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3169 Australia
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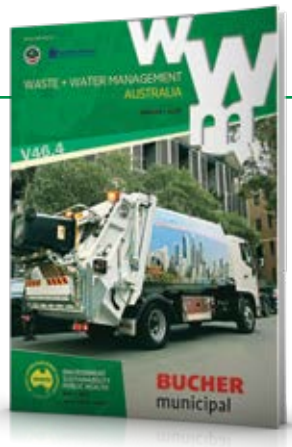


About the Cover

Building on its reputation for the design and manufacture of innovative, high performance and high quality collection, compaction and sweeping equipment, Bucher Municipal has launched a number of innovative new products across its collection vehicle, compaction equipment and sweeper ranges – all of which have been developed with a focus on productivity, performance and safety.

▶ Turn to **Page 10** for the full story.

Standing Together in the Face of Adversity

Dear Readers,

While I am loathed to repeat superlatives such as 'worst ever', 'most devastating' or most destructive', there can be no doubting the magnitude of the devastation in the wake of the 2019/2020 bushfire crisis.

Together with the devastating bushfires in Queensland (which have to date reportedly destroyed 38 homes and burnt over 250,000 hectares); Western Australia (more than 1.2 million hectares burnt and homes destroyed); Tasmania (8,000 hectares burnt and homes destroyed); and South Australia (which have sadly claimed four lives, destroyed more than 140 homes and burnt over 200,000 hectares - including a large proportion of Kangaroo Island); it is clear that New South Wales and Victoria are currently facing a bushfire crisis the likes of which we've never seen before.

Even as I write this, dozens of fires continue unabated (almost 4 months after the first of the major fires started), and although accurate statistics are understandably difficult to obtain due to the ongoing nature of the crisis, it appears from all reports that the current toll stands at 33 confirmed dead, over 3000 homes and many hundreds of other buildings destroyed (including several townships completely destroyed) and well over 8 million hectares burnt.

Unfortunately, even though there is a current lull in the weather – which is hopefully giving exhausted fire crews an opportunity to strengthen containment lines and get control of the last of the blazes – this bushfire season is not yet over.

Put simply, as the situation currently stands with the 2019/2020 bushfire season, it really is a case of 'where this ends nobody knows'.

With that in mind, I would like to use this opportunity to ask you, our many thousands of readers, to do what you can to help those who have been impacted by the fires – many of whom have lost their homes, their livelihoods, their stock, their crops... everything. And then of course, there's the abundance of injured wildlife that will need attending to.

Below you'll find QR Codes and 'short code' direct URL links to three of our favourite charities, each of whom do outstanding work in the field and are working tirelessly in the wake of the bushfires, even while they are still burning.

If you can spare a dollar for one or more these charities it will be very much appreciated – if you can spare more, all the better. The demand for their services is sure to be unprecedented for some time to come, and every dollar will definitely help.

Australia has been built on the true values of 'mateship', and the capacity of all Australians to stand together in the face of adversity, working together to overcome the greatest hardships and almost insurmountable odds – is world renowned.

At this time, that 'Spirit of Australia' is needed more than ever.

Our thoughts and prayers are with all those affected by these terrible tragedies.

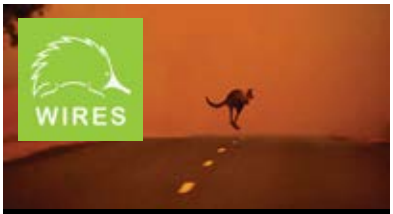
Anthony T Schmidt
Managing Editor

DONATE TODAY!

Salvation Army Disaster Appeal

https://l.ead.me/bbNNt9

SCAN ME



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Great Barrier Reef water pollution threatens dolphins

Rare snubfin dolphins in Queensland's Fitzroy River and humpback dolphins in Port Curtis are under threat from exposure to increasing amounts of water contamination, according to Southern Cross and Flinders University marine researchers.

A study published in *Ecological Indicators* sampled pollutants in the blubber and skin of humpback and snubfin dolphins in the Fitzroy River and Port Curtis in Queensland between 2014 and 2016.

The results were compared to samples collected between 2009-2010. In only five years, the concentrations of PCBs, DDTs and HCB in both species increased between two and seven times.

With the concentration of land-based pollutants in the Great Barrier Reef increasing over the same period, so is the accumulation of contaminants inside the favourite preys of dolphins.

Southern Cross University marine ecologist Dr Daniele Cagnazzi says 68% of the dolphins sampled had accumulated contaminants above levels that may affect their health and long-term survival.

"In the Fitzroy River and Port Curtis between 2011 and 2016 three major floods were recorded in the region compared to an average of one every six years before 2011. Extensive flooding in adjacent catchments is the most likely factor responsible for increased distribution of these contaminants into coastal waters.

The Fitzroy River catchment has been identified as a major source of contaminants into the Great Barrier Reef including sediment, nutrients and pesticides from agricultural land use and inland coal mines.

In Port Curtis, a wide range of industrial contamination from, shipping, coal stockpiles, power station products, landfill, urban development and sewage treatment have been detected.

Dolphins can consume 6% of their body weight in fish daily. As a result, the concentration of contaminants can be up to 200 times higher than what is recorded in their prey.

Flinders University Associate Professor Guido J Parra says climate change models expect intense rainfall events and floods to increase in the Queensland coastal region over coming decades, which in turn exposes dolphins to more potentially harmful contaminants.

"High contaminant levels add to the number of existing threats including climate change, coastal development, underwater noise and vessel disturbances, fishing bycatch and prey depletion faced by these vulnerable dolphin species."

"The build-up of these dangerous contaminants can lead to population decline. For example, in South East Asia, high concentrations of various pollutants have been linked to the extinction of the Yangtze River dolphin and the ongoing decline of the Indo-Pacific humpback dolphin."

"As a result, this could have implications on the long-term survival of entire dolphin populations in Queensland."

Researchers warn water flowing in the Great Barrier Reef is classified as poor quality, and the Fitzroy River Catchment, the Wet Tropics, Burdekin, Mackay Whitsunday and Burnett Mary catchments have been identified as medium to high-risk for land-based pollutants.

New ports and mining developments are underway in several locations along the Queensland coast and inland which, if not managed properly, will have an ongoing impact.

Basin jurisdictions remain committed to the Plan

All Basin jurisdictions remain committed to the *Murray-Darling Basin Plan* following December's Ministerial Council meeting in Brisbane.

South Australian Minister for Environment and Water, David Speirs, said continued progress in delivery of the Plan was the best outcome for South Australia.

"Before the Ministerial Council meeting, the South Australian Government called for mature, balanced leadership from all Basin jurisdictions to continue to deliver what has been agreed," said Minister Speirs.

"I am pleased that all Water Ministers agreed to continue to progress the Basin Plan to improve outcomes for the environment, farmers and communities that rely on the river.

"This is the best outcome not only for South Australia but for all of the communities across the Basin.

"Pleasingly, at South Australia's request, the Commonwealth agreed to investigate open channel irrigation systems across the Basin and how these could be improved to contribute to efficiency projects which would improve outcomes for both the river and farmers.

"A large part of the Basin is suffering significant drought and the Ministerial Council recognised that this is presenting challenges for those communities and the environment.

"The Basin Plan is critical in striking the balance between delivering water to these communities that rely on the river and ensuring the future health of the Basin environment.

All jurisdictions discussed the importance of the Inspector-General position, which South Australia advocated for at the last Ministerial Council meeting, to help improve community confidence in water management arrangements.

The Ministerial Council noted the high demand for the federal *Water for Fodder* program and South Australia's contribution.

"South Australia is doing our bit to help out drought-affected farmers across the country by ramping up production at Adelaide's Desalination Plant," said Minister Speirs.

"The *Water for Fodder* Program has had a huge response with thousands of applications in the first week and our government is proud to stand shoulder-to-shoulder with farmers across the nation during their time of need."

Wingfield and Lonsdale waste to be re-located

Co-mingled recyclables stored at the Wingfield site in Adelaide's inner-north and Lonsdale in Adelaide's the southern suburbs have become too degraded to be recycled with currently available technology, according to an independent waste expert, and will now be stored off site.

The material will be taken to a separate area in a landfill cell at Inkerman, some 85 kilometres north-west of Adelaide, and recovered if the technology and infrastructure becomes available in South Australia to process the materials.

SKM was made insolvent in July 2019, leaving more than 10,000 tonnes of co-mingled and PET materials at Wingfield and Lonsdale. SKM held contracts to collect and process kerbside recyclables from various councils in South Australia.

The stored waste represents just over 1 per cent of what goes to landfill in metropolitan Adelaide in a year.

Once collected, recyclables were transported to the two South Australian sites where they were baled and transported to Victorian plants for separation and processing before SKM's operations stopped. Cleanaway acquired SKM's assets in October 2019.

South Australian Minister for Environment and Water, David Speirs, said it was unfortunate the material had deteriorated too far to be processed or remanufactured at this time.

"All avenues to recycle the materials were explored but unfortunately there were no other viable options in the immediate future," Minister Speirs said.

"An independent waste expert examined the material and determined with current South Australian technology, the material is not suitable for recovery at this time due to degradation.

"Leaving the materials stored at the Wingfield and Lonsdale sites is also unacceptable as they will continue to deteriorate.

"Inkerman landfill has the capacity to receive and store the material in a separate part of the existing landfill cell until such time the infrastructure is available in South Australia to process the materials.

"South Australia is a nation-leader when it comes to recycling and resource recovery and I hope to see future innovation in this sector which will allow these materials to reprocessed.

"This will also allow the local owners of the shipping containers – who have not been paid rent for several years – to take possession of their property."

Sending the material to the landfill cell requires an exemption under the Environment Protection (Waste to Resources) Policy 2010. The re-location of the material will also be exempt from the Solid Waste Levy.

Bernie Banton Foundation to close as Karen Banton retires as CEO

Karen Banton, asbestos related disease campaigner and widow of Bernie Banton, is retiring from her role as CEO of the Bernie Banton Foundation, with the Foundation set to close its doors by 30 June 2020. The decision was based on a number of factors, but most importantly will allow CEO Karen Banton and her husband Rod Smith, who has served as Awareness and Support Coordinator at the Bernie Banton Foundation since 2012, to take a much needed break and focus on their health following twenty years of tireless asbestos related disease advocacy.

The Board felt the best way forward was to wind up the charity, particularly as the organisation bears the name of Karen's late husband.

The Foundation's funds and assets will be distributed in accordance with its Constitution to charities which have similar objects to the Company. The Foundation will give notice of these details via its website prior to the charity's closure.

The Bernie Banton Foundation is an apolitical, not-for-profit organisation founded in 2009 which builds on Bernie Banton's legacy of supporting sufferers of asbestos related diseases and their loved ones and raising awareness of the continued risks of asbestos exposure.

The Foundation has assisted victims and their families to navigate the challenging path forward upon diagnosis of an asbestos related disease, offered peer-based support from people who have the hands-on and lived experience of caring for an asbestos related disease sufferer and offered information about treatment options, medical practitioners and specialist dust litigators.

Over the last decade, the Bernie Banton Foundation has supported over 1,100 asbestos related disease sufferers and family members. Through their advocacy efforts, the Foundation has reached over 14 million Australians, sharing the important message about the risks of asbestos exposure and advocating for ongoing research to help current and future asbestos related disease sufferers.

"I'm extremely proud of what the Bernie Banton Foundation has achieved in the last decade," said Karen Banton, CEO at the Bernie Banton Foundation.

Rod Smith and Karen Banton

"One of the things I'm most proud of is our peer-based support program for asbestos related disease sufferers and their families. My partner in the Foundation and in life, Rod Smith, has done an incredible job driving this program.

"The Foundation was instrumental in advocating for changes to the Dust Diseases Board (DDB), which has resulted in vastly improved lead times concerning the registration process for dust disease claimants being accepted.

"We partnered with icare™ Dust Diseases Care, via the Dust Diseases Board's Grants Program, to fund the distribution of asbestos disease support brochures to GP waiting rooms across New South Wales. In over two and a half years, the average uptake rate has been 2,000 brochures per month. It is anticipated by the end of this program in May 2020, the program will have reached over 70,000 people.

"The Foundation's advocacy has also led to more funding for palliative care and more awareness of the risks of asbestos exposure.

"Now, after twenty years of advocacy for victims, Rod and I both losing a spouse to mesothelioma cancer, and ten years with the Foundation, it's finally time for us to retire and spend some much needed time together as a family.

"We're ready to pass the baton to the other asbestos related disease organisations already carrying out the good work of supporting victims and their loved ones and raising awareness of the risks of exposure.

"We encourage government, organisations and advocates to continue their support for asbestos awareness as a means to prevent future asbestos exposure and also for medical research into asbestos related diseases in an effort to discover new treatments toward ultimately finding a cure.

"Bernie was a major force in the fight for justice and compensation for asbestos related disease sufferers. It has been an honour to continue Bernie's legacy of supporting victims and their loved ones."

For more information on the Bernie Banton Foundation visit: **www.berniebanton.com.au**

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Montreal Protocol for ozone reduction will slow global warming by at least 1°C

The Montreal Protocol, an international agreement signed in 1987 to stop chlorofluorocarbons (CFCs) destroying the ozone layer, now appears to be the first international treaty to successfully slow the rate of global warming.

New research published today in Environmental Research Letters has revealed that thanks to the Protocol, today's global temperatures are considerably lower. And by mid-century the Earth will be – on average – at least 1°C cooler than it would have been without the agreement. Mitigation is even greater in regions such as the Arctic, where the avoided warming will be as much as 3°C – 4°C.

"By mass CFCs are thousands of times more potent a greenhouse gas compared to CO2, so the Montreal Protocol not only saved the ozone layer but it also mitigated a substantial fraction of global warming," said lead author of the paper Rishav Goyal.

"Remarkably, the Protocol has had a far greater impact on global warming than the Kyoto Agreement, which was specifically designed to reduce greenhouse gases. Action taken as part of the Kyoto Agreement will only reduce temperatures by 0.12°C by the middle of the century – compared to a full 1°C of mitigation from the Montreal Protocol."

The findings were made inadvertently when the team set out to quantify how the Montreal Protocol had affected atmospheric circulation around Antarctica. To get their results, the researchers modelled global climate under two scenarios of atmospheric chemistry; one with, and one without the Montreal Protocol being enacted. They then extended these simulations into the future using conservative estimates for unmitigated CFC emissions – set to 3% growth per annum, much less than the observed CFC growth rates at the time of establishment of the Montreal Protocol. Their results therefore likely underestimate the actual impact of the international treaty to reduce CFCs.

The success of the Montreal Protocol in mitigating climate change is even more striking when focusing on regional domains. For example, warming of between 0.5°C – 1°C has already been avoided over North America, Africa and Eurasia. By mid-century avoided warming in some of these areas will be 1.5°C – 2°C and over the Arctic avoided warming will be as much as 3°C – 4°C.

The researchers also found an amount of avoided ice melt due to the Protocol, with the extent of sea ice around the Arctic during summer around 25% greater today than it would have been without any reduction in CFC emissions. The avoided warming over Greenland also suggests that the observed accelerating ice sheet melt there and the associated sea level rise has also been reduced by the Protocol.

"Without any fanfare the Montreal Protocol has been mitigating global warming impacts for more than three decades, surpassing some treaties that were specifically aimed to ameliorate climate change impacts," said co-author Dr. Martin Jucker.

Looking ahead, co-author Prof Matthew England said, "The success of the Montreal Protocol demonstrates superbly that international treaties to limit greenhouse gas emissions really do work; they can impact our climate in very favourable ways, and they can help us avoid dangerous levels of climate change.

"Montreal sorted out CFC's, the next big target has to be zeroing out our emissions of carbon dioxide."

ABOUT CLEX

The Centre of Excellence for Climate Extremes (CLEX) is an international research consortium of five Australian universities and a network of outstanding national and international partner organizations supported by the Australian Research Council.

Climate extremes are the confluence of high impact weather and climate variability. The Centre will improve our understanding of the processes that trigger or enhance extremes and build this understanding into our modelling systems. The improved predictions of climate extremes will help Australia cope with extremes now and in the future.

