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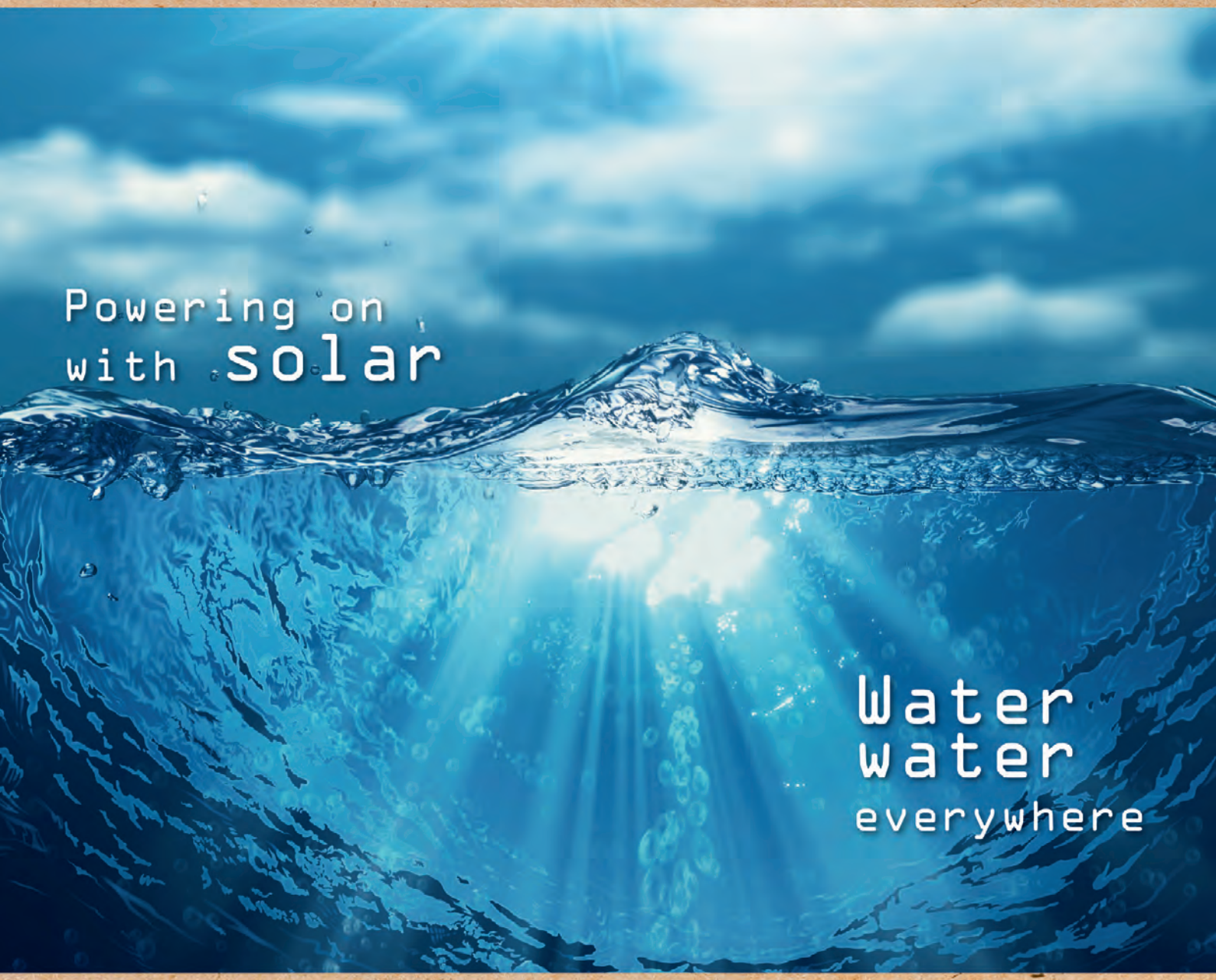

