national advancement of smart cities across Australia and New Zealand, while also leading a digitally enabled and data-driven recovery from COVID-19," Smart Cities Council's Executive Director Adam Beck said.

The City of Parramatta took home the coveted Leadership City category after rolling out a host of dynamic smart cities projects. Among these is a sensing network on a new 25-hectare development, a parking app that was enhanced in 2020 in response to COVID-19 and Floodsmart Parramatta, Australia's first automated real-time flash-flood warning system.

Four individuals were applauded for their leadership: City of Ipswich Mayor Teresa Harding was recognised for delivering Australia's first 'smart transparency and integrity hub'; Nicole Stephensen from Ground Up Consulting was presented with an award for her work to reframe privacy as an opportunity, rather than a roadblock; Sean Audain from Wellington City Council was acknowledged for harnessing technology to build resilience to earthquakes, sea level rise and other natural disasters; and Lake Macquarie Council's Claire Chaikin-Bryan was recognised as an emerging leader for her work to expand the use of IoT, support local innovators and encourage community digital and data literacy.

"Smart cities innovators have been laying solid foundations for several years, and some of these multi-year projects have been rewarded in 2020. But COVID-19 has also accelerated smart cities efforts in 2020, and we are seeing greater data sharing, digitally supported services and community engagement in smart cities innovation," Beck added.

"Together, our winners demonstrate the central role of smart cities in enhancing services for communities, building prosperity and enhancing resilience. 2020 confirmed that people are at the centre of the smart cities movement."

Smart Cities Awards 2020 winners

Policy leadership

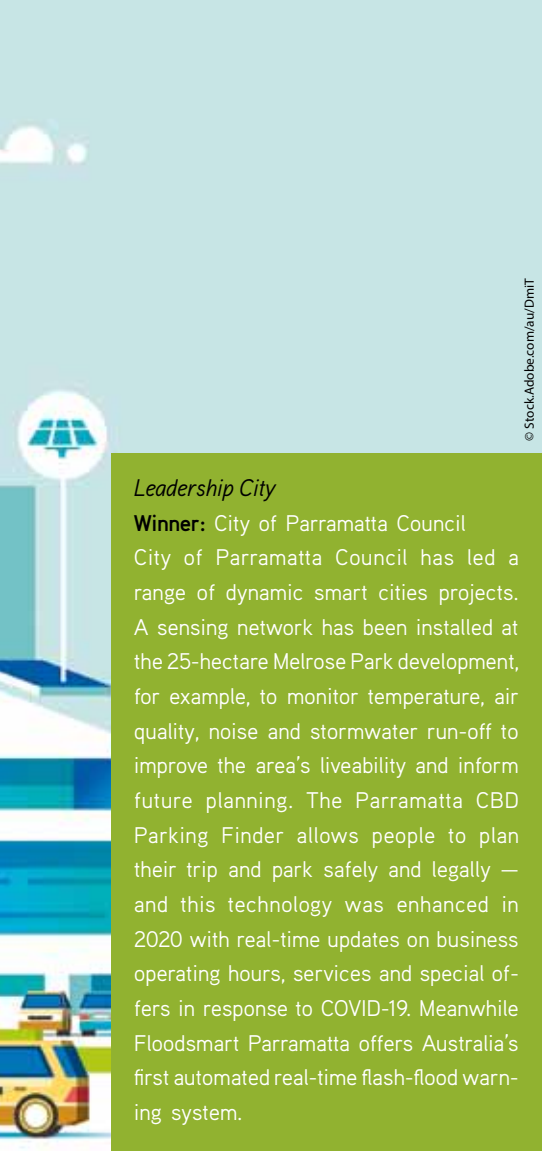
Winner: City of Darwin — Privacy Framework

The $10 million 'Switching on Darwin' project is reported to be the largest single smart city initiative in Australia. Investment in technological infrastructure included public Wi-Fi and environmental sensors, smart parking, lighting and CCTV, as well as wayfinding kiosks. The City aims to use technology and data to support better decision-making, provide the community with a safer city, enhance services and reduce energy consumption and costs. The City's privacy framework applies global privacy best practice and engaged privacy specialists to establish trusted, transparent relationships with the community.

Data leadership

Winner: Moreton Bay Regional Council — Artificial Intelligence

Moreton Bay Regional Council's $2 billion road network is its largest asset. In 2019, technology was installed on the dashboard of a council garbage truck, transmitting video footage to the cloud where machine learning algorithms could identify potholes, cracking, line markings and more. After a 12-month trial, the council began scaling up the project, with cameras now mounted on 14 waste collection trucks. All 28 trucks will provide 100% regional road coverage by the first quarter of 2021, allowing accurate defect records to be generated



© Stock.Adobe.com/au/DmiT

> "A sensing network has been installed at the 25-hectare Melrose Park development, for example, to monitor temperature, air quality, noise and stormwater run-off to improve the area's liveability and inform future planning

Leadership City

Winner: City of Parramatta Council

City of Parramatta Council has led a range of dynamic smart cities projects. A sensing network has been installed at the 25-hectare Melrose Park development, for example, to monitor temperature, air quality, noise and stormwater run-off to improve the area's liveability and inform future planning. The Parramatta CBD Parking Finder allows people to plan their trip and park safely and legally — and this technology was enhanced in 2020 with real-time updates on business operating hours, services and special offers in response to COVID-19. Meanwhile Floodsmart Parramatta offers Australia's first automated real-time flash-flood warning system.

for every road, every week, also supporting data-driven decisions and generating savings for ratepayers.

Future of Place

Winner: Lake Macquarie City Council — Smart Beaches

A spate of tragic incidents on NSW beaches in early 2019 highlighted inconsistency in beach data, with authorities collecting varying information on crowd numbers, activity and localised conditions. Manual collection is also a time-consuming and imprecise task for lifeguards. Smart Beaches — an initiative of Lake Macquarie City Council in partnership with Northern Beaches Council and the University of Technology Sydney — uses technology and data to support lifeguard risk assessment and management, allowing them to focus on their primary role of protecting public safety.

Impact Award

Winner: City of Casey — Direct Care Workers

The City of Casey's direct care workers are in regular contact with 3770 people over the age of 70 — and these people are the most likely to be living alone, without digital technology, during the COVID-19 pandemic. The Digital Activation Program is a coordinated, ongoing and scalable solution helping vulnerable community members get online with confidence. This included a device borrowing library of tablets with data plans, remote phone support and more than 300 hours of one-on-one digital skills sessions.

Smart Cities Leader

Winner Elected Official: Mayor Teresa Harding, City of Ipswich

After corruption and fraud scandals plagued the City of Ipswich, Teresa Harding campaigned for the top job on a platform of transparency and integrity. As the Queensland Government's Director of Open Data Office for nearly five years, Harding had led the state's approach to open data. After being sworn in as Mayor, Harding spent her first 100 days delivering a 'smart transparency and integrity hub'. A passionate advocate for better data use to empower smart communities, Harding delivered the hub on 1 July 2020. Now the people of Ipswich have access to the city's finances and can provide greater scrutiny over how council spends ratepayers' money to deliver better outcomes.

Winner Private Sector: Nicole Stephensen, Ground Up Consulting

Privacy is traditionally viewed as a compliance issue, and often as a roadblock or drag on innovation. But Nicole Stephensen is passionate about reframing privacy as an opportunity. Stephensen has held diverse roles including executive director of privacy and data protection at the Internet of Things Security Institute for four years. She also has a seat on the advisory board of cybersafety.org, a US-based charity focused on cyber-bullying. As a privacy consultant, Stephensen assists local governments to implement privacy-by-design as a core business function and unpack and address operational privacy issues.