Regulations pave way for WA Container Deposit Scheme in June 2020

The regulations for Western Australia's Container Deposit Scheme, *'Containers for Change'*, are now complete.

The *Waste Avoidance and Resource Recovery (Container Deposit Scheme) Amendment Regulations 2019* were published in the Government Gazette during December, detailing the legislative provisions for the scheme's commencement.

The regulations set out rules for the scheme co-ordinator, participants, refunds, and eligible containers.

'Containers for Change' now moves into full implementation phase in readiness for the June 2, 2020 start date.

People will receive a 10-cent refund when they return eligible beverage containers to refund points throughout the State.

More than 170 refund points will be in place by June 2020, and at least 229 points will be in place by the end of the scheme's first year.

The scheme will help create around 500 jobs across the State, and support employment of people with disability and the long-term unemployed.

Kennards hire on hunt for Australia's toughest trade

Kennards Hire has put a call out to Australia to help hunt down the toughest of trades.

During January, Kennards Hire released a number of job ads, sharing with Australia what is needed to take on the position of Australia's toughest Trade.

The job ads are part of their latest campaign and shines a light on the tough conditions that tradesmen and women across Australia work in day-in, day-out. Job ads call out requirements such as 'enduring hot summer afternoons, 'facing heavy scrutiny by clients and neighbours', and being 'roped into doing cashies on Sundays for distant relatives.'

Breaking down the 'mullet wearing', 'energy drink consuming' construction trade clichés, Kennards Hire wants Tradies to know that they understand the often grueling environment they have to put up with and know how they can help make their job easier.

Lara Galvin, Head of Marketing, said, "Every day we hear from Tradies how tough a work site can be. The heat, the rain, the physicality of the job, the constant changes of client briefs…it's not easy."

Far from a standard 9-to-5 office job, Tradies have one of the most physically challenging gigs around – regardless of whether they are a skilled chippie, sparkie, landscaper or plumber. And Kennards Hire wants to know which of the trades thinks they should have the title of the toughest.

"It's pretty clear to us that if you were looking through the ads, you definitely wouldn't be applying for one of these jobs," said Galvin.

If you think your trade is Australia's toughest you can vote by visiting: toughesttradie.kennards.com.au and completing the online poll with your name, email and your vote for the toughest trade.

To let Tradies know they are appreciated for the hard work they do in the rain, sun and sh*t, Kennards Hire is rewarding all Tradies with 20% off selected products.

To find out more about this campaign, please visit: **toughesttradie.kennards.com.au**

ABOUT KENNARDS HIRE

Kennards Hire is an Australian family-owned and operated company that has been in the hire industry for 70 years, with 180 sites and branches across Australia and New Zealand. Their diverse product range extends from general hire equipment for the home renovator and professional tradesperson to specialist equipment and heavy machinery used on some of the largest civil infrastructure and commercial construction projects in two countries.

Kennards Hire are proud members of Family Business Australia, Official Partner of the West Coast Eagles, Premium Partner of Sydney Football Club and Official Hire Company Supplier of The Block 2019.

For more information, visit: **www.kennardshire.com.au**

BUCHER municipal

POWERED BY INNOVATION

Having built their reputation on the design and manufacture of innovative, high performance and high quality collection, compaction and sweeping equipment, Bucher Municipal are not ones to rest on their laurels. Indeed, with the advent of the new decade, the team at Bucher have launched a number of innovative new products across their collection vehicle, compaction equipment and sweeper ranges – all of which have been developed with a focus on productivity, performance and safety.

From a new 100% electric rear loader collection vehicle and 100% electric compact street sweeper, through to their new 1200mm high capacity auger screw compactor, the latest additions to Bucher Municipal's product range not only build on the company's reputation for innovation, they also look set to play a major role in maintaining its position as a leading manufacturer and supplier of collection, compaction and sweeping equipment both throughout Australia and internationally.

"Bucher Municipal has been built on a mandate of Quality, Innovation and Customer Service," said Bucher Municipal's General Manager for Sales, Luke Aitken. "And while these terms are often bandied about as little more than a catchy marketing line, at Bucher, these three principals really are at the core of everything we do."

"Whether it's a completely new product or service, or updates and modifications to existing products, our focus is set squarely on developing products and services to provide our customers with smarter, greener, more cost-effective solutions that help increase the efficiency and profitability of their businesses."

"Needless to say, this focus extends well beyond simply getting product sold and out the door," he added. "Products such as these need to be designed and manufactured with a 'long-term view' to performance and reliability. Whether it's a collection vehicle, compaction equipment, a sweeper or vacuum tanker, our products need to be able to withstand the daily rigours of some of the toughest operating environments around – day after day, year after year."

"With that in mind, we also focus on developing quality products with the lowest whole of life costs and highest uptime levels. We work with our customers to develop solutions which are not only robust and reliable, but will also make their operations easier. This, in turn, can help them to win more work and grow their businesses," Luke Aitken said.

MASSIVE R&D INVESTMENT

As with most things, results require investment – especially when it comes to high-performance equipment. That's certainly a factor that's not lost on Bucher Municipal.

Bucher Industries has an internal philosophy of investing around 4% of its total turnover back into R&D each year, thereby ensuring it stays at the global forefront of equipment innovation and technology. To put that into perspective, Bucher's global turnover for 2018, was around AUD$4.5 billion... that equates to around AUD$180 million reinvested into product development and innovation in 2018 alone – a staggering investment by any measure!

Whether it's a collection vehicle, compaction equipment, a sweeper or vacuum tanker, our products need to be able to withstand the daily rigours of some of the toughest operating environments around – day after day, year after year."

Importantly, while Bucher is a massive global company, a significant proportion of its R&D investment is made right here in Australia, with the Australian design and engineering team working with their international counterparts to develop products for both the Australian and international markets. In fact, over the past four years alone, Bucher Municipal's Australian engineering department has grown in staff numbers by over 22%.

Interestingly, Bucher Municipal's focus on innovation is also reflected in the changing face of its Australian workforce – particularly when it comes to the company's engineering department.

With the products becoming more 'high-tech' (in terms of both their operation, diagnostic capabilities, connectivity and high-tech safety features) and, of course, with the introduction of 100% electric vehicles and sweepers, one of the strongest growth areas in Bucher's workforce is in Electrical and Software Engineering. Indeed, while the ratio of 'traditional equipment engineers' (Mechanical/Hydraulic) used to represent around 95% of the company's engineering workforce, Electrical & Software engineers now account for more than 23% of the total engineering department staff.

"Bucher's commitment to innovation is backed up by a serious investment in Research & Development," Luke Aitken added. "What's more, the culture of information sharing, sharing of technology, and joint development within the Bucher organisation, means the minds of over 15,000 employees are working on innovation globally - and that pool of knowledge and expertise directly benefits our refuse products in Australia."

NEW 100% ELECTRIC REAR LOADER

Developed with a focus on CBD and inner-urban applications, the latest addition to Bucher Municipal's collection vehicle range - the new UrBin 11e 100% Electric rear loader - looks set to change the face of CBD and inner-urban waste and recyclables collections across Australia and beyond.

Following a series of highly successful trials in Melbourne and Sydney, the new UrBin 11e is already winning high praise from councils, contractors and operators alike.

Speaking about the new UrBin 11e 100% Electric Vehicle, Product Manager, Marcus Hughes, commented:

"When it comes to a 100% Electric Vehicle, ensuring that it can cope with steep terrain and landfills and, perhaps most importantly, that it has the charge capacity to complete a full 8-hour shift, is paramount."

"While battery - and EV technology in general - has gone forward in leaps and bounds in recent years, our engineering team felt that with battery technology being where it is at the moment, the best course of action would be to first focus on developing a smaller and lighter 4x2 cab-chassis unit. That way we can be sure that the truck can deliver a full 8-hour shift and carry the full payload without the risk of running out of power part way through."

Not surprisingly, this product development strategy looks set to pay major dividends for Bucher, with the resulting 4x2 truck delivering all that it promised – and more. Indeed, following a series of highly successful trials in both Sydney and Melbourne (including the CBD's and inner suburbs of both cities) and for the Sutherland Shire in Sydney's south, the new UrBin 11e 100% Electric Vehicle consistently proved that it was more than up to the task. In fact, on some routes the truck was able to complete full 8-hour shifts and return to base with over 30% battery charge remaining.

Partnering with CMI Hino, the UrBin 11e has been built around a Hino FE 1426 cab-chassis with a 14-tonne GVM. The UrBin 11e provides up to 5-tonnes of collection payload, making it ideal for inner-urban residential and street bin collection routes. The unit features an SEA-Drive 120b electric drivetrain, powered by a Lithium-Ion NMC (Nickel Manganese Cobalt) battery pack. It has a top speed of 100km/h and a range of 190km, which thanks to its regenerative braking system, provides enough capacity for a full 8-hour inner-city collection route, with an average of 30% battery capacity to spare.

What's more, thanks to its on-board Inverter and Charger, the vehicle's design also does away with the need to install special charging infrastructure. All that's required for charging is a standard 3-phase, 5-pin 32 amp plug. A full charge cycle takes 8 hours to complete.

"Importantly, the new 100% Electric Vehicle has also proven extremely popular with the drivers," Marcus Hughes said. "They like the fact that it's quiet, reliable and easy to use, and it had no issues whatsoever out on the routes – even in hilly areas – or at the landfills,"

"In fact, one of the drivers even told us it's the best truck he's ever driven," he added.

'PLUG & PLAY' CHARGING

The UrBin 11e doesn't require special charging infrastructure. Its 'Plug & Play' design only requires a standard 3-phase, 5-pin 32 amp plug for charging.

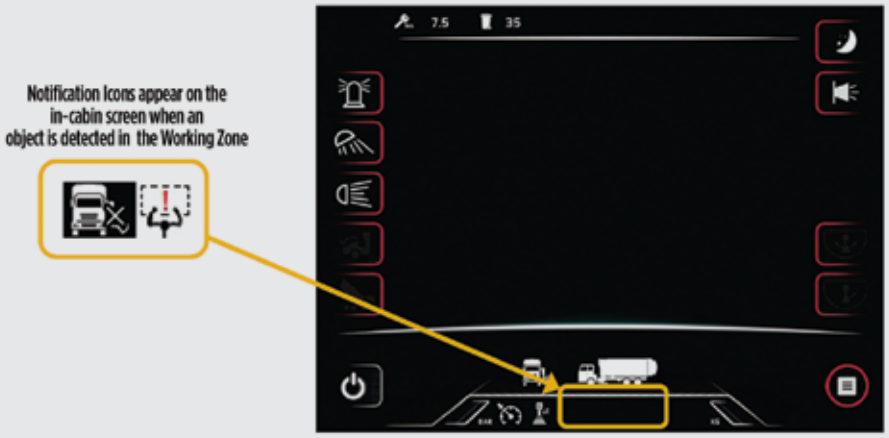


Figure 1: Location and appearance of the 'object detected' notification

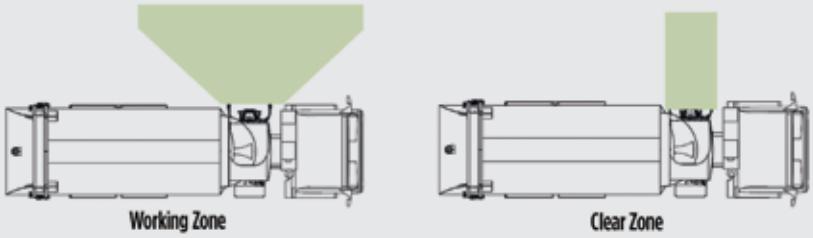


Figure 2: Bin Lifter collision avoidance system Working Zone and Clear Zone detection footprints

INNOVATIVE SAFETY

Building on the success of the Bucher Front ZONE protection system on its FORCE Series II front loader collection vehicles, Bucher's engineering team has developed a new Bin Lifter Collision Avoidance System for its range of side loader collection vehicles. The system senses objects around the bin lifter operating area of Side Loader units.

"Our aim has always been to create the safest waste collection equipment on the market," Marcus Hughes said.

"Even with an array of cameras and mirrors, and the most careful and observant operator - accidents can happen. Residential kerbside waste collection is a fast moving, highly mechanised activity that generally takes place in close proximity to footpaths, dwellings and parked cars."

"It only takes a fraction of a second for someone to move into the vehicle's work zone during the bin lift cycle, and if that happens, it can spell disaster," he said.

The Bin Lifter Collision Avoidance System is designed with the intelligence to detect hazardous objects within the lifting area. When a hazardous object is detected, an alarm sounds as well as a notification on the in-cab monitor. The intelligent system prevents the operator from lowering the bin or extending the slide, however, importantly, the operator can continue to lift the bin and perform a bin-shake function. This versatility allows the operator to continue emptying bins whilst ensuring the general public and property is safe.

The system utilises the latest 3D time-of-flight technology to ensure that objects can be detected even in low light operation. The Bin Lifter Collision Avoidance System is fully integrated with the Bucher control system, and as such, doesn't require any additional monitors or devices in the cab. All visual warning notifications are displayed on the vehicle's existing in-cabin monitor.

The Bin Lifter Collision Avoidance System is also able to be retrofitted to your existing Side Loader SPORT Gen6 fleet at one of Bucher Municipal's Customer Service Centres.

INNOVATIVE COMPACTION EQUIPMENT

Following the acquisition of the PakMor business in 2016, Bucher Municipal has continued to grow the bulk waste division, with the full range of equipment now marketed under the PakMor product brand.

"The integration of the PakMor business in 2016 saw the establishment of our bulk waste division which handles the entire PakMor product range," Dean Crozier, General Manager Bulk Waste, said.

"The integration of this business into the Bucher family has enabled us to maintain the nimbleness of a smaller family business unit, while using the resources of Bucher to develop these products further and support them through our extensive aftersales network around the country," he added.

Bucher's commitment to growing the bulk waste business is not only evidenced in the division's success and growth over the past four years, but also by extensive R&D investment being made.

Needless to say, as is the case with Bucher Municipal's other divisions, the R&D investment into bulk waste equipment is delivering some impressive results, including development of the largest single auger compactor made. Known as the PakMor AS120s Stationary Auger Compactor, this new state-of-the-art unit quite literally takes auger compactor technology to the next level – in terms of both size and performance.

Designed with a high performance 1200mm diameter screw, the Australian designed and manufactured PakMor AS120s can produce in excess of 25,000Nm of torque for unrivalled compaction force. Ideal for large and dense cardboard, paper trim from high volume printing presses, timber pallets, crates, furniture and other bulky items, the unit can process up to 7.2 cubic metres per minute, allowing for high volume and continuous feed of waste.

The unit is available with a choice of configuration options to suit a range of applications, including loading via: front end loader, conveyor, waste chute, bin lifter, tippler bins, etc. Its processing speed and capacity also make it ideal for use in low to medium volume transfer stations and Material Recovery Facilities (MRF's).

The PakMor AS120s is also available with the optional Pak-AXE Timber Pre-Crusher to process oversize timber crates and pallets, as well as Bucher's Pak-WEIGH Technology, which enables the weight per container load to be maximized, while sill ensuring compliance with NHVR and Chain of Responsibility requirements.

"As with all of our equipment, the new PakMor AS120s Stationary Auger Compactor has been developed with a focus on helping our customers to get the most out of their equipment, both in terms of performance and return on investment," Dean Crozier said.

"The unit's performance speed and efficiency, combined with its ability to deliver optimal tonnage per load (which reduces transport costs), as well as its robust reliability (which results in lower maintenance costs) all add up to deliver a lower whole-of-life cost and a faster return on investment – both of which are critical factors when it comes to investing in machinery," he added.

FAST FACTS

PakMor AS120s Stationary Auger Compactor

Compaction Method:	Continuous electric drive
Auger Diameter:	1200mm
Auger Shaft:	160mm High-Tensile
Chain Drive:	2.5 inch pitch
Cycle Time:	Customised based on waste composition, feed rate and other operational factors
Motor:	415V 3-phase / Option for 15kW or 22kw motor
Power Requirement:	For 15kw motor, 32AMP / D-curve circuit breaker / RCD on power supply For 22kw motor, 50AMP / D-curve circuit breaker / RCD on power supply
Weight:	3150kg

"Bucher's commitment to innovation is backed up by a serious investment in Research & Development... the minds of over 15,000 employees are working on innovation globally - and that pool of knowledge and expertise directly benefits our refuse products in Australia."