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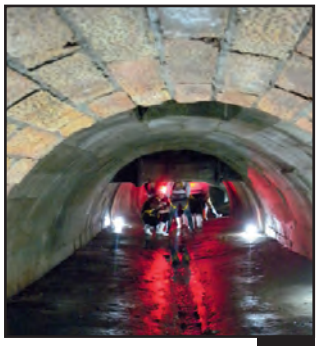

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WORDS FROM THE EDITOR

'Water, water, everywhere' and now 'plenty of drops to drink' thanks to the achievements of water utilities across Australia. Often unsung heroes, water utilities have been working hard behind the scenes to ensure we have enough water to cope with future population growth, climate variability, extreme weather and more. This issue highlights some of these key achievements, as well as thoughts and opinions from the leaders in the water utilities industry.

Powering on with solar, we hear from from Daman Cole, managing director, Yingli Solar in Australia, on page 6. Together with wind, solar is already making up the vast majority of new energy generation installed around the world, he says. He provides us with further insights and his opinions on the future trends for the solar industry in Australia, highlighting the growth of solar in the commercial market, the challenges for utility-scale solar and what businesses should consider when investing in solar.

Grid-connected and off-grid energy storage solutions are currently under much discussion in Australia, with the launch of the Australian Energy Storage Alliance late last year and conferences coming up soon (see page 49). Although many years away from being economically viable, energy storage could potentially drive the change to cleaner energy options in Australia. At a recent industry event, Mary Hendriks, industry executive, Australian Energy Storage Alliance, commented: "Energy storage is not just about better batteries; it covers the wider spectrum of technologies and innovative solutions for distributed power, on- and off-grid solutions, using stored energy in the built environment and rethinking our transport infrastructure."

It is hard to believe, but *Sustainability Matters* has been published for nearly nine years now and, as you can see, we have given the magazine a whole new look. The new design is based on your feedback, so I do hope you enjoy it. Also, please stay in contact with any ideas and suggestions - I am always happy to hear from you.

Carolyn Jackson

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Commercial solar in Australia goes from strength to strength

There is absolutely no doubt that solar will be one of the mainstream technologies of the future, both worldwide and in Australia. Together with wind, it is already making up the vast majority of new energy generation installed around the world.

> **We believe that for solar to grow to its full potential, the solar industry, government and energy companies need to find ways to integrate solar into the grid in ways that are more digestible for energy companies and make practical sense for investors.**

For example, one of the largest energy companies in the world, E.ON in Germany, has entirely divested away from traditional energy sources and is now focused solely on a portfolio of renewables.

Back on home ground, the commercial sector is the fastest growing sector of the solar market in Australia, with thousands of businesses realising its benefits in reducing business risk, locking in energy prices, slashing electricity bills and making a strong and positive statement about their environmental impact.

Solar provides businesses with a seat at the table with their own energy contracts and allows a little more control over energy and its rising costs. We have seen returns on investment of between 20-25%, year-on-year, depending on the type of business and subject to current electricity rates. What's more, solar is relevant for any organisation - in fact, our customers include a wide variety of businesses, from IKEA to Australia Post, Monash University to Burder Industries (manufacturing) and Glenlynn (aged care) to Balgownie Estate (wine).

However, there are several factors that businesses need to review before proceeding.

The quality of the products and the track record of both the manufacturer and the installer are all important questions to consider, in order to guarantee sustainable financial returns. Businesses need to apply the same level of due diligence as they would to any other major capital expense to ensure they have a quality product and dedicated local support for optimum performance over time. The solar market has become very price sensitive, but the cheapest products are unlikely to deliver the best long-term returns or have any local support mechanisms on the ground.

One useful tool for buyers is the Australian Solar Council's Positive Quality program. This benchmark (based on random spot checks of participating manufacturers) has been designed to provide customers with peace of mind regarding the components they are buying and a guarantee of quality.

One of the relatively unknown aspects with commercial solar is grid connection. The viability and process varies from site to site, so thorough upfront analysis by the solar installer and good communication with the local utility is essential. This only further highlights the need to choose a reputable installer with good commercial experience.

