



# A WORLD OF SOLUTIONS DRIVING THE CHANGE



## OFFICIAL SHOWGUIDE

#AWRE2019  
AWRE.COM.AU

PLASTICS RECYCLING  
UNIQUE TREATMENT OF RECYCLED  
WASH WATER

VISIT US #B44

Australasian Waste & Recycling Expo

- 100% recycling of wash water
- Odour reduction in production facility
- Odourless finished product
- Conserving the environment
- Minimal sludge removal required
- Fully automated wastewater treatment system
- Low power, robust, mechanically simple & patented technology



**DROWNING IN  
WASTEWATER  
PROBLEMS?**



# WELCOME

To the Australasian Waste & Recycling Expo (AWRE) — a world of solutions from the innovators shaping the industry.

**REGISTER NOW**  
Save the door entry, register online at [awre.com.au](http://awre.com.au)

**W**ith our return to ICC Sydney in 2019, it is my pleasure to welcome you to the 10th anniversary of AWRE — Australia's leading business event for the waste, recycling, resource recovery industry.

This year has presented many ongoing challenges, opportunities and a continued heightened public interest in waste and recycling, and AWRE 2019 plays a key role in driving change by bringing together stakeholders from across the waste and recycling supply chain to facilitate action and discussion around available solutions and market opportunities.

Over two days you will find leading suppliers and service provider brands presenting the latest solutions shaping the market, an unrivalled free-to-attend educational speaker program, the new AORA Organics Zone and the NWRIC Leadership Breakfast, plus much more.

With innovation and new ways of working driving industry growth, we're proud to bring the highest quality showcase of products and services to the industry. From the latest developments in software and technology and sustainable and

smart waste solutions, to the vehicles and machinery equipment keeping the industry moving, AWRE has you covered.

The 2019 Speaker Series presented across two dedicated areas on the show floor: Industry Forum, in partnership with NSW Department of Planning, Industry and Environment, and our new Food Waste Stage will discuss the key themes shaping the sector in Australia.

As Australia's premium trade exhibition for the industry, AWRE 2019 comes at an exciting time in the direction and opportunity across the sector and I would like to thank all our exhibitors, partners, sponsors and importantly our visitors for ensuring its continued success.

I look forward to welcoming you to AWRE 2019 as we join forces for a world of solutions towards a cleaner, more sustainable future!

**ANDREW LAWSON**  
AWRE Event Manager  
Diversified Communications Australia

## AWRE 2019 SUPPORTERS & PARTNERS

### MAJOR PARTNERS



### STRATEGIC PARTNERS



### SUPPORTING PARTNERS



### PRINCIPAL MEDIA PARTNERS



### SUPPORTING MEDIA PARTNERS





# PARTNER WELCOMES



**Tony Khoury**  
**EXECUTIVE DIRECTOR — WASTE  
CONTRACTORS & RECYCLERS ASSOCIATION  
(WCRA)**

Representing the waste and recycling sector across NSW and the ACT and with a current membership of 193 organisations, WCRA is well respected by key stakeholder groups and represents its members across a range of business and waste management areas, from environmental, local government, chain of responsibility, WHS, employment relations, training and more.

We have been a proud partner of the AWRE since the inception and we have again invited all our members and sponsors to attend this year in Sydney. AWRE provides the waste and recycling sector with a wonderful forum to meet equipment and service providers, for professional industry updates and networking.

WCRA thanks AWRE for showcasing our industry and we look forward to another fabulous show this year.



**Rose Read**  
**CEO — NATIONAL WASTE RECYCLING  
INDUSTRY COUNCIL (NWRIC)**

NWRIC is the national peak body representing waste and recycling businesses priorities to government.

Our national and state affiliate members service most households and businesses across every State and Territory. Collectively, they own and operate nearly every private waste and recycling asset in Australia for collecting, recycling, processing and treating waste.

The NWRIC commits to improving waste and recycling services for all Australians and working collaboratively with governments at all levels.

We welcome the opportunity to support the AWRE, which brings together business customers, local councils, waste and recycling service and equipment providers, government and professionals to share and explore the latest technologies, innovations and solutions.

The NWRIC is also pleased to be co-hosting the Leadership Breakfast on Thursday, 31 October, and is looking forward to showcasing our industry at AWRE 2019.

WHAT ARE YOU  
DOING ABOUT  
**WASTE?**

DOES YOUR  
BUSINESS  
HAVE A  
**LARGE HEAT  
DEMAND?**



Scot Heat and Power is pleased to announce that it is exhibiting at AWRE 2019, please feel free to get in touch or come and see us at the show where we can answer any questions that you may have.

**STAND E35**



**SCOT HEAT & POWER**  
BEST IN BIOMASS



[www.scotheating.co.uk](http://www.scotheating.co.uk)  
[info@scotheating.co.uk](mailto:info@scotheating.co.uk) +44 1506 444255

Scot Heat and Power is a UK based company which works with market leading technology providers to supply biomass boilers utilising virgin woodfuel, and WID compliant boilers utilising waste in forms of SRF, RDF and waste wood.

Scot Heat and Power can provide boilers from 4MW to 30MW along with a range of steam turbines.

Our technology partners are Kohlbach from Austria and Jernforsen Sweden, both with a well proven track record for manufacturing of the highest quality.



[www.jernforsen.com](http://www.jernforsen.com)  
[www.kohlbach.at](http://www.kohlbach.at)



# AWRE 2019 INFORMATION



## OPENING HOURS

Wed 30 Oct 10:00 am – 5:00 pm  
Thu 31 Oct 10:00 am – 4:00 pm



## FOOD AND DRINK

Food as well as hot and cold drinks can be purchased from the Isuzu Central Lounge and ICC Kiosk. Alcohol is served from the Isuzu Central Lounge according to NSW licensing laws.



## SPEAKER SERIES

The Speaker Series is hosted in two theatres: the Industry Forum, (located back left of the exhibition) and the Food Waste Stage (located front right of the exhibition). All education sessions are free to attend; however, seats are limited on the day — arrive early so you don't miss out. All sessions will be filmed in 2019, and available post show to those who have attended AWRE 2019.



## MOBILE APP

Make the most of your visit by downloading the AWRE 2019 official mobile app from [awre.com.au/app](http://awre.com.au/app) or download from your relevant App Store.



## PHOTOGRAPHY PROHIBITED

To protect the intellectual and product property rights of exhibitors, no video or still photography (including mobile phones) is permitted. These rules are strictly enforced and individuals caught taking unsolicited photography will be removed from the show. Permission to photograph products or stands within the show can only be granted with prior approval from the show organiser.



## FIRST AID

In the event of an incident onsite, please contact the Organisers Office, who will request assistance from Security and the venue. All security staff are qualified in First Aid procedures. Emergency telephone number for Ambulance, Police, Fire is 000.



## INFORMATION POINT

For further information about the exhibition, seminars or networking events please go to the AWRE Organisers Office. Refer to the floorplan on page 16 for locations.



## ORGANISERS CONTACT AND LOST PROPERTY

The Organisers Office and lost property is located at the back of the exhibition and is open for the duration of the event.

**CREATE**

**VALUE**

**FROM**

**WASTE**

 **Johnson  
Screens**  
A brand of  
Aqseptence Group

 **REDOX** WASTE RECYCLING

Johnson Screens has partnered with Redox Waste Recycling to create real value commodities from waste. Whether its plastics, metals, wood, paper, sand or stone, we can provide an innovative yet robust sorting line for your waste flow. Contact us today and lets work together to create value from waste.

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# TOWARDS ZERO LANDFILL

AWRE is leading the way in sustainable event management and we have an ambitious target — to send just 5% of our event waste to landfill. This compares to 70–80% five years ago when the Towards Zero Landfill project was born.

The event industry is notorious for generating huge amounts of waste and we can't achieve this target alone. We're working closely with our event partners on a shared sustainability vision to reduce our environmental impact and lead a behavioural shift within the industry. ICC Sydney, home to AWRE, has a strong sustainable event philosophy of its own and we're working collaboratively to achieve the same goal and work towards a zero waste vision for best practice.

AWRE will maximise the use of ICC Sydney's waste management facilities to help reach our 5% target, and with the backing of their solid sustainability foundations, we're closer than ever to meeting this ambitious goal.

With the support of ICC Sydney and our other event partners, our combined pledge to the Towards Zero Landfill project is captured in five core initiatives:

## Separation of waste

- Detpak RecycleMe stations for coffee cups will be set up around the show floor, including daily transferring of RecycleMe cups to BOH Bins
- Lanyard recycling bins will be placed at the exit
- Compostable liners for waste bins
- Organic waste separation in catering areas
- Individual bins for waste separation to sort paper, cardboard, organics etc
- Dedicated bins during bump in for soft plastics

## Reducing single-use plastics

- Digital signage will be utilised where possible to reduce printed coreflute/forex signage
- Removal of all bottled water. Drinking Bubbler units and bottle refill units will be placed around the show by Sydney Water. Saving 775,000 plastic bottles from use, indirectly reducing gas emissions by 400 tonnes.
- Replacement of plastic straws for cardboard ones.
- Engage Reverse Garbage for any coreflute/forex signage

## Use of recycled materials

- Printed signage to be recycled cardboard

- The two theatres' building materials are utilised from previous years and recycled materials such as cardboard, recycled wooden pallets and milk crates
- Food Waste Stage seating is 98% recycled plastic material. Donated by Replas, who are committed to reducing the amount of plastic going into landfill through turning plastic waste from kerbside collections into furniture.
- All coffee cups will be Detpak, who use a Next Generation lining that is easily removed during existing recycling procedures and recycled into paper living again up to 7 times. Look out for the Detpak RecycleMe stations around the show floor to do your bit.

## Energy reduction

- Power shutdown from 10pm until 6am on Wednesday, 30 October and Thursday, 31 October
- 5 to 7% of total electricity from event to come from green sources
- Only use new LED lighting

## Reuse and recovery of resources

- Unused excess food will be donated to OzHarvest.
- AWRE will work closely with Reverse Garbage to repurpose a range of items left over post event

The long-term strategy of the Towards Zero Landfill project is to increase the participation of like-minded partners to minimise our carbon footprint year-on-year, ensuring the project is close to zero waste by 2020.

Diversified Communications' strategy is to implement AWRE's Towards Zero Landfill project across all events to reduce costs and, most importantly, our carbon footprint as an entire organisation.

AWRE is committed to driving the change and kindly ask you to separate your waste where possible using the bins provided around the show floor, use our water refill stations when you can and put your used coffee cups in the Detpak RecycleMe stations.

#StriveforFive





# INDISPENSABLE TECHNOLOGY FOR THE WASTE MANAGEMENT INDUSTRY

## Turnkey HGV Weighing Systems

Avoid Overloading | Maximise Payloads | Reduce WHS Risk  
Meet Compliance & Reporting Requirements

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- › Onboard Weighing Systems

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Can Do

# WHAT'S ON



## INDUSTRY FORUM

in partnership with



Planning,  
Industry &  
Environment

Covering the critical topics impacting the future of waste and recycling in Australia.



## THE CENTRAL NETWORKING LOUNGE

supported by

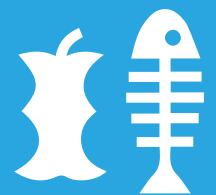
**ISUZU**  
TRUCKS

The Central Networking Lounge offers exhibitors and visitors a chance to continue business in a more relaxed setting on the show floor.



## ICC SYDNEY VENUE TOURS

See the inner workings of this sustainable venue by joining one of the free, guided behind-the-scenes tours.