100% ELECTRIC COMPACT SWEEPER

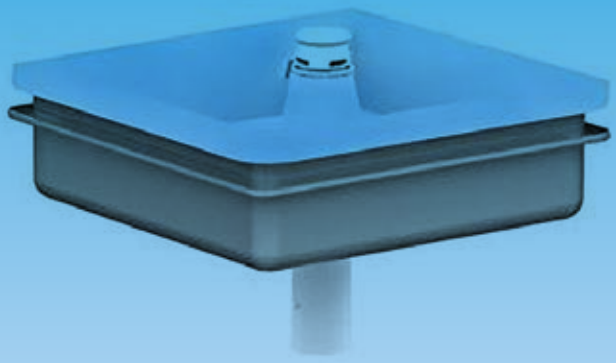
In keeping with their focus on innovation, Bucher Municipal has also introduced a new 100% electric-powered compact sweeper into their range.

Building on the success of the company's diesel-powered compact sweeper, the new CityCat v20e sweeper is already proving to be extremely popular with councils and contractors across the UK and Europe thanks to its sweeping performance, low noise operation and, of course, zero emission operation.

The new 100% Electric CityCat v20e is set to be released in Australia later this year.

For further information, please visit: **www.buchermunicipal.com.au**

GET SMART!



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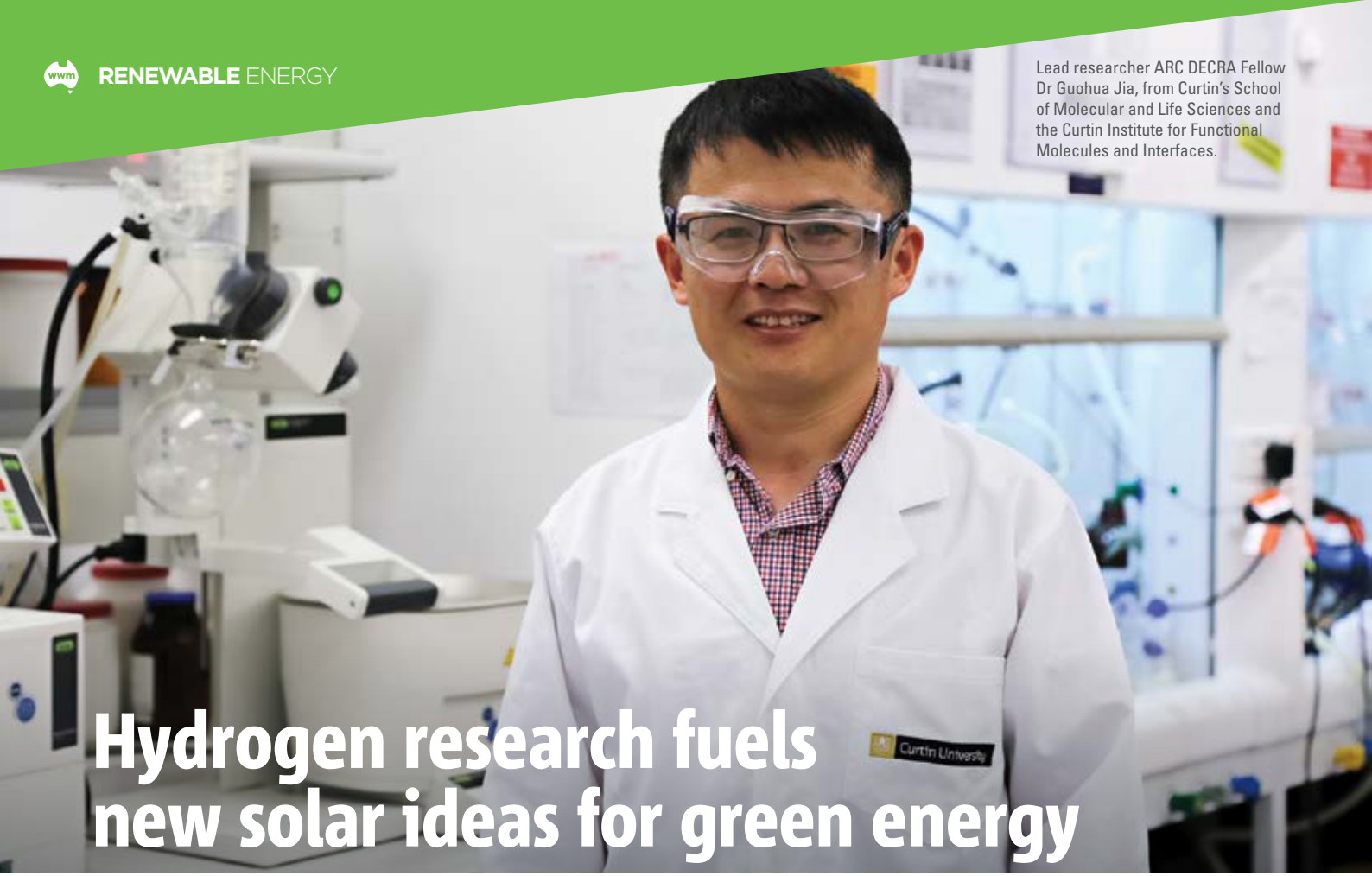

Lead researcher ARC DECRA Fellow Dr Guohua Jia, from Curtin's School of Molecular and Life Sciences and the Curtin Institute for Functional Molecules and Interfaces.

Hydrogen research fuels new solar ideas for green energy

New research led by Curtin University explores the use of methanol as a storage for hydrogen fuel, providing a potential green option for the extraction and creation of this zero pollution energy source.

Lead researcher ARC DECRA Fellow Dr Guohua Jia, from Curtin's School of Molecular and Life Sciences and the Curtin Institute for Functional Molecules and Interfaces, said hydrogen energy was one of the cleanest renewable energy carriers naturally available, but the current process of extracting hydrogen from methanol may require harsh conditions, potentially resulting in carbon emissions.

"Our research is exciting because the strategy we used to extract hydrogen from methanol opens up the feasible avenue to develop a methanol-storable solar hydrogen fuel, through a process with a low carbon footprint," Dr Jia said.

Methanol is low-cost, rich in hydrogen, and the manufacturing process of methanol can include renewable resources. However, traditional methods for hydrogen extraction from methanol generally require the methanol to be heated to a very high temperature, over 200 degrees Celsius, and reach a high pressure of about 25 to 50 bars.

"The usual process of achieving these results includes burning another fuel or using another type of energy to create the needed heat in order to breakdown the methanol, which may result in carbon emissions," Dr Jia said.

To increase the 'green' aspect of using methanol as a source of hydrogen fuel, the Curtin-led research team looked into the possibility of using solar energy to break down methanol at room temperature and under normal pressure, using atomically thin single-layer molybdenum disulfide (MoS_2) nanosheets.

Dr Jia explained that in his team's extraction process, the MoS_2 nanosheets act as photocatalysts, using the sun's light to extract the hydrogen from the methanol compound.

"This photocatalytic process proved successful, and we were able to produce hydrogen fuel from methanol through an environmentally friendly process, which was reliably workable under room temperature and under normal pressure," Dr Jia said.

Co-researcher Dr Zongyou Yin, from the Australian National University, explained that in order to complete this new process, the team developed new strategies that are capable of exclusively producing single-layer MoS_2 nanosheets in large scale.

"When the single-layer MoS_2 nanosheets were illuminated by the sun, the methanol molecules absorbed on the edges of nanosheets released hydrogen by decomposition, alongside the formation of formaldehyde," Dr Yin said.

"Once the hydrogen is extracted, it can be used as hydrogen fuel, thus showing that methanol is viable as a hydrogen fuel storage solution, and the process of extracting the renewable resource can be done in a clean and green way."

The research was a collaboration between several research groups from around the world, including the University College of London, the Australian National University, The University of Western Australia and Curtin University. It was funded by an Australian Research Council Discovery Early Career Researcher Award.

The full research paper Collodial Single-Layer Photocatalysts for Methanol-Storable Solar H_2 Fuel was published as the inside back cover in an issue of Advanced Materials and can be found online here.

ABOUT CURTIN UNIVERSITY

Curtin University is Western Australia's largest university, with more than 56,000 students. Of these, about 26 per cent are international students, with half of these studying at the University's offshore campuses. The University's main campus is in Perth. Curtin also has a major regional campus in Kalgoorlie in addition to four global campuses in Malaysia, Singapore, Dubai and Mauritius.

Curtin is ranked in the top one per cent of universities worldwide, with the University placed 9th in Australia according to the Academic Ranking of World Universities (ARWU) 2019.

The University has built a reputation around innovation and an entrepreneurial spirit, being at the forefront of many high-profile research projects in astronomy, biosciences, economics, mining and information technology. It is also recognised globally for its strong connections with industry, and for its commitment to preparing students for the jobs of the future.

For further information, visit **curtin.edu.au.**

The 10-megawatt storage system with a capacity of 15 megawatt hours.

Storage systems with SMA battery inverters enable stable power supply using renewable energies

Not a lamp or TV flickered, and the Christmas lights went on shining. The 7,500 inhabitants of the German town of Bordesholm did not notice a thing when their power supply was completely switched over to renewable energy.

During December, Bordesholm became the first ever town in Germany to be disconnected from the utility grid and supplied exclusively with renewable energy for an hour, before being discreetly reconnected to the transmission line. The power supply was enabled by a 10 MW storage system and the Sunny Central Storage battery inverters from SMA Solar Technology AG (SMA).

"This successful trial is an important milestone in the energy transition," said Boris Wolff, Executive Vice President Business Unit Large-Scale and Storage Solutions at SMA. "It demonstrated that renewable energies can supply power without impacting system stability. In fact, our Sunny Central Storage battery inverters and SMA Hybrid Controller supply the island grid with even greater stability and power quality than the utility grid."

"The disconnection, the island grid operation, and the re-synchronization with the utility grid went without a hitch," said SMA system development engineer Paul Robert Stankat, who was on site at the trial. "The storage system supplied the town's entire electricity demand which could thus be supplied exclusively from renewable energies."

In addition to a grid formation function, the SMA battery inverters are also equipped with an optional "black start" function, which allows the entire electricity supply to be restarted after a power outage. If the trial had been unsuccessful, the residents of Bordesholm would have had their power restored within just a few minutes.

PIONEERING ENERGY SECURITY FROM EXCLUSIVELY RENEWABLE SOURCES

"The trial was an impressive demonstration of how it is already possible and economically profitable to systematically expand renewables along with the required storage capacities without endangering supply reliability whatsoever," said Frank Günther, managing director of the Bordesholm utilities company.

"We have been pushing this nationwide pioneering project forward for many years. Now we have proven that a 100% renewable energy supply is both reliable and economically efficient. This makes our municipality a pioneer throughout Europe for energy reliability. We have been able to show that system stability can also be achieved with renewables only," he added.

Located in Schleswig-Holstein, Germany, Bordesholm has a 10-megawatt storage system with a capacity of 15 megawatt hours. Provided by project developer Renewable Energy Systems (RES), the system entered service in early 2019. Its main job is to deliver a primary operating reserve, but it also supplies electricity for direct marketing. The system has also been designed to safeguard the power supply in the event of a grid failure.

Comprising Sunny Central Storage battery inverters and an SMA Hybrid Controller XL equipped with stand-alone mode, black start and synchronization functions, SMA supplied a coordinated system solution for the project.

ABOUT SMA SOLAR TECHNOLOGY AG

As a leading global specialist in photovoltaic system technology, the SMA Group is setting the standards today for the decentralized and renewable energy supply of tomorrow. SMA's portfolio contains a wide range of efficient PV inverters, holistic system solutions for PV systems of all power classes, intelligent energy management systems and battery-storage solutions as well as complete solutions for PV diesel hybrid applications. Digital energy services as well as extensive services up to and including operation and maintenance services for PV power plants round off SMA's range. SMA inverters with a total output of 75 gigawatts have been installed in more than 190 countries worldwide. SMA's multi-award-winning technology is protected by approximately 1,400 patents and utility models.

The compact and discrete facility provides reliable renewable energy for the residents of Bordesholm, Germany.

Water cart pumps are working hard supplying much needed water in the current drought.

Water Cart Pumps... Unsung Heroes

With country towns around Australia trucking in water as dams and bores run dry, water cart operators are under pressure to increase the number of loads delivered per day. Tank loading times significantly dictate operator efficiency and there is a move to use larger pumps for this fast fill application.

When Australian Pump started, 25 years ago, one of their first products was a Honda powered 3" tanker pump designed for basic water delivery applications. Since then, the world has changed and big 4" & 6" pumps are being used with larger flows and more fuel-efficient engines.

Input from the market lead this company to develop a wide range of pumps suitable for water carts with petrol, diesel and even hydraulic drive configuration.

"Our first step was to turn a high volume pump into a high pressure and high volume pump just by changing over the impellers and volute," said Aussie Pumps' Chief Engineer, John Hales

"This was the origin of our 'Brigade Boss' series of pumps that also found their application in high pressure firefighting. These big pumps deliver flows of up to 1,800 litres per minute but also come in configurations that operate at up to 90 psi," Hales added. "Those high flow, high pressure combinations made them ideal for fast filling big tankers."

The company progressed to diesel drive pumps with a focus on both Yanmar and Kubota as the key drive.

"These reliable Japanese design engines provided loads of power and reliability. Parts are also readily available in Australia and overseas", said Hales.

There is a continuing sophistication of water carts with water cannons, adjustable sprayers and pumps that are a capable of working ten hours a day without failure.

HYDRAULIC DRIVES ARE COMING

Australian Pump was one of the first companies to develop a hydraulic drive tanker pump. They took a cast iron industrial trash pump and turned it into a high-pressure hydraulic drive piece of kit that can deliver flows of 1,200 lpm and pressures to 50 psi.

"Not only is that a great success, but we even were able to offer the advantage of a clean-out port being built into the pump's bowl. That means no disconnecting pipework to carry out a pump flush," John Hales said.

Australian Pump claim that the beauty of the hydraulic drive, is that it defeats the massive maintenance problem of dust on those single cylinder engines which are normally mounted at the back of the tanker.

"Dusted engines are a thing of the past when you go hydraulic," said Hales.

"The system is sealed and what's more, the pump can be mounted wherever you like because of the flexible hydraulic lines," he said.

The big self-priming cast iron pumps are also not subject to issues with pressure spikes. They prime from vertical depths of 6 metres meaning you can refill the tanker from streams, rivers or dams where necessary.

The company chose Casappa gear motors for their reliability, reasonable cost and rugged design. The motors are simple, capable of dealing with a little contamination, and easy to repair.

More information on the Aussie Pumps range, including a free tanker water cart selection guide, is available from authorised distributors around Australia or online at: **www.aussiepumps.com.au**

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UNTHA head downunder for Australian WTE Forum and Demo Day this Feb

UNTHA's waste-to-energy specialist Gary Moore will be heading down under to Australia to join the team at FOCUS enviro for AIEN's Australian Waste to Energy Forum taking place between 18 – 20th February 2020 at the Mercure Ballarat Hotel and Convention Centre in Victoria.

This year's event theme *'On the road to recovery',* has a specific focus on the waste hierarchy fundamentals and their application, as well as waste diversion and the energy supply landscape. Other key topics up for debate are the appropriate use of alternative WtE technologies and the definition of residual materials – just to name a few.

FOCUS enviro and UNTHA are proud supporters of this Forum and are sponsoring the popular Conference Dinner networking event on Wednesday 19th February, where Australia's favourite Venezuelan comedian, Ivan Aristeguieta will share his brilliant observations on Aussie culture and food.

Gary, from UNTHA UK, joins the FOCUS enviro team this year to discuss the latest equipment solutions from UNTHA and has also been invited to present on, RDF and PEF - Australia's future resources?

With almost 30 years' experience within the waste and recycling sector, he'll be drawing upon international examples from the ever-changing landscape to explore what role alternative fuels will play in the country's future resource strategy using successful, global WtE projects as reference points for delegates. Gary's session will be on Thursday 20th February 9am.