At Yingli, we are focused on empowering solar installers on the front line with our YINGLI 4 YOU Partner Program. We want to ensure that our installers have the most up-to-date training and product knowledge and understand the full electrical needs of solar, how the panels are made, how they generate electricity, how they offset usage and how it must be maintained for the long-term optimum efficiency of solar. The aim, of course, is for solar buyers to have confidence in businesses that can show partnership with global manufacturers.

Unfortunately, the growth of solar in the commercial market is not being reflected in large-scale, utility-scale solar. Political uncertainty around the Renewable Energy Target has stifled investment and confidence in large-scale projects and this has had a flow-on effect to the appetites of most banks and lending institutions. As a result, larger engineered projects are not evolving and the solar industry is currently very focused on the markets which can be serviced by upfront capital (commercial and residential).

We believe that for solar to grow to its full potential, the solar industry, government and energy companies need to find ways to integrate solar into the grid in ways that are more digestible for energy companies and make practical sense for investors. To date, government support for solar has been weighted towards consumers. We now need to find a blend and balance between the two. For me, it is about trying to find better unity between the solar industry and the existing grid. In some instances the grid may be transmitting from traditional coal-fired power stations from thousands of kilometres away, whereas if you can mitigate some of that by installing smaller solar farms along that transmission line, surely that would also benefit the networks and generators by providing a more cost-effective solution.

Around the world, there are large solar projects of anything from 30-600 MW, whereas it may be more relevant to consider a series of 2 and 5 MW projects in essential spots to support the grid. This approach would allow for a transition from residential and commercial rooftops to the application of smaller large-scale projects, all supporting communities and without heavily impacting the existing networks.

Ultimately, despite some innate uncertainty in the market, my core message is that the potential for commercial solar in this country is huge.

Daman Cole is the managing director for Yingli Solar in Australia, New Zealand and the Pacific. Having successfully launched Yingli Solar into the Oceania region in 2012, his main objectives are to provide strong support for industry partners, build and develop commercial and utility-scale projects and grow market share and profitability to create long-term, sustainable shareholder value. His skills include end-to-end contract management, project management, complex tender management and strategic development. In addition, he has in-depth experience in the development, delivery and execution of a number of commercial solar projects.


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With our partners, we operate and maintain metropolitan Adelaide's water supply and wastewater system, including 16,000 kilometres of water networks and 12 treatment plants. Each year, 140 gigalitres of safe and reliable drinking water is supplied and 26 gigalitres of recycled water is provided for irrigation.

In Roosendaal, our energy recovery plant manages residual waste produced by two million people.

With a capacity of 336 thousand tonnes, the facility generates 256,000 megawatt hours of electricity each year, equivalent to the consumption of 70,000 households. It also provides heat to nearby industrial greenhouses, and an urban heating system for the city of Roosendaal in Netherlands.

In Perth, we divert more than 50% of waste from landfill by turning household waste into compost.