# TOWARD ZERO LANDFILL

Here at AWRE we have an ambition to send just 5% of our event waste to landfill to honour our Towards Zero Landfill pledge with initiatives such as:

- Detpak RecycleMe stations will be set up around the show floor to recycle your coffee cups.
- Drinking Bubbler units and bottle refill units will be placed around the show by Sydney Water.
- Look out for the co-mingle bins to dispose of your rubbish correctly.



## LEADERSHIP BREAKFAST

in partnership with **NWRIC**

The industry's leading minds will come together to discuss the future of waste management in Australia. The Hon Matt Kean MP, Minister for Energy and Environment will open the breakfast, followed by NWRIC CEO, Rose Read and our panel of experts to discuss future issues and challenges.

The Leadership Breakfast is a ticketed event, head to the website for details.



## AORA ORGANICS ZONE

in partnership with



New for AWRE 2019, is the AORA Organics Zone - positioned on the exhibition floor the area will be dedicated to showcasing companies with recycling solutions to divert organic resources from landfill.

## FOOD WASTE STAGE

A new addition to AWRE 2019, the Food Waste Stage will facilitate discussion and a focus on the national issue that is food waste.



DISCOVER MORE  
[AWRE.COM.AU/WHATSON](http://AWRE.COM.AU/WHATSON)



# SPEAKER SERIES

DAY 1 WEDNESDAY 30 OCTOBER

## INDUSTRY FORUM

IN PARTNERSHIP WITH  **Planning, Industry & Environment**

10:30AM - 11:00AM	<b>NSW Department of Planning, Industry and Environment Opening Address — The circular economy and the future</b>
	<p>The presentation will provide an overview of the circular economy and the policy development process in NSW. It will also discuss opportunities and examples of the circular economy in NSW, and how implementation of circular economy principles can maximise the value of resources, reduce waste and deliver positive outcomes for business.</p> <p><b>Dr KarMei Tang</b>, A/Executive Director Waste Policy and Strategy – NSW Department of Planning, Industry and Environment</p>
11:30AM - 12:30PM	<b>The future is recycling</b>
	<p>The landscape of Australia’s recycling sector has never been as important to the community as it is today. Why is recycling so important to Australians? What areas can we improve? Are we placing the right type of materials in the bin with the yellow lid? How are we placed strategically across government, industry and commercially to really impact our environment and communities at such a vital time? State and Territory governments are increasingly using waste levies as a key instrument to influence waste management behaviour. Is this approach working? Our panel of experts will delve deep into the core issues, insights and opportunities currently facing the waste and recycling sector.</p> <p><b>Christine Hodgkiss</b>, General Manager Resource Recovery NSW – Veolia Australia &amp; NZ  <b>Kathy Giunta</b>, Director Programs Circular Economy – NSW Department of Planning, Industry and Environment  <b>Graham Knowles</b>, Chief Operating Officer – IQ Renew  <b>Tony Grebenshikoff</b>, State General Manager NSW – SUEZ Australia &amp; NZ  <b>Tony Khoury</b>, Executive Director – Waste Contractors and Recyclers Association NSW (WCRA)</p>
1:00PM - 1:45PM	<b>Benchmarking for 2025 National Packaging Targets</b>
	<p>In response to China’s National Sword, Australia’s Government has agreed to establish a sustainable path for Australia’s recyclable waste. With regards to packaging, Ministers agreed to reduce the amount of waste generated, to make it easier to recycle products and set a target to make 100% of packaging in Australia reusable, recyclable or compostable by 2025. APCO CEO Brooke Donnelly will lead a discussion that addresses the key developments and actions being taken in Australia.</p> <p><b>Dr Helen Lewis</b>, Principal – Helen Lewis Research  <b>Jacky Nordsvan</b>, Packaging Specialist – Nestlé Australia  <b>Brooke Donnelly</b>, CEO – Australian Packaging Covenant Organisation (APCO)  <b>Peter Allan</b>, Director - Sustainable Resource Use</p>
2:00PM - 3:00PM	<b>Old glass, new roads — reality or myth?</b>
	<p>With calls across the nation for greater uptake of crushed glass into civil construction works funded by local, state and federal governments, this session will explore the current reuse, recent changes to specifications, supply chain challenges and what future potential is there for this reuse market?</p> <p><b>Susy Cenedese</b>, Strategy Manager Environment – Local Government NSW  <b>Jim Appleby</b>, General Manager Reconomy – Downer  <b>Justin Koek</b>, Director Waste Policy – NSW Department of Planning Industry and Environment  <b>Sean McCormick</b>, General Manager Recycling – Alex Fraser Group  <b>Dr James Grenfell</b>, Senior Technology Leader – Australian Road Research Board (ARRB)  <b>Rose Read</b>, CEO – National Waste and Recycling Industry Council (NWRIC)</p>
3:15PM - 4:00PM	<b>RDF and PEF — Australia’s future resources?</b>
	<p>In the wake of announcements that the government is clamping down on Australia’s approach to waste management, particularly when it comes to export — what’s next for the country’s environmental agenda? Where do we go from here? And will resources such as Refuse Derived Fuel and Process Engineered Fuel have a role to play — or not? With the debate showing no sign of quietening down, and waste arisings on the increase, action is required, and fast! All the way from the UK, Gary Moore will talk delegates through topics such as the UK’s Waste Hierarchy model, the classification of alternative fuels as a resource not a waste, and what needs to be done to encourage public ‘buy-in’.</p> <p><b>Gary Moore</b>, Director of Global Business Development – UNTHA shredding technology</p>



## FOOD WASTE STAGE

11:00AM - 11:45AM	<b>Creating value out of food waste</b>
	<p>To open the 2019 Food Waste Stage at AWRE, Dr Steven Lapidge aims to surprise you with the opportunity that food waste presents at the local, national and global scales. This includes the lost economic and social opportunities as well as the significant environmental damage being done.</p> <p>The Fight Food Waste Cooperative Research Centre is Australia's industry-led R&amp;D program that is creating opportunities to REDUCE food waste, to TRANSFORM unavoidable waste into valuable products and to ENGAGE businesses and consumers to tackle this solvable problem.</p> <p><b>Dr Steven Lapidge</b>, CEO – Fight Food Waste Cooperative Research Centre</p>
12:15PM - 1:15PM	<b>State of the nation: putting food waste in the spotlight</b>
	<p>One-third of the world's food goes uneaten each year, causing significant social, economic and environmental impacts, and here in Australia that amount is 7.3 million tonnes per annum. This panel has been brought together to put this globally significant issue in the spotlight and not only explain just how important it is that we REDUCE, TRANSFORM and ENGAGE on this globally significant issue, but also some of the practical ways the waste and recycling industry can drive the necessary changes.</p> <p><b>Dr Steven Lapidge</b>, CEO – Fight Food Waste Cooperative Research Centre  <b>Sam Oakden</b>, Manager Food Sustainability – Food Innovation Australia Limited (FIAL)  <b>Sian McGhie</b>, Senior Project Officer Organics – NSW Department of Planning, Industry and Environment  <b>Roseanna Barbero</b>, Addison Road Community Centre</p>
1:45PM - 2:15PM	<b>How technology is solving our food waste issue</b>
	<p>4.1 million tonnes of food goes to waste every year in Australia in the commercial food sector. Food waste veteran Katy Barfield will walk through how innovative technology is tackling the growing issue of food waste and how Yume, the first Australian online marketplace for surplus food, is offering a unique and safe service to over 350 top Australian food manufacturers by finding new channels to market that generate a triple bottom line benefit.</p> <p><b>Katy Barfield</b>, Founder &amp; CEO – Yume Food Australia</p>
2:30PM - 3:15PM	<b>The role of packaging in minimising food waste</b>
	<p>Whilst the primary functions of packaging are to contain and protect the content, as well as providing information about the product, the role of packaging in reducing food waste needs to be better understood by food producers, manufacturers, brand owners, retailers and consumers. The connection between packaging design and food waste needs to be discussed more openly in the industry. From field to fork there are several possibilities for food loss and waste to occur. It has been approximated that up to 30% of the edible food produced does not reach the fork. Packaging's role in reducing food waste is the next big challenge for Packaging Technologists, Designers and Engineers.</p> <p><b>Alan Adams</b>, APAC Sustainability Director – Sealed Air  <b>Sam Oakden</b>, Manager Food Sustainability - Food Innovation Australia Limited (FIAL)  <b>Mark Barthel</b>, Special Advisor, Fight Food Waste Cooperative Research Centre  <b>Nerida Kelton</b>, Executive Director – Australian Institute of Packaging (AIP)</p>
3:30PM - 4:15PM	<b>How Coles halved food waste</b>
	<p>Coles had a target to halve food waste by 2020, which it met a year early. Fresh food, packaging, access to options to divert food waste, behaviour, allergens and animal products... all vexations in dealing with food waste. Vikas Ahuja, Coles Head of Energy &amp; Sustainability, asks questions to challenge perceptions about food waste.</p> <p><b>Vikas Ahuja</b>, Head of Energy &amp; Sustainability – Coles</p>

\* Program correct at time of print

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# SPEAKER SERIES

## DAY 2 THURSDAY 31 OCTOBER

### INDUSTRY FORUM

IN PARTNERSHIP WITH  **Planning, Industry & Environment**

10:15AM - 11:15AM	<b>State of waste: 18 months post China Sword are we making any progress?</b>
	<p>State and Territory governments have been busily releasing discussion papers and developing policies, strategies and plans for waste avoidance, resource recovery, circular economy, waste to energy, single-use plastics, infrastructure, organics, food waste and more. Additional funding has been committed by federal and state governments to grow a local resource recovery and processing industry. Circular economy hubs and networks are being created.</p> <p>This session will explore the plethora of activity across governments and analyse if we are forging a pathway that will enable Australia to manage its waste and resources more sustainably</p> <p><b>Stephanie Yu</b>, Unit Head Waste Markets – Department of Planning, Industry and Environment  <b>Pete Shmigel</b>, CEO – Australian Council of Recycling (ACOR)  <b>David Baggs</b>, CEO – Global GreenTag  <b>Kate Harris</b>, CEO – Good Environmental Choice Australia (GECA)  <b>Mike Ritchie</b>, Managing Director – MRA Consulting Group</p>
11:30AM - 12:00PM	<b>Australia's recycling future</b>
	<p>Taking responsibility for better managing Australia's waste is a key priority for the Morrison government. As the first ever minister with specific responsibility for waste reduction and recycling, Trevor will speak about the federal government's \$167m Australian Recycling Investment Plan to drive the growth of Australia's domestic capacity to process and recycle our own waste and build demand for utilising recycled materials.</p> <p><b>Trevor Evans MP</b>, Assistant Minister for Waste Reduction and Environmental Management – Federal Member for Brisbane</p>
12:15PM - 1:00PM	<b>Circular Economy and the global state of play, how does Australia compare?</b>
	<p>Since 2010, the circular economy has moved beyond a niche topic, to a priority area of research and practice, and an undeniable economic opportunity around the world. People are looking for a new vision for an economy that works, now and in the future. In response, the core principles of a circular economy are seen as an opportunity and a new narrative for innovation and progress.</p> <p>Coreo co-founders Ashleigh &amp; Jaime Morris, will share their insights to how Australia is placed in the global transition to a circular economy from a Government and Industry standpoint.</p> <p><b>Ashleigh Morris</b>, CEO - Coreo  <b>Jaime Morris</b>, COO - Coreo</p>
1:15PM - 1:45PM	<b>How effective are current landfill levies?</b>
	<p>This session will review the current state of levies across Australia, including a comparative analysis of what is being levied, how much is collected and where it has been invested, and discuss how this regulatory tool could be improved in light of the current challenges facing the waste and recycling sector.</p> <p><b>Rose Read</b>, CEO – National Waste &amp; Recycling Industry Council (NWRIC)  <b>Cr Linda Scott</b>, Vice President - Australian Local Government Association  <b>Mike Ritchie</b>, Managing Director – MRA Consulting Group</p>
2:00PM - 2:45PM	<b>e-waste: The fastest growing waste stream in the world</b>
	<p>e-waste is the fastest growing waste stream in the world. Globally we'll produce more than 50 million tonnes of e-waste this year alone, 700,000 tonnes of which will be generated in Australia. In light of these alarming statistics, what are the major issues facing Australia's e-waste industry? What action can we take to address this and how can technology and innovation help at such a critical time.</p> <p>Our experts will share their insights on all the key issues, trends and opportunities in the industry, including what role government should play.</p> <p><b>Warren Overton</b>, CEO - ANZRP  <b>Paul Klymenko</b>, CEO - Planet Ark Environmental Foundation  <b>Sharon Selwood</b>, General Manager Australia &amp; NZ - TES-AMM  <b>Janet Leslie</b>, Manager Sustainability - Canon Australia</p>
3:00PM - 3:45PM	<b>Essential supply chain elements necessary for achieving a circular economy for batteries</b>
	<p>How do we manage the risks and opportunities for repurposing our batteries? How do we reduce our reliance on conflict materials and poor environment practices? How can we best respond to the potential dilemma of costs of recycled vs new?</p> <p><b>Maryanne Coffey</b>, Emerging Technologies &amp; Projects Manager – Clean Energy Council  <b>John Polhill</b>, National Development Manager – Envirostream Australia  <b>Adrian Griffin</b>, CEO – Lithium Australia  <b>Gerry Morvell</b>, Chairman – Battery Stewardship Council  <b>Libby Chaplin</b>, CEO – Australian Battery Recycling Initiative (ABRI)</p>



