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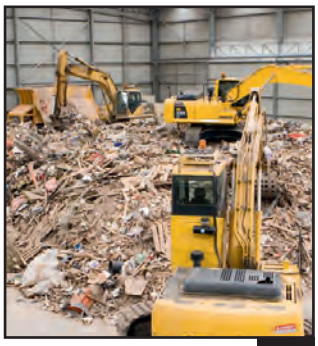

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WORDS FROM THE EDITOR

After weeks of intense rain in Sydney, it seems ironic to be talking about water security in this issue. While too much rain can cause problems of its own, with climate variability in Australia we are all too aware of the looming drought conditions that could follow. Water industry professionals must be forever vigilant to ensure water security for our future in our variable climate.

Tony Arnel, Global Head of Sustainability, Norman Disney & Young, points out in our article on page 8, "We cannot afford to be lulled into a false sense of water security." Tony highlights some of the lessons that can be learnt from innovative water-security techniques adopted both here and abroad. Some of these techniques include diversification of water sources and improved stormwater capturing techniques.

With advances in technology and the rise of the shared economy, the energy industry is also experiencing change with disruptive business model plans entering the market. As witnessed by the likes of Airbnb and Uber, disruptive business modelling can have many benefits, but it is also clear that legislation and government needs to keep up with these changes to ensure their continued success.

The advanced uptake of renewable energy, improvements in storage technology and environmental concerns associated with traditional energy sources have all contributed to the rise in disruptive business models in the energy market. Some new models are designed to adopt a more decentralised energy production. Read more about one such disruptive solar model on page 5 and read about another energy storage solution with grid stabilisation benefits on page 42.

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Disruptive solar models shaping Australia's energy future

Jonathan Englert and Anastasi Kotoros, Smart Commercial Solar

> **What's happening is the decentralisation of power generation, and the rise of highly efficient, ultrasustainable localised power creation.**

We see traditional ownership views shifting with the rise of the sharing economy and the likes of Airbnb. In the information economy, this ownership shift is seen with the rise of software as a service (SaaS) models. One theme unites these models: using only what you need creates revolutionary efficiencies that save money and in many cases deliver huge sustainability benefits.

This is now happening with energy and that's why it's going to affect everyone. A major disruption is occurring that in the short term is creating headlines about Australian power networks struggling to meet demand, but in the mid to long term will deliver big savings for both personal and business customers, and a huge boost to the environment.

What's happening is the decentralisation of power generation, and the rise of highly efficient, ultrasustainable localised power creation.

Traditionally, the energy market has relied on big centralised generators that burn 'something' to make electricity. The unit cost of creating this energy is referred to as the 'wholesale cost', which last month saw NSW wholesale costs go from $140 MWh to $1000 MWh. Furthermore, there are the costs involved in transporting that power.

Investment and generation behind the meter cut costs of wholesale and distribution costs of energy. The cost of energy to businesses is wholesale plus transportation cost of energy.

Here's where it gets really interesting. In NSW, the average cost of network charges is 5–15c/kWh, which means 10–25c/kWh pricing on average. This means that the largest consumers of energy get the cheapest price, but there's only a few of these big consumers. The other 80% don't consume that much energy, but because they pay for the same social infrastructure they're left with a big tab to pick up.

As a society, we have accepted this condition because in a sense it was just built in, the price we were all willing to pay for the background hum and security of the energy that powered our lives. We also didn't have a choice because there were no viable energy alternatives.

Now we do. New energy models are emerging in Australia built on the revolutionary economics of solar which has seen an 80% drop in component pricing and a rapid improvement of the monitoring technology and processes that can support stable localised power generation.

Many people are unaware that solar power has reached parity pricing with coal in Australia — this means it costs as much or less to generate power with solar than with coal. And the customer doesn't have to pay the network charges because the power generator is located on premises.

As a result of these new economics, a group of like-minded innovators and community members have come together and built a commercial solar model that is delivering free solar to businesses while simultaneously producing a healthy 7% return on investment for community funders.

Australian community solar fund ClearSky Solar allows smaller generators to get access to power at rates of the big consumers.

The model is called PayG and it was pioneered by ClearSky Solar planners like Christina Kirche and Smart Commercial Solar founder Huon Hoogesteger.

The reason the model works is because the difference between the cost of the solar being generated and the price charged for the energy it produces (still much lower than utility prices) is so great that people are willing to finance your system. And it's a comparison rate that makes it look better than a mortgage.

To date ClearSky Solar has pooled nearly $3m in investments for 17 projects installed by Smart Commercial Solar across Australia. Every single one of its projects is oversubscribed within hours of being announced, and the ABC reported that one solar investor was so pleased with the returns that she was pulling money out of her banking investments to put more into solar.

Businesses from the likes of industrial supply company Blackwoods to the Dudley Hotel are now generating power from solar installations paid for by the community. Energy output and financial returns are carefully monitored and user and investor exist in harmony — it's a vision of our shared energy future but it's here today.

Smart Commercial Solar
www.smartcommercialsolar.com.au

Water scarcity drives water efficiency

* Tony Arnel, Global Head of Sustainability, Norman Disney & Young

Water scarcity already affects every continent. Around 1.2 billion people — or almost one-fifth of the world's population — live in arid areas with water shortages. Another 1.6 billion people — one-quarter of our global population — face water shortages as a result of climate change.

In Australia, water conservation appears to have fallen off the radar. A decade ago, as drought ravaged the country, our attention was firmly focused on how to shore up our precious water resources. But times have changed. Dams are full, desalination plants have stalled and policymakers are more concerned with energy efficiency as they tackle climate change.

But we cannot afford to be lulled into a false sense of water security. According to the Climate Council, water inflows to key Sydney dams could decrease by as much as 25% by 2070 if greenhouse gas emissions continue on their current trajectory. Annual water demand will outstrip supply in Perth and surrounding regions by as much as 85 billion litres by 2030 — and that's enough water to fill 34,000 Olympic-sized swimming pools. Average annual stream flows to Melbourne's four major water harvesting storages could decrease by around a fifth by 2050.

As the driest inhabited continent, Australia must invest in technology and projects that drought-proof our cities and our economy.

So how do we guarantee the water security of our cities?

When your densely populated nation has no independent source of fresh water, like Singapore, scarcity drives self-sufficiency.

In less than 15 years, Singapore has invested in the infrastructure required to become a world leader in water management. The foresight of Singapore's utility agency means more than half of its water supply is met by a 'four tap' strategy. Rainfall,

> **"The government believes everyone in Singapore has a stake in water – as a necessary resource, an economic asset and an "environmental treasure".**

collected in artificial reservoirs, accounts for around 20% of the nation's water supply; reclaimed water, or what the Singaporeans call 'NEWater', meets 30% of demand; while seawater desalination provides a further 10%. The remainder is imported from neighbouring Malaysia.

The first production plant for recycled water opened in 2002. Using an innovative four-stage treatment process — conventional combined with microfiltration, reverse osmosis and UV treatments — means the water is drinkable. Singapore's first desalination plant opened in 2005, with another plant of double capacity currently in construction. Singapore's water catchment area has also expanded over the last five years — and now covers two-thirds of the city-state's land surface areas — with the completion of the Marina, Punggol and Serangoon Reservoir in 2011.

Public education campaigns have also made their mark, with consumption falling from 165 litres per person per day in 2003 to 155 litres in 2009. The government's target is 140 litres by 2030. Practical schemes, such as water efficiency labelling for taps, showerheads, toilets and washing machines, have also helped consumers make informed choices.

Singapore's ultimate goal is to be self-sufficient, with 40% of water from recycling, 30% from desalination and 20% from rainwater collection.

The Singaporean Government continues to invest in R&D to identify more cost-effective ways of treating, recycling and supplying water. It is building a reputation as a 'hydrohub' for water science and technology, and is contributing expertise to large water projects in China. The government believes everyone in Singapore has a stake in water — as a necessary resource, an economic asset and an "environmental treasure".

Australia can learn from the lessons of other nations whose battle with scarcity has led them to diversify their water sources and adopt innovative capture techniques.

In Morocco, for example, steel poles, hung with black polymer nets, are harvesting condensed fog from the nearby Atlantic Ocean. The technology, designed by researchers at the Massachusetts Institute of Technology (MIT) School of Engineering in the United States, has been rolled out in countries as diverse as Eritrea, Chile and Yemen.

In Saudi Arabia the $9.4 billion desalination plant on the Persian Gulf covers miles of oceanfront real estate, and pumps more than seven million litres of potable water into Riyadh each day. Saudi Arabia leads the pack in the desalination race and now contributes 18% of the world's desalinated water.

And in New York, two alternatives to conventional rooftop surfaces are being tested — green roofs to absorb stormwater runoff and blue roofs to capture it. Water from blue roofs is being used to supply irrigation, cooling systems and a host of other non-potable uses.

While there are innovative water-wise projects abroad, there are also inspiring case studies closer to home. And these case studies are being found in unexpected places.

In Queensland's Nebo, for example, a large maintenance facility for coal trains is harvesting and recycling 85% of the water captured on-site, thanks to a range of clever strategies implemented by NDY. Rainwater is collected and treated using three independent filtration systems — and as a result is clean enough to drink. Wastewater from the sticky coal dump pit is treated and re-used in the locomotive washdown area. And an aerobic system treats all blackwater, which is then re-used for toilet flushing. Together, these initiatives ensure the facility can operate without being reliant on mains water.

Meanwhile, an upgrade to the Metricon Stadium at the Gold Coast in preparation for the Commonwealth Games has delivered water tanks with a total capacity of 650,000 litres. This is complemented

with a whole-of-membrane fabric roof which can harvest water at eye-watering rates. An impressive 100% of water collected can be used — for toilets, urinals, general washdown of stadium concourse and seating areas, as well as watering of the grounds.

And at Monash University, a precinct-wide stormwater harvesting system enables large amounts of water to be stored and distributed around the campus. More than 10.6 billion litres of water are used each year for irrigation and toilet flushing, but 93% comes from the stormwater harvesting system.

Without water, there is no life. Without water, there can be no cities. When we envisage our nation in 20, 50, 100 years' time, we must imagine an urban water network where no drop is wasted. Achieving this goal may be difficult, but if we scale up our successes, diversify our sources and keep our water clean and close to home, Australia will be well on its way to a future that's water secure.

Norman Disney & Young
www.ndy.com

**Tony Arnel is the global director of sustainability at engineering consultancy Norman Disney & Young and works worldwide across all NDY offices and market sectors. He is the company's key strategist for Sustainability.*

Recycling food waste leads to smooth sailing for yacht club

The Royal Prince Alfred Yacht Club (RPAYC) used a Bin Trim rebate from the NSW Environment Protection Authority (EPA) to purchase a worm farm that will divert 5.25 tonnes of food waste from landfill each year.

RPAYC is a yacht racing and sailing club based in Pittwater on Sydney's Northern Beaches. Situated on 17 hectares of land, the club offers year-round services and activities for members. As a 5 Gold Anchor marina committed to continually improving its service, and with effective plastic and glass recycling already in place, the club was keen to identify other waste management areas that could be improved.

As the RPAYC was considering options for broader recycling measures, a Bin Trim assessor visited the club and suggested participating in the NSW EPA's Bin Trim program. Through the program, eligible businesses that employ between one and 199 employees can access a free waste assessment and a financial rebate from $1000 to $50,000 to help with the cost of purchasing recycling equipment.

The Bin Trim assessor helped the club complete a step-by-step assessment to clarify its waste collection, separation and management process in order to identify any gaps. Food waste was identified as an area where substantial improvements could be made; it was estimated that between 600 and 1000 litres of food waste from the club's restaurant was being sent to landfill each week.

Image credit: Pauline Coppin, NSW EPA.

The assessor assisted the club in applying for a Bin Trim rebate to help with the cost of purchasing a commercial-scale worm farm to manage kitchen waste. The application was successful, with the club awarded a $1285 rebate.

Approximately 90% of the club's kitchen waste is now recycled through the new worm farm and then re-used on the extensive club gardens as a fertiliser. The gardener collects the castings from the worm farm once a week to disperse across the club's 17 hectares of land, delivering positive results for the club and the gardens.

Club management has also found that the Bin Trim program delivered substantial results through applying small changes. This has led to greater staff interest and engagement in recycling, both at work and at home.

"The Bin Trim program has definitely increased awareness about recycling amongst staff and motivated us all to take action individually," said RPAYC Head Chef Steve Proctor. "In a sense the recycling improvements here at the club are rubbing off, and we're taking those changes home as well."

In 12 months the club will review its waste bin sizes, potentially leading to a reduction in waste collection costs.

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Looking Forward VEGA

Saving water in Perth's fast-growing suburb

As the population booms in Perth's outer suburbs, future-proofing new parks and buildings from tighter water restrictions is becoming one of local government's greatest challenges.

WA's capital is facing a drier climate. Its football grounds and cricket fields all need watering but the prospect of tighter water restrictions means innovative solutions are required by local governments.

In the City of Swan's growth corridor, about 20 km north-east of Perth, the struggle between providing community facilities and conserving water is particularly noticeable.

The population of one of the City's (and Australia's) fastest growing suburbs — Ellenbrook — spiked from about 14,000 residents in 2006 to more than 40,000 in 2016. Similar growth is expected in new subdivisions over the next decade too, presenting the City of Swan with further challenges.

Several years ago, the City needed a solution to provide playing fields for the Ellenbrook district. Faced with the obstacles of limited land, the exploding population and no water allocation, the City needed an innovative solution to secure recreational space.

Mayor Mick Wainwright said research determined traditional grass turf would simply not cope with the future wear and tear caused by the burgeoning community, whereas synthetic turf could handle three times the use.

"We proceeded to build the largest synthetic playing surface in the southern hemisphere," he said.

"Not only can the rectangular synthetic surface handle a higher turnover of teams, the watering and overall cost is lower than natural turf."