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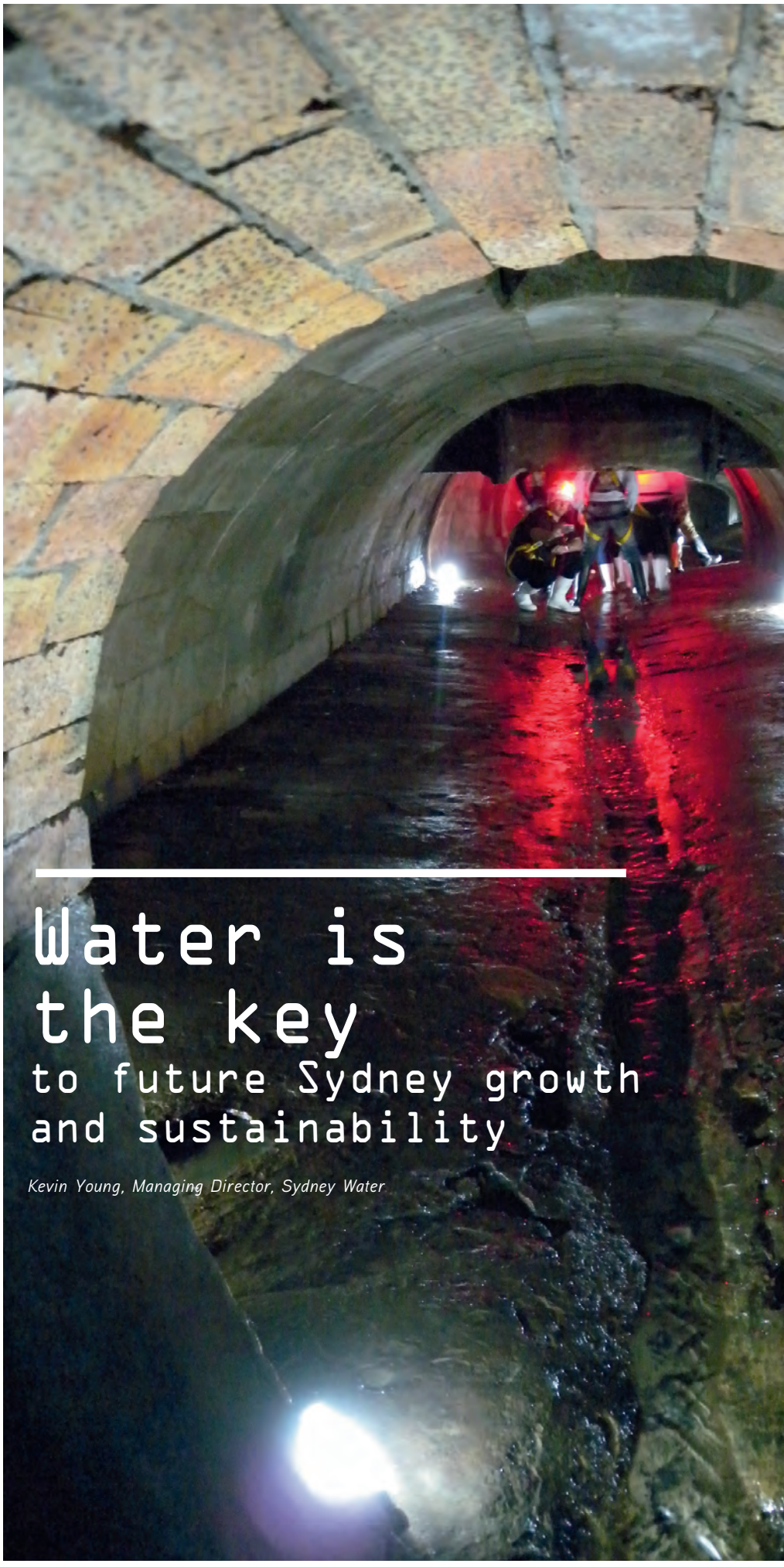
Kevin Young, Managing Director of Sydney Water, provides his insights on the utility's sustainability achievements and its plans for the future.



Water is the key
to future Sydney growth and sustainability

Kevin Young, Managing Director, Sydney Water

Sydney Water has supported the healthy growth of greater Sydney and its communities for 126 years with water and wastewater services.

We supply 1.4 billion litres of drinking water to our 4.6 million customers across Sydney, the Illawarra and the Blue Mountains every day. We also remove and treat a similar amount of wastewater every day.

The reality is that water is important to Sydney's history and, of course, our future. In fact, Sydney would not be located where it is today if in 1788 Governor Phillip had not realised the importance of the location of the Tank Stream for the survival of the first colony.

As we look to the future, the debate about our city's growth has tended to focus on housing and transport, but water and wastewater management is quintessential in any discussions on growth, sustainability and liveability. We should, as a community, be talking more about how we are going to plan for drinking water distribution and wastewater removal as the city grows and renews - perhaps the fact our water infrastructure is underground is one of the reasons its importance is sometimes forgotten.