## FOOD WASTE STAGE

11:00AM - 11:30AM	<b>Nourishing our country</b>
	<p>Hear from Ronni about OzHarvest’s work across the country, and the action needed from government and industry to halve food waste by 2030. Driven by a determination to find purpose in her life, Ronni Kahn began rescuing good food and delivering it to people in need. In 2004, OzHarvest was born and, it is now recognised as Australia’s leading food rescue organisation. OzHarvest’s purpose is to ‘Nourish Our Country’ and it delivers this through four pillars: food rescue, educate, engage and innovate.</p> <p><b>Ronni Kahn</b> AO, Founder &amp; CEO – OzHarvest</p>
12:00PM - 1:00PM	<b>Australia’s best practice food services packaging guidelines</b>
	<p>The food services sector plays a vital role in the Australian economy; however, it is also one of the highest consumers of problematic and unnecessary packaging, including single-use plastic. To assist the food services sector in addressing challenges and opportunities, APCO, in collaboration with the food services sector, have brought together industry, government and community stakeholders to develop a coordinated, evidenced-based approach to reducing the impact of food service packaging throughout the supply chain. The result of this collaboration has seen the development of sector-specific food services packaging guidelines, case studies and collaborative initiatives.</p> <p><b>Barry Cosier</b>, Director Sustainability – Australian Food &amp; Grocery Council  <b>Richard Fine</b>, Founder/Product Development &amp; Sustainability Director – Biopak  <b>Brooke Donnelly</b>, CEO – Australian Packaging Covenant Organisation (APCO)</p>
1:15PM - 1:45PM	<b>Halving food waste by 2030</b>
	<p>NSW has committed to the national and international goal to halve food waste by 2030. This presentation will outline the potential and challenges ahead in achieving the target, drawing on data, findings and lessons from delivery of the \$105 million Organics Infrastructure Fund under Waste Less, Recycle More over seven years. From avoidance education to new processing facilities and markets for compost, the program has transformed the landscape for food waste recovery in NSW and helped to identify pathways ahead to meet the 2030 goal.</p> <p><b>Amanda Kane</b>, A/Director Resource Recovery – Department of Planning, Industry and Environment</p>
2:15PM - 3:15PM	<b>How healthy soils are created from food waste</b>
	<p>In Australia, over 5 million tonnes of food waste currently goes to landfill. Organic matter is vital for good soil health, and adding quality compost derived from materials such as food waste has many benefits. Building healthy soils with compost provides nutrients, increases moisture retention, decreases likelihood of erosion, regulates soil temperature and provides capacity to store carbon. Come along to learn more and hear from expert panel speakers as they discuss key initiatives and opportunities driving long-term solutions.</p> <p><b>Charlie Emery</b>, Soilco &amp; Director/NSW Chairperson - AORA  <b>Angus Johnston</b>, Principal Consultant - Jackson Environment and Planning  <b>Virginia Brunton</b>, Principal Consultant Organics - MRA Consulting Group</p>

\* Program correct at time of print

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# AWRE 2019 FLOORPLAN







# EXHIBITOR LIST

FIND OUT MORE AT  
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888 Crushing & Screening Equipment	D59	EcoMorphosis Engineering Solutions	F12	Nantong Enerpat Machine Co., Ltd	D12
Aerofloat (Australia) Pty Ltd	B44	Eriez Magnetics	C49	Neilson Engineering AU	D36
Airepure Australia	F14	Finlay Waste & Recycling	A36	Northern Ireland	B22
Alemlobe	B31	Finlease	E11	Nu Style Eng Group	A47
ALLU Transformer	F43	FLIR Systems Australia	C43	Organic Recycling Group – ORG	E12
AMCS Wastedge	B16	FOCUS Enviro	A40	Ozmist Misting Systems	A11
ANZRP–TechCollect	A49	GCM Enviro Pty Ltd	A51	Pacific Materials Handling	A2
AORA (Australian Organics Recycling Association)	E34	GECA (Good Environmental Choice Australia)	A37	Pellenc ST	F18
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CSS Equipment Recycling Solutions	B18	Mercedes-Benz	C40	TFI Industrial	E59
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# CRUNCH TIME FOR THE WASTE AND RECYCLING INDUSTRY



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As a young, energy-rich country with plenty of space, Australia has never prioritised recycling household and industry waste very highly. For many years it was simply easier – and more cost-effective – to export reusable material such as plastics, paper and metals to other countries that had more efficient facilities.

But China's decision in 2018 to close its doors to low-grade waste from countries such as Australia forced the federal government, and others, to rethink how to handle the nation's waste and whether we could do more to divert recoverable material from our ever-expanding landfills and warehouse stockpiles.

In the lead-up to the Australasian Waste & Recycling Expo (AWRE) at Sydney's Darling Harbour in October 2019, Diversified Communications Australia, the Organisers of AWRE conducted a wide-ranging survey of stakeholders to identify the key issues (and opportunities) the waste and recycling sector faces.

While the results are not definitive, the survey reveals the sheer diversity of Australia's waste and recycling sector – representing everything from retail to aged care – and an overarching sense of optimism about the future, despite the short-term challenges following the loss of export markets.

Respondents, who came from every state and territory, pinpointed several opportunities for the home-grown industry, especially in the areas of energy generation and smarter recycling practices to prevent so much valuable material ending up in council landfills.

Indeed, 54 per cent of those surveyed said they were confident that new recycling technology, especially in energy generation, would transform the sector over the next one-to-three years.

Asked to nominate the main drivers for bringing about radical changes to Australia's waste and recycling sector, respondents nominated government policy, technology and international trends – with some also identifying climate change as a major influence on public policy and community attitudes.

Not surprisingly, there is still widespread concern about China's National Sword policy, which dramatically cut Australia's export of plastics, paper, metal and other

waste materials to that market. A majority of respondents said neither federal nor state initiatives had helped their business navigate the challenging new recycling and waste-recovery landscape.

Looking ahead, most of those surveyed said they were only expecting moderate growth in demand for their products or services over the next 12 months. Very few expected substantial growth.

Despite this caution about 40 per cent of businesses and organisations surveyed said they expected to make a significant investment over the next few years in response to shifting waste and recycling demands; the same percentage were uncommitted.

Organisations cited research and development, technology and innovation, and product development as their major investment priorities over the next three years – and they also expect to hire extra staff during the same timeframe.

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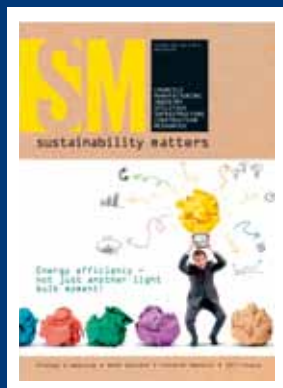


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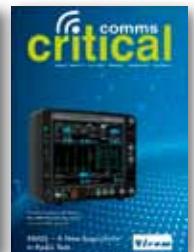


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The 32 months from January 2017 to August 2019 have been the driest on record averaged over the Murray-Darling Basin (34% below the 1961-1990 average), as well as over the northern Murray-Darling Basin (40% below average) and for the state of New South Wales (34% below average).  
*BOM September 2019*

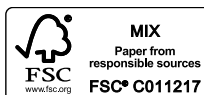
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# New weapons in war on waste

Professor Veena Sahajwalla\*

The joint announcement by the federal and state government leaders in Australia to ban – at some point – the exporting of waste materials to other countries marks a tipping point in how we manage our waste and recycling.

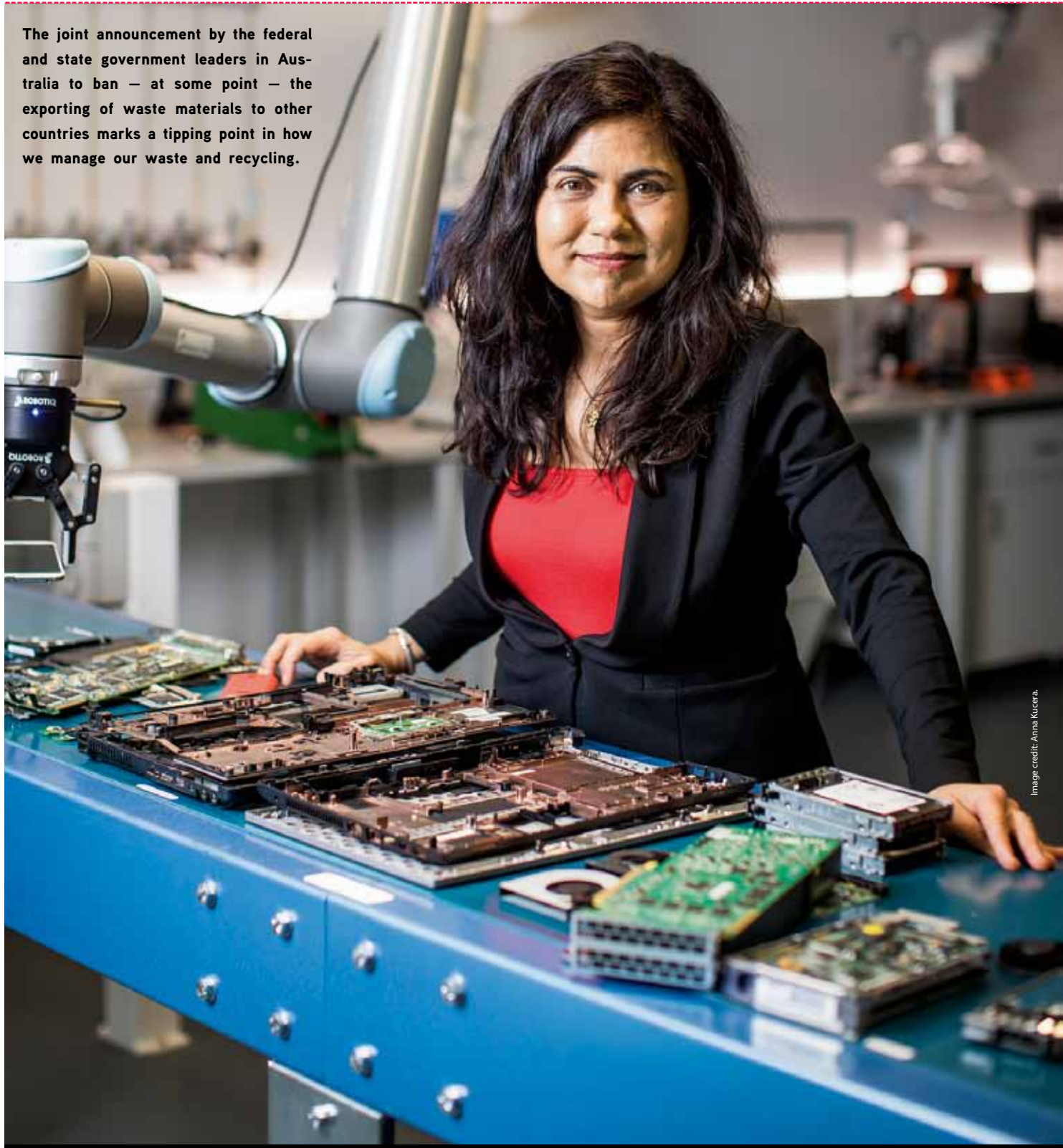
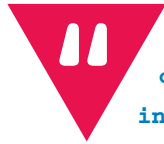
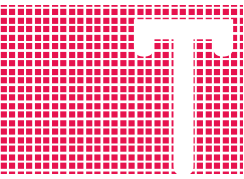