The AIEN AWEF is an annual platform for collaboration between Government, industry and individuals to be able to learn, network and discuss issues in an open forum with like-minded and interested companies and individuals.

For those interested in attending a limited spot viewing to see the latest UNTHA shredding technology in action on the afternoon of Thursday 20th Feb (at the conclusion of the Forum) in Melbourne please send your expression of interest for FOCUS & UNTHA DEMO DAY to simone@focusenviro.com.au for more information.

ABOUT FOCUS ENVIRO

TFOCUS enviro offers tailored solutions, from single equipment supply to complete integrated processing systems. FOCUS enviro effectively services the waste and organics industries by offering selected technologies that are proven, innovative, relevant, and reliable -working with world class experienced manufacturers and suppliers that specialise in the waste and organics industries, that understand the challenges of processing material in these sectors and who can offer custom solutions that are as individual as each customer and application.

For more information on FOCUS enviro solutions, the upcoming AIEN Forum, or the FOCUS & UNTHA DEMO DAY, please contact us on info@focusenviro.com.au or call +61 2 4365 4247.

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New generation Enerpac E-Pulse™ Pumps deliver higher flow, convenience and durability

A global market leader in heavy lifting technology and high-pressure hydraulics, Enerpac, is introducing to Australia, New Zealand and Papua New Guinea its new E-Pulse™ series of durable, high-efficiency hydraulic pumps offering offer superior flow characteristics through innovative motor controls.

The Enerpac E-series pumps – available with five valve options – feature new 'Smart Controls' that enable the motor to maintain constant power and provide higher flow than traditional .75 kW (one-half horsepower) pumps.

An adjustable speed control provides extraordinary precision as needed, says Enerpac National Sales Manager Darryl Lange, while the E-Pulse pumps also feature a new interactive pendant that delivers visual and tactile feedback, programming and diagnostic status to the operator through yellow, green and red LEDs and vibration pulses.

The power, sensitivity and flexibility of the new tools make them ideal for a wide range of precision tasks, extending from bolting of power, pipelines, resources, road, rail and construction and infrastructure tasks through to maintenance and fabrication jobs in bulk handling, mining, oil and gas and utilities involved in electrical distribution and water and wastewater reticulation.

"Through innovative design and advanced features, E-Pulse pumps are designed to drive higher levels of productivity and power to a number of hydraulic tools, including torque wrenches, cylinders, cutters, pullers, presses, punches, spreaders and benders. An E-Pulse pump can serve as the heart to any hydraulic system," Mr Lange said.

"The new series of E-Pulse Pumps represent the best combination of innovative features and technologies we've ever designed in hydraulic pumps of this operational class," Mr Lange said, adding that – like all Enerpac products – the E-Pulse range is backed in the field by long-established and extensive Enerpac sales and engineering support networks that ensure optimum safety and uptime of Enerpac equipment wherever it is used.

A high-efficiency, .63 kW (.85hp) direct-drive motor offers a six-piston block design that provides even flow and smooth operation of tools. Models offer a choice of five valves – 3/2 jog, 4/3 jog, 3/2 dump-and-hold, 3/2 dump and 4/2 torque wrench.

One of five new Enerpac E-pulse models featuring smart technologies and valving options.

E-Pulse pumps also feature a new interactive pendant that delivers visual and tactile feedback, programming and diagnostic status to the operator through yellow, green and red LEDs and vibration pulses.

Flow at rated pressure is .52 l/min (32 in3/min) with a maximum operating pressure of 700 bar (10,000 PSI). Other features include a 24V DC power regulator, built-in thermal protection, and 6m (20-ft) control cord on the torque wrench pump and a 3m (10-ft) control cord on the other four pumps. All models come with a convenient cord management system.

A fault code indicator warns operators of any issues related to voltage, temperature, button controls or service conditions. The innovative, IP 67-rated pendant fits into the handle of the pump and is secured via magnet.

The pumps feature an IP 54-rated durable aluminium housing enclosing the system components for maximum protection and easy service accessibility. The pre-calibrated, 4-inch gauge (100mm) torque wrench model comes with an Enerpac Spee-D Coupler™ that enables a quicker removal for re-calibration and features an integrated heat exchanger that effectively cools the pump during operation.

For more information about Enerpac equipment please contact Enerpac Australia on T:+61 (0)2 8717 7200, Email: sales@enerpac.com.au or visit the website: **www.enerpac.com.au**

ABOUT ENERPAC

Enerpac is an international market leader in high-pressure hydraulics, which has been established in Australasia as a major supplier of high-pressure (700 bar) hydraulic equipment for 50 years, having nationwide service backup and a strong distribution network.

Enerpac is wholly owned by the Enerpac Tool Group, a premier pure play industrial tools and services company serving customers from operations in more than 30 countries and is headquartered in Menomonee Falls, Wisconsin.

For further information on Enerpac Tool Group and its businesses, please visit the Company's website at: **www.enerpactoolgoup.com**

Zero Emissions Mini So Quiet it Gives JCB Something to Shout About

JCB has made company history with the unveiling of its first ever electric excavator – the quietest digger in its range and one delivering zero emissions. The brand new JCB 19C-1 E-TEC mini excavator has been developed in top secret at JCB's World HQ in Staffordshire.

With the drive towards lower emissions, the zero-emission JCB 19C-1 E-TEC will allow contractors to work inside buildings and in emissions-sensitive inner-city environments. It will also allow rail contractors to operate in tunnels and underground, without having to install costly exhaust extraction equipment.

Another huge advantage of the new electric mini is that the external noise, at 7dBA lower, is a massive five times quieter than its traditional diesel-powered counterpart. This means contractors can work after normal hours in urban streets without disturbing residents, as well operating in other noise sensitive environments including hospitals and schools.

On digging there is no compromise on performance with the fully charged electric machine capable of putting in a full shift in normal operation. And with no daily checks of coolant and engine oil levels required, the machine is off to work quicker than its diesel counterpart.

JCB Chairman Lord Bamford said: "JCB has been at the forefront of developing innovative, low emission construction equipment for many years. In producing an electric JCB mini excavator, we are offering our customers a practical and affordable solution for applications that demand zero emissions and quiet operation."

JCB Chief Innovation and Growth Officer Tim Burnhope said: "By replacing the diesel engine with an efficient, 48V electrical driveline, with the latest generation automotive battery cells, JCB has once again moved the mini excavator market forwards.

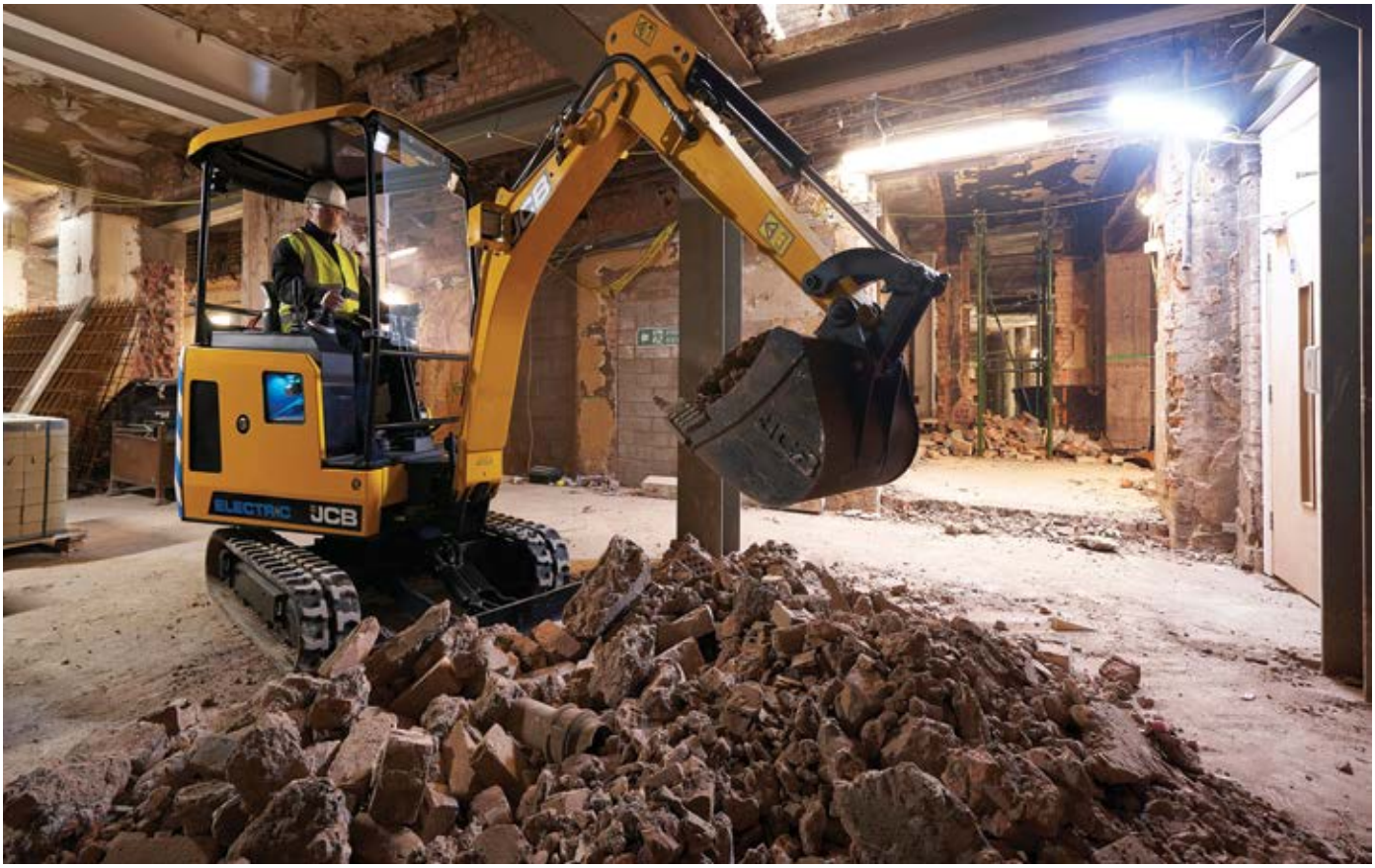
"The 19C-1 E-TEC will provide contractors with a zero-emission, low-noise solution, allowing them to work independently, in late night urban conditions, within buildings and even in rail tunnels with no requirement for costly exhaust extraction equipment. The 19C-1 E-TEC points the way to a new zero emission future for JCB mini excavators."

Key features of the 19C-1 E-TEC include:

- Three lithium-ion battery packs providing a 312Ah (15kWh) storage capacity
- A standard load-sensing hydraulic system delivering powerful digging performance
- Convenient on-board charger with 230V input for 6-hour recharging capability
- Comprehensive battery management system ensures full-shift availability
- Fast charge option on launch allowing a full charge in 2.5 hours

Designed to meet a growing need for zero-emission environmentally-friendly construction equipment, JCB CEA will launch the electric-drive 19C-1 E-TEC mini excavator to the market at the beginning of 2020.

Based on the premium specification 19C-1 conventional tailswing model, that was unveiled in 2018, the electric excavator



replaces the standard machine's diesel engine with an electric motor and three, next generation 104Ah battery packs, to deliver a full energy capacity of 312Ah (15kWh). The modular batteries utilise the most advanced NMC lithium-ion cells, shared with the latest road cars, in a rugged battery pack housing that has been designed to withstand the rigours of off-highway construction use.

Using the latest 48V electrical system, the highly efficient electric motor delivers instant, greater torque than the standard machine's diesel engine. The motor drives the 19C-1 E-TEC's proven Bosch Rexroth load-sensing hydraulic system, delivering the same sector-leading digging performance as the standard 1.9-tonne excavator.

The high efficiency of this advanced electric-hydraulic combination means considerably lower cooling requirement - only a small hydraulic cooler with a small thermostatic electric fan and no engine radiator - contributing to longer battery life and the much lower noise level. The 19C-1 E-TEC is equipped with the same adjustable undercarriage and choice of digging equipment as the diesel model, to provide a maximum digging depth of 2,576mm with the longer 1,100mm dipper arm.

A convenient on-board charger is provided as standard, allowing the machine to be fully recharged in six hours, using a conventional 230V plug. JCB will also offer a fast-charging option, a heavy duty off-board unit, allowing a full charge in 2 1/2 hours. The self-contained power system means that there is no requirement for an electrical power connection or cable during machine operation. The battery packs allow a full working day in a typical duty cycle or four hours of operation in an extreme duty cycle.

The 1.9-tonne machine will be capable of handling a range of powered attachments, making it an ideal base carrier for demolition and refurbishment projects.

The lack of engine noise will allow contractors to work after hours in urban streets without disturbing residents, while the zero-emission capability will permit rail contractors to operate within tunnels and underground, without having to install exhaust extraction equipment. There is also a substantial reduction in vibration without the diesel engine, improving the driving environment for the operator.

Initially, the mini excavator will be available with the ROPS/TOPS and FOGS certified canopy. As the electric excavator is based on the premium specification 19C-1, the excavator comes with proportional rocker switches for auxiliary functions and boom offset swing. The premium model also has a membrane switch pad to the right of the operator for all additional controls, while the fuel gauge has been replaced by an easy to read charge level readout.

The 19C-1 E-TEC benefits from a new box section main boom and dipper arm, with all hoses routed through the boom structure for added protection. The boom pins and dozer pivot points come with sealed graphite-impregnated bushings, allowing 500-hour greasing intervals. All grease points are located on one side of the machine to reduce downtime and there are fewer daily checks, as the 19C-1 E-TEC has no engine oil, coolant or fuel tank.

For more information on the full range of JCB equipment, please visit: **www.jcbcea.com.au**

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SUPERIOR PAK™

The 'Not So New' Kid On The Block

SUPERIOR PAK INTRODUCES THE FAUN VIAJET 6 SWEEPER TO AUSTRALIA AND NEW ZEALAND

While the state-of-the-art FAUN VIAJET 6 sweeper might be a newcomer to the Australian and New Zealand markets, when it comes to sweepers, both its pedigree and its name rank among the world's longest established and most respected equipment brands. Indeed, the name FAUN has been synonymous with the design and manufacture of high quality, innovative refuse collection vehicles and sweepers since 1916.

Now, following the recently announced alliance between FAUN Group and leading Australian equipment manufacturer Superior Pak, FAUN sweepers and waste collection vehicles look set to become a familiar sight on Australian and New Zealand roads – especially if the initial response to the new VIAJET 6 sweeper is anything to go by!

As the flagship of FAUN's mid-size VARIO CLASS sweeper range, the VIAJET 6 delivers the ideal combination of features, capacity and manoeuvrability to suit a wide range of applications. Glen Fuller, Sales Manager – Sweepers with Superior Pak, commented:

"We're very excited to be able to introduce the FAUN VIAJET 6 to the Australian and New Zealand markets. It delivers the versatility and performance that councils, contractors and road authorities are looking for in a sweeper. By working closely with FAUN we have developed an Australian specification VIAJET 6 that will provide our customers with the performance and reliability required when operating in harsh Australian conditions"

"From suburban streets and roads, through to major arterials, rural roads and transport hardstand areas, the VIAJET 6's size, features and capacity make it an ideal choice for a wide range of applications," Glen Fuller added. "Wherever we trial it, it delivers the same excellent results – and at the end of the day, that's what owners and operators are looking for."

Mounted on an Isuzu dual control FSR 140 260 4x2 cab chassis, the FAUN VIAJET 6 features a 6m^3 capacity collection hopper with high angle tipping for efficient emptying and easy cleaning. To provide greater stability during emptying, the unit's 1,900 litre high capacity water tank is completely separate from the collection hopper. The location and arrangement of the tanks, auxiliary engine and other components have been specifically designed to lower the centre of gravity and optimise weight distribution, thereby providing maximum stability during sweeping and emptying.

The VIAJET 6 comes standard with a high performance Deutz TCD 2.9l 4-cylinder auxiliary engine, which transfers power to the sweeper and blower units exclusively via hydraulics rather than through mechanical components which can be more susceptible to wear and tear.

The FAUN air circulation system recirculates air to the blowing nozzle behind the suction nozzle. When loaded with new debris, the already moistened and heated air is once again sucked into the suction nozzle and recirculated.