And this is no trivial matter. Over the next 20 years there will be an extra 1.3 million people living in Sydney in 500,000 new homes with an extra 635,000 new jobs. To cater for this growth, good planning for Sydney's water supply will be essential.

Sydney Water has, often incorrectly, been viewed as a collective of plumbers to simply provide water services, but we have proved to be much more than that - we have been Master Planners to provide the cornerstone which has allowed Sydney to grow in a sustainable way to be where it is today.


The Tank Stream

As we look to the future, the debate about our city's growth has tended to focus on housing and transport, but water and wastewater management is quintessential in any discussions on growth, sustainability and liveability.

Sydney Water's sustainability milestones

Our beaches

One of my greatest pleasures is to swim in the pristine waters of our local beaches and it is very rewarding for me as the managing director to know Sydney Water has been a significant contributor to the improvements in water quality.

As recently as 25 years ago, Sydney's iconic beaches were often closed due to pollution.

We have invested over $3 billion in today's dollar terms over the past 25 years in our deep ocean outfalls and wastewater treatment network to improve water quality along the Sydney coast. The results speak for themselves - all but one of our coastal beaches are rated 'good' or 'very good' in the *State of the Beaches* report.

Water demand

The introduction of our water efficiency programs for business and residential customers in 1999, in conjunction with improvements in technology, has provided significant reductions in water demand.

Current total water consumption levels for Sydney are at the same levels experienced in the 1970s despite an over 50% increase in population since then.

Our initial programs were driven by drought. Now we are planning to ensure secure water supply for a growing population, planning for new supply options while at the same time guaranteeing river health.

Climate change

Sydney Water's Climate Change Adaptation Program was developed to investigate how we can sustainably reduce the impacts of future climate change on our infrastructure, business processes and our customers.

In 2011, we worked with a range of partners including Water Services Association of Australia (WSAA) to develop AdaptWater, which is a risk and cost-benefit analysis tool that can project and quantify the probability of damage and failure of assets by existing and future hazards, and assess and compare adaptation options.

Innovative programs such as AdaptWater play a key role in our community, helping increase the resilience of our infrastructure and allowing us to maintain the level of service our customers expect. In turn, this could potentially save millions of dollars in avoided costs, by investing in mitigation options instead of expensive repairs.

Energy production

Sydney Water has developed an extensive portfolio of industry-leading, innovative renewable energy projects at our wastewater treatment plants, using hydro generation or co-generation, which uses biogas produced from wastewater digesters to generate energy.

These initiatives provide around 17% of Sydney Water's total energy needs and reduce greenhouse gas emissions by over 60,000 tonnes a year. These programs also minimise our exposure to energy price rises, the pressures of population growth and the resulting increased demands on water and wastewater treatment.

Environment projects

We are proud to have made a contribution to making Sydney more liveable. Through our various collaborations we have improved the local urban amenity and enhanced natural environments - outcomes our customers value.

Cooks River

A major environmental project just completed by Sydney Water is the revitalisation and naturalisation of the Cooks River.

1.1 km of the deteriorated concrete panels constructed in the 1940s have been naturalised and over 80,000 local native plants have been planted, along with the construction of a natural stormwater overflow treatment area at Cup and Saucer wetlands.

This project has provided wetland habitat for local wildlife and improved the urban amenity for local residents to enjoy.

Priority sewerage program

Our $157m Priority Sewerage Program has allowed thousands of customers on Sydney's fringe to connect to town sewer for the first time. The new scheme will help the community by reducing risks to public health, improving public amenity and protecting the environment as residents will no longer have to rely on septic tanks and pump-out services, which could save them hundreds of dollars, help reduce odours and eliminate dampness and seepage on their properties.

Liveable city programs

Sydney Water realises that we need to do more for our customers than provide water and wastewater services to make our city more liveable.

To this end we manage and protect over 200 built and natural heritage sites including the Tank Stream. Last year we discovered a remarkable Indigenous artwork site in the heart of suburban Sydney which, in conjunction with the Local Land Council, we will protect for future generations.