Image credit: Anna Kucera.





It is essential we strive to develop a more circular economy in which we keep materials in use for as long as possible and establish new business supply chains.



The decision to keep, rather than send overseas, our waste plastic, glass and tyres, so that we reduce the amount of rubbish going into overcrowded and new landfill, presents a game-changing opportunity for our manufacturing industries.

It is essential we strive to develop a more circular economy in which we keep materials in use for as long as possible and establish new business supply chains, which ultimately create new jobs along with other economic, social and environmental benefits.

Technology is now already available right here in Australia to process much of this unwanted material into new products and manufacturing feedstock. But currently there is little commercial incentive to adopt it because much of this material is seen as having no or little value and the circular supply chains are yet to be established.

The federal government's announcement of \$20 million of funding via Round 8 of its Cooperative Research Centre (CRC) initiative to grow our domestic recycling industry is very welcome, as is emergency and 'innovative initiatives' funding by the states for their local councils struggling with the current waste crisis.

The CRC funding is designed to help industry partner with researchers to innovate and develop new technologies, such as that developed with my team at the Centre for Sustainable Materials Research and Technology (SMaRT) at UNSW Sydney.

Through our microrecycling science, we developed microfactory technologies that can reform waste items like glass and textiles, including clothing, into flat ceramic building products, and it can also transform electronic waste into valuable plastic filament for 3D printing and metal alloys.

We also developed what is known as 'green steel' technology which uses old rubber tyres as a replacement for coking coal in steelmaking, and we are working with our Australian steel partner, MolyCop, testing waste plastics as an alternative source of coal-based carbon for steelmaking.

The coordinated decision by the Council of Australian Governments (COAG) to ban the exporting of our recyclable materials actually presents an opportunity for Australia to lead the world in the remanufacturing of discarded materials.

For example, we can take waste plastic and turn it into new, highly valuable products such as filament for use in 3D printing which is now mostly imported from overseas, and be reformed into other commodities which can be used in steelmaking and for other applications. This microfactory technology can be deployed to rural and regional areas where waste is stockpiled and bring local industries and councils together to create new circular solutions.

UNSW's own research shows 65.4% of people believe recyclables put into council bins goes to landfill (69.5% female, 51.4% aged 18-34, 75.1% aged 65-plus). 49% of people believe green and eco-friendly efforts will not have an effect in their lifetime, compared to 63.8% of those aged 65-plus seeing no benefits being realised.

And 72.4% of people would recycle more if they thought the material was reliably recycled and a majority say they would be prepared to pay more for reliable recycling solutions.

So the community knows more could and should be done to address this issue. The COAG and CRC funding announcements are to be commended, but we also need more coordination across all stakeholders.



SMaRT microfactory coffee table.

Also working as the new Director of the NSW Circular Economy Innovation Network, designed to bring together stakeholders across industry, researchers, governments and the community to create new circular solutions, I can see a growing willingness to adopt more sustainable outcomes.

A key challenge is to harness the commercial appetite and the current opportunity to create value from the materials that end up in landfill to ensure societies divert at scale the waste that can be reformed into new, valued-added materials, products and manufacturing feedstock.

This involves actively working with companies and organisations seeking to embrace circular economy principles into their operations so they can know who the other participants in these new supply chains are and the opportunities.

It's time to rethink attitudes towards all of the materials we design, produce, use and discard, to see them as renewable resources if we want to reduce our reliance on finite resources with major environmental and economic impacts.

When considering that the population growth trend is expected to continue in the following decades, from a current world population of 7.6 billion to approximately 9.8 billion by 2050, our resources globally and at home need to be preserved and re-used.

So, while there is growing concern around needing greater sustainability, I actually see 2019 as a positive tipping-point year when the momentum of change embraces a circular economy. This is a period of disruption we must have.

*\*Professor Veena Sahajwalla is a scientist, engineer, inventor and Professor of Materials Science and Engineering at UNSW Sydney, Australia. She is the Director of the UNSW Centre for Sustainable Materials Research and Technology, Director of the NSW Government's new Circular Economy Innovation Network and an Australian Research Council Laureate Fellow.*

Life cycle assessment (LCA) has been the toolbox for sustainable products for decades, but it is fair to say that it hasn't quite gained the level of popularity that could go with such a claim to fame. But maybe it doesn't need to be popular.

**L**arge brushstroke visions like cradle-to-cradle, bio-economy and circular economy should be the drivers of the necessary change, with LCA providing the evidence base making sure we choose optimal solutions and avoid unintended consequences. Without needing to know all the details, the broader sustainability community will benefit from understanding when and how LCA can be of use to them.

LCA is simply a framework to integrate environmental impacts over a full or partial value chain, ie, over several processes and entities, and across a range of impact categories. The framework is also applicable to social and economic aspects, and life cycle sustainability assessment covers all three simultaneously, but environmental LCA is the oldest and most common application. LCA is governed by international standards ISO 14040:2006 and ISO 14044:2006, with spin-off 'single issue' standards such as for carbon footprinting (ISO 14067:2018) and water footprinting (ISO 14046:2014).

En route to the circular economy (CE), LCA will make sure that circularity is accompanied by decreasing overall environmental impacts. Unfortunately, the two don't always go hand in hand. Even when all energy will be derived from renewable sources — and this is still a while away — there will be a need to optimise energy efficiency and material use, for example, solar cells and batteries.

Very broadly speaking, there are two ways to use LCA. One is as a decision-

# LCA provides the evidence base for circular economy

*Maartje Sevenster, President,  
Australian LCA Society*





En route to the circular economy (CE), LCA will make sure that circularity is accompanied by decreasing overall environmental impacts.

making or design tool, for products or processes. By integrating a (full) range of supply chain processes and impact categories, LCA can help identify hotspots and trade-offs. For example, the use of recycled material may increase the weight of a product and thus increase transport requirements. LCA can balance the pros and cons and show whether there is net improvement.

The other way to use LCA is as an accounting tool. In this context, LCA generates values for standard metrics that can meaningfully be communicated business-to-business or business-to-consumer, such as carbon footprints (CFPs) or environmental product declarations (EPDs).

The Australian LCA Society (ALCAS) is a volunteer-run professional organisation promoting understanding and proper use of LCA as well as driving continuous professionalisation of this field. Our activities are centred around five main programs: Australian Life Cycle Inventory (AusLCI), EPD Australasia, professional certification of LCA practitioners, best practice guidance in impact assessment methodology and organisation of a biennial conference.

The freely available Australian Life Cycle Inventory (AusLCI) database ([www.auslci.com.au](http://www.auslci.com.au)) contains data on environmental inputs and emissions of a host of (intermediate) products. It helps you to understand the environmental impacts these products have, and enables you to calculate, for example, the carbon footprint of a cubic metre of 40 MPa concrete, or fossil fuel depletion associated with 1 kWh of electricity generated in NSW. AusLCI data are used in (NCOS) carbon neutral assessments, LCA tools for buildings and infrastructure, EPDs, etc.

EPDs are highly standardised and verified declarations of the environmental impacts associated with intermediate products. On the website [epd-australasia.com](http://epd-australasia.com) you can find all the EPDs that are currently registered for the Australasian region. EPDs are used amongst others in green procurement and for credit points in Green Star ratings ([www.gbca.org.au](http://www.gbca.org.au)) and IS ratings ([www.isca.org.au](http://www.isca.org.au)). An EPD can easily be used to create a Climate Declaration, or for a streamlined certification process as part of the Australian Government's National Carbon Offset Standard (NCOS). ALCAS owns the EPD Australasia program together with our New Zealand counterparts LCA NZ.

A certification program for LCA professionals (LCACP) is run together with the American Center for LCA (ACLCA). Certified professionals meet requirements regarding knowledge of and experience in performing LCA as well as being up to date on current developments. An ever-expanding list of certified practitioners can be found on the ALCAS website ([www.alcas.asn.au](http://www.alcas.asn.au)).

A best-practice guide for life-cycle impact assessment in an Australian context was written by LCA experts to make the choice of metrics for environmental impacts easier. For climate change, we all know global warming potential in units of kg CO<sub>2</sub>e, but for other aspects such as air pollution or water scarcity, there is a bewildering number of methods available. The recommendations and associated impact factors are freely available on the ALCAS website and can be applied to single processes as well as life-cycle data.

For more information, visit [www.alcas.asn.au](http://www.alcas.asn.au).

## Counteracting waste levies with recycling solutions

Waste levies continue to rise throughout Australia as governments and councils work to reduce waste to landfill and increase recycling rates. Waste levies have been dictating how waste is disposed of in Australia for some time. Queensland has been the dumping ground for upwards of one million tonnes of waste from NSW due to the lower cost of waste disposal. However, this will come to an end as Queensland has now imposed waste levies to bring it in line with neighbouring states.

Simply put, the cost of waste disposal and the pressure to comply with environmental standards will continue to increase. The best thing organisations can do now to mitigate the impact of increasing costs and social pressures is to implement an effective and long-term recycling solution.

The China recycling ban was, in large part, implemented because the recyclables it received were low quality and heavily contaminated. Recycling solutions provider Method believes the future of recycling is separating at the source. This means that recyclables maintain their integrity; and with clear communication about what should go where, contamination is reduced.



Method's philosophy of open-plan recycling brings its bright, colour-coded bins out into the open-plan design of modern spaces. Placed together, they form flexible recycling stations that are located consistently throughout a space or building.

By removing convenient general waste options such as desk bins, users must make a short walk to the nearest station where each waste stream is available to them. Further, being out in the open increases accountability, even subconsciously.

Method has been helping organisations to recycle more and waste less with its innovative bins for several years, with clients including the Sydney Cricket Ground, Canva, Foster + Partners, Life Flight, Xero and many more. Using Method's system, Westpac New Zealand reduced waste to landfill from 70 to 30% and the company

is working to reduce this further.