Winner Public Sector: Sean Audain, Wellington City Council

A champion of smart cities in New Zealand, Sean Audain has actively secured investments from governments and private organisations to develop smart city initiatives that make Wellington a more liveable city. Among his projects, Sean has found new ways to use virtual reality to build resilience to earthquakes and sea level rise. He has deployed technology to save lives in the face of natural disasters and create coordinated multi-sector responses. He has experimented with digital twins, audio sensing and artificial intelligence to enhance long-term governance and build a culture of innovation.

Winner Emerging Leader: Claire Chaikin-Bryan, Lake Macquarie Council

As Smart Cities Lead at Lake Macquarie City Council, Claire Chaikin-Bryan has played a pivotal role in expanding the use of IoT in council operations, supporting local innovators and encouraging community digital and data literacy. Chaikin-Bryan has managed the rollout of public LoRaWAN across the whole of Lake Macquarie City, and played a lead role on the council's Smart Beaches project. Chaikin-Bryan is also responsible for undertaking sensor selection, onboarding, data integration, storage, visualisation, maintenance and training.

SDG Action Award

Winner: City of Canterbury Bankstown — Closing the Loop

The City of Canterbury-Bankstown is using AI and machine learning to detect and drive down waste contamination. In early 2020, the council launched a trial using AI and machine learning to analyse data captured from waste trucks' GPS and cameras to spot contamination. RFID tags were used to analyse problem areas. A custom-built AI was used to amplify efforts. Previously, human constraints meant only 1.4% of contamination was detected. Using AI, the contamination exposure rate is 68%, giving the council visibility of contamination incidents 130 times faster. What once took five years, now takes 14 days.

Water networks need to get smart, says report

©stock.adobe.com/au/chombosan

Smart water networks are at the forefront of smart city and IoT technology, with the sector set to boom in the coming years. A report released by IDTechEx predicts that, in the water pipe network alone, the industry of sensors will grow to over $3.5 billion by 2030.

The report — Sensors in the Water and Wastewater Treatment Industries 2020–2030 — points to the need to create a smart water network, but iterates that this will only happen with investment.

IDTechEx research predicts there will be a change in regulation in 5–10 years. This change will push for smarter sensor-based networks. The benefits of these systems will pay off any investment, providing a more efficient, safe and monitored network.

As an emerging technology, digitising and adding sensors to the water and wastewater networks may have benefits and hindrances. Companies may not wish to spend large sums on new sensors, pipes or technology, and the barriers for entry into the water and wastewater networks are already high. However, the benefits of adopting sensors into the networks outweigh these barriers.

There is a real need for remote monitoring. Monitoring removes the need for maintenance staff to check pipes as regularly or to collect samples for lab monitoring. It speeds up the identification of pollution events and reduces fines incurred by the water companies. It improves the efficiency of the treatment plants and provides a better service for customers. A steep investment, but the dividends pay off for many years to come.

Companies such as Suez have implemented smart water meters to track users' water consumption in some locations in France, providing them with a better understanding of how and when users consume water.

Data brings understanding, and understanding brings better management of a system. Collecting data on the flow in water pipes allows companies to quickly identify regions where there is an increase in demand and, as a result, lower pressure in the pipes. Utility companies can correlate their usage data with current events. They can then answer questions such as: how much water is used per day in a heatwave? Who uses the most water? At what times of the day is the network strained?

Which sensors can be used in water network pipes?

There are many different properties and measurements recorded in a water supply or a wastewater network, including the following:

- Pressure measurements (static, stagnation, head)
- Flow levels (depth, pressure, velocity)
- Flow meters (velocity)
- Acoustic emission (leakage)
- Temperature measurements
- Chemical measurements (pH, trace metals, etc)

IDTechEx's report details each of these sensors. The report also includes market forecasts, player profiles, investments and comprehensive company lists.

cress consulting

Committed to finding the right sustainability solutions for your business.

Cress Consulting believes organisations need to understand the risks of climate change and water scarcity to ensure they can create a more resilient, sustainable future for their business. We also believe that working towards a more sustainable business model offers opportunities to save costs and improve operational efficiency, performance and reputation.

Contact Cress Consulting to discuss how we can help your business secure a more sustainable future.

Australia toll free 1300 417 629 or visit www.cress.com.au

ALLIANCE FOR WATER STEWARDSHIP
CREDENTIALED SPECIALIST

Smart meter review

In a bid to increase uptake and help customers gain more benefits from advanced metering technology, the Australian Energy Market Commission (AEMC) has committed to review the rules governing electricity meters.

The Review of the Regulatory Framework for Metering Services will focus on driving retail innovation and consumer participation in a two-sided energy market — where all types of energy users actively buy and sell electricity or their demand for electricity — and will assess whether roles and responsibilities around metering under current rules need revising.

The AEMC introduced new rules relating to competition in metering in 2017, which included transferring responsibilities for metering away from distribution network service providers. The reforms were designed to increase competition, encourage new products, services and pricing to benefit consumers, and provide better information about energy use.

At this time, the AEMC committed to reviewing the change after three years to assess how the market had developed. During those three years, the energy landscape has changed significantly.

Intellihub CEO Adrian Clark said smart metering technology has come a long way since the introduction of metering competition across the National Energy Market in 2017.

"Smart meter technology has long since moved on from the simple task of remote connections and reading," Clark said.

"The meter can give you insights in real time; optimise the home for solar, batteries and electric vehicles; and enable new services like demand response and virtual power plants.

"They give more control over household energy costs, and when deployed at scale they reduce costs to serve, putting downward pressure on electricity prices and helping to deliver a more competitive electricity retail market.

Smart meters will be key to integrating distributed energy resources such as solar PV, electric vehicles and battery technology. They will also be an important consideration in developing a two-sided market, which is one of several post-2025 market development initiatives being led by the Energy Security Board.

Focusing on the grid of the future is particularly relevant to smart meter technology as it relies on greater access to data.

The smart meter review will be broader than envisaged when metering reforms were drafted in 2015. The AEMC will assess the ability of small customers to appoint their own metering coordinator and whether some form of access regulation is required for metering services, and in addition will holistically examine the entire framework governing metering.

The Commission has been seeking stakeholder input on the regulatory framework, asking a range of questions including:

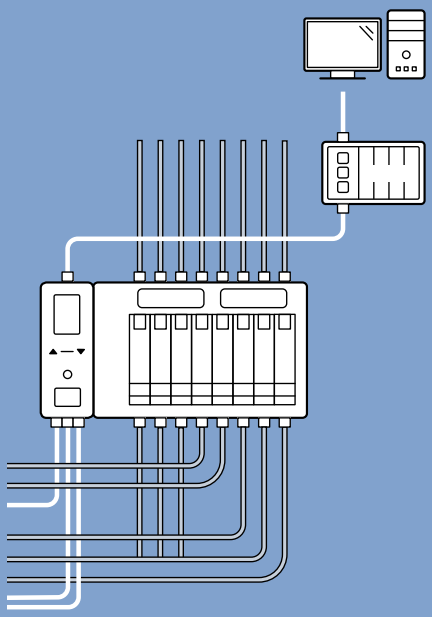
- whether expectations around smart meter rollout have been met
- what level of benefits consumers are experiencing from smart meters
- what the barriers might be to wider smart meter rollout and use
- what services smart meters might be expected to deliver in future.

"The AEMC review is an opportunity to make changes and improvements so we can accelerate the deployment of smart meters and share the benefits with more customers," Clark said.

Industrial Water prefers to partner with Bürkert

Supporting our customers with single cable technology for future-proofing their tomorrow.

Now that's Smart.



We make ideas flow.

bürkert
FLUID CONTROL SYSTEMS

Solving the sustainability challenge requires us to

rethink the role of a building management system

The building management system (BMS), or as it is sometimes called, the building automation system (BAS), is a critical tool for operating a building safely, efficiently and reliably. However, a hyper focus on energy efficiency and sustainability combined with fundamental changes in tenant needs and expectations are straining traditional BMS implementations, pushing them to grow and evolve.