We maintain a cycleway on our land around the Prospect Reservoir, which we have recently reopened following Water NSW's upgrade of the Reservoir Wall.

A further program has been an anti-graffiti program we have undertaken in partnership with Marrickville Council where renowned street artist Sid Tapia created a modern art piece on a 75 m^2 section of one of our buildings adjacent to the stormwater channel in Sydenham. The success of this project provided the catalyst for a similar project where artist Thomas Jackson painted an 80 m^2 mural on a concrete tank at Sydney Water's Wollongong Water Recycling Plant.

The future

Sydney Water is looking to the future to ensure we continue to 'lift the bar' to achieve improved levels of customer service and to keep downward pressure on costs. We also want to ensure that Sydney is an enjoyable city to live in.

Issues such as population growth, urban densification, long-term water security and climate change will greatly influence the liveability and the future prosperity of our city.

Demand forecasts

Sydney Water has just completed a new 50-year demand forecast that encompasses a range of future water-use scenarios for our projected growing population. We are taking a long-term strategic approach to managing demand. Our overall focus for water efficiency now is to deliver services that our customers value, in a way that keeps bills low.

Research programs

- Sydney Water, in association with other water utilities in Australia and internationally and Australian universities, won the Global Grand Award at the International Water Association's (IWA) 2014 Project Innovation Awards held in Lisbon for the Sewer Corrosion and Odour Research program (SCORe). The project helps to maximise the service life of sewer networks and savings in the order of hundreds of millions of dollars are expected to be achieved through its application across the globe.
- A similar collaborative research project is currently being conducted on condition assessment and leak detection on critical water mains. The aim is to remove the guesswork from critical pipe inspection. The research is not just about heading off major incidents but more importantly, ensuring that water mains are not being replaced before they need to be, which leads to substantial cost savings and less wastage of a valuable resource. It has been estimated that the Australian water industry could save $160 million over 20 years using the results of the project, which is due to be completed in 2016.
- Sydney Water and Randwick City Council are partnering on an innovative trial that could see kitchen food scraps processed at a sewage treatment plant to produce electricity and to reduce waste going to landfill.
- Sydney Water is also researching additional opportunities to generate green energy through co-digestion at our wastewater treatment plants to increase the amount of biogas produced from anaerobic digestion and increase energy yields.
- We are conducting a trial where glycerol, a by-product of biodiesel manufacture, is added to the wastewater treatment process to improve energy generation. At the same time, this reduces the waste stream and reduces impacts on the environment.
- In a partnership with private company Oxyzone Pty Ltd, Sydney Water developed an Ozone Trailer, using ozone as an alternative to chlorine disinfection of new water pipes. This innovation is now providing an annual saving of approximately $1.4 million to Sydney Water, with disinfection now taking a third of the time without the need to use a chemical such as chlorine. The process also uses less water and the ozonation offers significantly improved health and safety aspects for employees.

As the managing director, I am proud of what Sydney Water has already achieved and we are certainly looking at making an impression in the future, helping to shape the lifestyle of Greater Sydney.

To create a truly liveable city in the future will require everyone working together - transport, utilities, builders - to plan and implement integrated systems which put sustainability at the forefront.

The success of this liveability will be measured by how well all the planning stakeholders collaborate with each other, how well we engage with the community and importantly, from Sydney Water's perspective, how well we partner with our customers.

www.sydneywater.com.au

Kevin Young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Historic sewer pipe upgrade in Brisbane

Considered a major feat of engineering for its day, the S1 Main Sewer in Brisbane was built a century ago by miners using traditional tunnelling methods. The 100 year old sewer is now in need of a major upgrade and Queensland Urban Utilities has been tasked with the $130 million rehabiliation, which is expected to extend the life of the sewer by at least another 50 years.

Back in 1915, large tunnel boring machines were not available, so the S1 Main Sewer in Brisbane was built by miners who dug the tunnel by hand using dynamite to blast through sections of rock. It reportedly took three years to build.