Visit Method at the Australasian Waste & Recycling Expo (AWRE) this October (stand B51) to learn more about the innovative bins and how they can help your organisation. Or, visit [methodrecycling.com](http://methodrecycling.com).

**Method Recycling Australia Pty Ltd**

[www.methodrecycling.com](http://www.methodrecycling.com)

## Research could save our sand

University of Queensland PhD candidate Danish Kazmi has developed a sustainable solution to help preserve sand — a natural resource that is facing global shortages due to over exploitation.

Kazmi is exploring the use of crushed waste glass as an alternative to sand for ground improvement during construction, potentially providing a sustainable and cost-effective solution. It is estimated that nearly one million tonnes of waste glass is stockpiled annually in Australia, and its disposal has become an environmental challenge due to its limited end uses and non-biodegradable nature.

"Both sand and waste glass have a similar chemical composition, so we expect them to behave similarly when optimally used in geotechnical construction," Kazmi said.

"My research looks at the performance of waste glass within ground columns as an environmentally friendly alternative to sand columns that are commonly used at the moment. These waste glass columns are designed to strengthen the earth below a building and improve its load-bearing characteristics." Kazmi has found that using waste glass in ground columns not only preserves sand resources and promotes closed-loop recycling, but could reduce the carbon footprint of the construction industry by cutting down on the amount of sand that needs to be quarried.



"I have always been passionate about helping to create circular economies," he said.

Kazmi was one of 30 PhD students selected for the prestigious UQ Global Change Scholars program in 2018. His work focuses on building an eco-friendly future through sustainable construction practices with technical benefits, guided by PhD supervisors Professor David Williams and Dr Mehdi Serati.

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## Partnership creating wealth from waste



A partnership between Aqseptence Group and Netherlands firm Colubris Cleantech will deliver bespoke, waste recycling solutions to the Australian and New Zealand market via the Redox Waste Recycling brand.

Known for Johnson Screens, Aqseptence partnered with Colubris Cleantech to create real-value commodities from waste and deliver innovative yet robust sorting lines with the flexibility to tackle inconsistent waste streams efficiently and cost-effectively.

### Bespoke solutions for waste streams

Colubris Cleantech develops, produces and installs sorting lines for a variety of waste flows. Redox (a brand of Colubris Cleantech) sorting lines can distil waste flows from diverse sectors to give recyclates a second life as plastics, metal, wood, paper, sand or stone. In certain cases, Redox installations can recover over 95% of materials from waste streams.

### Municipal solid waste

Mainly generated by households, this waste stream consists of a diverse range of materials such as product packaging,

grass clippings, furniture, clothing, bottles, food scraps, newspaper, small appliances, paint and batteries.

About 75% of this waste stream can be separated using the Redox sorting system. Re-usable materials, for example paper, cardboard, plastics and metals, can be recovered to achieve local authority recycling targets. Organic wastes can be further treated and used in bioenergy systems.

Demolition waste predominantly consists of crushed heavy fractions, such as asphalt, concrete, tiles and aggregates. Construction waste can be much lighter and mostly consists of packaging and general rubble from building and renovating sites. The compositions of these waste streams differ greatly but up to 95% of the total mass can be recovered for re-use.

To effectively process waste streams, Redox has developed two kinds of separating and cleaning equipment: windshifters (cleaning with air) and drum washers (cleaning with water).

### Industrial and commercial waste

This waste stream varies widely but can include dry waste, such as general container (skip) waste, office and canteen waste, product packaging waste and production

waste. A coarse shredder can be used at the input to achieve higher throughputs.

Flexibility is key for mixed streams, with almost 80% of materials being recycled. Typical recyclates are paper, cardboard, plastic, stone, metal and wood.

### Compost, green and organic waste

Several systems can treat organic waste and compost. For dry, oversize composting operations, size separation takes place first, then windshifters are used to separate the inert fractions like stones and glass. Infrared optical separators remove plastics and other contaminations.

The windshifter is an energy-efficient and controllable method for density separation. For heavily contaminated organic fractions it may be desirable to use a wet 'up-flow' washing system. When dealing with water and sludge systems, organic and inorganic separation can be used to split the inert fraction such as stones and glass from the organic material. Sludges can then be used to produce biogas or in thermal recovery systems.

*Aqseptence Group*  
[www.aqseptence.com](http://www.aqseptence.com)



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# Bega Cheese upgrades wastewater system with new aerator



*This image shows the lagoon two weeks after the installation of the Venturi Aerator. Ripples from the aerator that radiate to all parts of the lagoon ensure a good level of mixing.*

In 2018, Bega Cheese Environmental Manager for Northern Victoria Sean Trebley was given the task of upgrading the wastewater aeration system at Bega's Strathmerton Plant.

The existing wastewater system consisted of a dissolved air floatation (DAF) unit, which flowed into an aerated lagoon. The resulting effluent was stored in two non-aerated lagoons during winter, with irrigation occurring in summer.

Aerators reduce chemical oxygen demand (COD) in wastewater as well as odours in the aerated and downstream non-aerated lagoons. Bega had an ageing system of surface aerators in the aerated lagoon, consisting of two 22 kW units and six 8 kW units, but generally only one or two of these units were operated at any time.

Over several years the ageing surface aerators had progressively failed. Repairs involved the deployment of cranes and/or boats to gain access — an expensive process that had resulted in damage to the dam liner. Eventually it became uneconomical to keep repairing the aerators.

Bega decided to look for a solution that was safer for operators and easier to maintain. Trebley contacted Hydro Innovations to discuss the use of the company's bank-mounted Venturi Aeration system. This solution is mounted on the banks of lagoons, using a self-priming pump to draw water from the lagoon. The unit draws in atmospheric air using the Venturi effect, mixes it with the water being pumped, and discharges it back into the lagoon, charged with dissolved oxygen.

Trebley and his team liked the idea of bank mounting because it gave operators easy access to equipment for monitoring and/or repair, making it safer and more cost-effective to maintain. Bega's only concern was whether the units were as efficient as surface-mounted technologies. Hydro Innovations was able to provide information indicating that, with the use of the right pump, oxygen transfer efficiency for Venturi Aeration units can be as high or higher than 1.86 kg O<sub>2</sub>/kWh, making them at least as efficient as surface (floating) technologies.

The aerated lagoon contained 45 ML of effluent, with in-flows from 80–120 ML

per year. This required a 150 mm Venturi Aeration unit, which was paired with a Gorman-Rupp V6A60-B self-priming pump, with a hydraulic efficiency of 70%.

Since installation, operators have observed a continued increase in the dissolved oxygen level and have seen COD fall by 50%, even though the higher level of mixing was re-suspending settled solids, which became more bioavailable to colony-forming units.

Trebley and the Bega Cheese crew are happy with the ever-increasing levels of dissolved oxygen, the reduction in COD and their odour-free lagoon. The wastewater and maintenance teams are also pleased that monitoring and maintenance can be done safely, without the use of cranes, boats or winches.

**Hydro Innovations**  
[www.hydroinnovations.com.au](http://www.hydroinnovations.com.au)



## Quality drinking water through ozone treatment

Drinking water is the most important food of all. Its preparation requires complex processes. To oxidise and disinfect drinking water in the course of treatment, ozone is often mixed in. Because of its high reactivity, ozone must be produced and added onsite under strict safety regulations. Vega's pressure transducers make an important contribution to the continuous processing of quality drinking water.

The water supply system in Baden-Württemberg is one of the largest and most traditionally far-reaching water supplies in Germany. Around 250 cities and municipalities are supplied with about 90 million cubic metres of drinking water each year. Top quality and a high level of security of supply take centre stage in the regional water supply's management. At the beginning of the 20th century, the population in the central Neckar region was already growing rapidly as industrialisation progressed. A far-sighted plan at the time was to bring drinking water from the Danube valley at the city of Ulm via the Remstal to Stuttgart. This laid the foundation for the regional water supply system.

Plants for the conversion of river water to drinking water consist of a raw water pump which draws the water directly from the river, a pressure pipe from the pumping station to the waterworks and the treatment facilities in the waterworks. In peak times, up to 2300 litres of river water per second can be converted into drinking water. The injection of highly active oxygen (ozone) for oxidation and disinfection during drinking water treatment represents state-of-the-art technology.

Ozone oxidises dissolved and particulate organic matter and kills or inactivates existing microorganisms. Ozone is always formed when some form of energy decomposes molecular oxygen ( $O_2$ ) into



Image courtesy of VEGA Australia.

individual oxygen atoms (O), which then react with molecular oxygen ( $O_2$ ) to form ozone ( $O_3$ ). This can occur through UV radiation, lightning strikes and also high-voltage electrical discharges. Because of its high reactivity, ozone is produced, transported and added to the water on the spot and in compliance with strict safety regulations.

The actual production process takes place in pressurised reactors, where electrical energy is applied to convert oxygen into ozone. Then, the resulting gas mixture flows into an ozone collecting pipe. The maximum ozone concentration is about  $180 \text{ g/Nm}^3$  at an operating pressure of 1.3 bar.

Injectors feed the ozone into the water, while mixers distribute the tiny ozone bubbles evenly throughout the water volume. The water remains for a few minutes in large

containers during which time oxidation and disinfection take place.

To ensure that pressure measurement in the ozone collection pipe and at other important measuring points is absolutely safe and reliable, the engineering department decided to use Vegabar 82, the pressure transmitter with ceramic CERTEC measuring cell and a second line of defence. This is an additional separation process by means of a gas-tight feedthrough above the process connection. Although the measuring cell is permanently resistant to ozone, the second line of defence provides an extra layer of protection against the leakage of ozone from the pipeline through the pressure transmitter. Vegabar 82 thus plays an important role in safe ozone generation as well as in the continuous production of quality drinking water.

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# Australia's wasted opportunity

Our nation's wasted recycling potential is costing millions

An EY report has revealed that — by failing to correctly handle our recyclable materials — Australia could be missing out on \$324 million each year.

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**T**he EY report found that the current method of commingling recyclables — mixing items such as glass, plastic and aluminium in one bin — is reducing the value of recyclable material from a typical kerbside bin to as low as \$2 per tonne. If uncontaminated recyclable materials were separated, the value of kerbside waste could increase to as much as \$156 per tonne.

This discrepancy means that only \$4.2 million of a potential \$328 million worth of recyclable material is being captured from kerbside bins in Australia each year.

By improving waste sorting, increasing education about how to recycle and developing new markets for recyclables, Australia could generate a thriving waste management supply chain worth up to the \$328 million figure.

According to EY Climate Change and Sustainability Partner Terence Jeyaretnam, this opportunity will only be realised by better sorting household waste and rethinking of waste as a commodity.

“There has to be a fundamental shift in our thinking. We must start realising and treating our waste as a tradeable commodity, like iron ore or gold, rather than just waste,” said Jeyaretnam.

“The old way of sorting our waste is not the right fit for 21st century Australia. Not only does it lead to poor environmental outcomes, it’s preventing us from grasping an opportunity worth hundreds of millions per year.

“We have this \$324 million opportunity sitting in our rubbish bins that can be realised by better methods of sorting, more education about how to recycle and developing new on-shore markets for our waste.

“To capture this opportunity will require all levels of government, industry and everyday Australians to work together to ensure we capture every last bit of value from our waste,” Jeyaretnam concluded.

### Key report findings:

- If Australia built a world-class recycling system on-shore, EY estimates that more than \$328 million worth of recyclable material per year could be captured and used in manufacturing and construction.
- A fundamental behavioural shift is needed to reduce contamination in our recyclable materials. This can be aided by better information for households, clearer rules on what can be recycled, and possible new infrastructure and incentives.