At the same time, advancements in cloud computing, IoT, analytics and artificial intelligence are leading to new and broader capabilities. With these as underlying technologies, next-generation BMSs become the integration and aggregation tool for all the building's data across multiple business and operations technology (OT) systems and sensors. By managing and controlling all the building's OT in concert with each other, energy and operational efficiency can be maximised while enhancing occupant productivity and wellbeing.

Three factors driving the evolution of BMSs

A typical traditional building has a BAS/BMS that is limited to HVAC and perhaps lighting, access control and power monitoring. The facility manager and their operations team use it simply to monitor for problems and do basic controls. Working from within a silo apart from the IT department, occupants, business units and corporate real estate, their focus is mostly just making sure the building systems function on a day-to-day basis. And that work tends to be highly manual and labour-intensive.

Building owners become wholly dependent on seasoned expert facility managers with lots of tribal knowledge to make sure things keep working. Maintenance is calendar-based and reactive. Tenants and occupants have no control or insight beyond what they might physically experience while in the building. All complaints, requests and service orders come through the facility manager. Each building is managed independently from other buildings that might be part of an organisation's real estate portfolio. This traditional model is going away. Both societal and technology factors are driving the evolution of BMSs from being primarily an HVAC control system to being more of a smart building system integration platform for proactive monitoring, control and automation.

Change is being driven by three fundamental factors:

1. Increasing demand for efficiency and sustainability.
2. Changing tenant/occupant requirements and expectations.
3. Emergence of newer IT, IoT and smart building technologies.

Increasing demand for efficiency and sustainability

Without question, buildings have a significant impact on the global environment. According to the World Economic Forum, the real estate sector uses more energy than any other sector and is a growing contributor to CO_2 emissions. Buildings consume about 30% of

©stock.adobe.com/au/Balazs

the world's energy according to the IEA, via their construction and operations, and account for almost 40% of annual global greenhouse gas emissions.

Environmental impact aside, building energy use has a significant impact on operations' budgets. In fact, it is estimated that roughly one-third of total non-fixed operating expenses go towards energy consumption. As a result, there is growing regulatory, financial and social pressure on commercial real estate firms and building owners to reduce energy consumption and to ultimately decarbonise their building operations.

This pressure, which is increasingly a requirement, to reduce energy use means there's a more intense need for detailed energy monitoring and real-time controls. Carbon pricing schemes such as carbon taxes, emissions trading systems (ETS) and results-based climate financing (RBCF) are providing pricing signals or the incentive to be creative and exhaustive in efforts to use building controls to reduce building energy consumption. This includes actions like participating in grid services, selecting among different energy sources based on time-of-day pricing, and controlling power and lighting based on knowing operational status of hard-wired and plug loads, utility price signals, room occupancy, weather data and so on.

> **"Far from just controlling HVAC systems, a BMS today needs the ability to monitor and control all powered systems in the building to fully optimise energy use throughout the entire site.**

Far from just controlling HVAC systems, a BMS today needs the ability to monitor and control all powered systems in the building to fully optimise energy use throughout the entire site. Traditional BMS systems are not well positioned to do this. A modern, next-generation BMS provides the tools needed to fully optimise energy use and comply with growing societal pressure and governmental climate regulations.

Supporting future technology evolution

Implementing the right building management system means a building will be more energy efficient, easier to maintain for the facility manager and more compelling for its occupants than it would be otherwise. But equally as important, it needs to evolve and grow over time.

Here are three examples of emerging technology trends that next-generation BMSs will capitalise on or help facilitate:

4. **Digital Twins** are software representations of the equipment and physical space in a building. They can be valuable in both construction and operations for better maintenance and change management but have been slow to gain traction as aggregating data from building systems silos is traditionally cumbersome. A building management system designed to be an open integration system with native cloud connectivity paves the way for more scalable creation and dynamic maintenance of Digital Twins.
5. **Artificial Intelligence** can yield valuable insights and even lead to full automation of building systems. Advanced models could allow for autonomous control of the building, which has been shown to be more effective than rules-based HVAC controls for energy efficiency, for example. Natural language processing will enable FMs and occupants to interact with building systems in a completely new way. Data orchestration will continuously optimise processes and enable self-adaption of building systems to meet the needs of people/environment. Like Digital Twins, AI is not mainstream in buildings today, and a big reason why is the difficulty of normalising and accessing the many different sources of data needed to train and implement it. A building management system with the characteristics described in this article is a huge step towards unlocking an AI-enabled future.
6. **Grid Efficient Buildings** are defined by the US Department of Energy as those with "next-gen sensors, controls, connectivity and communication". The vision for these buildings is that they give the occupant a better experience while also benefiting the electric grid and balancing the supply of renewable generation. A next-generation building management system is prepared to fill this need and coordinate with other sophisticated cloud-based software (such as ADMS) to optimise across community eco-systems.

The evolution of BMSs is driven by pressure to improve energy efficiency, changing occupant expectations and the existence of newer IT and smart building technologies. Expanding from simple HVAC controls to being a smart building integration platform, next-generation BMSs are a critical tool for operating the entire building — or even fleets of buildings — safely, efficiently, reliably and in a human-centric manner. A next-generation BMS enables users to take advantage of powerful new technologies that will simplify and improve management and control capabilities by being more proactive and eventually automated.

With the expertise of Schneider Electric, users can capture the power of an all-digital, all-electric infrastructure for a more sustainable, resilient, efficient and people-oriented building. Discover Ecostruxure for Buildings — a next-generation IoT solution that features a scalable, secure and global architecture to create future-ready smart buildings. To find out more, visit se.com/au/buildings-of-the-future.

Schneider Electric

www.se.com/au

Fuel from cardboard waste

The current method of producing biodiesel by chemically processing vegetable oil or waste cooking oil, such as palm or soybean oil, is limited because of the unreliable availability of raw materials. Therefore, there is an effort to develop biofuels by converting lignocellulosic biomass generated as a by-product of farming or logging, instead of consuming raw materials derived from food crops.

Dr Sun-Mi Lee and her team at the Clean Energy Research Center of the Korea Institute of Science and Technology (KIST) have now developed a novel microorganism capable of producing biodiesel precursors from lignocellulosic biomass such as discarded agricultural by-products, waste paper and cardboard boxes. This microorganism has achieved a product yield twice of what was obtainable from its predecessors.

The novel microorganism can produce biodiesel precursors during the process of metabolising sugars contained in the lignocellulosic biomass that it feeds on. The sugar contained in lignocellulosic biomass is generally composed of 65–70% glucose and 30–35% xylose. While microorganisms that exist in nature are effective in producing diesel precursors by metabolising glucose, they do not feed on xylose, thus limiting the yield of the raw materials.

©stock.adobe.com/au/Vlad Chomiy

To solve this problem, the KIST research team developed a new microorganism that can produce diesel precursors by effectively metabolising xylose as well as glucose. In particular, the metabolic pathway of the microorganism was redesigned using genetic scissors to prevent interference with the supply of coenzymes essential for producing diesel precursors.

First turbine installed at Mortlake South Wind Farm

A team of skilled personnel has successfully installed the first wind turbine of ACCIONA's Mortlake South Wind Farm project, erecting the installation over a four-day period.

The four steel tower sections were installed first, followed by the nacelle and hub, and finally, the three blades, which were bolted into place on 28 November.

The crane that lifted all the elements for the top of the turbine is capable of lifting the heaviest components together — the nacelle, hub and drive train — which collectively weigh 210 tonnes.

"This lift is the heaviest ever completed by a construction crew at a wind farm in the Southern Hemisphere and we're incredibly proud of our team for being part of such an impressive achievement," Mortlake South Wind Farm Project Manager Andrew Tshaikiwsky said.

"At the moment we have one main crane operating at site and this will be joined by a second later in December. On average, each crane will complete the installation of one wind turbine per week between now and late April," commented Tshaikiwsky.