The sewer has had numerous upgrades over its 100 years, but like most old sewer pipes in Australia, it has corrosion from the naturally occurring gas given off by sewage. The major upgrade which is now required is, according Queensland Urban Utilities, the most unique sewer project ever undertaken in Australia.

The project will involve relining a 5.7 km section of the sewer from James St in Fortitude Valley to the Eagle Farm pump station in Bunya St.

Queensland Urban Utilities Chief Executive Officer, Louise Dudley, said it will be a challenging project due to the age, size and depth of the pipe.

"The S1 Main Sewer carries 60% of the city's sewage, spans 1.5 m in diameter and is buried eight storeys beneath the ground," she said.

"We'll be using the latest trenchless technology to reline the old concrete pipe with a new pipe made from polyethylene.

The trenchless technology being used is known as spiral winding. Dudley explains how it works: "The new polyethylene pipe is wound into the old concrete pipe in one continuous piece. It is then grouted into place. This avoids the need for open trenching and minimises the impact on traffic."

The S1 Main Sewer services around 750,000 people and stretches 12 km from Toowong to the Eagle Farm pump station. The pipe will be re-lined in 40 sections, from manhole to manhole, and is expected to extend the life of the sewer by at least another 50 years.

"Re-lining is the most cost-effective and non-invasive technique to restore the service life of the pipe," says Dudley.

"[But] before we can begin the re-lining process, we need to first upgrade the old manholes so our crews can safely access the pipe."

Queensland Urban Utilities and the Brisbane Council have joined forces on this project to minimise the impact of the sewer and road works on this busy corridor.

It will take place in several phases, with the first starting in early March between Hunt St and Riverview Tce, before the Kingsford Smith Drive Upgrade begins. The sewer relining is due to be completed by 2019.

"This is the next chapter in the S1 Main Sewer's interesting history," concludes Dudley.

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ACF walks the walk with solar

The Australian Conservation Foundation (ACF) works to secure a sustainable and lasting environment, dedicated to transforming Australia's energy production into clean energy sources. In its latest effort to prove just how easy it is for commercial and corporate buildings to go green, ACF set up shop in what is now a premier green commercial building - 60L.

Even before the construction of 60L, environmental design, energy and resource use were the critical focus of the building design. Measures were taken to minimise the consumption of materials used and maximise their re-use, as well as minimise the consumption of mains water and maximise recycling of treated wastewater.

When it was time to add solar, Going Solar used its 36 years in the solar industry to choose the best solution for the job.

Going Solar recommended Enphase microinverters because, unlike string

inverters, they could decouple the panels from each other so that any shade from structural elements does not impact the entire system's production capability.

By using Enphase microinverters, ACF was able to maximise annual production, alleviate shade effects and provide access to system monitoring and production data.

Despite 60L's limited rooftop space, Going Solar was able to design the system that would reach maximum production potential by mounting the system north-facing, with modules both flat to the roof and on a 10˚ tilt. Enphase technology maximises annual energy harvesting capability at this low inclination, while at the same time ensuring best daily performance despite early morning and late afternoon shade effects.

But having solar on the roof wasn't enough: ACF wanted to see the results as they happened. The foundation requested a high level of operational transparency for the system to enable granular, module-level monitoring capability in real time.

Enphase's cloud-based Enlighten software allows both the installer and building manager to keep a close eye on system performance and provides remote system diagnostic tools for any cleaning and long-term maintenance requirements. The system's reliability is reinforced through Enlighten's automatic alerts, which tell the installer and owner that the system is operating as designed and safeguard against any unexpected downtime or loss in energy production.

Enphase Energy
www.enphase.com/au

Solar pump improves crop irrigation in Africa

A farming community in Africa is now able to irrigate its crops on a reliable year-round basis, thanks to a solar pumping solution from NOV Mono. The Sun-Sub submersible pump system is located on the banks of the Mereb River in Eritrea, where the community now has greatly improved access to water.