As many council areas face the triple threat of water restrictions, increasing population and demand for recreational facilities, City of Swan's new Ellenbrook Sports Hub is a paradigm shift.

Using synthetic turf saves about 35,000 kL of water a year — equivalent to 14 Olympic-size swimming pools.

The four synthetic soccer fields opened in September 2016 and are adaptable to five-a-side futsal, small sided AFL, touch rugby and ultimate Frisbee — set to service the community for decades to come.

Meanwhile, population growth necessitates the construction of more community centres and pavilions.

The City of Swan is trialling new water storage techniques in community buildings built in new suburbs such as Aveley, where underground and external tank systems supply most of the facilities water needs.

"While urban expansion presents environmental challenges, it also presents opportunities to trial new water and energy-saving technologies," Mayor Wainwright said.

"There is so much opportunity in suburbia to iron out the best ways to approach rainwater harvesting and tailoring that to the use of the building."

"The benefit of these systems is not always economic, but as water restrictions become tighter, it becomes a moral decision for local governments to implement these technologies."

"We look forward to trialling more technologies and investigating their most efficient application."

City of Swan
www.swan.wa.gov.au

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Turning waste streams into energy

There has been a major growth phase in processed engineered fuel (PEF) for cement kilns, according to ResourceCo, an international leader in resource recovery and advanced manufacturing.

ResourceCo Alternative Fuels Chief Executive Officer Ben Sawley said the company currently manufactures 250,000 tonnes of alternative fuels annually and there is tremendous opportunity to increase this volume significantly in Australia.

"Fuel diversification of cement kilns is the driver for our customers, as it reduces fuel price risk as well as the kiln's environmental footprint," Sawley said.

"Kilns that have introduced an alternative fuel mix among their energy intake have done relatively well in comparison to others that have been locked into purely fossil fuels, particularly in recent months where coal and gas prices have increased significantly.

"We are seeing a turning point in the cement industry in the take-up of alternative fuels and the importance of having diversification in energy."

ResourceCo has a Joint Venture that supplies an Australian cement manufacturer with nearly 100,000 tonnes per year of processed engineered fuel (PEF) to operate its kiln. This equates to a huge saving in the consumption of traditional fossil fuel usage.

"We are certainly focused on providing an alternative energy use to cement kilns to displace fossil fuels, and while Australia has four cement kilns, we have earmarked Asia as a major area for potential growth," Sawley said.

"South-East Asia has well over 100 cement kilns and there are countless more across China. Most of these kilns are yet to be tapped into."

ResourceCo has taken the group's leading alternative fuel technology directly into the Asian markets and is operating in Malaysia, Singapore and the Philippines.

The company's state-of-the-art PEF manufacturing plant in Ipoh, Malaysia, has 100,000 tonne-plus capacity and supplies the world's largest cement manufacturer, amongst others. These partnerships are reducing the reliance on fossil fuels in the production of cement.

> **"We are seeing a turning point in the cement industry in the take-up of alternative fuels and the importance of having diversification in energy.**

Global consumption of PEF at cement kilns is estimated to be around 40 million tonnes per annum, and while high rates of thermal substitution of PEF for fossil fuels is achieved, particularly in Northern Europe, it is relatively easy to produce a 25 to 30% energy substitution.

"Some kilns in northern Europe run at 90% of their energy requirement from alternative fuels, and while this is extremely rare, up to 50% is definitely doable," Sawley said.

"In South-East Asia, the substitution rate is estimated at less than 5%, so the opportunity is huge regarding what we can do there to turn relevant waste streams into PEF," he said.

"The advantage of working with cement kilns is that their process naturally removes all pollutants from the combustion emissions and the ash left over is incorporated into the cement product itself. They are the perfect alternative-burning facility. They're already established, which means you don't have to build a new specialised facility to take the alternative fuel. All that is required is a feed system and the right blend of PEF to complement the cement facility's processes.

"Typically, we need to secure a long-term contract with a cement kiln to ensure we can source the fuel to supply them. We can also look at co-investing in the feed system to the cement maker."

The key to making a PEF business work:

- Secure the back-end and front-end of the supply chain.
- Ensure the raw material streams are suitable to produce the specified fuel.
- Design the processing plant to suit the incoming and outgoing materials.
- Ensure that the fuel is going to be economically and technically suitable for the customer.

PEF can fit in easily with the existing waste supply. The only difference is that waste generators and collectors deliver their suitable waste to the PEF plant rather than landfill.

"The number one competitor to this industry is landfill. We think there is a great opportunity to put more and more waste materials into energy or fuel which can be converted into energy."

ResourceCo is extending its network in South-East Asia to direct relevant waste streams away from landfill.

"Not only do we have geographic diversification, but we provide a number of options to turn waste streams into PEF by either delivering wastes direct to an established PEF plant, build a PEF plant on a customer's site and operate it for them, or market PEF produced by a customer to our cement kiln network."

ResourceCo's Asia operations also intersect with its subsidiary Tyrecycle, which is claimed to be the biggest recycler of end-of-life (EOL) tyres and conveyor belts in Australia.

Tyrecycle converts rubber waste into quality tyre-derived fuel (TDF) and other value-added products, and has well-developed overseas infrastructure to service direct trading relationships with various cement kiln operators in the region.

ResourceCo has grown from a one-person operation in 1992 to over 400 staff operating in 21 locations in Australia and South-East Asia. ResourceCo has long-term partnerships with multinational groups such as SUEZ and Lafarge, and in Australia with Adelaide Brighton Cement. From its early days as a concrete crushing business, ResourceCo has expanded as an integrated resource recovery business and in 1998 developed a dedicated mixed waste processing operation that resulted in recycling concrete and asphalt. Working with Adelaide Brighton Ltd, ResourceCo developed Australia's first PEF manufacturing plant in 2006.

The company recycles more than 95% of incoming materials while processing over two million tonnes of materials annually.

ResourceCo Pty Ltd

www.resourceco.com.au

Lismore City Council solves sludge-pump choking problems

Lismore City Council was having chronic problems with its digester pump choking at its South Lismore sewage treatment plant.

The pump would choke on a daily basis during its job of turning over the digester, according to Matt Potter and Brad Hampson at the plant. They were using a Gorman-Rupp T3A3S-B self-priming sewage pump, but the sheer number of rags made it very difficult for even this excellent solids handling pump to pass all the rags, all the time.

Over the years, they tried different wear plates (even from different companies), but the best they could achieve was to limit choking to once or twice per week by installing one of Gorman-Rupp's self-cleaning wear plates.

The council was then told of Gorman-Rupp's new Eradicator Solids Management System and wanted to try it. The Eradicator system features an aggressive self-cleaning wear plate incorporating a number of notches and grooves, as well as a patent-pending lacerating tooth that helps break up stringy materials (such as rags), scrape them off the impeller vanes and pass them through the pump — all without impacting performance or interrupting service. A special cover plate with the system also includes a patented lightweight inspection cover that can easily be removed, if necessary, to inspect pump internals.

The Eradicator system is available on all Gorman-Rupp Super T Series pump models, so the range can achieve flows from 5 L/s through to 150 L/s and deliver heads to 40 metres, all while working on suction lifts to 7.6 m. Because they are self-priming pumps, the pumps can be located at ground level, giving operators easy and safe access to the pumps for monitoring and/or service, unlike submersible pumps which require cranes and several operators to access. And wet well lids stay closed with self-priming pumps so that operators are not exposed to falling into the wet well when anything needs to be done with the pumps. Clearance adjustments, oil changes and general inspections only take minutes, which adds up to massive savings in time over the life of the pump.

As the new system is available as an upgrade kit for existing Super T, Lismore council installed one of these into its existing Gorman-Rupp T3. The pump then ran for 3 months without a single choke. In the same period, they would have expected to have between 12 and 24 chokes. Potter, Hampson and their colleagues at the council were very pleased with the result.

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MANAGING ASSETS

When TRILITY considered developing a new water treatment plant near Perth in 2010, its team of executives and number crunchers sat down in the Company's Adelaide head office to assess a proposed 37-year contract to design, build and operate the 240 ML per day facility.

Yet the Company's Asset Manager, Matt Gulliver, was thousands of kilometres away, walking through the West Australian bushland. The manager whose job it is to determine how much TRILITY and its partners should bid to build, refurbish and maintain a project serving WA's parched Goldfields region was in hiking boots, shorts and a hat trekking along a 5km section of pipeline fundamental to the operation of the WA facility.

"I needed to see the asset," Gulliver says today. "I needed to get a feel for it well beyond a desktop review and understand what we were committing to before we submitted the tender.

"Walking the length of that section of water pipeline not only helped me shape our offer but I also found a leak which I duly reported to the prospective client before heading back to Adelaide."

TRILITY would go on to lead a consortium to deliver the $300 million project and, seven years on, the facility is running at optimum levels. For Matt Gulliver, building an understanding about the full life cycle of a facility and its operation is at the core of the asset management challenge.

"We have challenges at the design and procurement stage across most projects, primarily around whole of life costing," he says. "It's not widely appreciated that the majority of the asset's cost over its life is set as soon as the designer draws the asset on a drawing.

"Another major challenge is at the end of the asset's life, where decommissioned assets need to be maintained to keep them safe and there's usually no money or interest in this.

"Or the many aging assets such as the majority of Australia's water pipelines that were installed in the 70's and 80's and are now nearing end of life.

"And then there are all sorts of challenges in-between.

"At its core, asset management is about looking after assets to ensure that they perform as required. TRILITY must know what assets it has, where they are, what condition they are in, how they are performing and have clear and costed plans for their future that include both maintenance plans and renewal or refurbishment plans.

"Ensuring that the asset performs to the required service level is key and doing that at the lowest life cycle cost is now imperative," Gulliver says. "Gone are the days of just following the original equipment manufacturer (OEM) manual, or creating preventive maintenance tasks as knee jerk reactions to issues or budgeting purely based on historical costs.

"A robust, transparent and repeatable process is the expectation — from the client to the regulator. And the customer wants the lowest cost service with the highest reliability and quality."

Gulliver spends a week each month out on TRILITY sites. The Company's operations extend across Australia and into New Zealand, and it runs an Asset Management Team out of regional locations as well as head office in Adelaide. Sites in Berri in South Australia, Townsville in Queensland and Ballarat in Victoria deliver asset management services to the company's operations nationally.

Then there are the tools that are needed to deliver the "robust, transparent and repeatable process" Gulliver and his

"We now have a MOMS refresh underway and a number of machine learning (ML) projects underway and we're now able to 'read the waves', choose which wave to 'catch', be 'paddling' so we're ahead of the 'wave' and not just 'riding' it or being 'wiped out'."

team oversee at TRILITY. New and improved asset management tools are being steadily integrated into day to day operations for TRILITY" — and he utilises a surfing analogy to describe the changes underway.

"The 'swell' around using big data, predictive analytics and the internet of things is really starting to grow," he says.

"TRILITY has been experimenting in this area for the past five years and has made solid advances in the last 18 months. The advance has come from a maturing in the 'swell' and its direction is better understood.

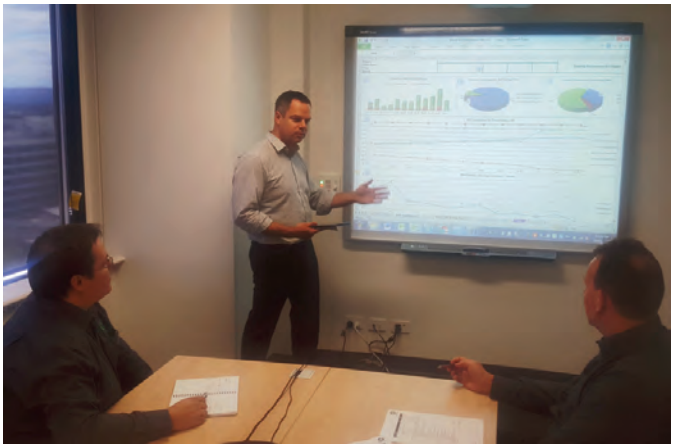
"TRILITY has readied itself by adding operational technology resources to asset management and investing resources into trialling different offerings in the manufacturing operations management system (MOMS), and machine learning (ML) space.

"We now have a MOMS refresh underway and a number of ML projects underway and we're now able to 'read the waves', choose which wave to 'catch', be 'paddling' so we're ahead of the 'wave' and not just 'riding' it or being 'wiped out'."

TRILITY's SAP system also plays a key role in daily business of the Asset Management Team. SAP was deployed across TRILITY in 2012 and Gulliver's team is seeing the benefits of the architecture behind modules such as Plant Maintenance including, in his words, "the right level of granularity of our data, as well as the right practices in the field".

"By linking purchase orders to work orders, we now have well over twice the amount of work order history," he says. "We also have good behaviours in terms of raising the right type of work order for the job."

The introduction of ISO55001 — the first ISO standard for asset management — enables companies to supersede previous standards. Gulliver says, "This is an important step forward for asset management professionals.



"There is now a benchmark to compare your asset management system to 'best practice'," he says. "Some commentators have written that ISO55001 will have ten times the impact of the quality standard, which is ISO9001.

"This analysis suggests that institutions such as banks and insurance companies will now ask your business to be accredited to receive lower premiums."

Gulliver says, "Key Performance Indicators (KPI's) have also been an important focus to ensure continuous improvement in asset management.