PATENTED AIR CIRCULATION SYSTEM

The key to the VIAJET 6's outstanding sweeping performance lies with its patented air circulation system which delivers the combined benefits of regenerative air sweeping with traditional vacuum sweeping. This system not only delivers outstanding sweeping performance across a wide range of surfaces, it also results in a significant reduction in fine dust emissions from the sweeper.

The FAUN air circulation system continuously transports the extracted air from the debris container to the blowing nozzle behind the suction nozzle. When loaded with new debris, the already moistened and heated air is once again sucked into the suction nozzle and recirculated. The quantity of recirculating air can be variably adjusted between 30 and 70% depending on the application.

Only the relatively small proportion of air which is not recirculated flows out smoothly under the machine. Fine dust emissions from the FAUN road sweeper with the air circulation system are therefore approximately 50% lower than for pure suction road sweepers.

Importantly, this unique design means that the VIAJET 6 does not blow dust around. Clean exhaust air is expelled behind the sweeper units on the portion of the road which is already clean. Adding water to the blast air also enables the road to be cleaned in the working area of the suction nozzle.

Both the suction and blast tubes are fitted with quick release fittings to enable easy change over and cleaning.

For further information or to enquire about a demo of the new FAUN VIAJET 6, contact Superior Pak on: 1800 013 232 or visit: **www.superiorpak.com.au**

Work begins on Adelaide green hydrogen plant

by Andrew Spence

Construction is underway on a pioneering hydrogen production facility in Adelaide, which will play a major role in South Australia's bid to become a global leader in certified green hydrogen.

Australian Gas Networks has begun construction of its HyP SA hydrogen production facility at the Tonsley Innovation District in Adelaide.

The AU$11.4 million HyP SA facility is being built at the Tonsley Innovation District and is expected to start renewable hydrogen production around mid-2020. The Australian Gas Networks facility will house a 1.25MW electrolyser – the first Australian demonstration project of its scale and size – with small quantities of renewable hydrogen produced and blended into the local gas distribution network from next year.

The recent ground-breaking ceremony coincided with the release of a report by national science agency, CSIRO, that maps the research steps Australia must take to realise a potential 7,600 jobs and $11 billion a year by 2050 from the burgeoning hydrogen industry.

Adelaide-based AGN is part of Australian Gas Infrastructure Group (AGIG) and received a $4.9 million grant from the South Australian Government's Renewable Technology Fund to build and operate the project.

Using a 1.25 MW proton exchange membrane (PEM) electrolyser, renewable electricity will be used to split water into oxygen and hydrogen gas. The renewable hydrogen will then be blended with natural gas and supplied to 710 customers in the adjacent suburb of Mitchell Park via the existing natural gas network.

AGN Chief Executive Officer Ben Wilson said the HyP SA project represented the first step towards decarbonising South Australia's gas networks.

"Commercial hydrogen production is achievable and can decarbonise Australia's energy mix while at the same time accessing export markets," he said.

"Developing the hydrogen economy will also play a key role and the momentum around hydrogen is building with burgeoning research and development underway.

"When burnt, hydrogen does not release any carbon emissions, only water and heat so it is essentially just another gas we can use in place of, or blended with, natural gas to provide energy and heat.

"There is no additional cost to customers receiving the blended 5 per cent renewable gas and the change will not impact any arrangements these customers have with their existing natural gas retailer."

South Australia is already a world leader in wind, solar and battery storage to the point where excess renewable energy is often shed during peak production periods.

The South Australian Government released its Hydrogen Action Plan in September last year in a bid to use that cheap renewable energy to generate hydrogen, which can be used as fuel or to generate electricity at a later time and place.

Other key hydrogen projects utilizing State Government funding underway in South Australia include:

- An $8.7 million facility at the University of South Australia's Mawson Lakes campus incorporating a solar installation, flow batteries, a hydrogen fuel storage cell stack and thermal energy storage to demonstrate the value of hydrogen storage paired with other new storage technologies.
- H2U is developing a 30MW water electrolysis facility near Port Lincoln using wind and solar to generate up to 18,000 tonnes of green ammonia a year to supply local agriculture and industrial sectors. The plant will also feature two 16 MW open-cycle gas turbines operating 100 per cent on hydrogen at the site to provide electricity generation to the grid during periods of low wind or solar output.
- Neoen Australia is investigating the introduction of a 50MW hydrogen super hub to produce about 25,000kg of hydrogen a day at its proposed Crystal Brook Energy Park in the Mid North of the South Australia.

Australia's current hydrogen research footprint includes 23 institutions actively exploring hydrogen in various technology and research areas as well as another 23 hydrogen-specific demonstration projects and research facilities around Australia.

CSIRO Research Director Dr Patrick Hartley said the national science agency was on a mission to bring together industry, government and other research organisations to fast-track emerging hydrogen technologies.

"This isn't limited to the domestic industry development – we'll link Australian expertise with international projects," Dr Hartley said.

"The overall focus will be on enabling Australia's domestic and export hydrogen industries.

"Importantly, solving the challenges identified can have a multiplier effect that boosts demand for hydrogen – particularly in large scale industrial settings – and encourages further hydrogen supply cost reductions through improvements in efficiency and economies of scale."

Geoscience Australia released a report in September showing prospective hydrogen production regions of Australia. This map showed many parts of South Australia as being highly suitable for hydrogen production and export.

Bright thinking on rooftop solar could help businesses and the NEM

On behalf of the Australian Government, the Australian Renewable Energy Agency (ARENA) recently announced $497,000 in funding for Epho Pty Ltd (Epho) to develop an innovative solution to dynamically distribute the energy output of a solar PV system between a building tenant and the network at wholesale electricity prices.

Epho's project will design and develop a 1.7 MW rooftop industrial solar PV system to demonstrate their 'Bright Thinkers Power Station' concept. The concept differs from traditional conventional rooftop solar PV systems in its ability to direct solar energy either partially or fully to the consumer on site, or directly trade the energy on the National Electricity Market.

Epho has partnered with the global market leader for contract logistics solutions and global property company Goodman Group to deliver the project at Oakdale Industrial Estate in Horsley Park, New South Wales.

The switching technology is being developed by Epho in collaboration with its technology partner, Siemens Corporation, in order to meet the requirements of property companies and their large corporate tenants.

ARENA CEO Darren Miller said if successful, Epho's project would allow energy output from rooftop solar to be split or switched between the building and the grid.

"The project will unlock further investment and installation of solar PV on the entire usable roof space of commercial and industrial buildings. This compares to the present practice where current rooftop solar PV systems are constrained in size to align with tenant demand."

"ARENA supports the companies and institutions that are building our future energy system and this unique take on rooftop solar will help ensure that we are furthering our priority in integrating renewable electricity into the grid," Mr Miller said.

Epho Managing Director Dr Oliver Hartley said: "Epho developed the Bright Thinkers Power Station concept to allow large rooftop solar systems to be connected both behind-the-meter as well as an independent, market registered power station. Epho's innovation allows the entire roof area to be utilised, turning the roof into an urban power station."

For further information, please visit: **www.epho.com.au**

Sewer technology passes the sniff test

University of Queensland monitoring technology to identify potential odour and corrosion hotspots in urban sewerage networks has been adopted by ASX-listed environmental management technology firm Envirosuite.

The SeweX technology uses mathematical modelling to predict odour and corrosion hotspots and to optimise mitigation strategies in sewer mains, and was developed by researchers from UQ's Advanced Water Management Centre.

UQ's technology transfer company UniQuest negotiated a licence agreement with Envirosuite.

AWMC Director Professor Zhiguo Yuan said the technology was developed in response to needs identified by the water industry.

"Corrosion and odour problems in sewers are most often caused by sulphate-reducing bacteria in sewer biofilms that produce hydrogen sulphide," Professor Yuan said.

"Hydrogen sulphide is released into the atmosphere above the wastewater, causing odour problems, and is converted by sulphide-oxidising bacteria into sulphuric acid, which is corrosive to concrete sewer pipes.

"Sewer networks can include many kilometres of sewer pipe and various topographical elements, such as rising mains, gravity mains, pumping stations and manholes. It is practically difficult to physically inspect all these structures to identify corrosion issues, making modelling a more efficient and cost-effective alternative."

Envirosuite Chief Scientist Robin Ormerod said corrosion in sewer and drinking water systems was estimated to cost almost $1 billion every year in Australia.

"This technology will keep towns and cities with reduced odour and will save wastewater operators millions of dollars every year in operational costs and consumer complaint management," Mr Ormerod said.

"This partnership is an exciting one. Bringing together tools like the UQ-developed SeweX, with Envirosuite's digital technology focus, is hugely powerful."

UniQuest CEO Dr Dean Moss said SeweX incorporated complex algorithms into its model to cleverly predict odour and corrosion hotspots across sewerage networks.

"It is fantastic to see UQ research helping an Australian company like Envirosuite to drive key improvements to the way water utilities manage wastewater to benefit communities right across the country, and even globally," Dr Moss said.

Envirosuite will integrate SeweX into its product suite in early 2020.

Three new projects to boost rural water supplies in WA

Western Australian Water Minister Dave Kelly recently announced the WA State Government will partner with a further three local governments in dryland agricultural areas to help these communities adapt to the impacts of climate change.

The State will provide $210,000 through the *Community Water Supply Program* to help the three rural communities meet emergency community water needs and reduce scheme water use.

The latest grants will fund projects to:

- Build a new 25,000 kilolitre capacity dam including construction of an eight hectare roaded catchment in the Shire of Kulin to provide a year round non-potable water supply, including for emergency livestock needs ($100,000);
- Quadruple the capacity of the Tarin Rock Siding dam in the Shire of Dumbleyung from 2,500 kilolitres to 10,000 kilolitres and install two 45-kilolitre storage tanks and a new solar pump system to increase emergency livestock water supplies ($42,560); and
- Install a new 250 kilolitre storage tank and solar pumps at Fitzgerald Dam and refurbish the catchment area to the dam in the Shire of Ravensthorpe to enhance emergency livestock water supplies ($67,437).

Through the *Community Water Supply Program* WA local governments in dryland agricultural areas receiving less than 600 millimetres average annual rainfall can apply for grants of up to $100,000 to establish or improve community water supplies.

Speaking about the grants, WA Water Minister Dave Kelly said: "The McGowan Government is realistic about the impacts of climate change on our dryland agricultural areas and is committed to supporting these regional communities with emergency water needs."

"This $210,000 investment takes the total funding committed through this program to assist rural communities this year to $500,000, and comes on top of our $1.3 million investment to create new or upgrade rural State-owned Strategic Community Water Supplies."

"This funding provides vital assistance to communities that are becoming increasingly vulnerable to water shortages as climate change continues to reduce rainfall in these areas," the Minister added. "These new and upgraded water supplies can be used by farmers for emergency livestock needs and also for community firefighting services."

"The Government will continue to partner with rural local governments over the coming summer to ensure our farmers and rural communities have access to emergency water needs for animal welfare."

Projects eligible for funding include the construction of new water catchments and dams, improvements to existing surface water catchments and storage dams, tank installation and development of groundwater resources.

For more information on the Community Water Supply Program, please visit: **www.water.wa.gov.au**

Pall Water Announces New Offering Designed to Maximize Water Production

Pall Water, a world leader in water filtration, separation, and purification, has released the newest offering in their Aria™ FAST product line: T96.

Designed to maximize space and plant uptime while improving operator experience, the T96 is a turn-key mobile filtration solution for producing clean, compliant water.

Recognizing industrial customers' need for cost efficiency, operational versatility, and performance reliability, Pall Water developed the T96 to meet production demands within a smaller footprint. Greg Golden, Global Marketing Manager shared, "We have heard from a number of customers over the years that the resources required – cost, time, and manpower – to operate effectively are becoming more and more unpredictable, so we set out to solve the problem in a new way."

"We know they have to innovate to keep up with changing demands, so we're doing the same," he said.

Capable of treating a variety of water types, the Aria™ FAST T96 increases your surface area for water treatment capacity more than any other self-contained membrane-based trailer, providing an economical choice over existing designs.

Key features include 96 total modules that maximize production in a small footprint, a plug-and-play design that ensures each trailer begins producing almost immediately after arriving onsite, built-in compliance with current electrical and drinking water regulations, and the Aria™ SMARTBOX remote monitoring system to simplify operations and optimize uptime.

The T96 is further supported through Pall Water's experienced, best-in-class service and support team.

"The T96 is reliable, easily manoeuvrable and can be configured into virtually any step in the production process, to treat your most challenging waters," Mr Golden added.

To learn more about Pall Water and the Aria™ FAST T96, please visit: **www.pallwater.com**

ABOUT PALL WATER

Pall Water, a member of the Danaher portfolio of water companies, is a leader in membrane-based water treatment solutions, with more than two billion gallons of installed capacity spanning six continents. Pall Water offers a broad portfolio of reliable water and wastewater systems and pre-treatment filters for industrial and municipal customers to ensure the continual supply of safe and reliable water.

Suez Brings Top Tech To Boost Melbourne's Water Network

Melbourne Water has partnered with waste and water resource management company SUEZ in an innovative project to optimise and automate distribution throughout its drinking water supply network and reduce its overall energy consumption.

SUEZ was awarded the contract to implement its proven Aquadvanced® Energy solution across the drinking water network, which supplies residents with over 400 billion litres of water each year. The real-time optimisation software automates scheduling of production and management of distribution throughout every stage, ensuring high quality water is delivered when and where it is needed at the lowest possible cost.

Aquadvanced® Energy has been successfully deployed across numerous networks in the USA and Europe, and was adopted across Hunter Water's networks on New South Wale's Central Coast during 2019 following highly effective trials in 2018. The system is proven to reduce energy costs while maximising operational performance, water quality and energy efficiency for an enhanced environmental footprint.

Evan Atkinson, General Manager, SUEZ Smart Solutions said that the implementation will be rolled out in three phases over two years, due for completion by mid-2021.

"Our Aquadvanced® Energy solution is a proven solution that remains at the leading edge of innovation in water sustainability and smart networks. We're seeing incredible results applying this solution in diverse networks both overseas and here in Australia, generating network efficiencies and cost savings," said Mr Atkinson.

"Our objective is to drive increased network resilience, reduce likelihood of water quality events and greater operational consistency for Melbourne Water and the city's residents. Embedding this technology will also enable the network to further leverage its hydro generation assets and exploit opportunities in the evolving energy market."

The project is expected to realise significant energy and cost savings for Melbourne Water and will help future-proof its workforce through the capture and retention of network knowledge.

Melbourne Water Automation Team Leader, Russell Riding said that the move to automation of our water network is a fundamental step towards achieving the company's ambitious targets.

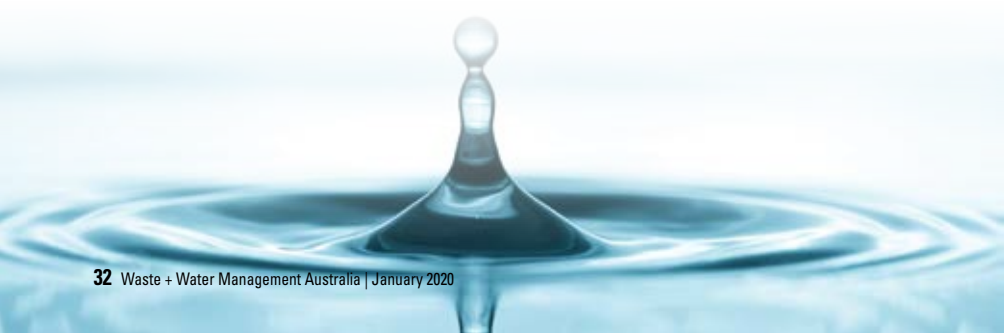
"Melbourne Water is committed to reducing our carbon emissions and our energy consumption which ultimately will provide value for our customers. The implementation of Aquadvanced® Energy supports the digital transformation of our network." Mr Riding said.

"Melbourne Water is always exploring new and innovative solutions to deliver sustainable water services."

The first phase of the project will see Aquadvanced® Energy implemented on the Winneke- Water Treatment Plant supply system leading to the Melbourne CBD before subsequent extension across the remainder of Melbourne Water's network.