- To improve recycling, product lifecycle needs to be examined, including packaging design, choice of packaging material and on-pack information detailing packaging systems, collection and recycling services.
- Correct sorting of recyclables before collection, rather than after, is key to extracting maximum value from recyclable items.
- More recycled material should be included in the production of goods, infrastructure and packaging.
- Harmonisation of regulation between federal, state and local governments should be considered as a way to provide clarity about the types of materials that can be recycled.
- Data collection should be improved to better understand the issues in the market, as well as the opportunity in our kerbside bins.
- Further investment, drawing on state waste levies and federal funding should be directed to developing the collection, recycling and markets to create a sustainable domestic recycling industry.

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# The future of high-quality PEF

Ben Sawley\*

As governments and communities across the world grapple with the challenge of dealing with the mountains of waste produced through modern living, the need to grow existing, and establish new, markets for the repurposing of waste is becoming ever more critical.

China's decision to stop accepting rubbish from countries like Australia since the beginning of 2018 turned significant community and political focus to what countries do with their waste. What's important within that debate is that we are able to have a meaningful conversation about the very distinct differences between contaminated rubbish being dumped on foreign shores and legitimate high-value recycled commodities, including waste-to-energy solutions, for which there is high global demand.

Encouragingly, the Council of Australian Governments (COAG) recently agreed to establish a timetable to ban the export of waste plastic, paper, glass and tyres, saying Australia needed to take responsibility for its own waste. Hand in hand with that decision is the need to continue to build Australia's local recycling capacity, changing from a make, use and dispose model to the recovery, recycling and re-use of products to extract their maximum value. It's in this space that opportunity abounds for Australia's advanced waste-to-energy

sector, which has a significant role to play in adding capability to the emerging global circular economy.

As an international leader in resource recovery and alternative fuels, ResourceCo has already repurposed 40 million tonnes of raw waste materials that would have otherwise found its way into landfill. The construction and demolition and commercial and industrial components of that waste is converted into energy, in the form of processed engineered fuel (PEF). PEF is a finished product that is generated from select dry non-recyclable materials, and not from municipal waste. For more than a decade, ResourceCo has been producing this ready-to-use alternative fuel source that replaces the use of fossil fuels, servicing well-established markets for high-energy users in both Australia and South-East Asia. The company continues to invest significantly in research and development, with its two Australian PEF plants producing a product that has a lower emissions profile and displaces millions of tonnes of fossil fuels at a lower price point, as well as abating hundreds of thousands of tonnes of CO<sub>2</sub>.

While traditionally the product has been used in cement kilns in Australia, in Europe this fuel has been used in biomass boilers to produce lower cost, lower emissions heat and electricity for decades.

As demand, and likewise opportunity, for sustainable, environmentally sound energy solutions increases on the back of governments and communities looking for ways to conserve the earth's limited resources, it is vital that product quality is not compromised. The market for PEF is rapidly expanding both here and abroad because it offers a win-win solution to businesses grappling with increased regulation, while also crying out for cost-effective alternative energy solutions in the face of skyrocketing gas and electricity prices. PEF's growing reputation as the 'Holy Grail' in sustainable energy production and its broadened scope of application for energy-hungry businesses is attracting numerous new entrants into the market.

As an Australian leader in PEF production, we are encouraged by its uptake as an alternative energy source but advise those seeking alternative fuel options to do their homework. Not all PEF is cre-

ated equal and inferior products will most certainly deliver inferior results, both in terms of energy production, energy continuity and environmental outcomes. The key factors that influence PEF quality are energy content of the fuel, ash, moisture, particle size and key chemicals including chlorine and sulfur.

The critical first element to ensure a high-quality end product is sourcing the right mix of raw waste materials and then forensically processing the waste to ensure adverse chemicals and inert materials are meticulously removed. This is achieved through a combination of mechanical, pneumatic, magnetic, eddy current, optical and human processes. Without the right equipment and expertise, the production process yields an inferior PEF with higher ash and moisture content and less of the high calorific content which reduces energy yield. The final imperative in the processing of PEF is to ensure the final fuel is sized to the correct particle

dimensions as the wrong-sized final fuel can cause significant problems for the end users' equipment. It takes experience to producing a fuel to specification, every time, for years.

To safeguard against a lower quality fuel, the best advice is to ask questions about a potential supplier's experience, ensure you agree on a comprehensive specification which matches your business needs and seek out independent product testing through a laboratory with National Association of Testing Authorities (NATA) accreditation.

The future for PEF is enormous. Its ability to harness the energy value of material currently going to waste in landfill sites is unrivalled. More than 20 million tonnes of waste is still landfilled in Australia each year — the energy content in this waste alone is equivalent to half of all natural gas used in Australian industry. PEF presents a cost-effective, circular solution to the generation of sustainable

baseload energy, helping to address the complex and expensive issues of waste management and energy production. In realising the opportunities at hand, we must draw on the best science, research and commercial experience to deliver the best outcomes — both for industry and the environment.



*\*Ben Sawley is the CEO of ResourceCo's Sustainable Fuels business and a recognised leader in sustainable energy and resource recovery. He is also a Director of the Board of the Waste Management and Resource Recovery Association of Australia. Prior to joining ResourceCo, Ben held a number of executive leadership positions across Australasia, the US and Europe, including National General Manager for Transpacific's Post Collections business, General Management roles with Boral, and a consultant with The Boston Consulting Group (BCG).*

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# The role of energy storage in decarbonising Australia's energy mix

Mary Hendriks\*



Decarbonising the energy mix is essential for the urgent need to lower carbon emissions globally. With vast resources of solar and wind power, Australia has the ability to not only make this transition but become a global leader and export energy-related services. The success of this change to integrating higher levels of variable renewable energy depends on how we use and value the services of energy storage systems at grid level, for managing distributed energy resources and in microgrids and remote sites.

**T**he switch to higher penetrations of renewable energy in Australia is well underway, with over 2 million solar rooftops and installation of large-scale renewables exceeding national targets.

At grid level, decarbonising our energy supply means moving away from centralised fossil fuel thermal generation. Integration of more large-scale renewable energy requires new market rules, building additional transmission infrastructure and providing incentives to encourage uptake of energy storage to support this change.

Historically, pumped hydro energy storage systems have provided storage to the main Australian energy markets. While no projects were developed in the past 30 years, there is a renewed

interest in pumped hydro, including the innovative 250 MW Kidston pumped storage hydro project in Queensland, and the proposed projects in Tasmania, alongside development of an additional undersea interconnection. Projects at this level are constructed over long timespans and require significant investments and additional transmission infrastructure.

Australia also needs more nimble options, such as utility-scale battery energy storage systems (BESS), able to be completed in time frames of months rather than years, and which can be sited alongside the growing number of solar or wind farms. BESS will play an important role in the energy transition as our ageing coal-fired power stations retire.

Over the past few years, Australia has become a global leader in the uptake of utility-scale BESS commencing with the

build in South Australia's 100 MW Tesla battery at the Hornsdale Power Reserve. This was followed in Victoria by Energy Australia/Ausnet's 30 MW Fluence system in Ballarat and Edify's 25 MW Tesla system in Gannawarra. While these battery systems received some financial support, the first non-subsidised utility-scale BESS system has now been developed, with more expected as the market starts to value the many services and capabilities of battery storage.

BESS is reducing use of gas peaker plants to support the grid, resulting in lower emissions and costs. BESS will play an increasingly important role in the energy transition as coal-fired power stations retire.

Distributed energy storage will help lower emissions while keeping energy costs down for businesses, farms and industry. Many sites already with installed solar will add battery storage over the next decade. Longer duration storage will be optimal for some applications, such as the VSUN vanadium redox flow battery soon to be installed on a Victorian apple farm alongside a solar array. ▶

## energy storage



**Australia also needs more nimble options, such as utility-scale battery energy storage systems (BESS), able to be completed in time frames of months rather than years.**

Australian home owners have already achieved cost savings from rooftop solar and the addition of battery storage not only increases self-consumption, but also leads to further decarbonising of the grid through participation in aggregated systems such as virtual power plants (VPPs). South Australia's programs provide stored energy from large numbers of individual battery units when needed to support a grid with high percent of renewable energy.

Microgrids with energy storage are one of the most innovative ways of supplying energy; they can be grid-connected or standalone, enabling integration of renewable energy while providing local control and increased reliability. For remote microgrids, the main benefit of battery storage is to reduce the amount of diesel or gas generation, often with significant cost reductions.

Western Australia is among the global leaders in development of microgrids with battery storage for remote communities and mining operations, and is now looking to export Australian innovation in microgrid systems able to supply electricity for areas with limited or no grid services.

Urban grid-connected microgrids are also being implemented, such as the Monash University Clayton Campus installation, which includes one of Australia's largest hybrid battery storage systems.

Energy storage, together with innovative energy management systems, is key to fast-tracking a lower emissions grid, enabling more distributed energy to be used and reducing consumption of gas and diesel in remote areas.

To find out more about the Australian Energy Storage Alliance (AESAs), visit [www.energystoragealliance.com.au](http://www.energystoragealliance.com.au).

*\*Mary Hendriks is the Industry Executive of the Australian Energy Storage Alliance (AESAs), an industry-focused information hub and advocacy group for the energy storage sector. Mary has over 10 years' experience in various roles supporting the uptake of renewable energy, most recently in the energy storage sector. She also volunteers as committee member for the Sydney branch of the Australian Institute of Energy. Mary's passion is for a well-managed transition to clean energy systems in Australia.*



## ROBOTIC WASTE RECYCLING SORTING SOLUTIONS

Diverseco will be showcasing its range of intelligent, fully automated robotics sorting systems at the Australasian Waste & Recovery Expo in Sydney. The systems are designed to help revolutionise the waste

recycling industry and make a significant contribution to sustainable development.

The easily configured system employs advanced vision guided robots, machine learning and artificial intelligence (AI) systems to automate the sorting and segregation of waste products at single-stream materials recovery facilities, mixed-waste processing facilities, C&D sorting facilities, plastics reclaimers and others.

In addition to reducing operational costs and WHS risks by replacing human pickers in recycling centres, the vision guided robotics systems also increase the pick rate and quality of recovered waste that will re-enter production processes as secondary raw materials.

Each robotics system comes equipped with an advanced vision and scanning system that continuously monitors the waste stream. This multidimensional data is then processed by the AI system, which identifies the desired materials to be selected from the waste stream within a split second. This data is processed by the robot controllers that then direct the robotic arms to precisely pick the items using a range of different robot grippers.

Because each scanning system comes preconfigured, the robotics experts at Diverseco can integrate the system onto existing recycling lines in a short period of time.

Diverseco  
[diverseco.com.au](http://diverseco.com.au)

## RECYCLING BINS

Method recycling bins are designed to optimise recycling and waste for the modern space. The philosophy of open-plan recycling changes recycling and waste behaviours through visibility and increased accountability.

The 60 L recycling bins can be placed together to form flexible recycling stations, located throughout a facility. Method's bins are made from polypropylene, a durable plastic of which at least 50% is recycled materials. At the end of their long life, the bins are fully recyclable in a circular fashion, meaning they can become bins again and again.

Method's innovative system benefits all those involved in a building's waste and recycling process. Facility managers save time and money over the course of a year with fewer bins and liners to purchase and service with communal stations. As well as the reduced costs of waste disposal with increased recycling rates.

Organisations can visibly assert their sustainability efforts, waste management providers receive waste that has been accurately sorted and users are united by a collective mission improving recycling behaviours at work and subsequently at home.