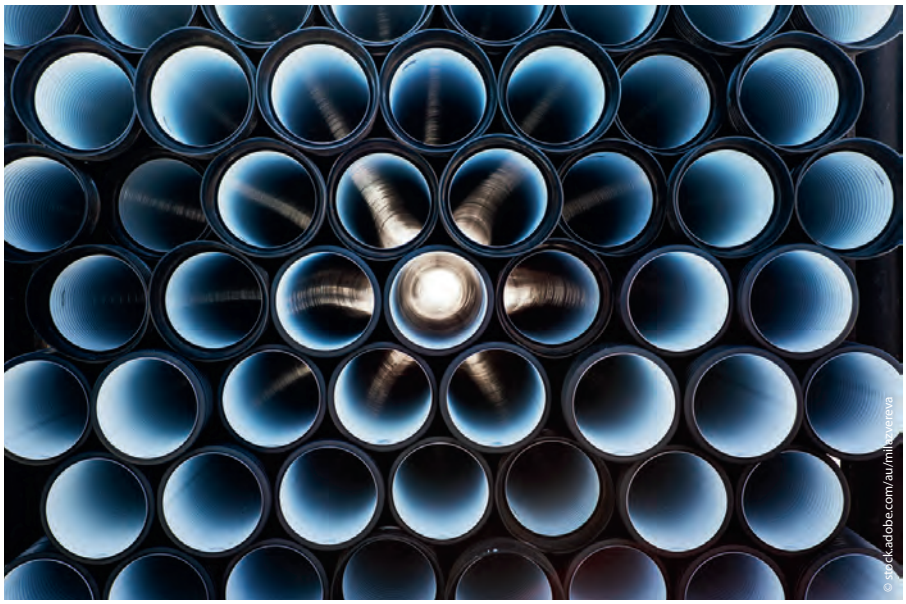
"Choosing the right KPI's to ring the right alarm bells and having the right data to be able to produce these KPI's is critical," he says. "Using the famous saying **'what is not measured is not improved'**, we measure and discuss these results regularly with all our teams around Australia.
"And, ultimately, we see the improvement."

TRILITY Pty Ltd
www.trility.com.au

Alternative models for funding water infrastructure

A new report from the Australian Water Association (AWA) looks at the current issues surrounding water infrastructure funding and considers ways in which new funding models present serious business opportunities for investors.

AWA CEO Jonathan McKeown said it is going to be crucial for the sector to look at alternative ways to pay for water infrastructure projects if it is to meet Australia's growing needs. He stated, "Unprecedented burdens on existing infrastructure caused by urbanisation, climate change and our booming population means current funding models have simply not been able to keep up."



In the discussion paper 'Alternative models for financing water infrastructure', written with ANZ and law firm Allens, the association recognises increased synergies between our water infrastructure needs and the capacity of private sector finance. Utilities have been forced to increase their borrowings in recent years, with consequential impacts on their commercial performance and ability to take on additional debt.

"As the need to upgrade water infrastructure becomes increasingly apparent, so does the need to understand the funding implications and options," said Katharine Tapley, head of Sustainable Finance, ANZ. "The models outlined in our report shed light on some of the viable alternatives available to the government, private sector and community alike."

The discussion paper presents a number of financing models for water infrastructure projects, as well as case studies on how these models have been used already and their application to the water industry. The paper also identifies new opportunities for developments that can meet future needs.

"Alternative financing models that decrease the cost of capital to utilities, particularly in our regional and rural areas, can lead to more affordable projects and reduce costs on water users," said McKeown. "It will also reduce pressure on the balance sheets of state governments. Most importantly, these alternative sources of finance will enable water infrastructure projects to proceed to meet the requirements of our expanding population."

"Investors want surety and long-term vision," added Kate Axup, a partner at Allens. "Innovative funding models such as those proposed in our report balance the needs of investors, governments and the community ensuring new, sustainable water infrastructure into the future."

AWA

www.awa.asn.au

Modelling best placement of green infrastructure to reduce urban heat

A numerical tool for designing Water Sensitive Cities — a concept closely aligned with water wise cities — is creating demonstrated impact in places like the City of Unley, Adelaide.

Unley faced a problem common to many urban communities. How can planners and utilities best configure their implementation of green infrastructure — elements like trees in streetscapes, vegetated green walls and roofs, and technology for recycling stormwater?

For Unley, a specific question centred on mitigating rising heat in its major streets, reflecting that familiar city experience in which hard impervious surfaces retain the day's heat to create 'islands' that remain hotter than surrounding areas. Greening streetscapes can powerfully cool those same concreted environments — a specific benefit for which communities are willing to pay. In fact, households in

Melbourne and Sydney are willing to pay between $47–81/year for cooler summer temperatures according to research by the Cooperative Research Centre for Water Sensitive Cities (CRCWSC).

But deploying green innovations effectively requires data on where and how implementations will improve temperatures — and by how much. This has traditionally been an information gap, with some planners recently resorting to drone flyovers and state-of-the-art thermal imaging equipment. Despite the expense of such methods (which can cost $60K for just 4 flight hours), the data from aerial surveys are more detailed than required, and may not represent how the surveyed area's temperature behaves over time.

Now, a new tool — part of the Water Sensitive Cities Modelling Toolkit — allows planners to replace or complement drone data by drawing on recent advances in urban heat modelling.

Designed by the CRCWSC, the evidence-based Toolkit provides a range of tools for quantifying the benefits of installing green infrastructure in a particular context. Importantly, it empowers users to be more strategic when guiding their planning and decision-making.

"The tool lets you map out a region so that you can pick areas [for implementing green infrastructure] that make sense," explained CRCWSC researcher Dr Peter Bach. "You can use it to validate your existing drone data to determine if they are representative. And you can construct alternative scenarios — like 'What happens under X, Y, or Z plans for a particular area?'

"And with the Toolkit's microclimate module, the Unley case study also showed that we can really efficiently input local data to simulate heat mapping, and to visualise different strategies for mitigating heat."

For professionals such as Mellissa Bradley from Water Sensitive SA, the tool is well timed. She is dealing with challenges like 'underperforming asphalt' and needs innovative approaches. "The true value of the Toolkit is in its cost-effectiveness, and its capacity to let users explore and compare scenarios," said Bradley.

For councils and water utilities, the other big benefit is that the heat models provide an invaluable communications aid. Maps of heat across streetscapes, and visuals of 'before-and-after' scenarios, enable people to 'see' the outcomes of infrastructure work and participate in discussions without needing to engage with the technical details.

But with integrated urban water management at its core, the Toolkit has intuitive benefits for utilities as well as governments.

It supports needs ranging from planning at regional scales to quantifying the benefits of harvesting and recycling water sources like stormwater as part of a portfolio of supply options.

Those linkages recognise the inter-agency value of greening cities. Not only can organisations such as councils and water utilities benefit individually from more powerful ways to strategically plan their projects, but the new generation of tools — such as the Toolkit — increasingly enable councils, utilities and communities of water wise cities to band together to achieve benefits for livability, cooling, wellbeing, water and irrigation.

For more on the Water Sensitive Cities Toolkit, visit: https://watersensitivecities.org.au/solutions/water-sensitive-cities-toolkit/.

CRC for Water Sensitive Cities
www.watersensitivecities.org.au

Solar success for Victorian bulb farm

P Aker Flowerbulbs is a bulb farm located at Silvan, Victoria, in the rich volcanic soil area of the Dandenong Ranges. Energy is one of the major overheads of the farm, due to the need to power different cool rooms at a precise temperature depending on the species of bulb.

"We only started in Australia in the 1980s and sell tulips, lilies, irises, gladioli, hyacinths, daffodils and other bulbs," said the company's managing director, Matt Blom. "Our cool rooms have to maintain a precise temperature ranging from 30+ to -1.5˚C, depending on the species.

"The purpose of the temperature control is to put the bulb to sleep so that our customer, the flower grower, can produce flowers all year round."

After averaging $60,000 a year on energy, the company recruited energy management company AEES Group to design and install a solar system to help reduce costs. Richard Martin, AEES Group managing director, said the company started on the design by taking the solar usage interval data which is now available from the smart meters that have been installed throughout Victoria.

"We used this to determine the size of the solar system that would be required and the economic justification for the capital cost," said Martin. "The data allowed us to do an accurate cost-benefit analysis.

"We recommended a system with 231 Trina Smart panels coupled with Tigo DC optimisation as we have always received high yields from this system with remote live time monitoring, which allows us to provide timely maintenance and quickly detect any problems.

"The monitoring results are also beamed to the head office of Aker Flowerbulbs in Holland and they have been so impressed that they have moved to install their own solar system based on the Australian experience," he said.

Blom said P Aker Flowerbulbs is now on track to substantially reduce its energy costs, relying on solar power during the day and off-peak grid power during the night. "But even so, we are currently exploring the economics of the use of batteries in conjunction with our solar," he said.

"We expect to save the capital cost of the system in five years, with savings of $13,497, or 32%, in year one and continuing to $176,010, or 31%, in year 10."

Trina Solar
www.trinasolar.com.au

From coal to biomass: converting a power plant

Britain's EPH Lynemouth Power has awarded Emerson a contract to help convert the 44-year-old coal-fired Lynemouth Power Station to a biomass-fuelled power plant. When the conversion is complete in late 2017, the plant will be fuelled by approximately 1.4 million tons of wood waste per year, supplying the national grid with up to 390 MW of low-carbon electricity.

As main automation contractor and main electrical contractor, Emerson will be responsible for helping the project come online within budget and on time. This includes responsibility for demolition, engineering, installation, start-up, commissioning and coordination of work among multiple suppliers and contractors.

Emerson offers a single integrated automation platform for all applications — turbine, boiler, fuel handling and balance-of-plant processes, as well as electrical systems. This capability, along with the company's project management expertise, was critical in EPH Lynemouth Power's decision to select Emerson and its Ovation distributed control system for this project.

"Relying on a single supplier and a single technology platform for both the automation and electrical scope provides our client a number of benefits," said Bob Yeager, president, Power & Water, Emerson Automation Solutions. "From a planning perspective, having a single interface and contract for design, engineering and delivery improves overall project efficiency. On the operational side, utilising one technology platform will simplify plant operation and enhance plant performance on an ongoing basis."

According to Yeager, the demand for biomass-fuelled power is growing as utilities diversify their generating portfolio to meet evolving environmental mandates. Unfortunately, biomass power plants are challenging to operate because the moisture content of biomass fuels can vary, having a negative impact on plant performance. Technology integrated into Ovation continuously monitors fuel for moisture content, adjusting combustion air as necessary to improve plant efficiency and reduce maintenance costs.

"We are helping the industry meet its targets by seamlessly bridging the automation and electrical aspects of these projects, resulting in a total solution that has a positive impact on the plant's commercial and operational success," said Yeager.

Emerson Automation Solutions
www.emersonprocess.com.au

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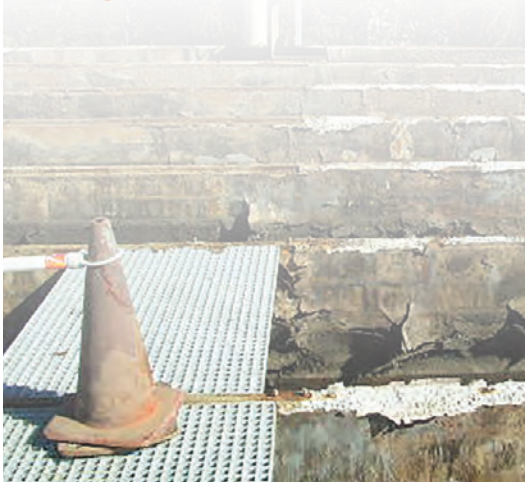

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Crafting a community

Marrickville housing development gets underway

Lauren Davis

Real estate group Mirvac has unveiled its hotly anticipated plans for Marrick & Co, a residential development set to be located in the heart of Sydney's Inner West.

It all started back in 1990, when Marrickville Council (now Inner West Council) bought the site of the recently closed Marrickville Hospital. Council had always planned to turn the increasingly dilapidated site into a library and community hub, funded by the redevelopment of the remainder of the site into housing. It was not until 2012, however, after many years of community consultation, that a library design competition was held, with BVN Architecture emerging as the winner.

Three years later Mirvac came into the picture, proposing to develop over 220 apartments and terrace homes on the site. The group successfully won the tender to deliver both the housing project and the library, as well as the preservation and restoration of heritage buildings including the then 118-year-old hospital (as part of the library) and nurses' quarters as part of the housing development.

Marrick & Co, the proposed name for the new site, would serve as a multipurpose development, featuring the library and community hub, a variety of housing options (including nine affordable units for council), a public park, playground areas and more. The aesthetic was inspired by the industrial heritage of Marrickville along with the 'pitched roof' design of the future library, created by BVN. According to Ksenia Totoeva, from the design team at TZG Architects, the varied skyline creates a playful look which reflects the residential feel of Marrickville.

"The buildings have their own unique design aesthetic drawn from the diversity of building styles in Marrickville," noted Tim Greer, owner of TZG Architects. "The facade features a series of chevrons which articulate the building by echoing the roof form of the surrounding buildings and library roof.

> We've taken the elements on the site, the public access, the framework of the library, the access to solar… and actually crafted a new habitat.

"When we designed the building, we deliberately set out not to design a perfect, seamless, perfectly controlled building," continued Greer. "We wanted to make it out of a series of little buildings, if you like, with diverse elements. So part of the fun of the architecture was bringing these different motifs together."

The other aspect the designers focused on, said Totoeva, was the use of outdoor space. The public park, for instance, will be a multi-function area that can utilised by council for events such as outdoor cinema screenings and market stalls. TZG and Mirvac even agreed to remove an entire building in order to create a brand new space called The Common — a tree-lined lawn area where the public and private domains overlap.

"Being at the centre of the site means that the buildings around the perimeter open on to a beautiful landscaped space, which is not only about enjoyment but also has a role to play in the collection of rainwater as part of the water filtration for the site," said Greer.

"It's very unusual for an apartment building, cos it has these really significant pieces of outdoor space that are passive and utterly recreational."

Residents will enjoy access to a shared street library, a community kitchen garden and tool shed, and a roof terrace with BBQ facilities. Other sustainability features will include electric vehicle charging facilities, a 'green switch' which turns off all appliances except the essentials, rainwater recycling and an entry wall made of recycled brick. The library, meanwhile, will feature FSC-certified white mahogany, skylights and natural ventilation, with a green wall outside to keep out noise and pollution.