Construction on the Mortlake South Wind Farm began in early 2019 and will see more than $180 million directly invested into regional Victoria.

Image courtesy of ACCIONA

ACCIONA Energy's Managing Director Brett Wickham said, "Building a wind farm is a significant undertaking, and after so much preparation, and particularly in light of the COVID-19 pandemic, we're pleased to see the towers going up. Our team is working hard, and our local subcontractors continue to contribute their valuable skills to this project — we couldn't do it without them, and we thank the community for their ongoing support."

Over the next five months, 34 more turbines will be installed at the site, bringing the total to 35 wind turbine generators, each with a hub height of 105 m and a maximum tip height of 186 m.

"The turbines being installed at the Mortlake South Wind Farm represent the latest technology, with each turbine capable of producing 4.5 MW of clean energy, the highest output of any wind turbine in Australia," Tshaikiwsky said.

Once commissioned, the wind farm will produce 530 GWh of clean energy every year, enough to power up to 117,000 households.

Component deliveries and turbine assembly will continue over the coming months, with completion of the wind farm anticipated for late April.

ACCIONA Australia
www.acciona.com.au

HANNA® instruments

HI9829

Multiparameter Meters with GPS and Autonomously Logging Probe for pH/pH+ORP/ISE, DO, EC, temperature

www.hannainst.com.au

3D concrete bio-inspired by lobsters

Concrete 3D printed in patterns inspired by the internal structure of lobster shells

Image credit: RMIT

Digital manufacturing technologies like 3D concrete printing (3DCP) have immense potential to save time, effort and material in construction.

In a new experimental study, researchers at RMIT University looked to the natural strength of lobster shells to design special 3D printing patterns.

Their bio-mimicking spiral patterns improved the overall durability of the 3D printed concrete, as well as enabled the strength to be precisely directed for structural support where needed.

When the team combined the twisting patterns with a specialised concrete mix enhanced with steel fibres, the resulting material was stronger than traditionally made concrete.

Lead researcher Dr Jonathan Tran said 3D printing and additive manufacturing opened up opportunities in construction for boosting both efficiency and creativity.

"3D concrete printing technology has real potential to revolutionise the construction industry, and our aim is to bring that transformation closer," said Tran, a senior lecturer in structured materials and design at RMIT.

"Our study explores how different printing patterns affect the structural integrity of 3D printed concrete, and for the first time reveals the benefits of a bio-inspired approach in 3DCP.

"We know that natural materials like lobster exoskeletons have evolved into high-performance structures over millions of years, so by mimicking their key advantages we can follow where nature has already innovated."

3D printing for construction

A 3D concrete printer builds houses or makes structural components by depositing the material layer by layer, unlike the traditional approach of casting concrete in a mould.

With the latest technology, a house can be 3D printed in just 24 hours for about half the cost. The emerging industry is already supporting architectural and engineering innovation, such as a 3D printed office building in Dubai, a nature-mimicking concrete bridge in Madrid and The Netherlands' sail-shaped 'Europe Building'.

The research team in RMIT's School of Engineering focuses on 3D printing concrete, exploring ways to enhance the finished product through different combinations of printing pattern design, material choices, modelling, design optimisation and reinforcement options.

The most conventional pattern used in 3D printing is unidirectional, where layers are laid down on top of each other in parallel lines.

The new study published in a special issue of *3D Printing and Additive Manufacturing* investigated the effect of different printing patterns on the strength of steel fibre-enhanced concrete.

Previous research by the RMIT team found that including 1–2% steel fibres in the concrete mix reduces defects and porosity, increasing strength. The fibres also help the concrete harden early without deformation, enabling higher structures to be built.

The team tested the impact of printing the concrete in helicoidal patterns (inspired by the internal structure of lobster shells), cross-ply and quasi-isotropic patterns (similar to those used for laminated composite structures and layer-by-layer deposited composites) and standard unidirectional patterns.

The results showed strength improvement from each of the patterns, compared with unidirectional printing, but Tran said the spiral patterns hold the most promise for supporting complex 3D printed concrete structures.

"As lobster shells are naturally strong and naturally curved, we know this could help us deliver stronger concrete shapes like arches and flowing or twisted structures," he said.

"This work is in early stages so we need further research to test how the concrete performs on a wider range of parameters, but our initial experimental results show we are on the right track."

Further studies will be supported through a new large-scale mobile concrete 3D printer recently acquired by RMIT.

Packaged together

Brent Gazzaniga

Sally Williams (Sustainable Sally) joins forces with the Martogg Group in a combined effort to promote Australian, sustainable packaging solutions to brands and consumers.

Since leaving her role as Brand Power presenter some years ago, Sally Williams has dedicated her career to only supporting and representing brands and companies that are making a concerted effort to reduce waste.

Taking a realistic stance on sustainability, Sally realised the growing need for industry groups, consumers — and importantly, government — to unite in order to make any significant change to the way we use, and possibly misuse, single-use plastic.

When approached earlier this year by Martogg Group's Product Manager Austen Ramage to join forces with the company as an ambassador for their recycled plastics range, Sally jumped at the opportunity.

"Our investment into the recycled PET market really highlighted the need for action now," Ramage said.

"We have a real problem with plastic waste in Australia and there is clearly a need for more education around sustainable packaging that will help to facilitate meaningful action. The time for talking is over — we have to start making a difference by re-using our plastic waste.

"Since 1975 we have had a strong company focus on recycling and sustainability, and over the years we have continued to invest in new processes to support the manufacturing of truly sustainable material.

"Plastic is an amazing material that changed the world, but we have become complacent and have neglected the recyclability of this fantastic and valuable resource.

"It's time for us as a company to come out of the shadows so to speak and let government, industry and consumers know that there are alternatives. To do this we needed a voice — that's why we turned to Sally, who for years has been the household name in consumer purchase decision-making."

Williams said that the alignment represents a major step forward in positive action, "the kind we need if we are to make any inroads into stopping the growing pollution and waste problem that will inevitably effect our future".

In the guise of Sustainable Sally, Williams sees her role as Martogg ambassador as an opportunity to get Martogg's message across to a wider, non-industry-specific audience. She commented that this — combined with the support from the people who have been following Williams for years — can influence what types of packaging ends up on our supermarket shelves.

Now there is a recyclable plastic product range that manufacturing and packaging industries can rely on, and it is up to us to direct consumers to these products and help them make the right purchase decisions.

Together, Sally Williams and Martogg intend to educate institutions, brands and consumers to make sustainability the number one factor when making their purchase decisions. They will collaborate with industry bodies to establish clear and common labelling protocols around recycled content for the future.

It is intended that the Martogg alignment with Sally Williams will be a long-term partnership that will see industry communications — normally published in-house — reaching audiences Australia wide.

Martogg Group

www.martogglcm.com.au

SA Water unveils solar-powered pipeline

The 19,000+ solar panels located at the pipeline's third pump station will help reduce SA Water's operational costs.

In a continuation of SA Water's progression to a zero-cost energy future, the Morgan–Whyalla Pipeline — which spans a large part of regional South Australia — is now powered by more than 19,000 solar panels.

At a length of around 358 km, and starting from SA Water's Morgan Water Treatment Plant, the concrete pipeline transports treated, high-quality drinking water from the River Murray across to the Upper Spencer Gulf region.

The solar array forms part of SA Water's industry-leading renewable energy project working towards a zero-cost energy future, headlined by the installation of more than 500,000 solar panels across the state, producing a total of 242 GWh of green energy each year.

The solar array located at the pipeline's third pump station in Geranium Plains is now participating in the National Electricity Market, with the large solar photovoltaic panels capable of generating 14,000 MWh of clean, green energy.

SA Water Senior Manager Zero Cost Energy Future Nicola Murphy said each panel at the pump station is constructed on a pivoted racking system, to track the sun from east to west throughout the day.