Find out more about how Method can help companies recycle more and waste less at AWRE stand B51.

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## PRESSURE TRANSMITTERS

VEGABAR 80 series pressure transmitters can measure gauge, absolute or differential pressure in all liquids, gases and viscous media. Specially designed ceramic and metallic measuring cells enable high-precision measurement. Their area of application ranges from -1 to 1000 bar at process temperatures from -90 to +400°C.

With the VEGABAR 80 series, all conceivable applications can be covered with only three process pressure transmitters: the all-rounder VEGABAR 82 with ceramic measuring cell and temperature shock compensation, which can cover 80% of all applications; VEGABAR 83 with metallic measuring cell for high-pressure applications; and the classic VEGABAR 81 with chemical seal, which is used when high temperature and/or chemical resistance is required.

The ceramic measuring cell in VEGABAR 80 provides accurate measurement data. In addition to the usual temperature sensor on CERTEC, there is a second sensor in the glass joint directly behind the ceramic diaphragm. Due to its exposed position, it doesn't miss even the slightest temperature change. Any thermal shock is fully compensated by means of a sophisticated algorithm.



Other features include: high overload resistance up to factor 200, withstanding of temperatures up to 130°C, front-flush mounting and self-cleaning.

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## REMOTE DISPLAY FOR FLOW TRANSMITTER

The Series A-IEF Remote Display can be installed almost anywhere near a Series IEF flow transmitter. Both the indicator and the full functional display versions have a maximum display cable length of 30 m to permit easy viewing of flow readings. The full functional display allows for convenient adjustment of configuration settings and can print the IEF configuration from a computer.

Product applications include: mechanical rooms with a small footprint; hard-to-reach piping; chilled water; condenser water; make-up water; heating water; and boiler feed water.

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## IMPRESSIVE **SOUTH AUSTRALIAN HOTEL REDEVELOPMENT** USES **SCHNEIDER ELECTRIC SOLUTIONS** TO CREATE A MORE SUSTAINABLE AND EFFICIENT OUTCOME

**With ongoing commercial and residential growth in Adelaide's inner-southwest, The Hurley Hotel Group has redeveloped the Marion Hotel to offer luxurious accommodation and improved bar and dining facilities for those living in and visiting the area.**

**T**he \$20 million redevelopment includes a five level accommodation tower with 62 rooms, as well as a bigger bottle shop, new front bar and a state-of-the-art function and conference centre. The design style throughout is "quirky and industrial" and the Hurley Hotel Group, working with their long-term electrical contractor Sam Gordon of Contact Electrical, were looking for an electrical solution that would complement these aesthetics. They also needed the solution to be robust and reliable, energy efficient and easy to use.

### **Automation for efficiency and ease of use**

With the hotel dramatically expanded, the size of the incoming electrical supply line was also increased. The new supply line is almost three times the demand as previous, and Sam has installed a new main switchboard, 12 custom distribution boards and generator power facilities. Each board features metering of mechanical, power and light circuits. This data is then collected by Schneider Electric's Com'X Energy Management Software and reported through to EcoStruxure Facility Expert.



This powerful cloud-based software keeps track of equipment to ensure ongoing reliability and faster troubleshooting in the event of an equipment fault. The monitoring solution will be used by The Hurley Hotel Group to keep track of their energy use and over time to make efficiencies which can be replicated at other hotels in the group's portfolio.

Using the new Clipsal by Schneider Electric C-Bus Network Automation Controller, two C-Bus networks have been installed at the hotel — one in the accommodation tower, and the other in the bars and dining area. In the accommodation hallways C-Bus scenes alter lighting levels depending on the time of day. Similarly, different lighting scenes have been programmed in the bar and dining areas to create different moods depending on the time of day. Newly released Clipsal Iconic C-Bus switches and Clipsal eDLT switches allow hotel staff to manually alter the lights.

The Marion Hotel function area boasts the perfect space for weddings, conferences and get-togethers. To be suitable for

this range of activities, the space can be transformed from one large space into several smaller ones. For this reason, a Clipsal DALI lighting solution, which can also be used either as one large bank of lights, or as separate 'rooms', has been installed to control lights and AV equipment.

Clipsal Iconic Anthracite and Iconic Styl Silver Shadow switches and sockets have been used throughout the project, with the range picked by the group for its fresh and edgy look.

"The Hurley Hotel Group is known for keeping things fresh and up to date, so the ability for them to safely and easily change the skins on the Iconic switches and sockets is something I expected they will take advantage of in the years to come," Sam said.

For their part, Contact were involved in the project for around 18 months. They chose Schneider Electric and Clipsal by Schneider Electric products and solutions for the project because of the quality and support that comes with them.

"I have been using Clipsal and Schneider Electric products for well over 20 years. It is a brand I can trust," Sam said. "Schneider Electric is very supportive of their product. If we encounter something difficult, we can call them and they send someone down to help us out. They have some great solutions and ideas which always help us out. You really wouldn't go with anyone else."

For more information on Schneider Electric's hotel solutions, visit [se.com/au/hotels](http://se.com/au/hotels)

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### MULTIVARIABLE FLUOROMETER

TriOS has introduced the multivariable matrixFlu sensor with excitation and detection at multiple wavelengths in a single, compact design.

When exposed to specific wavelengths of light the different pigments of algae, cyanobacteria and coloured dissolved organics (CDOMs) in water naturally fluoresce or glow. The amount of fluorescence back from each of these different pigments, at their specific wavelengths, can be measured by the optical detection channels within the matrixFlu fluorometer to provide not only the single values but also a 4x4 matrix of wavelength combinations to allow quasi-synchronous in-situ detection of excitation emission matrices (EEMs).

Stability of measurement values is achieved through the combination of specially selected LEDs (for fluorescence excitation) and internal temperature compensation.

Equipped with the TriOS G2 (browser) interface, the matrixFlu allows the user to configure the sensor, set measurement cycles and download information from the internal datalogger of the sensor via any browser and device (computer, tablet or phone). Furthermore, the G2 interface enables quick integration into third-party systems from complete SCADA process control to standalone data loggers in remote monitoring.

The nanocoated hydrophobic lens of the TriOS matrixFlu helps to repel build-up and minimise manual cleaning, though in more demanding applications the sensor can also be supplied with an automated brush wiper system to keep the lens clean.

The matrixFlu can be used for surface water, lakes, rivers, ponds, drinking water treatment plants and environmental monitoring to

Control Components Pty Ltd  
[www.controlcomponents.com.au](http://www.controlcomponents.com.au)





## CLAMP-ON GAS FLOWMETER

The Katronic KATflow 180 clamp-on flowmeter for gases is designed to provide reliable clamp-on measurement of gaseous flow in applications from high-pressure flow systems to locations where, in the past, clamp-on devices would not have been considered suitable.

The device can be installed on metallic gas pipes where the pressure is far lower than the recognised five-bar minimum, with measurement possible down to atmospheric conditions. This is achieved through a combination of sophisticated electronics, adaptive filtering techniques and innovative signal processing algorithms using digital signal processors.

The device can measure flow of a variety of gaseous media from 0.1 to 75 m/s. The transducer assembly offers both shear and Lamb wave measurements, with a minimum number of sensors, for greater simplicity.

The unit is available for permanent use in both safe and hazardous environments with rugged housings for Zones 1 and 2. The KATflow 180 is easily programmed with a magnetic pen for increased safety and can be positioned on all commonly used pipe materials.

AMS Instrumentation & Calibration Pty Ltd  
[www.ams-ic.com.au](http://www.ams-ic.com.au)

## INDUSTRIAL CONNECTORS

The Han 1A industrial connector from HARTING is made of high-performance plastic, lightweight and requires little space. It is suitable for IP20 connections in switch cabinets as well as for outdoor requirements, as when closed it achieves the IP65 protection class. Due to its modularity and a variety of different deployment scenarios, it is particularly suitable for sensors, small drives and lighting.

Han industrial connectors allow for rear mounting of interfaces in switch cabinets in wind turbines. With this option, all connection-related work steps can be done from within the switch cabinet. In addition, many installation steps can be upstreamed into assembly, saving man-hours worked by technicians in the facility. The rear mounting option is available for both the Han B metal and Han B plastic housings. This allows the user to improve the manufacturing process of the wind turbine.

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# Compressed air powers plastics circular economy



Advanced Circular Polymers has recently established a \$20 million plastics recycling plant in Somerton, Victoria, to help solve a significant part of the state's waste disposal problems while realising a business opportunity.

Using the latest compressed air powered robotics and laser recognition machinery, a wide variety of plastic waste from domestic, commercial and industrial sources is sorted, separated into polymer type and thoroughly decontaminated.

Precision compressed air jets sort the different types of plastic and artificial intelligence is used to further refine the process. The separated plastics are then chopped into high-quality flakes that are used to manufacture a wide range of new plastic products.

AC Polymer's management, headed by Harry Wang, sought an efficient compressed air power source to run this precision machinery while minimising energy usage and cost. The primary electrical power is by renewable energy from Goldwind Australia's wind farm near Ballarat.

Kevin Smith, Maintenance Manager at AC Polymers, stated, "The decision to install two

110 kW, 2-stage, rotary screw compressors from Southern Cross Compressors Australia was based on our need for reliable, high-efficiency, high-volume quality air supplied for variable demands throughout the plant. Their highly qualified, mobile technician team and regular maintenance program plus their lifetime warranty on the compressor airends were also deciding factors."

With an immediate demand for effective waste disposal and recycling due to China's recent decision not to accept more of Australia's waste products, AC Polymers anticipates a rapid growth in both processing plastic waste and the market for the end plastic flake products. Wang stated that most of these products will be sold in Australia and that more than half of the current output will be used in Victorian manufacturing.

With new regulations, forcing manufacturers to use a percentage of recycled materials and costing more to use virgin materials, there is already a great demand for recycled, re-usable raw plastic inputs



and it is expected that need will continue to grow in the coming years.

The business is based strongly on the circular economy, which is self-sufficient through recycling otherwise waste products into a useful and required commodity. Many of the products manufactured from the flakes are the same as those the waste recovery is made from, including beverage bottles and other plastic containers for foodstuffs, cleaning products, etc. The flakes can also be used to produce economical wood substitute products such as fencing and outdoor furniture.

"As long as these products are in the recycling system they can be recycled again and again... the circle is endless," Wang concluded.

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# Don't dig yourself into an unsustainable hole



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**R**iccardo Wong\* discusses how, with the economic and infrastructure boom in Australia, the onus to develop and build new infrastructure responsibly, as well as profitably, should be top of the agenda — starting with excavation. While fair trade has its advocates and sceptics, its aim is generating and producing positive impacts and benefits for producers in the developing and developed world.

The G20 recently identified infrastructure as one of the key drivers of achieving SDGs (sustainable development goals). The focus has been on climate change and achieving sustainable infrastructure development without carbon-intensive activity. However, wherever you are in the world, infrastructure building also requires sound thinking regarding waste management in terms of mitigating soil pollution, minimising disruption to the daily economy and profitability of the city in question.

In July 2019, it was reported that the Australian Government is under pressure to bring forward the implementation of key, long-awaited infrastructure development. There's an urgent need to reduce congestion on highways, rail lines in NSW and ring-roads in Queensland, among other projects. As the Reserve Bank

calls for urgent action in releasing funds to commence some of this \$58 billion worth of building projects and jump-start job creation, there's a big dig coming — so will it be executed in line with SDGs?