"We've approached this almost like an ecologist, a renewal ecologist, approaches a damaged environment," said Kim Bazeley, a senior architect at Mirvac Design. "We've taken the elements on the site, the public access, the framework of the library, the access to solar… and actually crafted a new habitat."

Marrick & Co is the first residential project in NSW, and the largest residential development of its type, to receive One Planet Living Community certification from Bioregional Australia. Incorporating principles such as culture and community as well as zero waste and sustainable water, One Planet Living is an international framework that helps people lead happy and healthy lives within the Earth's finite resources.

"The future of our cities is in learning how to develop communities that have high living standards and quality of life, whilst at the same time prospering from the resource limits of our one and only planet," said Suzette Jackson, executive director of Bioregional Australia. "Bioregional Australia Foundation is very excited by the commitment of Mirvac to this journey."

With construction set to begin mid-2017 and completion expected in 2019, all those involved in the project agree that its success so far is down to one key factor: collaboration.

"The collaborative way in which both council and Mirvac have approached this project is a game changer for future development," said Mirvac's general manager of residential development NSW & major projects, Toby Long.

"The needs and wants of the community have been put first and foremost in the design and provision of both public and private amenity. This project reinforces Mirvac's purpose to reimagine urban life."

A central nervous system for buildings

Helmut Macht, CTO, Siemens Building Technologies

Networked, energy self-sufficient, adaptable and, above all, smart — that is what the building of the future should be. Rapidly advancing digitalisation in building technology will soon make this vision a reality.

Whether it is ICT, the automobile industry, media, entertainment, finance or pharmaceuticals, the digital transformation has spread to virtually every sector and begun to change markets with new competitors and business models. Now digitalisation is taking hold in building technology, fundamentally changing the way buildings will be planned, constructed, used and, ultimately, managed.

The potential offered by digitalisation is enormous even if you look at nothing but energy consumption: buildings not only account for more than 40% of global energy consumption and a majority of all CO_2 emissions, they are also one of the largest expense items in a company's balance sheet. Operating costs make up almost 80% of the total costs across the entire life cycle. For this reason, efficient, automatic monitoring, as well as control of lighting, ventilation, heating and security systems, are important levers. In new construction, this has already become a reality. But the true revolution is taking place behind the scenes.

The digital twin

In contrast to today's practice of doing planning work while construction has already begun, Building Information Modelling (BIM) is centred on planning the entire building with all its disciplines all at once and then simulating, testing and, if needed, correcting it in a virtual data model. This makes it easy to eliminate errors and inconsistencies in the software — instead of having to do it at the construction site where it is a much more laborious process. In essence, the building is constructed twice: first on the computer (virtually) and then in the real world (physically). This is referred to as the 'digital twins'.

Since planning for the various disciplines takes place at the same time, it is possible to create coordinated multidiscipline solutions. In the past, this was difficult to achieve because of the project award practices in use. Virtual planning and the use of a common data model allows early verification even of detailed variants in order to optimise the building.

What impact does the choice of a specific type of facade have on the construction and investment costs as well as on maintenance, cleaning and user comfort later on? How does an additional door affect future evacuation scenarios, comfort and heating costs? If such questions can be answered before ground is broken, it becomes possible to make construction projects more cost effective, straightforward and sustainable and to operate buildings more safely, comfortably and efficiently.

In the past, end-to-end building information modelling failed because the technical requirements could not be met. Cloud computing — virtually unlimited computing power and storage capacity as well as uninterrupted availability of networks and end devices — has eliminated the obstacles that made implementation difficult before. At least in theory. Broad-based adoption is still hampered by the fragmentation of the various sectors encompassing many stakeholders with different interests. The companies and people who work on the individual processes or disciplines within a building have traditionally acted independently. The close coordination

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achieved through BIM is a novel concept and requires customised process steps and business models. Other limiting factors include the comparatively high purchase costs of suitable systems, a lack of standards and interfaces as well as the fact that only a few manufacturers to date have been able to provide BIM-compatible data for their components. In addition, current project award practices are such that 'digital' planning and simulation are typically neither budgeted for nor reflected in the fee schedules.

Nevertheless, an ever increasing number of public construction and infrastructure projects now require BIM, and at the EU level its introduction has already been decided.

Communicating and evaluating everything

Another cornerstone of digitalisation in building technology is the Internet of Things — the internetworking of machines, devices, components, sensors, actuators and other objects. This convergence between the real and the digital world is the foundation for connecting the different disciplines in a building and for creating new digital services and building models. Remote service solutions, for instance, make it possible to detect and correct component problems quickly and efficiently from virtually anywhere. Preventive maintenance concepts minimise downtimes because components are able to notify their manufacturer at the first sign of trouble — long before there is actual damage which would cause disruption. Today, business continuity is a vital factor in business planning.

Sensors, actuators and similar devices supply a wealth of valuable information, most of which remains unused. Intelligent evaluation using big data applications could combine these massive but unstructured amounts of data into meaningful performance indicators — in real time if needed. Smart algorithms evaluate trends and recognise patterns in user behaviour or consumption, thus enabling informed decisions, predictive strategies and continuous optimisation. This, together with sophisticated self-optimisation functions, gives buildings a central nervous system — making them smart.

Smart buildings increase productivity and save energy

Building users benefit from such building intelligence. Since the indoor environment is perfectly balanced in terms of lighting, air quality, temperature and humidity, they feel comfortable. This, in turn, has a positive impact on their productivity at work. In addition, smart buildings also have a positive effect on energy efficiency.


Image courtesy of Siemens

> **Smart buildings determine consumption as well as current and predictive user demand, control themselves and procure energy only when it is in adequate supply and available at a reasonable rate. This is how building intelligence will ultimately help stabilise the entire power grid.**

This aspect is becoming more important as the call for 'zero net energy buildings' is increasing at the European level. Smart buildings meet this demand because they do not simply consume energy, they also generate it using local systems such as photovoltaics, wind power or combined heat and power plants (CHP). This is what is known as distributed generation. Any excess energy generated by the building is fed into a general power grid or stored locally, for example in electric vehicles connected to the building and used as temporary batteries while they are not being driven.

Smart buildings determine consumption as well as current and predictive user demand, control themselves and procure energy only when it is in adequate supply and available at a reasonable rate. This is how building intelligence will ultimately help stabilise the entire power grid. Today's cloud-based building and energy management platforms from Siemens are important approaches towards that goal.

The evolution of buildings

Digitalisation will take buildings into a new dimension in terms of efficiency, security and comfort. Because sensors are everywhere and the data they supply is evaluated intelligently, buildings will become dynamic ecosystems that respond intelligently to their environment and leverage their benefits over the long term in conjunction with other buildings and infrastructures ('smart grids').

The digital transformation in building technology will bring about a paradigm shift for the entire industry: it will lead to new and changing business models. Software will become a central factor; openness and transparency will be key; closed and proprietary systems will be big losers. This transformation process will lead to opportunities that can only flourish in the digital world. However, new business models have already begun to change the rules of the game and have the potential to shift the balance of power in the marketplace. As a result, classic competitive situations will give way to more complex constellations where, through a network of partnerships and alliances, companies are interconnected in ecosystems but at the same time act as competitors in the market. It also means that partnerships between traditional industrial enterprises and large IT players will play a much more significant role. The alliance between Siemens and IBM is a targeted response to this development.

For further information on the Building Technologies Division, visit www.siemens.com/buildingtechnologies.

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Advanced oxidation process for taste and odour removal

K-Water owns and operates the Sung-Nam Water Treatment Plant (WTP) in Sung-Nam Metro-City, providing drinking water to Sung-Nam, Yong-in and Suwon City. It serves over 3 million people and a beverage industry filling over 45,000 bottles of drinking water per day.

Seasonal algal blooms cause taste and odour, leading to complaints

Seasonal algal blooms in the Han-River, the Sung-Nam WTP water source, produce elevated levels of taste and odour (T&O) compounds like geosmin and 2-MIB. These T&O compounds are difficult to remove and can only be eliminated through high-strength oxidation.

Difficult T&O compounds require advanced solutions

To assure the delivery of high-quality water, South Korea invested over US$70 billion to build additional advanced water treatment facilities utilising advanced oxidation processes (AOPs) in combination with activated carbon filtration. An AOP system, combining ozone and hydrogen peroxide, would effectively remove these compounds and other contaminants of emerging concern, delivering dependable, high-quality water to residential and industrial customers.

To remove T&O compounds at Sung-Nam WTP, Xylem provided a complete AOP system. K-Water chose Wedeco because the brand offered reliable ozone generating technology, experience in engineering work and efficient mixing technology for operational savings. The Wedeco MiPro eco3 system oxidises taste and odour compounds, destroying them and other organic contaminants.

Ozone is produced by three Wedeco PDO 1000 ozone generators, with a total capacity of 51 kg ozone per hour, fed with liquid oxygen. The ozone feed is combined with hydrogen peroxide to form hydroxyl radicals — highly effective oxidising agents and the key to T&O destruction. Xylem also provided the underground hydrogen peroxide storage and the delivery system that efficiently mixes the ozone and hydrogen peroxide via two DN 1000 diameter ozone injection lines. Following injection, the water flows through two separate concrete contact tanks for reaction and degassing.

Taste and odour complaints eliminated

The reliable and efficient Wedeco ozone generating technology, as well as the outstanding engineering work done by the Xylem team, enabled K-Water to supply high-quality water to its customers, regardless of the season. Highly efficient ozone generation and mixing reduce operational expenditures. The Wedeco MiPro eco3 AOP system completely removes taste and odour causing compounds, eliminating customer complaints and delivering dependable quality.

End user:	K-Water
Flow rate:	34,390 m³/h
Ozone dose:	2 g/m³
H_2O_2 dose:	0.5 ppm
2-MIB removal:	0.5 LOG

Xylem
www.xylem.com

Solar power for the aged-care sector

With Perth's aged-care industry rapidly growing, energy consultancy Perdaman Advanced Energy (PAE) is helping the sector to become more financially and environmentally sustainable.

"While the aged-care industry as a whole doesn't have a reputation for being quick to embrace new technology, the move towards large-scale retirement and aged-care village developments means the industry is ripe for using clean energy like solar," said PAE Managing Director Dominic Da Cruz.

"Aged care is a growth sector in terms of investment and growth, so factors such as energy use become more important in the overall success of facilities."

Da Cruz said the company had just completed a $700,000 project for Southern Cross Care (SCC), installing solar energy systems across five of its retirement villages in the Perth metropolitan area. Generating approximately 657,940 kWh annually, the 328 kW of solar photovoltaic systems will provide between 19 and 30% of the electricity required by each site, reducing the carbon impact of the sites by 539 tonnes of CO_2 per year.

"We're now at an interesting time for the clean energy industry because production costs have lowered, making the use of solar much more appealing, especially for growth industries," said Da Cruz.

"The use of solar means lower power consumption costs, obvious benefits for the environment and greater social responsibility.

"The return on investment has improved significantly in the last few years." In addition to the SCC project, PAE has also assisted aged-care provider Bethanie with its electricity supply procurement, identifying steps the organisation can take to reduce its total portfolio electricity costs by over $250,000 annually. The company is additionally working on the development of a microgrid for a series of planned retirement villages, which would ensure lower-cost electricity for residents.

"Our aim is to engage other retirement and aged-care providers — not just in WA but across the country — and provide microgrid and solar energy solutions for as many villages as possible," said Da Cruz. PAE Chairman Vikas Rambal said there has "never been a more exciting time" to be involved in the clean-energy and aged-care sectors, "as both industries are experiencing unprecedented growth".

"We're confident this is just the beginning of revolutionising retirement villages and ensuring more aged-care operators follow suit by making the change to clean energy," said Rambal.

Perdaman Advanced Energy

perdamanadvancedenergy.com.au

Sports ground gets a solar-powered sewer

Solar technology is being used to power a pressure sewer system at the Truemans Road Recreation Reserve on the Mornington Peninsula, futureproofing sports club facilities for the local community and opening up new possibilities for the provision of wastewater facilities in remote areas.

The milestone comes courtesy of South East Water's Peninsula ECO project, which involves the connection of more than 16,500 properties on the Mornington Peninsula to an intelligent pressure sewer network that is able to cope with the region's peak season usage. It is also tackling the issue of failing septic tanks, which can cause pollution of groundwater and waterways.

With Mornington Peninsula Shire Council facing repairs to an ageing septic tank system serving the reserve's busy club rooms, South East Water saw an opportunity to showcase its solar-powered pressure sewer technology, which uses solar PV panels as the source of energy for the pressure sewer pump and OneBox controller. Flows are remotely managed on an individual property basis, removing peaks and troughs and enabling the use of smaller pipes.

The project successfully demonstrated that solar power supported by battery technology can be used to pump wastewater from the pressure sewer holding tank to the reticulated network and on to the water recycling plant, regardless of the time of day or season. For council, the result is a reliable, cost-effective reticulated sewer connection located off the electricity grid, minimising construction and operating costs and freeing up more space in the reserve.

Charlie Littlefair, General Manager for Asset Creation at South East Water, Councillor Antonella Celi of Mornington Peninsula Shire Council and Daniel Mulino MP, Member for Eastern Victoria, with members of the local soccer and cricket clubs that will benefit from the solar-powered sewer installation.

"The use of solar-powered, intelligent sewer technology will deliver significant benefits for residents of the Mornington Peninsula by extending access to pressure sewerage services," said Member for Eastern Victoria Daniel Mulino. "This cutting-edge technology will also result in gains for the environment as more equipment will be powered by renewable energy." Kevin Hutchings, managing director for South East Water, added that the project highlights the benefits that solar-powered pressure sewer technology can deliver in remote and rural communities.

"Areas with unreliable power, or no power at all, can still take advantage of pressure sewer technology and the environmental and cost benefits it delivers," he said. "It's an important step forward in improving the livability and sustainability of our communities."