"Given the Morgan to Whyalla Pipeline is responsible for delivering clean, safe drinking water to tens of thousands of our customers from the Riverland, Barossa, Mid North and Upper Spencer Gulf regions, the energy requirements to pump such volumes of water are significant," Murphy said.

"With this large solar array now energised and capturing the sun's rays, we are harnessing green energy to reduce our pumping expenses without any impact to the pump station's overall performance.

"The direct current (DC) voltage captured by the panels is converted into high-voltage alternating current (AC) energy, where it travels underground to a connection point for use at the pump station."

Murphy explained that any excess electricity generated at the site can be sold back to the national grid.

"The array is one of four being installed along the Morgan to Whyalla Pipeline, with a further 15,000 solar panels at the fourth pump station outside Robertstown aiming to be energised by mid-2021," she said.

SA Water's extensive water and wastewater operations make it one of South Australia's largest electricity consumers, with the utility's 2019–20 electricity costs reaching approximately $86 million.

"Increasing our renewable energy generation will help sustainably reduce operating expenses and ensure we can keep prices low and stable for our customers across the state," Murphy said.

"At SA Water we provide our state's most important and essential service — the delivery of safe, clean water and dependable sewerage services. We are a corporation owned by the people of South Australia, and are committed to providing our 1.6 million customers with trusted water services that represent excellent value. We invest $300 million a year in sustaining and enhancing our statewide network, to ensure it continues to play an integral role in South Australia's social and economic development.

"The positive impact of our zero-cost energy future project also extends to the wider South Australian environment, with our total emissions reduction the equivalent of planting more than seven million trees, or removing more than 30,000 motor vehicles from the road every year of operation."

SA Water's zero-cost energy future initiative has already seen around 160,000 solar panels positioned at sites like the Bolivar Wastewater Treatment Plant and the Adelaide Desalination Plant, with the remaining panels due to be installed over the coming months.


Aerofloat
WASTEWATER TREATMENT SPECIALISTS
HAVING ODOUR PROBLEMS WITH YOUR RECYCLED PLASTIC?
Plastic recycling plants often have odour issues in their finished product. Clean, reusable washwater will solve the problem.
Aerofloat has award-winning wastewater solutions for plastic recyclers:
• Clean, reusable washwater
• Odour-free finished recycled plastic
• Less wear and tear on machinery
• Minimal downtime: no need to replace your washwater
• Sustainable water reuse solution
www.aerofloat.com.au
ISO 14001 : 2015 ISO 9001 : 2015 ISO 45001 : 2018

5 MW Li-ion battery in Vic and clean energy for NSW

Energy Storage Solutions (E22), part of Grupo Gransolar (GRS), has started the installation of lithium-ion batteries in Longwarry, Victoria, to supply Ausnet's distribution network with 5 to 7.5 MW capacity to address changing demand during summer and peak usage periods. It is E22's first storage system manufacture, supply and installation project in Australia.

The energy storage system will include installation of the EMS and power control systems. This system will allow the distribution network to quickly respond to peak periods of higher usage. The five-year agreement between E22 and Ausnet will also ensure the system is supported with ongoing maintenance once built.

E22 General Manager Jaime Vega commented, "Starting our first project in the Australian market has been challenging and rewarding. Supplying Ausnet with solar surge power is the start of many partnerships to come opening up more markets."

The project started in early November 2020 and is expected to be completed in early 2021, dependent on a successful network connection process.


Molong Solar Farm

Vega continued, "2020 has been a difficult year for us all, starting a project like this towards the end of it continues our successes for the year and sets us up for a strong 2021."

The installation of E22's first lithium-ion battery in Australia strengthens Grupo Gransolar's position as a storage EPC contractor.

Solar project in NSW

GRS has also successfully energised Amp Energy's Molong Solar Farm, in Central West New South Wales. This is the preliminary step towards its commissioning and the start of grid connection tests. The 80-hectare photovoltaic project contains 89,088 photovoltaic modules and 1024 solar trackers. It has an installed capacity of 39 MWp, which produces approximately 78,000 MWh of clean energy per year. Once the installation reaches 100% production capacity, it will supply energy to around 11,000 Australian homes, saving approximately 53,585 tonnes of CO_2 emissions annually. The Spanish-owned company has built Molong Solar Farm within schedule, despite significant challenges caused by the COVID-19 pandemic.

GRS Australian Managing Director Carlos López commented: "The work of all those involved during these months has been fantastic; I'd like to congratulate their efforts to adapt so well to the challenges brought by the pandemic. The completion of the Molong Solar Farm, completed on time, is another successful development in our growing Australian operations."

Grupo Gransolar
http://grs.energy

Car battery recycling program saves tonnes of waste

A battery recycling program is allowing the Royal Automobile Club of Queensland (RACQ) to reduce its environmental footprint and prevent 2500 tonnes of potential waste from going to landfill each year.

Club spokesperson Lucinda Ross said around 90% of batteries replaced by RACQ Roadside Assistance patrols and contractors are recovered for recycling.

"In the past financial year we recycled 165,000 batteries, and in a typical month we collect and send eight truckloads to be recycled," Ross said.

"We've been involved in battery recycling since the 1990s and, as battery technology continues to improve, we're now at the stage where more than 95% of the content of a car battery is recyclable.

"A car battery has, on average, a lifespan of about three years, depending on usage, which is why it's so important we have a comprehensive battery recycling program that minimises the environmental impact of such a large amount of potential waste."

Ross explained that the club's battery program reflects a whole-of-life philosophy.

"We have a strong focus on where we source our batteries, what goes into them, how they are sold and especially how old batteries are recycled to lessen the environmental impact," she said.

"While most batteries are made overseas, the recycling is done right here in Australia. Scrap is collected at our three distribution centres in Brisbane, Rockhampton and Townsville and delivered to our contracted recycler in Sydney.

"The lead recovered from car batteries is separated from other chemicals, melted and shipped to Korea, where it's reused to make new batteries or other products. The plastics are recycled for use in a variety of new products, including wheelie bins, and battery acid is cleaned and reused in such products as gypsum."

Cool savings for the University of Sunshine Coast

Keeping an entire university cool is no easy feat, especially in a warm climate, but the University of Sunshine Coast (USC) achieved this using a giant solar-powered 'water battery'. In its first year of operation, the battery has saved more than 4232 tonnes of carbon dioxide emissions — the equivalent of planting almost 70,000 trees and growing them for 10 years.

The Australian university partnered with environmental solutions company Veolia to build a thermal energy storage tank and install more than 6500 solar panels across campus rooftops and carpark structures, with the system switched on in late August 2019.

USC Vice-Chancellor and President Professor Helen Bartlett said the system's success in its first year was a major milestone towards the university's goal of becoming carbon neutral by 2025, and proof that regional universities played a key role in innovation.

"USC is the first university in Australia to install a water battery powered by renewables, which is further proof that you don't need to be in the big cities to do big things," Professor Bartlett said.

"In the first full year of operation, the system has generated more than three million kW hours of solar electricity for our Sunshine Coast campus, representing more than 34% of the total electricity required."

An additional two million kW hours of electricity are fed back into Queensland's energy grid.

"On top of this, we are tracking our energy savings in real time and using that information to teach our engineers, designers and leaders of the future about the enormous and cost-effective possibilities in renewable technologies," Professor Bartlett said.

The 2.1 MW photovoltaic system produces enough energy to cool 4.5 megalitres of water, effectively acting as an 8 MW battery. The cooled water is stored and used for air conditioning, which is currently the single biggest user of electricity at the campus.

The system is expected to save more than 100 thousand tonnes of carbon dioxide emissions over 25 years, equivalent to the emissions of 525 average Australian houses for the same period. It will lead to an estimated $100 million saving for the university over the 25-year life of the project.