ABOUT SUEZ

With 90,000 people on the five continents, SUEZ is a world leader in smart and sustainable resource management. We make the best use of water and waste by providing smart and sustainable resource management solutions for towns, cities, business and industry. In Australia & New Zealand, we help supply seven million people with safe drinking water and divert 1.2 million tonnes of waste from landfill every year.
Find out more at: **www.suez.com.au** and about the Aquadvanced® suite at: **www.suezsmartsolutions.com**



Yarra Valley Water joins leading global companies in signing UN climate change pledge

Yarra Valley Water has joined leading companies around the world in signing the United Nations Global Compact pledge towards preventing a worldwide temperature increase beyond 1.5 degrees Celsius, eventually dropping to net-zero by 2050.

Signing the pledge coincided with the 25th annual *United Nations Climate Change Conference* which took place late last year.

Yarra Valley Water Managing Director, Pat McCafferty, said that signing the pledge is consistent with the organisation's climate change goals and current emissions reduction strategy.

"As a water utility, we're very aware of the risk that climate change poses for our core business. A hotter and drier climate increases the risk of water scarcity, especially as Melbourne's population rises and the demand for water grows," Mr McCafferty said.

As part of signing the UN pledge Yarra Valley Water will develop science-based targets to help guide its activities towards net-zero emissions and preventing temperature rise above 1.5 degrees Celsius.

Yarra Valley Water is already well on its way to cost-effectively producing 100 per cent of its own renewable energy by 2025 by investing in key projects which are driving down its greenhouse gas emissions and reliance on traditional forms of electricity.

Yarra Valley Water's flagship environmental project is its food waste to energy plant which has been operating for over two years. The facility has converted more than 63,000 tonnes of commercial food waste into renewable energy capable of powering 1,500 homes.

The plant generates 25 per cent of Yarra Valley Water's electricity requirements, delivering savings in energy costs and producing 90 per cent less greenhouse gas than if Yarra Valley Water used fossil fuel from the grid, and saves 8,500 tonnes of carbon per year.

Solar panels that generate energy for Yarra Valley Water's head office, treatment plants and electric vehicle fleet, combined with a long-term power agreement with a solar farm in northern Victoria, are also enabling Yarra Valley Water to make strides towards its goal of producing 100 per cent of its own energy by 2025.

Signing the pledge follows Yarra Valley Water becoming the first water utility in Australia to commit to the UN Global Compact and Sustainable Development Goals.

The goals guide the business strategically towards investing in projects that benefit the environment and customers.

Pat McCafferty said that Yarra Valley Water is looking beyond being carbon neutral and exploring options for creating economically viable environmental value in the future.

"We've moved from compliance, to creating zero negative impact and we are now working towards becoming regenerative and creating extra value for the environment."

"We have been on a continual path of exploration, learning by doing and we are committed to increasingly bolder ambitions for the environment in the future," Mr McCafferty said.

Hydro Harvester is making a splash to solve global water shortage

In what could be a game-changer for solving the world's water shortage problem, an atmospheric water generator (AWG) developed at the University of Newcastle is one step closer to commercialisation.

The Hyrdo Harvester is designed to extract drinkable water from air at a cost less than five cents per litre. The project, led by Professor Behdad Moghtaderi, has been awarded $330,000 from the NSW Physical Sciences Fund to prepare the prototype for commercial trial.

From the University's Newcastle Institute for Energy and Resources (NIER), Professor Moghtaderi said the funding brings them closer to their goal of developing an accessible, economic solution for the global water shortage crisis.

"By 2025, it's estimated that 1.8 billion people will live in regions with absolute water scarcity," Professor Moghtaderi said.

"We believe atmospheric water generation is part of the solution. At any given time there is enough water in the atmosphere to meet the needs of the world's population for one year," Professor Moghtaderi said.

The Hydro Harvester is an apparatus which absorbs water from the air at night using silica gel. During the day, solar energy or waste heat is used to produce hot, humid air – and the hotter the air, the more water it holds. This hot air is then cooled using ambient air as a heat sink to extract water for drinking or irrigation.

Professor Moghtaderi said unlike commercially available AWGs, the Hydro Harvester works by heating air instead of cooling it.

"By using solar thermal energy or waste heat, the Hydro Harvester has a lower electrical demand and lower average cost of water per litre than commercial atmospheric water generators," Professor Moghtaderi said.

"Refrigeration-based AWGs, which work by cooling the air to form condensation, are energy intensive and are limited to specific temperature and relative humidity ranges for optimum results. In cold climates or areas with low humidity, for example, its performance significantly decreases, producing less water and therefore increasing the cost per litre.

"Our technology is designed to operate independent of the ambient temperature and humidity, so it's suitable in virtually any environmental condition, and is cheaper to run."

University of Newcastle Research Associate, Dr Andrew Maddocks, said the Hydro Harvester is suitable for residential, community or industrial applications and therefore should help improve water accessibility anywhere in the world.

"The simplicity of the technology, with no fancy materials and low maintenance costs, means it's viable for use in developing countries too," Dr Maddocks said.

"It will produce water at less than five cents per litre, and even cheaper if it's operated at a larger scale utilising waste heat.

"You can imagine the difference this kind of technology would make to drought-stricken areas or in an isolated village of a developing country."

University of Newcastle Acting Deputy Vice-Chancellor, Research and Innovation, Professor Deborah Hodgson, said the funding signifies an exciting next step to accelerate the commercialisation of the project.

"We're proud to see our researchers tackling global issues and helping to bring about very tangible and accessible solutions for people right across the world," Professor Hodgson said.

Alongside Professor Moghtaderi and Dr Maddocks, the University's Hydro Harvester project team includes Associate Professor Elham Doroodchi, Dr Priscilla Tremain and Dr Cheng Zhou.

Professor Behdad Moghtaderi (left) and Dr Andrew Maddocks with the revolutionary Hydro Harvester.

It is important to understand the effect that any new equipment or processes may have on existing waste and water treatment infrastructure

On-site trials: a low-risk approach to proof of concept

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

There is a lot of truth to the old saying 'seeing is believing'. There's nothing like seeing the results with your own eyes in order to tell whether or not a trial has been successful; if new equipment delivers everything that you hoped for; or if changes to production have delivered the expected improvements in quality. Trials are also invaluable for assessing product quality parameters, testing system designs and environmental performance, consumer research, or producing samples for chemical or microbial analysis, or even assessing the feasibility of a particular process.

Due to the complexity of modern waste treatment and environmental processes, it can be hard to assess multiple options and the processing of small batches. That's why HRS has developed a range of portable and trial units, which allow clients to test a variety of equipment including tubular and scraped surface heat exchangers and pilot evaporation plants.

TRIALLING TREATMENT TECHNIQUES

If you already have a successful treatment process, making changes can provide cost savings or other financial and environmental improvements; but it is not without risks. Before making wholesale changes – for example, altering the temperature and time regimes for an evaporation process – it can be reassuring to find out what the effect on both the end material and the overall process will be. After all, nobody wants to invest in major changes to production equipment which then have to be reversed due to adverse environmental outcomes.

One way to do this with heat exchangers is with a trial unit for in situ testing of equipment, or by performing trials and analysis on materials and waste streams at the client's own facility. These types of trial not only help to inform the design of the heat exchanger, but can also provide buyers and users with the confidence to invest in, and install, new equipment.

Evaporation is a key part of many waste treatment systems, so it makes sense to trial technology before committing to a full scale installation.

One of the mobile HRS evaporation plants which can be used to trial changes to waste treatment processes on site.

GENERAL ADVANTAGES OF TRIALLING PRODUCTS

In today's competitive market, companies, their clients and consumers are all looking for the next trend. However, the environmental performance of businesses is now often as important as its products themselves and so staying up to date with the latest waste treatment techniques and infrastructure is crucial.

In some markets, trials are required for process to be approved prior to licensing; for example, where wastewater streams are discharged to the environment. Trials also allow potential treatment issues or glitches to be identified and rectified before investing in a full-size facility, and can even inform assessments such as Hazard Analysis and Critical Control Points (HACCP) before full-scale installation.

EQUIPMENT TO FACILITATE IN-HOUSE TRIALS

Buying dedicated equipment for trials can be prohibitively expensive. However, good equipment which is flexible enough to be used for a wide variety of trial and production purposes can quickly repay the initial investment.

To facilitate this type of trial, HRS has produced a range of trial-size equipment with the reliability and performance of their full-size counterparts, but which have been specifically designed to be easily portable between sites. The modular nature of many HRS heat exchangers means that we can also provide trial units of many of our heat exchanger models.

Recent examples include using trial versions of the HRS R Series of scraped surface heat exchangers. In each case mounting the trial heat exchanger and relevant controls on pallets or a purpose-designed suitable skid frame not only aids delivery and installation of the equipment, but makes it easier to move around production facilities, for example to investigate the use of different lines and possible installation locations.

Evaporation is often a key part of waste stream processing and HRS has trial evaporator units available which can be configured for a wide range of waste treatment applications. Investing in any new processing equipment not only represents a significant capital outlay, but results in inevitable disruption during installation, however by trialling equipment prior to investment both users and manufacturers can be sure that the best solution has been chosen.

For further information, please visit: **www.hrs-heatexchangers.com**

ABOUT HRS HEAT EXCHANGERS

Located in Melbourne, HRS Heat Exchangers is part of the HRS Group which operates at the forefront of thermal technology, offering innovative heat transfer solutions worldwide across a diverse range of industries.

With almost 40 years' experience in the waste sector, specialising in the design and manufacture of an extensive range of turnkey systems and components, incorporating our corrugated tubular and scraped surface heat exchanger technology, HRS units are compliant with global design and industry standards.

HRS has a network of offices throughout the world: Australia, New Zealand, UK, Spain, USA, Malaysia and India; with manufacturing plants in the UK, India and Spain.

Aussie Pumps' Hamish Lorenz picking up tips from the company's Bushfire Survival Guide.

Aussie Pumps at the Fire Front

Aussie Pumps distributors in five states have responded to the needs of their communities for information on fire protection! Aussie Pumps staff, working with dealers in regional areas, have found that the biggest issue is a lack of preparation putting homes, commercial buildings and whole townships at risk.

"No one expected the severity of this year's catastrophic fires," said Aussie Pumps Operations Manager, Hamish Lorenz.

"Dealers, fire fighters, farmers and the users all report on a lack of preparation for what appears to be the worst fire season in a century," he said. "Even farmers who have worked with and used pumps all their lives have been caught by surprise with, in some cases, devastating results. Stock, crops and machinery have been lost, not to mention houses, sheds and, most tragically, lives."

Australian Pump Industries (Aussie Pumps) print tens of thousands of their free *Bushfire Survival Guide*s to aid homeowners, businesses and even Government authorities.

"Preparation could have been carried out in Winter and early Spring," said Lorenz.

The *Bushfire Survival Guide* provides invaluable information on a wide range of fire fighting topics. Taking the RFS, CFA and CFS guidelines, Aussie built on that framework with information provided by dealers, farmers and users across the country.

"Even now, we're learning every day from this years' fires on how we can make the Survival Guide better for next season," said Lorenz.

Aussie staff working at the counters of dealerships across the country report a consistent lack of understanding of even the basics of protecting homes and property. A classic example includes a customer of one of the South Coast dealerships wanting to buy a pump to protect his property without having any available water supply.

"Our man on the spot was able to stop the customer spending hundreds of dollars on an Aussie pump that would have used all the water capacity that he had in a matter of minutes. We advised him to block up the downpipes on his gutters, fill the gutters with water after clearing out any debris, and clearing as wide an area around his house as possible," Hamish Lorenz added. "That's practical advice that's all in the Aussie Survival Guide."

The Guide is now in its 10th year of printing, with every season's version being improved based on the growing knowledge bank compiled by Australian Pump. The company believes first and foremost in producing the world's best fire fighting pumps and secondly making sure that the users of the product get the very best out of them.

Copies of the *Bushfire Survival Guide* have also been made available to fire fighting authorities throughout the country. Although fire services do a brilliant job on television and online services, many customers still like the feel of a printed document that they can read and digest. The Guide is available on the Aussie Pumps website but is now in its third print run for the season based on the unexpected demands for information on fire preparation.

Australian Pump believe that everybody, including the company itself, completely underestimated the dangers presented by the moisture stress in forests across Australia. That unprecedented event, based on the drought, meant that even farmers were unable to prep their properties. In many cases, they weren't even able to get a crop or even keep stock based on the dreadful effects of what we're now calling the Millennium Drought.

Australian Pump is moving fast to triple their production capacity of fire fighting pumps and beefing up not only the standard units but also diesel and Honda electric start versions.

"Many customers living in coastal areas are retirees. They don't need the dramas of a pull-start, " said Lorenz. "Electric start means it's easy and it's just about turning the key on the engine driving the pump."

"Free copies of the Aussie Pumps *Bushfire Survival Guide* are readily available to CFA brigades, RFS and all fire fighting authorities throughout Australia. We give away tens of thousands of this tremendously important document as our contribution to helping the country," said Lorenz. "Working with the RFS and CFA volunteers is a humbling experience and one that inspires us," he said.

For more information on Aussie Pumps' product range - including their range of high pressure fire fighting pumps – or for a copy of the *Bushfire Survival Guide*, contact your local Aussie Pumps dealer or visit the website: **www.aussiepumps.com.au**


Aussie Pumps provide reliable front line fire fighting protection across Australia.

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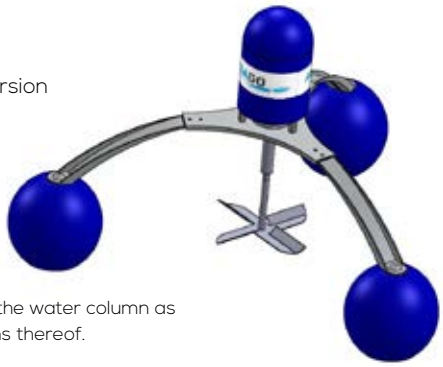

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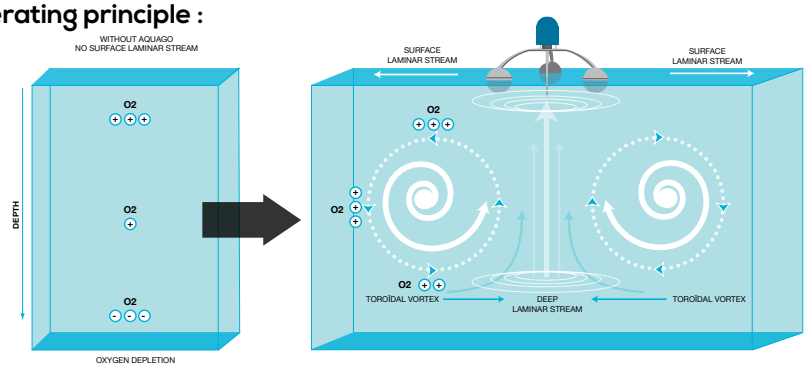

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Melbourne - Australia

NWRIC discusses waste export bans with Federal Environment Minister

The National Waste and Recycling Industry Council (the 'Council') met with Commonwealth Environment Minister, the Honourable Sussan Ley MP at its quarterly meeting in Canberra late last year, and held discussions including how to best implement the waste export bans.

At the meeting members of the NWRIC indicated their support for the ban's intent; for Australia to manage its waste at home. The Council welcomed the strong leadership now being taken by the federal government.

"At last we have a federal government that recognises the importance and value of the waste and resource recovery industry," said NWRIC CEO Ms Rose Read. "An industry that not only provides essential services to the community and contributes significantly to Australia's economy, but also has the potential through greater resource recovery to create more jobs, decarbonise our economy, provide renewable energy and drought proof our soils," she added.

Members discussed with the Minister the implications of the proposed timetable, as well as the list of waste materials to be banned from export.

Specifically, the NWRIC requested that banning of 'whole bale tyres' be brought forward to July 2020, in parallel with glass. The potential harm to humans and the environment by exporting whole baled tyres is significant, and there is ample capacity domestically to process these into value added products including rubber crumb and clean fuels.

In regard to mixed plastics, the NWRIC advised that more time is required for industry to purchase equipment, scaling up its processing capacity, as well as the need to fast track more local demand for plastics into packaging.