South East Water Ltd
www.southeastwater.com.au

WASTEWATER SOLUTION MEETS STRINGENT REGULATIONS

The MEMCOR® MemPulse® MBR System achieves increased effluent quality while reducing energy requirements by 30-60% compared with conventional MBR aeration.

A low-maintenance wastewater solution using Australian technology and membranes was implemented at the North Head Sewage Treatment Plant (STP). This has resulted in a number of benefits including: improved water conservation and energy efficiency, higher quality output, lower operation/maintenance costs and minimal environmental impact.

Being one of the largest wastewater treatment facilities in Sydney, the North Head STP uses a large amount of potable water in the various processes of the plant.

Drought across Australia prompted the increasing implementation of recycled water regulations. With these tightened regulations in 2005, the Sydney Water Corporation (SWC) sought a viable alternative to the STP's water source. In addition to abiding by new restrictions, the plant's location within a national park necessitated a solution that would have minimal impact on its surroundings, while still producing the required quality and quantity of water.

A membrane bioreactor (MBR) system from Evoqua was chosen for the recycled water plant due to its ability to provide consistent high-quality water, within a small footprint at lower capital and operating costs. Additionally, MBR technology allows a high sludge concentration and replaces clarification with membrane filtration and therefore requires relatively low maintenance with cleaning conducted while the membrane modules remain in the tank. The result has little impact on the surrounding environment.

The MBR system comprises separate aerated, anoxic and solids separation zones. Filtrate from the membrane zone is dosed with sodium hypochlorite to provide a chlorine contact time (CT) of at least 30 mg/L min. The membranes are hollow fibre with a 0.04μm nominal pore size. Screened settled sewage is pumped into the anoxic zone and mixed with a mixed liquor return. This combination then passes into the aerobic zone. Pumps draw from the aerobic zone and deliver mixed liquor to the membranes in the membrane operating systems (MOS).

Advantages of the Evoqua MEMCOR® MBR system include:

- Smaller footprint and high water quality output
- Low maintenance system requirement
- System longevity and performance
- Long-term ability to meet regulatory criteria
- Environmentally sound investment

Using the MBR system, the plant's filtered water is drawn through membrane fibres by a suction pump to produce high-quality treated water. Simultaneously, the membranes are constantly scoured by an air/liquid mixture using MEMCOR® membrane bioreactor technology. Filtrate flows to chlorine contact tanks for disinfection before use in the treatment works, while mixed liquor recycles to the anoxic zone. Stable membrane performance is maintained by two types of routine cleaning. During weekly maintenance cleans, dilute hypochlorite is used as backwash. The three-monthly clean in place (CIP) is a much more rigorous cleaning process, involving removal of mixed liquor from the MOS, followed by washing.

In 2007, Sydney Water undertook a detailed study of the plant's MBR system to determine its effectiveness in removing microorganisms. The results were log reduction values (LRV) in the range of 4.7 – 6.2 for F-specific RNA bacteriophage, 5.4 – 6.7 for *E. coli* and 3.7 – 5.2 for somatic coliphage.

The MBR also reduced *Cryptosporidium*, *Giardia* and human enteric viruses present in the influent to below detectable levels. These log reduction values exceeded most of the LRV range given for membrane filtration in the 2007 Australian Guidelines for Water Recycling (AGWR), despite being limited by the number of microorganisms present in the influent, proving that the MBR system is an effective and beneficial solution for pathogen removal, as well as high quality water output.

Evoqua Water Technologies has been leading the membrane industry for over 30 years and has had a dedicated MBR team since 1995. Our MBR technology is currently in operation in over 150 municipal and industrial plants worldwide and has been proven to deliver greater effluent and productivity at a reduced life-cycle cost. The company's global R&D and sole membrane manufacturing facility is located in Windsor, NSW.

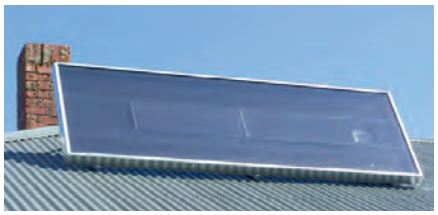
Solar heating enhances air quality in schools

A Massey University construction professor was recognised at the 2016 New Zealand Institute of Building Awards for her work on a solar heating project in New Zealand schools.

Professor Robyn Phipps was highly commended for the James Hardie Innovation Award for her leadership on the project, funded by the Health Research Council of New Zealand and Lottery Health. The aim of the initiative was to improve health and indoor climate in low-decile classrooms with a low-cost solar ventilation unit.

Nine out of 10 New Zealand classrooms are naturally ventilated through open windows. But due to the combination of a high density of occupants and a reliance on natural ventilation, it is challenging to provide these classrooms with adequate ventilation — and, consequently, an acceptable indoor air quality (IAQ) — during the winter months.

Conventional mechanical ventilation systems are capital- and energy-expensive, and are therefore not affordable for most NZ schools. Consequently, an alternative and affordable method for



increasing classroom ventilation rate in winter is needed. Professor Phipps's project found such a method in a solar air heater from Danish company SolarVenti.

Professor Phipps' research team installed roof-mounted SolarVenti solar air heater panels to heat fresh air and ventilate classrooms in Palmerston North, 150 km north of Wellington. The study involved 10 primary classrooms in winter 2013 and 12 primary school classrooms in winter 2014. One school was added in 2014 to the 2013 school sample. "As schools' operating hours coincide with peak daylight hours needed for solar heating, it is common sense to use free solar energy for heating the air," said Professor Phipps. "However, this is a novel concept in most countries."

Results suggested that classrooms with roof-mounted solar ventilation units require less conventional heating than adjacent classrooms, reducing the cost of heating in schools by up to 2.5 times. An air quality test, conducted in association with GNS Science, meanwhile found that the solar ventilation unit had a positive impact in decreasing PM10 (particulate matter smaller than 10 µm) concentrations by a factor of 1.5 in the treatment classroom.

The study is also using genomics to identify bacteria collected by swabs taken from the children's throats, which acts as a measure of the trial's success in reducing student illness. "Analysis of the data is ongoing," said Professor Phipps, "but it could be an effective tool in reducing incidents of *Streptococcus* within New Zealand schools."

Solair
www.solair.com.au

Agrifood company acquires a biogas generator

Agrifood company Rivalea is set to minimise its environmental footprint and reduce its energy consumption with an upcoming biogas generator installation.

Conventional power generates around only 35% of primary energy as usable electricity and the rest is released into the atmosphere. The biogas fuel used by the Rivalea system will be captured from the natural breakdown of pig manure and turn a waste product into an energy source.

The 2G Avus500plus unit, supplied by Evo Energy in a 12 m container module, offers combined heat and power technology that ensures energy efficiency of up to 90%. This means enormous cost savings as well as a massive reduction in carbon emissions.

The installation is expected to generate around 25% of the site's power per year, resulting in considerable energy cost savings for Rivalea. The project is estimated to offset over 28,000 per tonnes of CO_2 equivalent emissions, from grid and methane emissions avoided, every year.

2G, a manufacturer of biogas cogeneration systems for decentralised energy production, has commenced the Rivalea custom build in its main production site in Heek, Germany. The build is expected to be installed in early 2017.

"We are focused on initiatives that can improve our energy performance and reduce our environmental footprint," said Ian Longfield, Rivalea's senior environmental officer. "Using biogas for energy is a major opportunity for the company to achieve both."

Evo Energy Technologies
www.evoet.com.au

Ageing treatment plant gets a makeover

Thirty minutes north of the Sydney CBD, fringed by the Ku-ring-gai Chase National Park, you will find the Terrey Hills Golf and Country Club. A former quarry site, the club opened in 1994 and is today renowned for its natural bushland and close proximity to the city.

The course's superintendent, Stuart Gill, noted that the club is "committed to environmental best practices and caring for our natural assets, which includes treating our wastewater on-site for re-use on the course". So when the club realised that its ageing wastewater treatment plant was underperforming, it knew it had two options: build an entirely new plant or upgrade the existing one.

After reviewing a variety of technology platforms, the club decided to retrofit BioGill above-ground bioreactors to the existing plant. Developed by the Australian Government, BioGill technology is based on the premise of harnessing nature. Nano ceramic media, known as 'gills', provide

The BioGill treatment plant at the golf course.

an oxygen-rich habitat for microorganisms, enabling them to grow and flourish. This increases nutrient removal from wastewater, resulting in high-level reductions of BOD, COD and organics.

The plant uses six BioGill Towers and four custom-made submerged modules to treat 40,000 L/day of sewage from a residential estate and wastewater from the restaurant kitchen and toilets at the club. The treated wastewater is then re-used for subsurface irrigation within the estate.

"One of the main advantages, from my point of view, is that the BioGill system has reduced the levels of nitrogen coming into our irrigation water," said Gill. "Previously, we had a high nitrogen water source which played a major role in delivering more nitrogen to our turf surfaces without our control, causing a variety of playability and turf health issues, including puffy turf that is prone to mower scalping."

The plant is now fully compliant, with independent testing showing total nitrogen reduced from 40 mg/L to less than 8 mg/L, total BOD reductions from 340 mg/L to less than 10 mg/L and soluble BOD in the effluent reduced to undetectable levels. The plant is meeting all the treatment requirements from the local authorities.

"Our makeover approach has saved the club money, increased the treatment performance and extended the life of the existing plant," said Gill.

BioGill Operations Pty Limited
www.biogill.com

ROTARY SCREW COMPRESSORS

Kaeser Compressors has announced its latest generation DSD.3 series rotary screw compressors, featuring a high-performance Kaeser rotary screw compressor block equipped with the flow-optimised and energy-saving 'Sigma Profile' rotors.

The series boasts up to 6% better power performance compared with previous models. It includes a 'super premium efficiency' IE4 electric motor that complies with and exceeds prevailing Australian GEMS regulations for three-phase electric motors, while also contributing to lower energy costs. Transmission losses associated with gear or belt drive solutions are further eliminated with these 1:1 direct drive systems.

All models feature a built-in Sigma Control 2 industrial PC-based compressor controller that is responsible for dynamically adjusting the flow rate to match actual compressed air demand, thereby assuring further energy savings. Energy-saving control modes, variable communication interfaces for communication with centralised control systems and an SD card for update and backup are just some of the many features available on the Sigma Control 2.

Relevant information can be viewed at a glance from the easy-to-read display. RFID technology further assures secure login, meaning that service work and system changes to the compressor can only be performed by authorised personnel.

The sensor-controlled electronic thermal management (ETM) system dynamically controls the screw compressor block discharge temperature. The control valve actuator is controlled via signals from the Sigma Control 2 controller, which is coordinated with the oil cooler's speed-controlled fan. For the end user, avoiding high screw compressor block discharge temperatures leads to reduced energy consumption and potentially a longer fluid service life.

The units are available air- or water-cooled, with drive power 75 to 132 kW, working pressure 5.5 to 15 bar and free air deliveries from 3.6 to 25.45 m^3/min. They are available as a standard machine, with integrated refrigeration dryer and/or with Sigma Frequency Control.

Kaeser Compressors Australia
www.kaeser.com.au

Sludge screens help Sydney Water produce biogas from sewage

STRAINPRESS® technology from Hydroflux HUBER is playing a small but vital part in helping Sydney Water achieve its goal of making a number of improvements at its Malabar sewage treatment plant. One of the major benefits will be an improvement in the quality of biosolids produced.

The Malabar STP, which processes nearly half of the city's sewage through its primary treatment processes, produces about 33,000 tonnes a year of nutrient-rich biosolids — a soil conditioner/fertiliser which is used extensively to improve the fertility and structure of farming soils in NSW. These biosolids can produce green energy in the form of biogas.

"To increase the performance and efficiency of anaerobic digesters that process the biosolids, Hydroflux HUBER supplied the Malabar STP with three HUBER STRAINPRESS® sludge screens," said John Koumoukelis, a director of Hydroflux HUBER.

"These STRAINPRESS® sludge screens have been operating for six months and are successfully removing unwanted screenings such as plastics, fine rags and cotton buds from biosolids before it is processed in the anaerobic digesters. These materials would also block mixers, heat exchangers and sludge pumps that are installed within the digesters.

"These unwanted materials would otherwise accumulate within the digester, leading to a reduction in performance, maintenance headaches and a reduction in the amount of gas produced."

The STRAINPRESS® sludge screen is a pressure-fed inline system for screening any type of sludge, including highly viscous and greasy waste. Said to increase the reliability of downstream sludge treatment systems and to reduce maintenance requirements, it consists of inlet and screening zone, a press zone and a discharge section.

A pump presses the liquid through the screening zone and delivers it to further process steps or utilisation. The liquid is under pressure. The coarse material, which is retained on the screen surface, is stripped off by a coaxial screw and pushed through the press zone, where the material is extensively dewatered and compacted. The compacted material is pressed through a gap around a hydraulically operated pressure cone, which closes part of the pipe end and builds up counter pressure.

The system does not need any wash water, as backwashing of the screen is unnecessary. The perforation and design of the discharge section are individually adjusted to suit specific requirements and it is easy to integrate the product into the existing pipeline and automatic system.

"One of the major benefits of STRAINPRESS® is that it prolongs the need to put a digester offline for cleaning by many years — so the three sludge screens will make a major contribution to minimising the maintenance costs at the Malabar STP," said Koumoukelis.

Hydroflux HUBER Pty Ltd
www.hydrofluxhuber.com.au

Groundwater monitoring

Going beyond the environmental impact statement

Robin Ormerod, Managing Director, EnviroSuite

Before any large-scale construction project is approved, authorities are certain to require the preparation of a comprehensive environmental impact statement. Whether it's the extension of a major highway, building a new airport runway, or the development of a shipping port, all the ways in which the surrounding environment could be affected must be assessed.

Such impact statements are complex documents that need to incorporate data about a diverse range of factors. First, the environmental conditions that exist prior to the project's commencement must be carefully measured and documented. This could include everything from water quality in rivers and lakes, to soil quality, air quality and the health of any native birds and animals.