Veolia Regional Energy Solutions Manager Andrew Darr said the system had surpassed its targets by saving 4232 tonnes of CO_2 emissions — with 3082 tonnes saved by USC through using solar power instead of grid electricity, and the rest by Veolia sending solar energy back to the electricity grid.

"The system has performed beyond expectation during its first year of operation and has attracted global attention for its innovative approach and environmental benefits," Darr said.

"USC has implemented a project that has positioned the university as a sustainability leader across the higher education sector and beyond."

The project won the prestigious Out of the Box category of the Global District Energy Climate Awards in 2019 among strong international competition.

It also recently won the Denis Joseph Award for Innovative Use of Solar Energy in HVAC&R (heating, ventilation, air conditioning and refrigeration) from the Australian Institute of Refrigeration, Air Conditioning and Heating.

Veolia Australia and New Zealand

www.veolia.com.au

Biomethane efficiency must be maximised

Chris Little, Managing Director, HRS Heat Exchangers

The recent announcement that Sydney's Malabar Wastewater Treatment Plant will produce biomethane to power up to 24,000 homes is great news, as is the potential for New South Wales to utilise enough biogas to supply 1.4 million homes. However, the secret to maximising the greenhouse gas savings from any renewable energy project is to maximise efficiency at every stage of the process. In the case of anaerobic digestion (AD, the process that generates biogas), this includes maximising the efficient use of the high-quality digestate biofertiliser produced during the AD process, as well as maximising biogas production.

The Malabar Biomethane Injection Project has received considerable coverage in the regional and environmental press, but one thing that none of the published stories mention is the fact that AD creates a valuable organic fertiliser that also offers environmental benefits compared with synthetic fertilisers. However, a key issue the industry is facing is the perception of digestate and how it will be classified to avoid hazardous substance ratings.

By adding organic matter, digestate improves soil health and, with long-term use, this can increase the ability of soils to sequester carbon. Using digestate to fertilise soils also reduces the need for synthetic nitrogen, phosphorus and potassium fertilisers.

HRS Heat Exchangers provides two systems specifically aimed at improving the efficiency of digestate production and maximising its value in nutritional and economic terms.

Image credit: HRS Heat Exchangers.

The HRS Digestate Pasteurisation System (DPS).

Digestate concentration

The HRS DCS uses patented technology to remove up to 80% of the water contained in the liquid fraction and concentrates it to 20% dry solids while, at the same time, maximising the nutrient content, using heat from the AD plant's CHP engine. Less water also means reduced road and field traffic, bringing further benefits in terms of reduced compaction caused by the application of the digestate to land.

The first part of the DCS process involves heating the liquid digestate in heat exchangers so that minimal additional water and energy is required, as the surplus water from the plant's CHP engine is used as the heating media. The steam produced from this first cycle is then used as the heating media for the second effect, whereby the process is repeated with further cycles. The DCS is virtually self-sufficient — minimal energy or water is bought in, nothing is wasted and the surplus energy from the CHP is re-used up to four times.

Another benefit of the DCS is odour control, which helps increase the nutrient content of the digestate. The high temperatures needed to concentrate digestate can cause the release of ammonia, largely responsible for the odours associated with digestate. However, the DCS overcomes this by acid-dosing the digestate with sulfuric acid, thereby decreasing the pH levels. This turns the ammonia into ammonium sulfate, which is not only less odorous, but is also an ideal nutrient.

Digestate pasteurisation

To prevent the spread of potential pathogens that may be present in wastewater, either the feedstock or the digestate should be treated appropriately, with pasteurisation being a tried and tested technique across the world.

One of the most energy-efficient, and therefore cost-efficient, methods to pasteurise digestate is the HRS Digestate Pasteurisation System (DPS), which is based on heat exchangers rather than tanks with heating jackets. Using heat exchangers means that effective digestate pasteurisation is possible using surplus heat while allowing additional thermal regeneration levels of up to 60%. This saved heat can then be used for other processes, such as evaporation of the digestate to remove water.

The standard three-tank DPS provides continuous pasteurisation, with one tank being pasteurised while one is filling and another being emptied. The HRS pasteuriser uses a double-tube heat exchanger to heat the digestate to 75°C above the required pasteurisation temperature. This allows for variation in the sludge consistency and its incoming temperature, making sure that the digestate is always properly pasteurised. The tanks can also be used individually to allow for routine maintenance.

The DPS and DCS are examples of several systems that HRS produces to improve the efficiency and sustainability of biogas plants and the AD process, with other examples including systems to dry biogas and recover waste heat from exhaust systems. Making biogas plants as efficient as possible will not only increase the environmental benefits they provide but will also improve economic returns for developers and operators, helping to increase the deployment of this vital technology.

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

New facility to solve Vic's toxic waste challenges

© Stock.Adobe.com/au/Tiziano

A new recycling facility to be built by Remondis Australia in Dandenong, Victoria, will process a third of the state's solvent waste each year.

The facility will give cleaning solvents, inks and paints a second life, turning them into products that can be reused by industry, such as secondary cleaning liquids used in spray guns, alternative fuels and raw solvent material.

In addition to reducing the need for storage — which carries fire, health and environmental risks if managed inappropriately — the initiative will significantly reduce the 29,000 tonnes of recyclable liquid hazardous waste that are disposed of each year in Victoria.

Victorian Minister for Energy, Environment and Climate Change Lily D'Ambrosio visited Remondis's industrial wastewater processing facility at Dandenong (trading as Organic Environmental Solutions), a precinct that will soon be expanded to include a highly specialised solvent recovery facility. She announced the new $9 million recycling facility, which is reported to be the largest of its kind in the state.

"We're taking the important steps needed to reduce the risks of hazardous waste management. Recycling it where we can means we're building a cleaner, greener state, creating jobs and generating new value for the Victorian economy," D'Ambrosio said.

Remondis Australia will build three distillation units within the new facility, which will be able to process up to 9600 tonnes of hazardous solvent waste once up and running in 2024. The Victorian Government is contributing $1.3 million to the project, with a further $10.2 million available for companies looking to invest in hazardous waste management.

Member for Dandenong Gabrielle Williams said, "To have Remondis expand their existing operations to include hazardous waste recycling is great news — it means more local jobs and reducing Victoria's dependency on raw materials."

A spokesperson from Remondis added, "Being recognised by the Victorian Government this way is testimony to our abilities when it comes to liquid hazardous waste recycling.

"This facility will be a game changer for solvent recycling in Victoria, turning what would normally be waste into something that can be reused in various products.

"This creates tremendous benefits for the Victorian economy and the environment."

Remondis has also acquired Waste2Water Technologies and Aquasoil Recycling, which are both based at Somerton.

Waste2Water is a non-hazardous liquid waste processing facility and collection service specialising in many fields including the management of contaminated site water, contaminated stormwater and car wash pit cleaning. AquaSoil specialises in the disposal of drilling and non-destructive digging mud.

These acquisitions give Remondis a strategic liquid waste management foothold in Melbourne's north, following the acquisitions of Eastern Liquid Waste Services and Organic Environmental Solutions in the city's east and south-east in 2019.

The ramp-up in Melbourne complements the company's liquid waste activity in other cities and states around Australia.

Remondis Australia Pty Ltd
www.remondis.com.au

ABB equips solar farm for smooth grid integration

Two ABB synchronous condensers are enabling the new Darlington Point Solar Farm in NSW to feed a large amount of clean electricity into the local power network while maintaining grid stability and reliability.

With a projected annual output of 685,000 MWh, the 275 MW (AC), 333 MW (DC) solar photovoltaic farm commenced operation in August 2020 and is reported to be the largest solar farm connected to Australia's grid.

Octopus Investments partnered with solar developer Edify Energy to build the solar farm, seeing it as an important step in transitioning the country to renewable energy. The solar farm — featuring nearly 1 million solar panels spread over 1000 ha — will provide clean electricity for around 115,000 homes, saving up to 583,000 tonnes of greenhouse gas emissions per year.