The NWRIC also advised that banning the export of baled paper and cardboard was illogical, as local demand is limited and there are strong overseas markets where this material is going straight into paper mills. This also applies to the export of single resin polymer plastics, such as clean bales of PET and HDPE. This vast majority of this resource is going to legitimate licensed overseas manufacturers.

A key point of discussion was how to build local demand for recovered materials for packaging, products, and infrastructure. The Minister emphasised the government's commitment to increase the uptake of recovered materials by changing their procurement practices. She also stressed that businesses must step up too, especially the packaging industry, manufacturers and retailers by ramping up the use of recycled materials. This program is especially needed in plastic packaging and products.

Members also requested the Minister consider banning the export of whole crushed car bodies, white goods and waste motor oils. All of these products, when exported unprocessed, are causing serious harm to human health and the environment in locations across Asia.

The NWRIC also argued that; for the ban to be successful, new obligations must extend beyond the waste and resource recovery sector, to include organisations importing products to Australia.

"A circular economy requires all parts of the supply chain participate. This also includes consumers who must buy recycled, along with households plus businesses sorting recycling better."

Importantly, the Minister acknowledged that Australia is a net importer of plastics and paper, so this needs to be considered in implementing the export ban.

Progress of the review of the Product Stewardship Act was discussed, specifically the urgent need for a whole of industry funded national battery recycling scheme. There is an urgent need to get batteries out of the yellow and red bins where they are causing fires and contaminating plastics, paper and glass being collected for recycling. The Minister advised that she had written to the major brands Duracell and Energizer asking them to join the rest of

the battery industry in delivering a national product stewardship scheme.

The challenges of diverting organics from landfill to compost for soils was also discussed, including how best to bring the agriculture and composting sectors together to solve these challenges. The minister expressed a great interest in improving Australia's soils through the use of compost.

The need for consistency in landfill levies across states and territories in delivering better resource recovery outcomes was also discussed. Along with the need for greater transparency and investment of these levies back into developing recovered materials markets, community education, compliance activities, research and data collection. As well as the importance of these state investments being matched by the Commonwealth.

Also attending the meeting were representatives from the Clean Energy Finance Corporation, who will administer the soon to be released $100 million 'Recycling Investment Fund' promised by Prime Minister Scott Morrison at the election.

"Industry are ready to participate in the 'green loans' provided by this fund, which will help to build the infrastructure we need for domestic recycling."

ABOUT THE NWRIC

The National Waste Recycling Industry Council (NWRIC) is the national peak body representing waste and recycling businesses priorities to government. We work to improve waste and recycling services for all Australians.

The NWRIC members work together and cooperatively share a vision for a fair, safe, innovative and sustainable waste and recycling industry. They do this by:

- transforming waste into resources for reuse or energy;
- ensuring the safe handling, disposal and treatment of non-recyclable and hazardous waste; and
- providing a safe and clean environment for the community.

Our national members and state and territory affiliates, service most households and businesses across every State and Territory. The NWRIC's 450 plus members range from small family-owned businesses to multi-billion-dollar global companies. They collectively own and operate nearly every private waste and recycling asset in Australia for collecting, recycling, processing and treating waste.

NWRIC calls for Victorian State Government to intervene on City of Kingston decision

The National Waste Recycling Industry Council (the 'Council') is calling on Victorian Premier Daniel Andrews to intervene in the City of Kingston's recent decision to deny the extension of the Alex Fraser Group recycling facility at Clarinda.

Speaking about the City of Kingston's decision, the NWRIC CEO Rose Read said, "the Clarinda recycling facility is of State significance. It's capacity to recycle up to 1 million tonnes of construction materials represents approximately 25% of Melbourne's recycled material each year."

"To lose this site will have significant ramifications for resource recovery in Victoria and the population of Melbourne," Ms Read added.

Not only does the site supply recovered materials to major construction projects throughout Melbourne, it also received a State Government grant to increase capacity to recycle up to 200 million bottles per year into roads, including bottles collected from the City of Kingston.

According to the NWRIC, the Alex Fraser Group is an exemplar recycler, best in class Australia wide. Not only committed to greening our roads by reusing construction materials and glass from yellow bins but also in running facilities that are environmentally sympathetic to their neighbours. Their commitment to their local community is genuine, as clearly illustrated by their proposal to the City of Kingston to guarantee Council ownership of the site in the medium term.

"What is also disheartening about the City of Kingston's decision is that they have chosen to completely ignore the State Government's Sustainability Victoria's Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP), where the site is identified as one of Melbourne's key 'resource recovery hubs' necessary to maintain State recycling capacity."

The NWRIC said the decision illustrated another major weakness in the Victorian Government's ability to manage waste and recycling, where clearly they have failed to integrate their infrastructure planning with local and state government planning regulations.

"If Victorians want best practice recycling it is important that state significant resource recovery hubs identified in state plans are protected and not simply overridden by local decisions. Moving these sites is not a simple matter, there are significant impacts not just on the recycler and its commercial operations but on the whole of Victoria's economy, employment and the environment."

"If the Victorian government is serious about getting recycling back on track in Victoria, the Premier needs to step up and mediate a more realistic solution for the future of the Alex Fraser Clarinda site as a matter of urgency."

Exports of Clean Paper and Cardboard Must Not Be Banned

The National Waste Recycling Industry Council (NWRIC) is calling on the Council of Australia Governments (COAG) to ensure that clean, high grade paper and cardboard are exempt from the proposed waste export bans.

The COAG announced the proposed waste export ban in August 2019. The Environment Ministers at their meeting on 8 November 2019 agreed that waste plastic, paper, glass and tyres that have not been processed into value-added material should be subject to the export ban. They determined that the ban should commence on 1 July 2020 with a phased approach:

- All waste glass by July 2020.
- Mixed waste plastics by July 2021.
- All whole tyres including baled tyres by December 2021.
- Remaining waste products, including single resin polymer plastics that have not been processed, mixed paper and cardboard, and baled paper and cardboard, by no later than 30 June 2022.

"While industry supports banning the export of waste glass, whole baled tyres, mixed plastics and mixed paper, the NWRIC does not support banning the export of clean paper and cardboard," said Ms Rose Read, CEO of the NWRIC.

"Australia currently exports close to 1.1 million tonnes of clean, high grade paper and cardboard every year, approximately one third of the material we use. This export market is estimated to be worth more than $230 million.

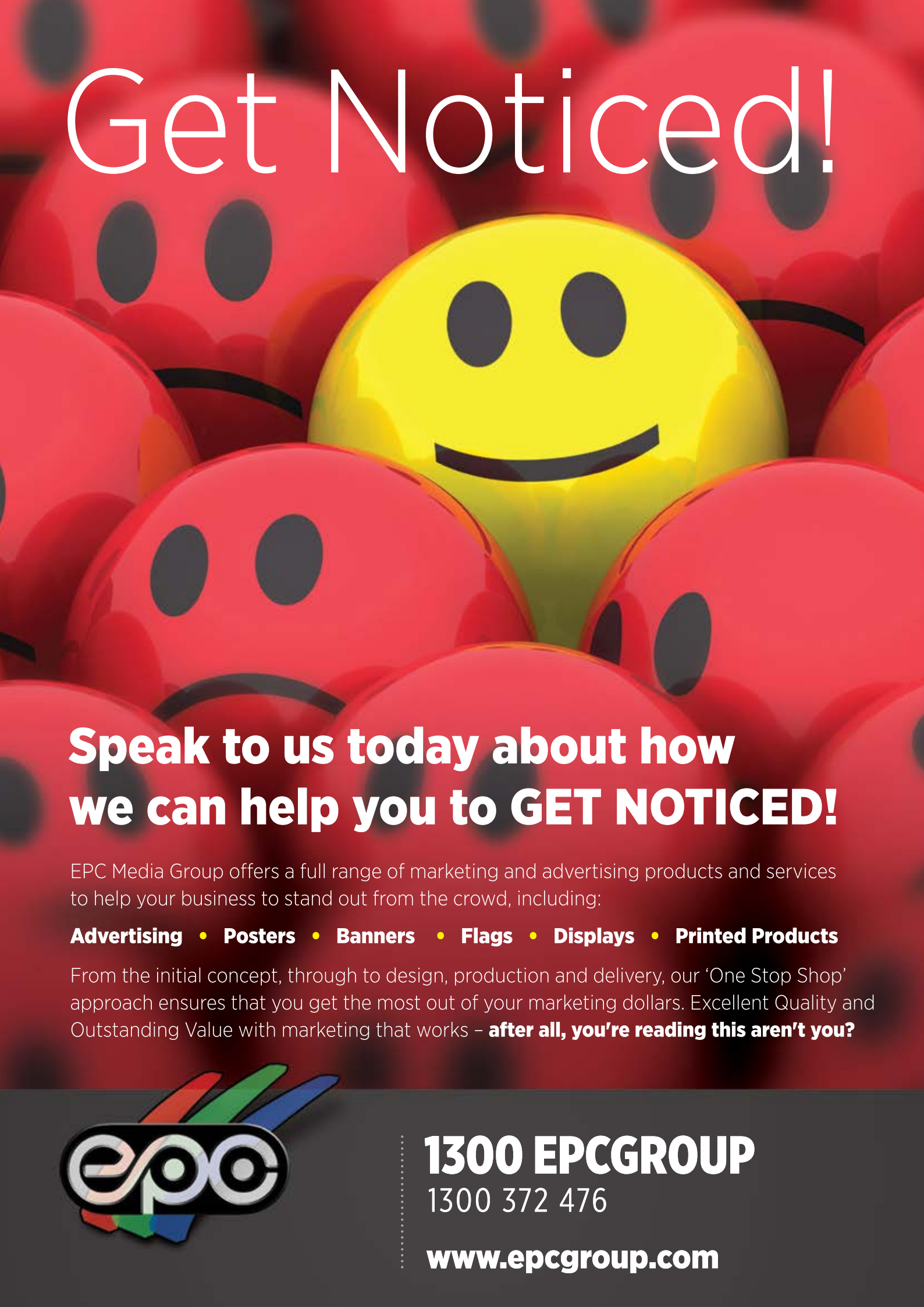
"Without the capacity to export clean paper and cardboard, recycling services could fail, including household kerbside collections," cautioned Ms Read.

"Also, Australia does not currently have the capacity locally to remanufacture all the paper and cardboard it generates," Ms Read added.

"Australia's domestic paper mills that process recycled paper are in Victoria, NSW and Queensland. These mills do not currently have sufficient capacity to take all of the recycled paper and cardboard generated on the east coast. Let alone that generated in SA, NT and WA, who rely on overseas markets."

Recycled paper is only purchased by a small number of reprocessors, limiting competition.

To ensure the export of quality recovered materials, the NWRIC is inviting COAG to work with the waste and resource recovery industry to develop national scrap specifications for metals, plastics, paper, cardboard, e-waste and other recycled materials. These would give the waste management and recycling sector clarity and certainty on what can be exported, and manufacturers confidence in the recovered material being supplied.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PRECAST PROVES LONGEVITY AS CONSTRUCTION OF NEW BRIDGE REPLACES TIMBER STRUCTURE

Project: Turners Flat Bridge Replacement
Precaster: Waeger Constructions
Location: Skillion Flat, New South Wales
Builder: Waeger Constructions
Engineer: Bridge Design
Client: Kempsey Shire Council

The replacement of a tired timber bridge spanning over the Macleay River across Turners Flat Road in Skillion Flat NSW is nearing completion. Replacing it is a brand new precast concrete bridge which will improve safety and reduce impact from future major weather events.

The local Kempsey Shire Council received close to $2 million in funding for this project, adding to the total budget of $4 million.

DESIGN DELIVERS SAFETY AND PROTECTION

The new bridge design has taken inspiration from the existing bridge but will widen the route to two lanes, increasing safety and accessibility for those travelling across the river.

Major floods within the district in 2009 led the existing bridge to be closed for an extended amount of time after two full spans were destroyed. Due to this high risk of future flooding events, the design of the new precast bridge included lifting the overall height by 1.5m. This protects and provides safety for the local Kempsey commuters in future major weather events.

MULTIPLE PRECAST ELEMENTS

Many precast concrete elements were manufactured, with an aim to last decades into the future.

National Precast Member Waeger Constructions supplied 30 prestressed beams, measuring 710x850x24m, as well as two abutments measuring 9.1 metres wide by 1.7 metres high, and four wingwalls measuring 1.5 metres wide by 1.7 metres high for the project.

Produced to the latest AS5100:2017 Bridge design standard, the precast manufacturer has maintained a high standard of safety during the manufacturing of the precast elements. This has continued throughout the construction process, while consistently following the client's expectations and specifications.

DURABILITY AND LONGEVITY DRIVE MATERIAL CHOICE

Precast was chosen for the construction of the new bridge rather than timber, due to the material's high durability and longevity.

Using precast in bridge construction allows for longer spans using prestressed beams. Longer spans allow for less piling and headstock supports leading to fewer materials used for the overall construction.

In planning construction, Waeger Constructions set out to have the lowest possible environmental impact throughout the construction of the bridge by having less piling. This also allowed for less construction time on site. It also had the added benefit of minimising the time workers are exposed to working at heights.

CHALLENGES OF PILING SIX METRES DOWN ACROSS A 110-METRE SPAN

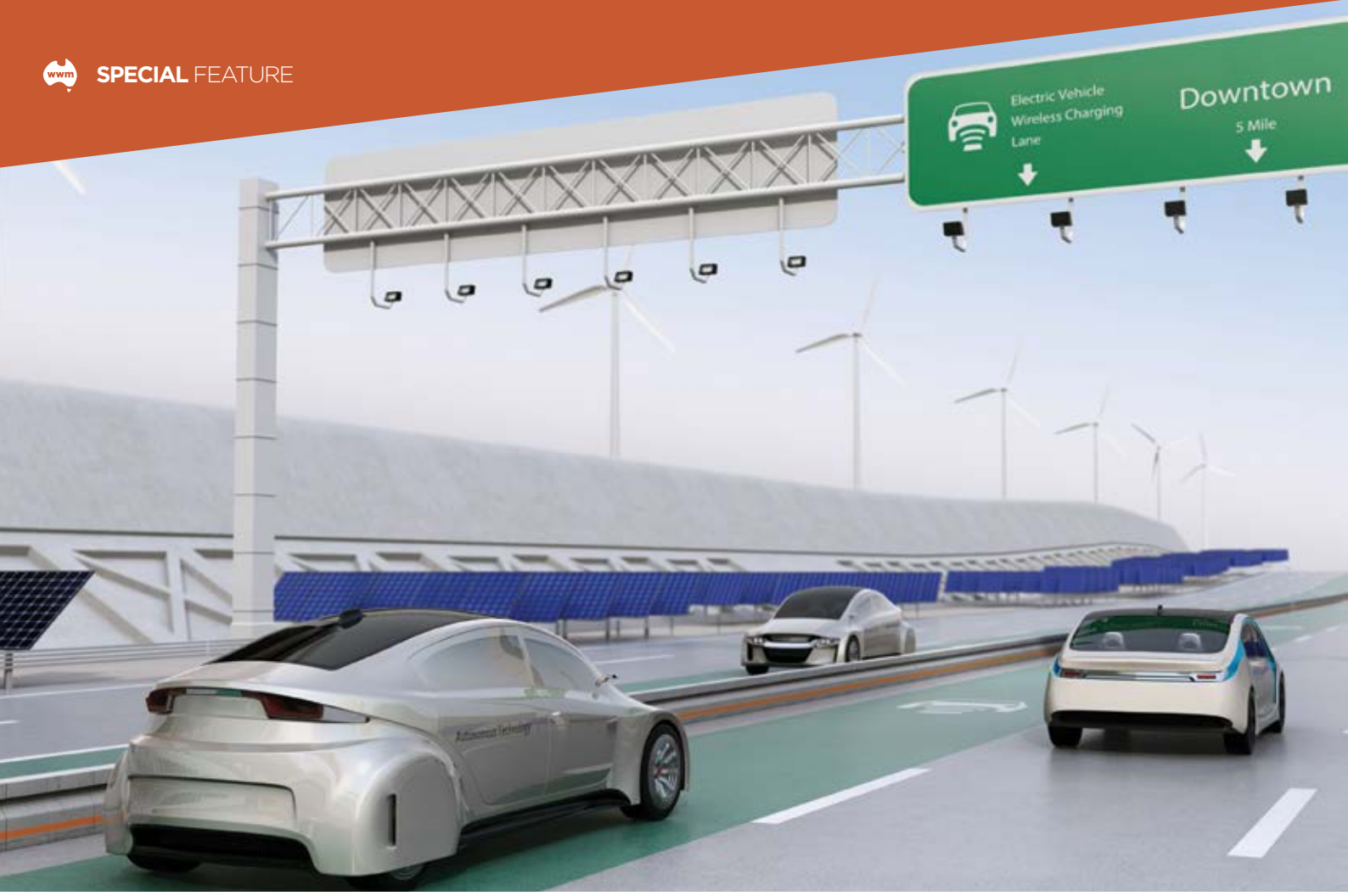
One of the major challenges with this project was to construct the piers within the water of the Macleay River where levels would reach up to five to six metres deep. Additionally, with the Macleay River spanning a total of 110 metres, this made access on site difficult. The ground conditions of the site also proved a challenge for construction.