## Sustainability starts from the ground up

There have been key discussions about what the face of sustainable infrastructure development looks like. At a recent Future Cities Roundtable, the Commonwealth Bank's Managing Director for Future Cities, Institutional Banking and Markets, Michael Thorpe, indicated that it's a good time to invest in and create cities that truly meet the diverse needs of the population. Thorpe focuses on the relationship and interdependence between commercial real estate, economic and social infrastructure, sustainable financing and technology. However, no one really discusses sustainable aspects of manifesting these aspirations environmentally, which if undertaken properly also contribute to the longevity of sustainable practice. As far as CDEnviro is concerned, sustainability starts from the ground up.

Non-destructive digging, or NDD, is a less invasive/non-destructive approach of excavating earth in a controlled manner. It is

a quicker, much more effective and generally safer method of excavation.

In the throes of all the proposed infrastructure works, non-disruption of the public's existing lives and activities will be of significant importance. People still have to travel — getting from A to B cannot be unnecessarily impaired if at all possible. Local economies will count on that.

While NDD is more discreet and controlled, the main by-product and disposal challenge is the mud waste produced. Even if it is accepted at landfill sites, the costs to dispose of it are prohibitive as it weighs so much because it is waterlogged. Furthermore, the content of the mud may include contaminants which, if not removed, may leach into the surrounding soil and cause untold environmental damage. However, this is where we scrutinise differently to find the positive opportunity in this conundrum rather than purely the disadvantages.

## Creating unlikely revenue streams

As environmental legislation becomes more stringent, recoup and re-use will become more desirable as the payload per truck will be reduced.

The leftover NDD mud also contains a lot of useful, re-usable materials that can be recycled and made available for resale. Thereby, a new



revenue stream is created, turning what might be perceived as a loss into a potential profit. This is more of a circular economy approach, which contrasts with the traditional linear approach of extract, use and dispose.

There are tailored solutions available such as bespoke reception centres for processing hydrovac waste and recovering sand, stone and organics to produce independent revenue streams. Technology also allows for thorough dewatering of the final clay content to ensure easy, and much less expensive, disposal.

The capability exists to cater to a wider range of more challenging and more lucrative waste streams. For heavily contaminated waste mud, it's possible to remove heavy metals and hydrocarbons from the wastewater stream as well.

Screening and scrubbing material ensures effective removal of contaminants, density separation, attrition and high-pressure washing, resulting in clean and separated stone,

sand and organic material, primed for re-use. As well as creating these revenue streams, the cost savings on transport and disposal are huge, meaning that businesses who invest in treating hydro excavation wastes are earning and saving simultaneously.

As Australia braces itself for the start of its massive infrastructure drive, discussions about sustainability should really permeate every part of the process. The desired end results for the users are only really valid if the entire exercise has sought and followed sustainable practice throughout.

This is where the construction and engineering sectors can really make a difference. We must look for opportunities to work smarter, more efficiently and more cost-effectively, and become 'circular economists' in the way that we rebuild our cities.

As a result, the infrastructure industry is afforded greater control of its waste using sustainable means, reducing disposal costs as well as transportation time and resources.



*\*Riccardo Wong is Business Development Executive at CDEnviro and has worked at the waste management solution provider for four years. Prior to this he undertook roles in engineering and research. Riccardo is responsible for identifying, developing and nurturing new and existing business opportunities in the waste, recycling, construction and wastewater industry in Australia. Riccardo is solution-focused and works with CDEnviro customers to develop bespoke solutions for wastes in order to reduce landfill, make business processes more efficient, and ultimately champion a new world of resources.*



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## From lithium waste to cathode feedstock

The challenge of diverting used batteries from landfill is being successfully addressed by Lithium Australia, with the aim of closing the loop on the energy-metal cycle in an ethical and sustainable way. The company has developed a technique to produce refined lithium phosphate using spent lithium-ion (Li-ion) batteries as a feed material.

Spent lithium-ion batteries are shredded at Envirostream Australia's battery processing facility in Victoria, producing mixed metal dust (MMD), which is mainly derived from battery electrodes. The MMD is then supplied to Lithium Australia for recycling technology development studies.

At its Brisbane VSPC cathode powder pilot plant, in collaboration with the Australian Nuclear Science and Technology Organisation (ANSTO), Lithium Australia has developed a process to recover lithium from the MMD in the form of lithium phosphate. The lithium phosphate is subsequently refined for use as a precursor in the production of lithium-ferro-phosphate (LFP) cathode powder. Subsequently, the LFP will be used to make coin cells for performance testing of the cathode materials.

*Analysis of lithium phosphate produced using MMD from spent Li-ion batteries*

Li <sub>3</sub> PO <sub>4</sub> (%)	K (%)	Na (%)	Ca (%)	S (%)
>98%	0.001	0.05	0.005	0.24

"Currently, few recycling operations around the world can recover lithium from Li-ion batteries," said Lithium Australia Managing Director Adrian Griffin.

"Lithium Australia's process has the potential to not only improve the sustainability of Li-ion batteries, but also ease future supply constraints that may prove problematic to the industry.

"The company's ability to employ lithium phosphate in the direct generation of LFP is a significant technical achievement, one that reduces the number of process steps required to manufacture the cathode powder," Griffin continued. "That's great news, because LFP is the perfect battery configuration for energy-storage systems suitable for the harsh Australian environment."

Lithium Australia's objective is to produce refined lithium phosphate from spent lithium-ion batteries and use it to produce new LFP cathode material. Other battery metals, including nickel and cobalt, have also been recovered in the process as a concentrate suitable as a feed for conventional refining processes.



© Lithium Australia NL

## Wood chemistry turns nut shells into sunscreen

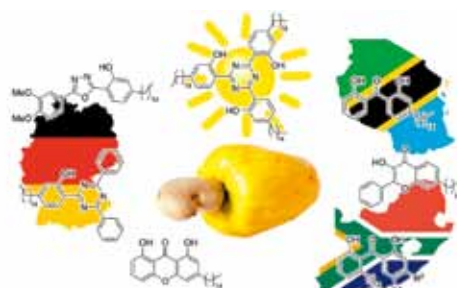
A team of international scientists has found an eco-friendly way to produce potential sunscreens from cashew nut shells.

Via a chemical process called xylochemistry (wood chemistry), the team of 'green chemists' from the University of the Witwatersrand, Johannesburg — along with researchers from Universities in Germany, Malawi and Tanzania — is working on ways to produce useful compounds from wood and other fast-growing, non-edible plant waste.

From cashew nut shells, the team has produced new compounds that show good UVA and UVB absorbance, which may be applied to humans, livestock, polymers or coatings to protect them from sun damage. The research is published in the *European Journal of Organic Chemistry*.

UV rays are damaging to most materials, with exposure leading to the discolouration of dyes and pigments, weathering, yellowing of plastics, and loss of gloss and mechanical properties. In addition, UV exposure can lead to sunburn, premature ageing and the development of potentially lethal melanomas in humans and animals.

To mitigate UV damage, both organic and inorganic compounds are used as UV filters. Ideal organic UV filters display a high UV absorption of UVA rays (ranging from 315–400 nm) and UVB rays (280–315 nm). One important family of UV absorber molecules is derived from aromatic compounds known as phenols, which contain a hydrogen-bonded hydroxyl group that plays an



*A graphic representation of the international collaboration to find sustainable solutions to produce useful compounds. Image credit: Wits University.*

important role in the dissipation of absorbed energy.

For example, an organic compound known as oxybenzone is a common ingredient that has also been added to plastics to limit UV degradation. Apart from their petrochemical origin, a major drawback of current UV protection agents is their negative effect on aquatic ecosystems associated with poor biodegradability.

As a result, there is growing attention from regulatory bodies and stricter regulations are being enforced on the production of sun-filtering products.

"With the current concerns over the use of fossil resources for chemical synthesis of functional molecules and the effect of current UV absorbers in sunscreens on the ecosystem, we aimed to find a way to produce new UV absorbers from cashew nut shell liquid (CNSL) as a non-edible, bio renewable carbon resource," said lead author Professor Charles de Koning from the Wits School of Chemistry, together with Till Opatz from Johannes Gutenberg University in Mainz, Germany.

"Cashew nut shells are a waste product in the cashew-farming community, especially in Tanzania, so finding a useful, sustainable way to use these waste products can lead to completely new, environmentally friendly ways of doing things," Prof. de Koning said.

The team has filed a patent application in order to commercialise the process in South Africa.

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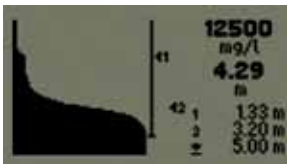
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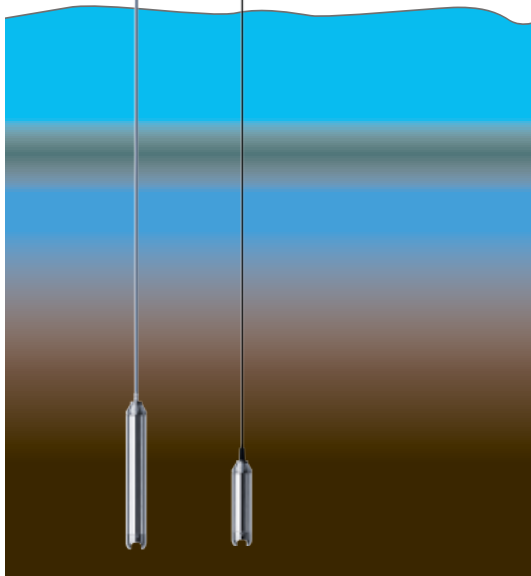
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# Foam solution mops up oil

A team of researchers from Queensland University of Technology (QUT) has developed a non-toxic, low-cost foam for cleaning up oil spills. The team's findings are published in *The Journal of Physical Chemistry*.

**W**hen an oil spill occurs, the foam can be sprayed onto its surface to quickly absorb the waste. The foam is then scraped away for safe disposal. "Thousands of tons of oil have been disgorged into our oceans over the decades," said Associate Professor Jingsan Xu.

"One of the most memorable was the Exxon Valdez oil spill in Prince William Sound, Alaska, in 1989, which spilled 37,000 metric tons of crude oil and is considered one of the worst ever human-caused environmental disasters."

"More recently, the Deepwater Horizon oil spill in the Gulf of Mexico in 2010 had the dubious honour of becoming the largest marine oil spill in the history of the petroleum industry."

Prof Xu explained that current methods for cleaning up oil spills are usually messy and difficult to contain, while some methods such as in situ burning create more hazards for the environment. He said that the key to saving the environment from maximum damage is to mop up the oil as quickly as possible.

"So what we have focused on is the adaptability and possibilities associated

with surfactants which are already widely used in research, industrial production and daily lives via household cleaning products," Prof Xu said.

"Surfactants are compounds that lower the surface tension between two liquids, between a gas and a liquid, or between a liquid and a solid — in other words, they can be detergents, wetting agents, emulsifiers, foaming agents and dispersants."

"One way to remove the floating oil from [the] sea surface is adsorption. Hydrophobic porous foam — low-density material that can float on liquid — is a promising candidate to achieve that and we recently reported on the synthesis of a hydrophobic hybrid foam which showed excellent adsorption performance to a range of organic liquids."

Prof Xu and the team have created what they call a 'hybrid surfactant' by combining stearic acid, an oil-soluble molecule, with water-dispersible alumina nanofibres via chemisorption at the oil-water interface.

"Our hybrid surfactant exhibits reversible switching between hydrophilic (molecules attracted to water) and lipophilic (able to dissolve in fats, oils, lipids and non-polar solvents) states by manipulating the adsorption-desorption volume of stearic acid attached to the alumina nanofibres," he said.



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