Once this has been completed, estimates must be made of the impact the completed project will have on this baseline data. Key questions need to be asked about how particular factors will change the environment and what steps can be taken to mitigate these changes. How will increased traffic levels on the new highway affect local bird life? What will rising aircraft numbers do to noise levels in the area? To what degree will extra shipping movements be detrimental to water quality and fishing areas?

Not a set-and-forget process

Unfortunately, for many large construction projects, after approval has been granted, their detailed environmental impact assessment report becomes little more than a document of record. The company agrees to adhere to any conditions of the construction approval relevant to the impact assessment, but then focus shifts to the project itself. Little attention is given to whether or not the estimated impacts occur, or are actually exceeded.

To overcome this it is important for construction companies to incorporate the ability to undertake ongoing monitoring into their project designs. During the construction phase, a network of sensors should be deployed that can collect data about key variables and feed this back to a central store for analysis.

The type, number and location of sensors will vary depending on the nature of the construction project. For example, when building the highway extension, some could be placed on light poles to monitor air quality and noise levels. Others could be embedded in the roadway itself to monitor traffic volumes at particular times of day.

In the airport project, sensors could be placed at the boundary of the facility to monitor the air quality and noise conditions being experienced in the surrounding environment. In the shipping port, they could be attached to moored buoys and detect changes in water quality and aquatic noise levels that could affect local fish stocks.

Ongoing data analysis

Data from these sensor networks can then be combined with data from other sources. This could include weather conditions and forecasts, feedback from local communities and incident reports, and operational data about the new facility itself.

Once all this data has been collected, sophisticated analysis tools can be put to work to identify trends. These can then be compared with the original impact statement to see exactly how the new facility is affecting the surrounding areas.

These tools can also undertake 'what if' scenario planning to determine how changes in external conditions could change the impact of the facility. For example, how could forecast heavy rain cause changes

in the port's water quality? To what degree will strong winds shift pollution from aircraft into a nearby residential area? Depending on the tools being used, many of the results can be provided in graphical form, and overlayed on maps of the area. This allows staff to clearly see the effects that operations are having and any problems that have been predicted before they occur.

Armed with these data-based predictions, operators can make informed decisions about their facility. By combining data from sensor networks with that created by the facility's infrastructure, a clear picture can be created of the impact that changes in operations has on the surrounding environment. Decisions can then be made in real time on whether factors need to be changed to improve conditions.

For example, a decision may be taken to divert traffic to a different motorway until atmospheric conditions change or noise levels can be brought back below those required by the original approval. Or perhaps shipping arrivals need to be halted during a forecast period of higher than normal rainfall.

Better outcomes for all parties

Access to real-time data on the impact of operations can also make it easier for operators to respond to complaints from external parties. Residents close to an airport may report higher than usual pollution or noise levels which can be quickly mapped against change in runway use. Reports from fishermen of falling catch numbers can be linked to a surge in shipping numbers.

> "Unfortunately, for many large construction projects, after approval has been granted, their detailed environmental impact assessment report becomes little more than a document of record.

By being better informed, thanks to access to real-time data from a variety of sources, operators of facilities can become much more proactive in the way in which they are managed.

By going beyond a 'set-and-forget' environmental impact statement, those responsible for the ongoing operation of new assets can be confident they are adhering to the set standards throughout its operational life. This will result in better outcomes for all parties involved.

EnviroSuite Pty Ltd

www.envirosuite.com

HYBRID SOLAR INVERTER

Redback Technologies has developed an integrated hardware and software system to capture, store and manage solar energy, giving residential and commercial users more control of their energy usage.

The Redback Smart Hybrid Inverter is a 4.6 kW inverter which can be paired with over 6 kW of solar array. The system allows for hybrid capability, offering an uninterrupted power supply and back-up power all in one. It is IP65 rated so it can be mounted either inside or outside the home.

The inverter is compatible with popular battery chemistries including LG Chem and Pylontech. It has an IP54 environmental protection rating and has been designed with a robust powder-coated cast aluminium casing. In addition to the lightweight, easy-to-install hardware, the product's software is hosted in Microsoft's Azure cloud platform, ensuring easy updates and upgrades as technology develops.

The system utilises the Internet of Things to ensure smart household appliances can be switched on and off at optimal times to get the best use of the power generated. It has the ability to use machine learning to gather intelligence over time, learning from user preferences as well as drawing data from external factors like the weather.

The inverter can be managed and monitored through the Redback app or portal, giving users and installers full visibility and control of the energy flow in a home.

Redback Technologies Australia
www.redbacktech.com

AIR VELOCITY TRANSMITTER

Dwyer Instruments' Series AVUL Air Velocity Transmitter is a versatile, duct-mount thermal anemometer that is suitable for measuring air velocity or volumetric airflow in VAV systems or building ducts. By measuring the heat loss between its two sensing elements as air flows, the product converts this reading into air velocity or volumetric airflow, without the potential for getting clogged like a pitot tube.

Accuracy ranges of 3% and 5% are available to suit a variety of needs. The optional BACnet or MODBUS Communication Protocol allows units to be daisy-chained together while providing access to all of the velocity and volumetric flow data, as well as additional information such as air temperature.

All models can be wired for 4 to 20 mA, 0 to 5/10 VDC output or simultaneous current and voltage output, providing a universal connection to PLCs and monitoring equipment. The optional, integral LCD or A-435-A portable remote display tool provides an additional and convenient way to locally monitor process values and configure the unit.

Onboard dip switches allow users to quickly and easily select the full scale velocity range, output type, engineering units and velocity or volumetric flow mode, saving time on configuration and installation.

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

GAS DETECTOR SOFTWARE

Industrial Scientific has introduced an updated data environment for users of its iNet Control hosted software for managing gas detector fleets. The product improves safety by presenting data more effectively to help manage people, hazards and equipment.

Compatible with desktop or handheld electronic devices, the user interface includes improved spacing, intuitive graphics and sleek colours and fonts, making it simple to review, report and analyse data. Data management upgrades improve response times and enhance data security and privacy.

The product provides visibility into the maintenance, usage and alarm data from gas detection equipment. The improved user interface adapts to any screen size, making it easier to use than ever before.

Current users of iNet Control will see the update automatically the next time they log in to the software.

Industrial Scientific Corporation
www.indsci.com

TOTAL CHLORINE ANALYSER

The TC-80 Total Chlorine Analyser from Electro-Chemical Devices (ECD) monitors total chlorine in drinking water, rinse water, cooling water and other freshwater samples, from 0.05–20 ppm chlorine as the standard range or 0.005–2 ppm with the low-range sensor.

The plug-and-play device incorporates a constant head flow control device, a pH sensor, a chlorine sensor and ECD's T80 analyser/transmitter mounted on a PVC panel.

The sensor is a three-electrode amperometric sensor with a gold cathode, silver halide anode and 304 SS counter electrode. The pH sensor provides compensation for samples between pH 4 and pH 12, eliminating the need for sample conditioning systems.

The flow controller maintains the optimum flow by the sensor over a range of incoming sample flow rates. The minimum flow required is 38 L/h and the maximum flow rate is 302 L/h, with the sample going to drain at atmospheric pressure.

The analyser is available with either 110–240 VAC or 24 VDC power. The device graphically displays both the total chlorine and pH, allowing for easy trend analysis. The standard configuration has two 4–20 mA outputs and three alarm relays.

An auto clean option includes a solenoid actuated spray cleaner using either 2 bar process water or air. A timer controls the period and duration of the cleaning cycle.

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

Start-up could solve SA's power problem

Tens of thousands of South Australian homes and businesses have been repeatedly left without power because of storms and the unique ecosystem of the SA power market.

In March, the South Australian Government launched a plan for energy security in an effort to curb these power issues. Key components of the government's new plan focus on renewable energy storage and gas, and include:

- a call for tenders to develop a 100 MW grid-scale battery storage facility for renewable energy, using approximately $150 million from the Renewable Technology Fund;
- development of a new 250 MW gas-fired power plant to offset the intermittent nature of renewables, expected to cost $360 million;
- legislation to allow the Energy Minister powers for market intervention in the electricity market, for example, to instruct for generators to be turned when required;
- establishment of an energy security target — confirming its commitment to a 50% renewables target;
- $24 million investment in gas exploration under its Plan for Accelerating Exploration;
- gas royalty incentives for landowners.

The pros and cons of Jay Weatherill's state plan to take control of its energy future have been hotly debated since its release.

According to Dr Kevin Moriarty, chairman of Adelaide-based 1414 Degrees, the government doesn't even need to look outside its own borders and workforce for the solutions.

Originating from CSIRO research, the 1414 Degrees solution is a patented thermal energy storage system (TESS), which is claimed to reduce energy costs by increasing the efficiency of renewable generation and stabilising grid supply.

A full prototype is now ready for commercialisation after a decade developing this highly complex machine.The prototype development was co-funded by an accelerating commercialisation grant from AusIndustry. Moriarty said that at this stage, approximately $3m has been invested by shareholders.

The solution uses abundantly available elemental silicon for storing and retrieving electrical energy enabling low-cost storage of energy and a stable supply back to the grid — a critical requirement as renewable generation increases, not just in SA but globally. This has advantages from an environmental perspective, as the decommissioning of a TESS is benign. The company said: "Waste produced is solidified silicon that can easily be disposed of or recycled. It does not need to be treated or specially contained and has no damaging chemical impact if it needs to be discarded at the end of its useful life."

Stabilising the grid

The prototype TESS had its first successful run on 30 September 2016. The company has calculated that it can install sufficient storage, capable of supplying hundreds of MW of electricity, at just $70,000 per MWh to provide for a reliable electricity supply with up to 90% renewable sources and end the blackouts in South Australia. As well as producing electricity, excess heat can also be used to heat water for use in heating and other industrial processes. As a comparison, lithium batteries cost 10 times as much and need to be regularly replaced.

The TESS is differentiated from pumped hydro and solar thermal by having minimal site-specific requirements and is a containerised solution for cost-effective integration in almost any location.

The solution can be placed near grid interconnects, which minimises the additional costs of kilometres of high-voltage lines and their commensurate energy losses and positioning adjacent to a district heating network. This, therefore, reduces the cost of connecting expensive and disruptive infrastructure.

10 and 200 MWh modules are available and can be connected to fill the range from 10 MWh to +2 GWh.

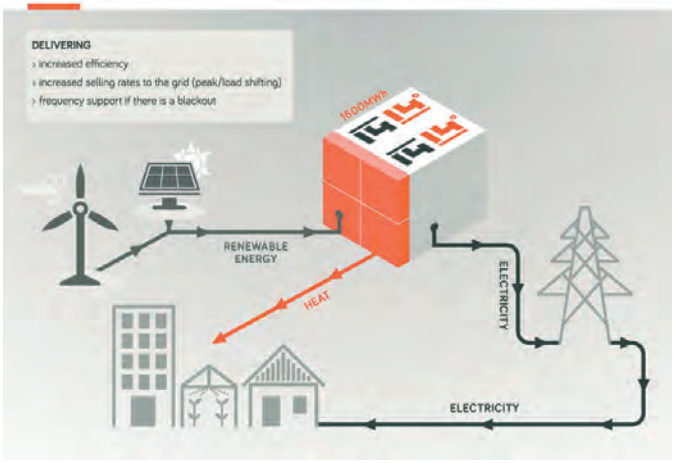
The solution can provide peak shifting by storing renewable generation at times of low demand and releasing at periods of high demand. "A sufficiently large TESS presence on the grid would increase the efficiency of existing wind generation and allow more to be built without risking stability," Moriarty said.

"Our approach is to build our TESS energy storage units where the clean hot air heat from the turbines can be used for industry and residential heat requirements to displace gas.

"An additional advantage is that the in-built turbines can be fired by gas or biofuel if there is an emergency where renewable sources are cut off, such as happened in the state-wide blackout," Moriarty said.

According to Moriarty, some of the industries that could benefit from this type of technology and why include:

- Renewable generation could expand, become more efficient and increase cash flows.
- Industries that use large quantities of low-grade heat, such as food processing and production, could access low-cost heat without emissions.
- Cold climate cities and towns use substantial amounts of energy to heat housing and buildings — 'district heating'. Currently this is sourced from burning gas or from the grid but TESS could store renewable energy at times of low demand (and low prices) and supply both heat and power at a lower cost.



1414 Degrees is now assessing industry and generation sites for its first installations of a 10 and a 200 MWh TESS. Suitable sites for 1414 Degrees would be at a wind farm or near an existing gas-fired generator. The technology will increase efficiency and revenues of a wind farm through load shifting to times of maximum demand.

The company is working towards building the first commercial installations in 2017. It is also now considering a non-compliant tender for the SA Government's Energy Reform Plan's emergency gas power plant to incorporate storage with the planned turbine plant.

1414 Degrees
www.1414degrees.com.au

DIGITAL PRODUCTS FOR REVERSE VENDING MACHINES

TOMRA Connect is a portfolio of digital products for machines collecting cans and bottles for re-use and recycling. The products offer further insights and engagement opportunities for locales providing the machines and the recyclers who use them, going beyond the bin-approaching-full indicators that have so far popularised the Internet of Things for waste collection.

With engagement program TOMRA ReAct, consumers earn points to redeem rewards or make donations. The machine's touch screen enables retailers to promote specials and campaigns.

Analytics pulls business intelligence from big data. It shows queueing time, cleaning quality, recycling volumes throughout the day and more.

Notify + Assist gives personnel real-time notifications when machines require attention and step-by-step guidance on fixing. The product also combats fraud attempts through real-time validation of refund receipts.

TOMRA Sorting Solutions Pty Ltd
www.tomra.com

GSM CELLULAR KIT FOR SOLAR MONITORING

SolarEdge is now offering a GSM cellular kit that includes a pre-installed SIM card with a data plan. The product enables PV internet connectivity to enhance monitoring and PV asset management.