"Solar farms of this scale will become increasingly essential for the expansion of renewable energy in Australia," Octopus

Investments Australia Managing Director Sam Reynolds said.

"This comes with the challenge of ensuring new facilities can operate reliably on the power grid and maintain system strength. With two synchronous condensers, we're confident this project can be seen as a trailblazing template for the future of renewables in Australia and beyond."

The ABB synchronous condensers are large rotating machines developed to mimic the operation of coal- or gas-fired generators that historically gave power grids the spinning inertia essential to maintain a stable voltage. They support the connection to TransGrid's high-voltage transmission network by providing reactive power compensation and additional short-circuit power capacity.

The condensers contribute to short-circuit capacity in weak networks so that the network can easily ride through any fault conditions and avoid loss of power in the region. At Darlington Point Solar Farm, the units are crucial in helping to strengthen the power grid in a part of NSW that challenges new projects' abilities to meet the stringent connection requirements.

ABB Head of Motion Mike Briggs said, "We're proud to be supplying our synchronous condenser units for the Darlington Point Solar Farm project. They will add system strength to the power grid, helping to manage the ongoing integration of renewable energy generation. It's a complete synergy with ABB's mission to support a sustainable future."

ABB Australia Pty Ltd
www.abbaustralia.com.au

Chemical-free algae and DO management in wastewater

© Stock.Adobe.com/au/Kari Gustafsson

Tucked away in a hidden enclave on Sydney's North Shore is a private golf course — a golf course with a water issue that needed to be tackled. A long narrow dam of theirs in the base of a gorge suffered from low dissolved oxygen (DO) and destratification. The low DO was causing unwanted odours and poor water quality for use on the course. Wanting to tackle the problem the right way, they employed the services of a specialist consultancy firm, who specialise in assisting their clients with investigation, procurement, operation and maintenance of water and wastewater infrastructure.

The consultancy firm suggested the use of Venturi-Aerators from Hydro Innovations. These aerators are mounted on the banks of dams or lagoons, making access easy for maintenance. They require a pump to deliver flow to the inlet nozzle (under pressure), where an increase in velocity uses the Venturi Principle to draw in atmospheric air, mix it with the water, and discharge it saturated with DO into the dam. Venturi-Aerators are very efficient at delivering DO, but because the suction and discharge of the system can be located at any depth within the dam, destratification issues could also be dealt with.

The consultancy firm enlisted the help of a local specialist pump installer, who was given the task of installing the equipment at the bottom of a steep gorge. Two pumps were installed to deliver flow to two 4" Venturi-Aerators, which were set up to deliver 11.8 kg of DO per hour per unit.

After running the units for a few weeks, Oxidation Reduction Potential (ORP) and DO readings were taken. The ORP measured >125 mV at all depths from 1.0 to 4.0 m below the surface. This compared to measurements that were taken after a rain event earlier in the year, which showed ORP to be less than 60 mV through the same depths.

The DO measurement showed 6.0 mg/L at the surface, and 7.3 mg/L at a depth of 4.75 m. This compared to previous measurements of <0.3 mg/L also taken earlier in the year. This led the Managing Director of the consultancy firm to comment, "In short, results look fantastic! A positive ORP and higher pH will reduce dissolved metals and take load off the other components of the water treatment system."

Hydro Innovations will generally pair Venturi-Aerators up with Gorman-Rupp self-priming pumps to allow installation of the systems on the banks of dams and lagoons, making them safer and more cost effective to maintain. When the right pumps are selected, oxygen transfer rates can be as high as 1.86 kg O_2/kWh, making good use of available power.

Hydro Innovations

www.hydroinnovations.com.au

$3m for joint UNSW recycling tech project

UNSW Sydney researchers will take part in a collaborative project to develop technology that will divert up to 10,000 tonnes of paper and plastic waste into construction materials for building roads.

In partnership with State Asphalts, Closed Loop, Primaplas and Asphaltech, UNSW will work to convert mixed plastic and paper waste into value-added additives for use in asphalt. The project aims to recover 3000 tonnes of material per year, which would otherwise be exported as waste or landfilled.

The initiative has received $2.98 million in federal funding through a Cooperative Research Centre Project (CRC-P) grant to develop the technology.

Professor Nasser Khalili from the School of Civil and Environmental Engineering said UNSW will conduct important research to address the lack of commercial technologies available to recycle paper and plastic.

"Australia disposes more than four million tonnes of plastic and paper waste each year at a cost of $600 million. Our current recycling infrastructure lacks capability and capacity, and instead relies on landfill and exporting waste," he said.

"This project directly addresses the gap by developing technology to recycle these materials into materials which also have tremendous potential for commercialisation and international exportation."

©stock.adobe.com/au/djhalcyonic

State Asphalts and Asphaltech will use the products for construction projects, while distribution partners Closed Loop and Primaplas will source waste materials and distribute recycled products.

Professor Khalili will lead the UNSW research along with Dr Ailar Hajimohammdi and Dr Babak Shahbodagh. He said the work will create technical leadership in the recycling sector, improve competitiveness through reduced infrastructure costs and create environmental benefits.

"The project will advance new pathways to addressing Australia's recycling capability and capacity through developing value-added products to the competitive advantage of Australian road construction industry. The solutions developed will accelerate the transformation of plastic and polymer-coated paper waste to high-end, safe and marketable products with enhanced engineering properties," Professor Khalili said.

The CRC-P program supports collaboration between industry, researchers and the community. It is a proven model for linking researchers with industry to focus on research and development for practical use and commercialisation.

THERMAL ENERGY METER

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

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

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

MODULAR RECYCLING SOLUTION

Source Separation Systems' MultiSort recycling system is a modular recycling solution that gives users the flexibility to select individual recycling bins for specific locations. For example, a standard four-stream solution might be implemented in a common office space, a confidential paper bin in a photocopier room, or a bin for coffee cup lids outside lifts in an office building.

The range extends to more specialised streams including solutions for clinical spaces, soft plastics and dry waste.

The MultiSort bases are manufactured using 100% post-consumer Australian recycled content such as milk containers and food packaging (polypropylene) or cling wrap and plastic bags (low-density polypropylene). They build upon the success of the FOGO Kitchen Caddy, which is also manufactured from 100% Australian recycled content.

MultiSort bases are available with the option of a bag holder insert.

Source Separation Systems Pty Ltd
www.sourceseparationsystems.com.au

CHLORINE ANALYSER

The plug-n-play TC-80 Total Chlorine Analyser from Electro-Chemical Devices (ECD) offers simplified monitoring for water and treatment processes, easy installation and less maintenance for lower ownership costs. The analyser monitors total chlorine in drinking water, rinse water, cooling water or other fresh water samples from 0.05–20 ppm chlorine as the standard range or 0.005–2.000 ppm with the low-range sensor.

The advanced panel-mount design includes built-in flow control, eliminating the need for complicated pressure regulators and rotameters. Built-in automatic pH compensation also eliminates the need for expensive reagents to reduce maintenance and life-cycle costs.

The device is ready to use after connecting the sample and drain lines, then the power and outputs. The TC-80 is calibrated at the factory before shipment, with calibration accomplished by DPD comparison.

The TCA sensor is a three-electrode amperometric sensor with a gold cathode, silver halide anode and 304 SS counter electrode. The TC-80's pH sensor provides accurate compensation for samples between pH 4 and pH 12, eliminating the need for expensive sample conditioning systems to control the pH of the solution.

Amperometric chlorine sensors are flow sensitive — the minimum required flow by the sensor is 0.5 ft/s, above this value the output is virtually flow independent. A 'constant head' flow controller maintains the optimum flow by the sensor over a wide range of incoming sample flow rates. The minimum flow required is 10 gal/h, and the maximum flow rate is 80 gal/h with the sample going to drain at atmospheric pressure.