To resolve this issue, existing river materials were used to build up platforms so that piling rigs and cranes could be placed within the river area. This led to rock anchors being used to develop adequate tensile strength to resist flood loading on the bridge.

All but one of the piers were constructed using a temporary work platform built into the bank of the Macleay River. The last pier installed was constructed with the use of a barge to reduce the environmental impacts of the works on site. The temporary platform was also used to install the 23t beams that will form the bridge spans.

Each beam was installed using a 220t mobile crane. As the beams were installed, the temporary platforms were progressively removed.

With only minor disruptions to traffic flow, Kempsey Shire Council approved the existing bridge to stay open whilst the new precast bridge finishes construction. The new bridge is scheduled to be opened in January 2020. It will have a huge impact on the local area as it creates a vital connection from either side of the Macleay River.



Using six sigma to address climate change and eliminate highway melting

K.C.Somaratna, Managing Director of Somaratna Consultants (Pvt.) Ltd.

INTRODUCTION

The Paris Accord has allowed individual countries to find their own solutions for climate change and it is left to us to make use of the opportunity. My objective for this article is to show how one could arrive at a solution to address climate change using Six Sigma Methodology.

Six Sigma has been developed into a complete array of new techniques leading up to and not limited to Six Sigma DMADV2 (Define, Measure, Analyze, Design, Verify and Validate) Methodology with astounding results for the companies using these.

APPLICATION OF SIX SIGMA METHODOLOGY

We started with the first phase called Define phase and used that definition by International Energy Agency in Executive Summary of Energy Outlook 2009 document.

It said that *"It is no exaggeration that future of human prosperity depends on how successfully we tackle the following two central "energy challenges" facing us today:*

(1) Securing reliable and affordable energy; and

(2) Rapid transition to (a) low carbon (b) energy efficient and (c) environmentally benign form of energy"

So, we depicted the energy generating process as indicated below, identifying Inputs for the process, Process itself and Outputs from the process.

Figure 1. Energy Generation Process

INPUTS

- Fossil fuel in Storage
- Energy Conversion Machine
- Operators
- Operating Instructions

INPUTS

Convert Energy in Fossil Fuel into the desirable form of Energy for the Recipient

OUTPUTS

- Energy for Industries
- Energy for Commercial Sector
- Energy for Residential Sector
- Energy for Transportation

Undesirable outputs from the process: CO_2, NFW, Waste Energy

We identified seven potential Critical to Climate characteristics as follows:

a) Reliability;
b) Affordability;
c) Carbon content;
d) Energy efficiency;
e) Carbon dioxide generated;
f) Water vapour generated; and
g) Waste heat generated.

Being environmentally benign is not influencing the environmental balance associated with components of the climate system and three climate parameters, namely: temperature, precipitation and wind. These CTC characteristics will influence the values of (1) extents and / or (2) quality of atmosphere, biosphere, cryosphere and hydrosphere, temperature, precipitation and wind.

We then discarded carbon content as it is again captured by carbon dioxide emitted which is a much easier characteristic to measure, monitor and grasp. We also discarded Energy Efficiency as Waste Heat Generated is also an indicator of the same; higher the energy efficiency, lower the waste heat generated.

Then the three parameters which influences the climate system were found to be:

1. carbon dioxide emitted
2. Newly Formed Water (NFW) vapour emitted as it influences:
   a. atmosphere by reducing oxygen content in air and being a Greenhouse gas
   b. hydrosphere by ultimately ending up there
   c. cryosphere by enhancing the temperature more than carbon dioxide
   d. biosphere by actively engaging in all biogeochemical processes
   e. temperature by contributing to its enhancement
   f. precipitation by directly leading to precipitation
   g. wind by reducing wind shear more than other three gases (O_2,N_2,CO_2) and
3. waste heat given by the fossil fuel while providing energy for an anthropogenic use.

Table 1. Measure & Analyse

CTC Characteristics would have the following values in respect of the different sectors (Data from USA – EIA – Energy Outlook 2009 Pages 111, 112, 114 and 144 for year 2010)

Sector	Fuel Type	Cost of MBThu in $	Energy used Qn BThu	Waste Energy Qn BThu	CO_2 Emission MT	NFW Emission MT
Residential	Gas	7.01	11.44	10.46	1237	<1200
Commercial	Gas	7.01	8.66	10.35	1092	<1000
Industrial	Gas/Liquid	15.00	23.83	<20	1582	<1582
Transportation	Liquid	23.00	27.81	22.23	1891	773

Then an analysis was carried out on the four sectors - commercial, industrial, residential and transportation - to identify the sector, that needs to be addressed first, in order to speedily bring significant benefits in respect of CTC characteristics. The outcome of this analysis is shown in Table 1.

It was found that gasoline fuelled transportation is the most significant contributor to climate change.

PLEASE NOTE: in Residential & Commercial Sectors only natural gas and electricity were used and waste energy given is what corresponds to the waste associated with the electricity used. In the case of industrial sector, other fuels are used and the value of waste energy is an estimate on the high side. Because electricity and other fuels are used in these three sectors, NFW emission is given as been less than CO_2 emitted.

Liquid fuels and natural gas generate one (18kg) and two (36kg) molecules of NFW respectively for each molecule (44 kg) of CO_2.

In the case of transportation, only oil is used – this was prior to former US President Barak Obama's promotion of gas-fuelled transportation – and NFW is based on that, while waste heat is taken as 80% of energy in the fuel as per thermal efficiency figures quoted in literature. Cost of Million British Thermal Units (MBThu) is provided an indication of affordability of the energy.

Table 2. Review of Possible Designs

How they perform vis-a-vis CTC Characterisitcs						
Fuel	Vehicle	Transition Speed	Cost/ 100km Rs.	Waste Energy MJ/km	CO_2 Emission (g/km)	H_2O Vapour Emissions (g/km)
Oil	ICE		(Toyota Camry) 1170/=	2.1	264	108
H_2	HFCV	5% by 2035				
Gas	ICE		356/=	2.1	225	184
Grid Electricity	BEV	30% by 2030	480	1.26	101	<101
Renewable energy	BEV	30% by 2030	480	-	-	-
Sector is identified, vehicle is designed, origin needs to be finalized						
Possible renewables – Hydro, Wave, Biofuel, Geothermal, Wind, Solar						

We got into the design phase and started reviewing designs available to replace the ICE powered vehicles and the corresponding fuel combinations using the same CTC characteristics. It was found that the Battery Electric Vehicle - Renewable Energy combination was the most advantageous.

Please see Table 2 – This Table is based on data given in World Energy Council's document *"Transport Scenarios in 2050"*, a Ph.D. Thesis at MIT titled *"On the Road in 2035"*, the three objectives pronounced at UN Climate Summit in September 2014, and current prices in Sri Lanka.

Data relating to the Hydrogen Fuel Cell Vehicle (HFCV) was not completed due to uncertainties associated with the path to obtain the hydrogen. There are two ways of obtaining hydrogen; namely by electrolysis of water and by steam reforming of natural gas. Both do have inefficiencies as follows:

- If electricity is available from renewable sources, it could be used to power Battery Electric Vehicles at 95% efficiency while HFCV will give us an efficiency of 48% only.
- If natural gas is to be used to get hydrogen, then it could power an ICE vehicle directly generating CO_2 and NFW, without first converting gas to hydrogen using steam and then converting it in fuel cell.

Both processes will generate CO_2 and NFW at least to the same extents; but the second is less efficient.

THE SOLUTION

Of course, renewable energy sources themselves have so many options, including hydro, solar, wind, geothermal, and so forth, with Solar proving to be the most favourable in respect of the extent of availability and reliability. Even in respect of solar, there are different technologies to consider, including photovoltaic solar and concentrated solar thermal, etc.

What we propose is laying PV solar panels along and above the highways - we call it *Highway Solarisation* - and using that electricity to power Battery Electric Vehicles or supply to the grid. As well as providing the best possible values for the CTC characteristics, this particular solution delivers a range of significant advantages.

Incorporating the establishment of dedicated infrastructure for charging battery-powered electric vehicles using solar energy collected by PV solar panels installed along and above highways, Highway Solarisation has the potential to significantly mitigate the climate impact of road transport.

As such, this most powerful technique of Six Sigma DMADV[2] has provided us a very good solution for climate change in Battery Electric Vehicles associated with Highway Solarisation. We believe would be able to completely eliminate generation of carbon dioxide, NFW vapour and waste heat currently associated with vehicular transportation.

It could also be considered as a geo-engineering solution (*"human intervention to counteract prospective warming"*) due to absorption of about 82 – 90% solar radiation by the highway and subsequent re-emission as long wave radiation leading to global warming (1.4 kWhrs of global warming eliminated for every 1 kWhr of electricity generated).

IMPLEMENTATION ISSUES

With so many Highways available across the world, and in many instances, designs that can be easily implemented with the existing road and highway design, construction, engineering and safety frameworks, we believe that Highway Solarisation even has the potential to become a major investment and revenue opportunity for traditional energy providers – including those in the fossil fuel sector.

Importantly, we also believe that Highway Solarisation could be implemented and operational in an extremely short time-frame, even up to a few Terra Watt hours, which would bring significant revenue extremely quickly.

Reference : Design for Six Sigma for Green Belts & Champions by Dr. Howard S. Gitlow, Dr. David M. Levine and Dr. Edward A. Popovich.

CST's advanced screening technology boosts WWTP performance

Inline rotary fine screening for industrial and municipal wastewater avoids blockages, spills, maintenance and OH&S issues.

Advanced wastewater fine screening technology being introduced by CST Wastewater Solutions is designed to curtail blockages, spills, maintenance and associated OH&S issues in municipal and industrial WWTP applications. The robustly engineered horizontal in-channel rotary drum screening technology is designed to simplify fine screening processes for both industrial and municipal wastewater treatment plants (WWTPs), throughout Australia and New Zealand.

The in-channel design – with low fluid head loss at peak flows for increased solids removal efficiency – is used on wastewater flows ranging from municipal plants through to applications involving food, beverage, abattoirs, tanneries, pulp and paper, textile plants, manufacturers and many more industries.

The low-maintenance, high quality stainless steel design is custom-engineered for conditions in Australia and New Zealand, where initial projects are proving the technology in municipal and manufacturing applications, says CST Wastewater Solutions Managing Director, Mr Michael Bambridge.

"Advantages of this technology when dealing with fine screening of larger flows (5mm or less screening on flows up to 2,000 l/sec flow) include mechanical simplicity, self-cleaning and high efficiency screening for reduced maintenance and cheaper whole-of-life costs compared with other types of screens, such as band and inclined drum screen designs, for example," he said.

FUNCTIONALITY

Key to this functionality is the configuration of the design, in which the screening drum is installed horizontally semi-submerged in line with the incoming wastewater. The plate at the back of the drum directs flow radially through the mesh to optimise solids separation and self-cleaning.

The rotary drum is manufactured from either self-cleaning wedgewire for primary screening, or perforated plate for fine pre-membrane bioreactor (pre-MBR) screening. It is washed by a system of spray nozzles at a moderate pressure.

An internal hopper collects the screenings, which are flumed out to the integral lifting and dewatering screw, to efficiently dewater and reduce screenings volume. The lifting screw is shaftless to avoid any blockages, even in the presence of long rags and fibrous products and includes screen and screening washing.

Lifting and screenings handling can also be conducted outside the channel, which increases options for additional washing and dewatering, according to individual applications, says Mr Bambridge.

"Screening and the solids lifting and dewatering are separate operations, using high efficiency screening technology to convert the high-flow, low-solids wastewater to low-flow, high-solids dewatering," he said.

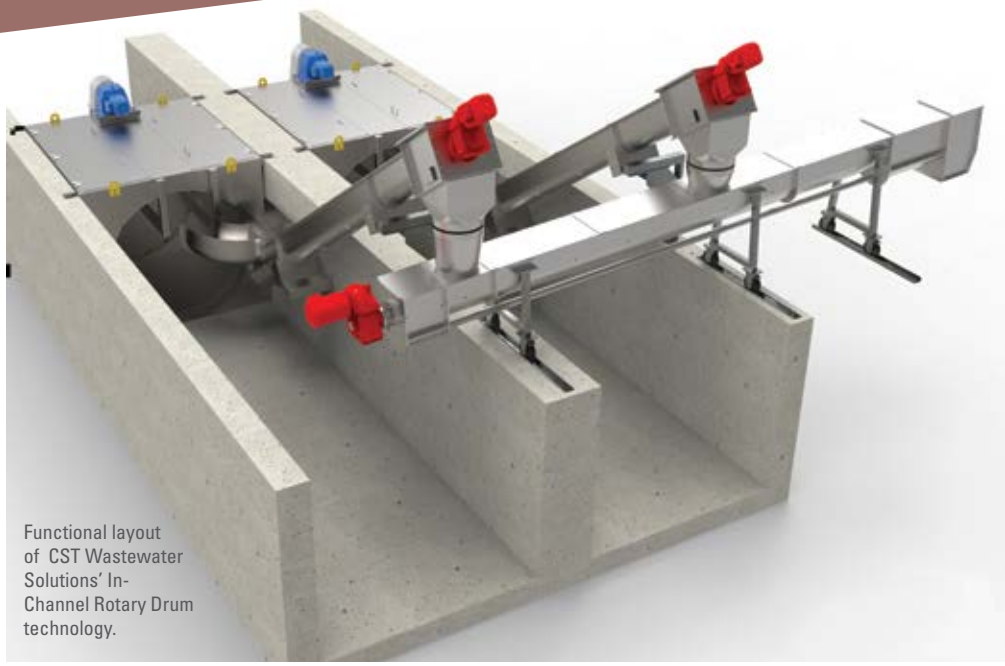
"Separate screening and lifting equipment makes access simpler for more cost-effective housekeeping and maintenance for lower whole-of-life costs," Mr Bambridge added.

CST's simpler but smarter inline rotary fine screening of industrial and municipal wastewater avoids blockages, spills, maintenance and OH&S issues.

ADVANTAGES OF HORIZONTAL DRUM DESIGN

The system's horizontal drum design delivers a number of significant benefits, including:

- Lower operating depth and range to reduce average screen velocities for higher removal efficiencies, and easier cleaning than alternative screens.
- The design increases available open area for equivalent operating depth, which enhances functionality.
- Tailored to local conditions, the robust one-piece, closed drum is fully assembled in a frame for installation into a channel. It incorporates a simple, long-life inlet seal that can be replaced without removing all equipment from the channel.
- All parts subject to routine maintenance are located above the sewage flow, simplifying maintenance and reducing OH&S issues.
- Screening and lifting screw equipment are proven, simple and robust technologies. No bearings or other high maintenance moving parts are located in the wastewater. Housekeeping and servicing are conducted from above the flow channel. No mechanical devices are used inside the screen drum.
- Open entry for clean collection of solids – no rag wrapping, reducing maintenance and OH&S issues. The screen zone of the lifting screw incorporates a washing system to reduce the contents of faecal matter in the screenings.



Functional layout of CST Wastewater Solutions' In-Channel Rotary Drum technology.

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