Typical communication strategies require installers to enter the premises for set-up and then for the system owner to maintain that connection via their router throughout a system's lifetime. Both of these requirements can be burdensome. The GSM cellular kit is said to simplify the set-up of solar monitoring connections by eliminating the need to access the premises, speeding up installation times and reducing installation costs of the installer, while also removing the requirement for the system owner to maintain router connectivity.

Suitable for locations without internet access or broadband infrastructure, the GSM cellular kit includes a GSM network card combined with a pre-installed SIM card including a five-year data plan. The kit can be used in combination with any single-phase SolarEdge inverter, including SolarEdge's StorEdge solutions, to provide online PV, battery and consumption monitoring.

SolarEdge Technologies Inc.
www.solaredge.com

MEASUREMENT AND VERIFICATION SERVICE

BuildingIQ has announced a measurement and verification service that allows building owner/operators to automatically measure and verify the effectiveness and impact of energy-saving measures in order to qualify for utility or organisational savings incentives and mandates.

Called Automated Measurement & Verification (AM&V), the service is compliant with the International Performance Measurement and Verification Protocol (IPMVP) practices and is designed to deliver fast M&V. It enables organisations to deploy M&V technology once and use it frequently, saving time, money and complexity.

The methodology used in the service is consistent and repeatable, effectively eliminating the human error inherent in standard M&V practices including data collection (independent and dependent variables), baseline creation, baseline prediction output, savings calculations (baseline vs actual) and non-routine adjustments. Baseline models are rigorously reviewed prior to use and all results undergo periodic quality assurance.

BuildingIQ
www.buildingiq.com

WASTEWATER TREATMENT SYSTEM

NCH has unveiled its environmentally friendly solution for the treatment of trade wastewater. Growing 30 trillion bacteria each day, the BioAmp system directly targets fats and greases in wastewater, reducing biological oxygen demand levels.

The technology involves automatically delivering live bacteria into the trade waste system, which fast-tracks the natural recycling process. Treating wastewater run-off from dairy farms and piggeries is an area where this is particularly effective, as bacteria reduces sludge and crust with minimal intervention.

NCH also provides on-site analysis and tailored programs that take an integrated approach to the management of trade wastewater. Drain maintenance, lift stations, grease traps and the reduction of COD and BOD are all utilised by the company, along with the BioAmp technology.

A comprehensive program implemented by the company aims to improve the quality of trade waste effluent, reduce odours and keep drains flowing. Advising manufacturers on the most effective methods to reach particular wastewater benchmarks, NCH specialists ensure legal standards are adhered to and trade waste costs are kept to a minimum.

NCH Australia
www.nchasia.com/en-au

SOLAR INVERTER

ABB Australia's UNO-DM-PLUS single-phase solar inverter is suitable for residential photovoltaic (PV) owners. Its embedded wireless connectivity and smart grid capabilities provide home owners with advanced monitoring, control and maintenance. Installers benefit with a quick and easy self-commissioning process, while their maintenance burden is eased due to web-enabled service software updates.

All service software is embedded within the inverter and wirelessly accessible using any smart device or PC. This reduces the operation and maintenance burden for installers and associated costs for home owners.

The unit's connectivity package allows for smart grid capabilities such as dynamic feed-in control, which manages the energy fed into the grid. It uses the SunSpec-compatible open communication protocol to ensure compliance with future grid codes and maintains off-the-shelf interoperability with other devices in the system.

Rated from 3 to 5 kW, the inverter sports a streamlined physical design with reduced component count. This contributes to a lighter and smaller inverter than its predecessors.

ABB Australia Pty Ltd
www.abbaustralia.com.au

Achieving business sustainability

Management systems approach aligned to ISO 55000

Farshad Ibrahimi, Executive Advisor & Service Line Leader, Asset Management, GHD Advisory

Asset management requires a multidisciplinary approach. It spans across a wide range of disciplines including engineering, finance, operations, information systems, management, contract and supplier management, human resources and organisational development.

Increased service expectations and asset utilisation, combined with a challenging economic outlook, are some of the challenges facing managers of critical water infrastructure.

Water utilities and other organisations with large asset portfolios are increasingly being asked to show regulators and stakeholders that they are delivering services in the most sustainable and efficient manner.

Plan for Victoria

In what is claimed as a first for the Victorian water industry, GHD was engaged to undertake a review of South Gippsland Water's (SGW) Asset Management (AM) strategy, and develop an improvement plan, in alignment with two distinctive frameworks, namely: ISO55001 AM standards and the Victorian Department of Treasury and Finance (DTF) Draft Asset Management Accountability Framework (AMAF) requirements.

ISO55001 defines the requirements of an asset management system to provide an organisation with a disciplined approach to maximise value and/or minimise liabilities for its portfolio of assets. Most organisations aiming to increase their AM maturity are aligning their current practice to the key requirements of this standard, which will also set the organisation to efficiently achieve ISO certification in the future, with less additional effort.

The AMAF details mandatory asset management requirements as well as general guidance for state government agencies in Victoria. Mandatory requirements include developing asset management strategies, governance frameworks, performance standards and processes to regularly monitor and improve asset management.

Both the ISO55001 and AMAF frameworks share a focus on outcomes, and intend to help the organisation deliver better services. They encourage an increased focus on governance and executive-level ownership of asset management, using a management systems approach. Furthermore, asset owners are encouraged to display further diligence in maintaining and protecting their portfolios (sometimes billions of dollars worth of assets), which are integral to the sustainable futures of our communities, and the environment we live in.

The role of asset owners and managers (ie, utilities and essential service providers) is increasingly signified and recognised as one of utmost importance in creating livable communities while protecting the environment for the long term. Local frameworks like AMAF increasingly reflect the global focus on better asset management and service delivery. In this context, asset managers are at the forefront of driving and influencing change that will benefit not only our current, but future generations.

The project

SGW's existing AM Strategy was focused on four strategic improvements: embedding AM into the business, using data to make informed decisions, formalising AM activities and implementing advanced AM.

The project involved a full review of the enterprise asset management framework, and the development of a strategic asset management plan and roadmap for full lifecycle asset management, through a Management Systems approach, aligned to both ISO and AMAF.

GHD used a carefully structured process to compare SGW's AM Strategy and practice against the requirements of ISO55001 and AMAF. This involved:

- a comprehensive document review;
- an initial status quo assessment and validation;
- engaging key stakeholders from executives through to practitioners;
- comprehensive review of a series of AM and business documents;
- development of a strategic asset management plan.

Outcomes

The exercise identified a series of challenges for SGW, both strategic and operational. A corresponding number of improvement strategies have been developed, supported by detailed action and implementation plans. Each improvement plan correlates to a mini business case, outlining context, background, issues/challenge, recommended actions, estimate of resources and timelines.

The strategic asset management plan developed for SGW will also inform the utility's attestation effort, to publicise its asset management activity outcomes through its annual reporting frameworks, with more confidence. It provides the roadmap for a seamless transition towards compliance with global asset management standards (ie, ISO) and sets the benchmark for similar-sized organisations to take the leap.

Lessons for the industry

This level of improvement planning allows asset owners and managers to not only understand the metrics and strategies they need to comply with international standards and meet state government requirements, but also to be guided with the level of effort involved in driving change. Driving and influencing change at this level is not limited to technical and business process level improvements, but also extends to cultural transition, capability building, and increased operational and business resilience. Most importantly, the focus is on outcomes: ie, driving better service delivery to the community.

With advances in technology, and the Internet of Things, making information and knowledge readily available at our fingertips, our customers are becoming smarter in managing their service providers. The demand for improved service levels, and justifications for cost of service, are notionally at an all-time high, driving a customer-centric approach to service levels, and asset management strategies and investments. Asset owners and managers are therefore obligated to demonstrate further diligence in development of responsive strategies to meet these demands, and adapt an appropriate management systems mindset.

GHD Pty Ltd

www.ghd.com.au

ENERGY INTELLIGENCE PLATFORM

BuildingIQ has launched its BuildingIQ 5i platform-enabled services, designed to deliver value to building operators at any stage of a building's life cycle. Compared to previous approaches, the platform and services are said to provide a better building IoT solution for owner-operators due to the five-pillar approach of data capture analysis, advanced modelling, measurement and verification, closed loop predictive control and expert human analysis.

The company's services can be deployed selectively to meet the needs of any building. They are subscription based and require little to no infrastructure changes to implement. Services built on the platform work together synergistically, so owner-operators need not worry about BMS changes or market evolution.

The platform learns daily to provide a powerful energy intelligence foundation for a building. As buildings evolve, so does the platform — accommodating new BMS, new feedback methodologies and sensors, and alternative generation such as solar and local storage. The platform and services use a holistic approach to meet the diverse needs of building owners, recognising a difficult building system management environment, demanding and sophisticated tenants, and the inherent enthalpy of large and complex building systems.

By leveraging a building's internal data (occupancy comfort, building characteristics and meter data), external data (demand response signals, energy tariffs and weather forecasts) and 24/7 access to BuildingIQ's expert team of operators, building engineers and data scientists, the platform is able to deliver a blend of energy saving, operational efficiency and tenant comfort benefits.

BuildingIQ
www.buildingiq.com

COMBUSTION CONTROL OXYGEN ANALYSER

The XZR500 combustion control oxygen analyser from Michell Instruments is designed to monitor the oxygen levels in combustion processes. Its purpose is to determine the optimum amount of air needed for combustion, ensuring the fuel is used efficiently and potentially saving thousands of dollars. It monitors the exhaust gas for excess oxygen ensuring that the conditions are kept close to stoichiometric (ideal) levels.

The product uses Michell's zirconium oxide oxygen sensor, which has a metallic sealed reference (MSRS) to give long-term reliability. The combination of this type of sensor, placed in an isothermal oven within the analyser, negates the effects of varying, high temperatures as well as the corrosive nature of the gas. This also reduces time spent on maintenance: if a sensor needs replacement, this can be done within minutes without interrupting the process.

The analyser has a control unit which can be placed at ground level for convenience, a sensor head close-coupled to the stack for ease of installation and quick response, and a variety of probe materials allowing a wide range of applications to be addressed.

For most applications the probes use the Pitot effect to extract non-conditioned sample gas from the process to the sensor head and back to the flue. Placing the probe as close to the burner as possible gives the most accurate readings, so the unit has ceramic probes capable of operating effectively in temperatures up to 1300°C.

Typical applications include combustion efficiency for boilers, industrial waste incinerators and crematoria. When operated in dirty applications, such as coal-fired power stations, the product can be offered with a blow-back mechanism for increased reliability in readings and reduced manual intervention.

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

METERING SERVICES

Spotless has launched a metering model to help the utilities sector respond to changing regulatory, technological and digital data environments. Spotless Advanced Metering (SAM) delivers a simple, efficient, scalable, whole-of-life metering proposition that is delivered by a single contract, interface and fee.

From 1 December 2017, all new and replacement meters installed in homes and small business will be advanced digital meters. Spotless's business model provides a service direct to retailers, including meter supply and finance, installation and maintenance servicing, and remote digital services.

SAM focuses on contract and operations efficiency, as well as effective risk allocation. It provides the required standards with the good value, allowing retailers to focus on their core retail energy business of today while providing a platform to help them to thrive tomorrow.

Spotless will provide industry, particularly retailers, with end-to-end metering services enabled through state-of-the-art technology, digital data capture and analytics, and operating and financing solutions. The company has a deep retail and customer expertise across the metering industry and a strong understanding of risks associated with the market.

Spotless
www.spotless.com

MULTIPARAMETER SONDE

The In-Situ Aqua TROLL 600, distributed by Thermo Fisher Scientific, is a customisable and powerful multiparameter water analysis instrument. It combines water quality sensors with smartphone mobility to collect and analyse users' data.

The water quality platform is rugged in groundwater and corrosion-resistant in surface water, delivering data in an easy-to-use, flexible instrument that performs for years. It is said to be the only multiparameter sonde to have a sub-2″ active antifouling system with cleanable conductivity.

Base sensor configuration includes EPA-approved optical dissolved oxygen, pH/ORP, turbidity, conductivity, temperature and pressure. The product can be integrated with In-Situ telemetry systems and HydroVu Data Services for real-time feedback on remote monitoring sites.

The LCD display provides an instant visual indication of sensor status, data log, battery life and overall functionality to offer confidence during deployment. The onboard SD card allows for quick and easy data backup and transfer.

A self-compensating turbidity/RDO/level, smart diagnostics and stable sensor technology provide minimal drift with a NIST-traceable factory calibration report. Smart sensors store information internally, maintaining data and calibration within the sensor for traceable results.

Thermo Fisher Scientific
www.thermofisher.com.au

Energy storage disrupting the electricity market

Energy storage lies at the heart of grid digitisation and is part of a larger trend of technologies that is disrupting South Australia's network for the better, according to Terry Teoh, general manager of engineering at ZEN Energy.

Ahead of his presentation on monetising storage at the grid edge in Adelaide's CBD at the Australian Energy Storage Conference, Teoh said battery storage currently has strong market potential in South Australia and the National Electricity Market (NEM).

"Energy storage and the ability to perform peer transactions lie at the heart of grid digitisation and will drive the democratisation of energy, just as we are seeing the democratisation of services, media and R&D," he said.

Teoh and ZEN Energy are undertaking a groundbreaking project demonstrating real-time optimisation and monetisation of battery storage in the NEM by connecting four high-profile Adelaide CBD buildings to 513 kWh of behind-the-meter storage.

What: Australian Energy Storage Conference and Exhibition
When: 14–15 June
Where: International Convention Centre Sydney
Web: www.australianenergystorage.com.au

The four sites — the Art Gallery, State Library, Adelaide High School and the Adelaide City Council works depot in Thebarton — were chosen for their contrasting load and occupancy patterns, and their potential to apply battery storage in conjunction with solar and demand response.

Teoh said the $1 million project will play a defining role in opening up the commercial storage market, starting in South Australia.