The device is available with either 110–240 VAC or 24 VDC power.

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

auma®

Solutions for a world in motion

BARRON

78 Dickson Avenue Artarmon NSW 2064
Telephone: (02) 8437 4300
Email: info@barron.com.au Website: www.barron.com.au
BARRON GJM PTY LTD ABN 90 003 560 076

DUST CONTROL SYSTEMS

Italian emission control company EMI Controls has developed the H1 Dust Control System, a versatile misting system that's tailored to suit each application — large or small.

The H1 Dust Control System is suitable for use in: materials bulk handling equipment; conveyors and transfer points; open storage facilities; odour control in composting plants; crushers; hoppers and bins; and haul roads.

At the heart of the H1 system is the pump. Available in a variety of sizes, H1 Pumps include robust pistons to reach pressures that produce the optimal water droplet size, binding dust and odours without wetting or puddling. Depending on the pump size selected, the H1 Pumps have a flow rate of 1–21 L/min and can generate up to 100 bar of pressure. In fact, pressure levels can be adjusted for each pump. These pumps are particularly well suited for intensive use.

For small plants, the H1 Box is lightweight, compact and easy to fit into tight spaces or onto machinery. It is also suitable for transport between sites.

For a complete solution there is the H1 Station, which can accommodate up to four independent pumps, a control cabinet and self-cleaning filters.

The H1 Trailer is a mobile solution containing two pumps, self-cleaning filter, 50 m-long high-pressure hose and 20 m-long supply line for complete mobility and temporary dust control installations.

For large-scale or harsh environments, there is the H1 Swing and H1 Proxy Rotating Dust Control Heads. Able to cover over 500 m^2 (without wind), they are specifically designed for large construction sites, industrial plants, composting facilities, storage areas, dusty roads and similar applications. Their spray heads are made from AISI 304 stainless steel to produce a high concentration of 10 micron droplets to abate breathable dust particles from 0.1–1000 microns.

All H1 Dust Control Systems come with automation options which can be installed with new or existing systems. When paired with the software known as CURT (Control Unit for Remote-controlled Turbines), they offer a fully automated, site-wide monitoring and control system that is managed from a centralised control room.

CURT uses a combination of sensors and measurement devices to monitor onsite atmospheric and operational conditions to activate or deactivate the site's various dust control systems. The automated system minimises water and energy usage as equipment is only activated when required. It also eliminates operator error and enhances onsite safety.

In Australia, the H1 Dust Suppression System is exclusively available from Tecpro Australia.

Tecpro Australia
www.tecpro.com.au

WASTEWATER AND SEWAGE PUMPS

The Gorman-Rupp High Pressure Ultra V Series of solids-handling sewage and wastewater pumps, with Eradicator Solids Management System, comprises self-priming centrifugal pumps designed specifically for handling municipal and industrial wastewater containing stringy, difficult-to-pump solids in suspension (such as 'wet wipes', rags and feathers).

The rugged and dependable pumps have been designed for economical, trouble-free operation, with design features that deliver good solids-handling capability and a large inspection cover to access pump internals for service or blockage removal.

Gorman-Rupp Ultra V Series wastewater and sewage pumps have been used for pumping of WAS and RAS and for digester recirculation with great success in wastewater treatment plants, as well as food process plants, paper mills and other heavy industries. The Eradicator system advances the solids-handling capabilities of this range.

Advantages include: ability to mount high and dry above the wet well (not in it); low cost of ownership; reduced OH&S issues; easy access for monitoring or service; advanced safety features to protect operators; improved maintenance features to reduce maintenance time and costs, with removable rotating assembly; and a variety of materials of construction to handle abrasive and/or corrosive fluids.

Hydro Innovations
www.hydroinnovations.com.au

ecycle SOLUTIONS

Ewaste & Polystyrene Recycling

www.ecyclesolutions.net.au

NOW OFFICIALLY AUSTRALIA'S BIGGEST RECYCLER OF POLYSTYRENE

Helping make regional and remote communities more sustainable

Ecycle Solutions – Polystyrene and ewaste collection and recycling specialists

How can we help local governments and small businesses be more sustainable?

- Fully compliant Co-Regulator of the National Television and Computer Recycling Scheme
- Reduce EPS waste from landfill by recycling it into a re-useable material
- Easy, simple solution with over 300 collection sites across Australia

For more information:

03 9706 5966

1300 432 952

chris@ecyclesolutions.net.au

www.ecyclesolutions.net.au

Chili compound peps up solar panels

© Stock.Adobe.com/au/ Rafael Ben-Ari

The compound that makes chili peppers spicy has been found to boost perovskite solar cell performance. According to scientists in China and Sweden, a pinch of capsaicin — the chemical compound that gives chili peppers their spicy sting — may be a secret ingredient for more stable and efficient perovskite solar cells.

The research — published in the journal *Joule* — determined that sprinkling capsaicin into the precursor of methylammonium lead triiodide ($MAPbI_3$) perovskite during the manufacturing process led to a greater abundance of electrons (instead of empty placeholders) to conduct current at the semiconductor's surface. The addition resulted in polycrystalline $MAPbI_3$ solar cells with the most efficient charge transport to date.

"In the future, green and sustainable forest-based biomaterial additive technology will be a clear trend in non-toxic, lead-free perovskite materials," senior author Qinye Bao from East China Normal University said.

"We hope this will eventually yield a fully green perovskite solar cell for a clean energy source."

Although metal halide perovskite semiconductors represent a promising component for state-of-the-art solar cell technologies, they are plagued by nonradiative recombination, an undesirable electron-level process that reduces efficiency and exacerbates heat losses. Bao and colleagues sought out a natural, forest-based, inexpensive additive to overcome this limitation and enhance solar cell performance.

"Considering the electric, chemical, optical and stable properties of capsaicin, we preliminarily found that it would be a promising candidate," Bao said.

Testing capsaicin's capabilities

To test capsaicin's capabilities, Bao and colleagues added 0.1 wt% of the compound (the optimal determined concentration) into a $MAPbI_3$ perovskite precursor, which they used to fabricate solar cells. Next, the researchers performed a series of techniques, including ultraviolet photoelectron spectroscopy, X-ray photoelectron spectroscopy and time-resolved photoluminescence, to determine how the capsaicin additive affected the solar cells' properties.

They found that while control devices showed a power conversion efficiency of only 19.1%, devices containing capsaicin had an efficiency of 21.88% — nearly as high as the record 21.93% efficiency of single-crystal MAPbI3 devices.

The enhanced solar cells also showed improved stability, maintaining more than 90% of their initial efficiency after 800 hours of storage in ambient air.

Bao and colleagues also determined that capsaicin greatly reduced the perovskite film's defect density, increasing electron density by an order of magnitude and boosting charge transport. Additionally, they observed a smaller leakage current in solar cells containing the chili pepper compound, suggesting it successfully suppressed nonradiative recombination.

Capsaicin enabled these improvements by transforming the perovskite material's surface energetics, creating an interface between p-type semiconductor layers, which contain more electron-deficient 'holes' than electrons, and n-type semiconductor layers, which contain more electrons than 'holes'. This interface promotes charge transport and suppresses the loss of efficiency observed in traditional perovskite semiconductors.

"We will further focus on the relationship between chemical structures of natural forest-based biomaterial additives, their interaction with photoactive materials and the corresponding photovoltaic performance," Bao said.

"We hope to generate new knowledge of great value to further increase the power conversion efficiency and stability of perovskite solar cells."

NMI APPROVED METERING
WITH

Power of Choice (PoC) Energy Metering

Another 1st by

SATEC
Powerful Solutions

Phone: (02) 4774-2959
www.satec-global.com.au

KELLER

SINCE 1974

MADE TO MEASURE **PRESSURE**

KELLER products available at

BESTECH

Sensors & Teaching Equipment

keller-druck.com/**custom-solutions**