"It will provide real implementation experience and benefit quantification of batteries located in commercial sites, monetising multiple value streams," he said.

"It will turn a theoretical concept into a commercially executable reality for commercial and industrial customers looking for a lifeline to alleviate their energy price distress in South Australia."

Teoh's presentation at the Australian Energy Storage Conference, 'Monetising Storage at the Grid Edge in the Adelaide CBD: The South Australian storage demo project', will explore the deployment of commercial storage in Australia and, in particular, how storage can be used to safeguard South Australia's electricity network.

The conference and exhibition will run from 14–15 June at the International Convention Centre in Sydney. Themed 'Investing in Australia's Energy Storage Future', the event will feature more than 50 Australian and international speakers presenting on the possibilities of storage.

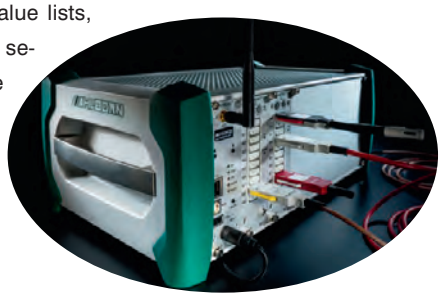
DATA LOGGER WITH TABLET CONTROL

The ALMEMO 500 data logger, by Ahlborn, features simultaneous multi-user access via Wi-Fi and tablet control. Users will be able to configure the device via an 8″ tablet with a preinstalled app.

A variety of sensor types can be attached to the device due to its galvanically isolated and independent measuring input sockets. The standard version provides 20 measuring input sockets and is capable of synchronously measuring up to 4000 measuring operations/s.

The measured values can be displayed as single measurement values, value lists, freely configurable displays or as a line graph. Historical measurement sequences saved on the measurement data storage can be loaded offline as well as during measurement operations. Measurement data is either exported via the program WinControl or via Excel.

The device features 3 GB data memory, which allows for up to 600 million measured values, and can be powered by either mains or battery.



Bestech Australia Pty Ltd
www.bestech.com.au

Ozwater'17

What: Ozwater'17
When: 16–18 May
Where: International Convention Centre Sydney
Web: www.ozwater.org

The Australian Water Association's international water conference and trade exhibition, Ozwater, will be held from 16–18 May at ICC Sydney. The event will see water professionals, students, scientists, researchers and policy- and decision-makers from across Australia and internationally unite to usher in a new dawn for Australia's water security.

The event's conference program will include more than 150 sessions over eight streams, bringing together the who's who in water to discuss the important topics facing the water industry and provide a platform to exchange strategies and ideas in a public forum. Keynote speakers announced so far include: Lucy Turnbull AO, Chief Commissioner, Greater Sydney Commission; Dr Sander Klous, Partner-in-Charge Data & Analytics, KPMG; Dan Gregory, Founder and CEO, The Impossible Institute; and Jane Huxley, Managing Director, Australia and New Zealand, Pandora.

In particular, the conference will be focusing on the theme 'Embracing innovation and disruption for a smart water future', encouraging the belief that change, disruption and innovation are the keys to a resilient and a smart water future. The event will provide the opportunity to explore what this exciting future looks like for the water sector through technical papers, case studies, interactive workshops and Q&A panels.

The trade exhibition will feature a large display of the latest water industry science, innovation, technology, products and services for all water professionals and associated industries. New to the exhibition is the Innovation Pavilion — a space for inventors, creators, builders and makers to showcase products and services that are advancing the goals of sustainable water usage for future generations. There will also be an extensive social program, enabling attendees to meet with their peers. A networking evening will be held on 15 May, prior to the main conference program, while Happy Hour at the Club House will enable guests to unwind at the end of the first day. The highlight of the program will be the Gala Dinner and AWA Australian Water Awards, held on 17 May — a celebratory event that allows guests to recognise industry excellence while enjoying a three-course meal.

Solar Energy Exhibition and Conference'17

What: Solar Energy Exhibition and Conference 2017
When: 3 and 4 May 2017
Where: Melbourne Convention & Exhibition Centre
Web: www.solar.org.au

Presented by the Australian Solar Council and the Australian Energy Storage Council, the Solar Energy Exhibition and Conference is being held on 3 and 4 May in Melbourne.

The Australian Solar Council Chief Executive John Grimes said: "The Solar and Energy Storage Show presents a great opportunity for delegates to expand their network, meet key industry decision-makers and find new clients. Because we are industry insiders, we bring together the very best conference presenters. We know what is topical, engaging and useful for our delegates. We are committed to the best solar installer professional development training available anywhere in the world."

The rapidly emerging storage sector is universally described as a game changer, a smart, dynamic and disruptive force. It has attracted innovators, entrepreneurs and thought leaders keen to take part in the clean-energy revolution, many of whom will be seen and heard on the podium at the conference. There will be three free conference streams: Applied Energy Storage, Policy and Market, and Professional Development. The conference is designed to present the latest in technology, policy, projects, regulations, industry analysis, forecasts and project financing.

Applied Energy Storage hot topics include: technology breakthroughs, smart energy business models, energy storage, real-world data, battery testing performance results, microgrids and fringe-of-grids, Internet of Things and big data, making commercial solar and energy storage work, and energy management 'bringing it all together'.

Policy and Market hot topics include: state and federal government policy, unlocking project finance, large-scale solar and storage, energy market reform and global developments.

A range of over 100+ expert speakers will educate and inform about every aspect of the exciting changes underway. Among the invited guest speakers are Josh Frydenberg, Mark Butler, Lily D'Ambrosio, John Hewson, Simon Corbell, Mike Cleary, Ivor Frischknecht, Christine Milne and Mark Bailey.

Complementing the conference is the industry exhibition that features the latest, and arguably the smartest, solar and energy storage products and services from Australia and overseas.

The event is suitable for battery and panel manufacturers, inverter innovators, commercial and residential PV installers, large-scale developers, technicians, trainers, trading certificate agencies, policymakers, bureaucrats, builders, architects, consultants, academics and more.

Trust in the circular economy

In the Feb/March issue of Sustainability Matters magazine, Mike Ritchie made a strong case for the circular economy and the need for government intervention to achieve it. There is also a need for 'soft power' in driving the circular economy. As Søren Hermansen, from renewable energy island Samsø, in Denmark, highlighted during a forum at the Australian National University in February — trust is a very important factor in getting people to opt into change.

A case in point is the current debate surrounding a plastics-to-fuel recycling plant proposed to be located in Hume, right on the border of ACT and NSW. Even if one might like to phase out fossil fuels in the long term, at this point in time the proposal embodies circular economy thinking.

Alas, there is not a single economic activity that does not cause so-called external damages. In cost-benefit assessments, however, traditional economic factors always seem to get more weight, as also argued by Mike Ritchie. This has put local residents on guard, because they feel that their loss from, say, noise or air pollution is not taken fully into account. There is no trust that the process is fair.

When it comes to recycling activities, a good number of societal costs and benefits are in the same domain, which means we can weigh them up more easily. Increased energy use and emissions on location will lead to a reduction of resource extraction, energy use and pollution elsewhere. That should be the idea, at least.

Life cycle assessment (LCA) provides a well-established and internationally recognised framework to assess those trade-offs between local and regional or even global effects. Would the people of the ACT be willing to accept some additional emissions if they trusted the activity would prevent considerably more pollution in, for example, the Middle East, and they trusted that air pollution limits would not be exceeded locally?

Back to the island of Samsø. Inhabitants took some convincing, but now many of them own shares in windmills or produce straw for the new district heating system. Apparently, no-one reports being affected by noise pollution or loss of visual amenity due to the windmills. The message in this is not that nimbys (not in my back yard thinkers) are just imagining things, but that people's perspectives on changes are by definition subjective and thus influenced by other factors. Trust is essential for a successful move towards a circular economy.

The question is how to build trust in this post-truth era. Facts and figures are still necessary, but it is not sufficient to just generate them. They need to be communicated in an integrated, transparent and targeted manner. If only the negative, local effects are fully quantified in an environmental impact statement, it is only natural that they get all the attention. All relevant effects, positive and negative, local and global, should be quantified as much as possible to get the full picture. And once such an evaluation is made, it shouldn't be expected that the numbers speak for themselves.

> **"All relevant effects, positive and negative, local and global, should be quantified as much as possible to get the full picture.**

In a recent case in the Netherlands, a community group opposed the practice of storing fossil-oil-production wastewater in underground reservoirs, even though this is where this high-mineral, high-salt water largely comes from. Clear results of LCA and risk evaluations for a range of water treatment and storage alternatives were dismissed as 'excessive' calculations. Again, trust in the process was clearly lacking.

Indeed, too often the results of LCA, or air quality or any other evidence-based modelling, are not communicated appropriately to the wider public. Such communication requires a highly tailor-made approach. People will feel either like they can't see the forest for the trees, when only a fully detailed, technical report is published, or that they are not getting the full story when the numbers are kept hidden from the public. Either way, they will feel bamboozled. This creates an atmosphere where emotions take over, leading to sometimes paradoxical stances. Paradoxical in the sense that groups with clear concern for the environment end up arguing against initiatives that may well align with their own objectives. By presenting arguments such as "other states will be dumping plastic waste in the ACT" they are also bamboozling people. All parties can do more to present factual arguments to steer debates away from a 'yes it is, no it isn't' stalemate. Transparent and considered communication between all stakeholders will be key to building trust and ultimately achieving our common, circular economy objectives.

Maartje Sevenster is director of consultancy Sevenster Environmental, which aims to contribute to sustainable development of society as a whole by enabling customers as well as consumers to make environmentally wise decisions. She has 15 years of experience in environmental consultancy, specialising in life-cycle oriented policy and strategy advice for clients in all sectors, such as the ACT Government, ASICS Corporate, Greenpeace International and Friends of the Earth. She is a board member of the Australian LCA society (ALCAS).

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Thinking differently:
Renewable gas from household waste

Ben Jeffreys, CEO of ATEC Biodigesters

There's no escaping talk about the energy crisis facing Australia at the moment. Watching on as an Australian living in Cambodia, it's baffling as to why renewable energy in Cambodia is so straightforward yet seems anything but back home.

I spend a lot of time in rural Cambodia talking to farmers and it always surprises me when they talk about climate change. The surprise isn't because they bring it up, but how clearly they understand how climate change will directly affect their livelihoods. For Cambodians, they also see simple solutions, such as using resources they have readily available to generate their energy needs.

One such solution is the one we work with at our social enterprise, ATEC Biodigesters. A biodigester is a simple technology that transforms animal manure and kitchen waste into renewable biogas for cooking and fertiliser for farming. We sell and distribute these system to farmers across the country.

It is a simple technology, but often, the hardest things to get right are the simple things.

It started almost 7 years ago with Engineers Without Borders and Live and Learn working together, with vital assistance from Australian Aid. These two Aussie NGOs worked hand in hand with local communities to determine how to better address their energy and farming needs. This is how we created the first biodigester that was truly designed to Cambodian conditions.

While the gas and fertiliser are obvious benefits, more importantly, we've seen the incredible impact biodigesters are having in helping Cambodians to transform their lives. In Cambodia, cooking with wood kills more people than traffic accidents each year and globally, it kills more people than malaria. Reality is, cooking with wood is a common occurrence for people living in struggling communities — around 3 billion people still cook and heat their homes using solid fuels (including wood, crop wastes, charcoal, coal and dung) according to the World Health Organisation. Inefficient cooking fuels/technologies produce high levels of kitchen air pollution, which causes debilitating health effects not dissimilar to smoking cigarettes. The strain placed on households using these traditional cooking methods is very real, resulting in:

- 1.5 days each month spent collecting wood;
- 3 hours a day spent on chopping wood and preparing the cook stove;
- a reduction in household expenses with bottled gas costing Cambodians $274 per year on average.

Further to the health and income effects, these traditional cooking methods also translate to environmental degradation. In Cambodia's case, wood comes from unsustainable, illegal logging, including for domestic cooking use. This places a significant amount of pressure on its forests — Cambodia has the third highest deforestation rate in the world.

With this simple technology, Cambodians can improve their health, their livelihoods and support the local ecosystem on which they rely.

But the benefits aren't limited to Cambodia. We see that we're only at the start of using waste on a global scale, or as we cheekily refer to it, the Brown Revolution! We know there's a significant untapped market for international use of ATEC biodigesters, both in areas that are similar to Cambodia's rural landscape, as well as in developed countries using kitchen and backyard green waste. In Australia, we're literally throwing away highly valuable organic waste that could be used in the household, both for gas for cooking and fertiliser for your veggie patch or garden.

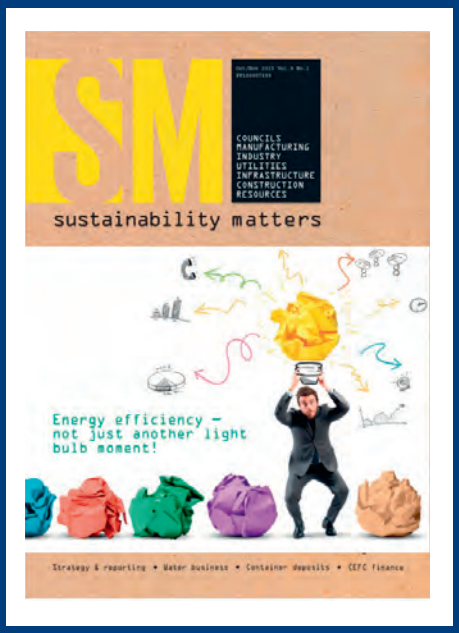
> **"... we're only at the start of using waste on a global scale, or as we cheekily refer to it, the Brown Revolution.**

That ATEC can support thousands of Cambodians and even talk about a global waste revolution is thanks to Australian Aid. Support going back many years in the technology design phase helped ATEC get to where it is today.

Australian Aid
www.australianaid.org

FREE

to industry and business professionals



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