"Severe shortages of diesel, and very high prices, mean that conventional pumps are often not an option for irrigation water duties in places like Eritrea," said Mono's Maurice Calderon. "However, Mono has a very successful track record of providing solar pumps for this type of application."

Available with either a stationary or GPS tracking array, and with solar panel options ranging from 150 up to 2400 W, the submersible pump can produce very high flows and discharge pressures. It requires no external diesel or electrical power supply, and can easily be configured for automatic operation by the use of float switches, a pressure kit or a built-in electronic control. This allows the product to turn on when water is required and off once any storage vessels are full, thereby conserving water and reducing wear on the pump.

Working with the team at Visual Direct International, a provider of energy management products and systems, the pumping system was fitted with a stationary array. This enables it to draw some 100 m^3 of water per day from the 7.3 m deep well and pump it over 228 m to a concrete surface reservoir. This can hold up to four days' supply, ensuring that the farmers always have water to irrigate their citrus trees.

With speeds of 1800-2400 rpm, the progressing cavity pump provides maximum water output, even in bores containing silt or iron oxide. It delivers water with every rotation, while its low speed capability extends rotor and stator life in abrasive bores.

All Sun-Sub systems are supplied complete with pre-wired solar modules, array frames, a pump element, submersible motor and solar motor controller, making them easy to assemble and install. With all electrical plugs and sockets pre-fitted, no specialist electrical knowledge is required.

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Proactive sewer corrosion and odour management

Josef Cesca, Regional Technology Manager, CH2MHILL, Zhiguo Yuan Centre Director

The complexity of monitoring in-sewer processes and the industry's limited understanding of optimal corrosion and odour management techniques have historically made it difficult to identify an optimal solution for managing sewer corrosion and odour complaints.

To address this gap and improve industry knowledge of in-sewer processes, the Australian Research Council (ARC) Linkage Program in collaboration with many Australian water utilities funded the Sewer Corrosion & Odour Research Project (SCORe) completed in 2013 - a $21 million, five-year project to uncover beneficial tools and innovative technologies to help water utilities manage odour and corrosion issues within sewer systems. The project, which was completed in conjunction with an ongoing Water Environment Research Foundation (WERF) ventilation research program, leveraged the input of 15 water industry partners (www.score.org.au) and five university partners to develop new or refined techniques for:

- sulfide speciation using ionic chromatography, which provides valuable information on all the sulfur species allowing for accurate mass balance of these compounds;
- determining the importance of relative humidity (RH) for the concrete corrosion process and established a preliminary relationship for sewer corrosions in relation to H_2S concentrations, temperature and RH;
- predicting both natural and forced

"Once validated, the model is used to identify hotspots or locations in the sewer network where odour release could result in odour complaints or where high H_2S concentrations could lead to an unacceptable corrosion risk.

ventilation air movements in sewers based on the conservation of momentum model which has proven to be much more reliable than previous models;

- understanding of the physical, chemical and biological processes involved with the five most commonly used chemicals used for sulfide control, developing their application guidelines and online control algorithms;
- understanding the most common odorous compounds in sewers, establishing their relative abundance, reproducible methods of analysis and performance of abatement systems for treating these compounds;
- understanding the performance and causes of delamination of epoxy resins and the effective life expectancy of various sacrificial coatings such as calcium aluminate cement (CAC), gunite and calcareous aggregate concrete;
- developing new sulfide control approaches.

The SCORe team developed a powerful modelling tool, which describes all key in-sewer chemical, biological and physical processes. It comprises components that predict:

- biological processes in the liquid phase including the reactions catalysed by the sewer biofilms, leading to the production of hydrogen sulfide, methane and other compounds;
- chemical processes in the liquid phase leading to the oxidation, precipitation of hydrogen sulfide as well as the variation of sewage pH;
- gas-liquid mass transfer of volatile compounds including hydrogen sulfide, methane and oxygen, among other volatile organic and inorganic compounds;
- the oxidation of hydrogen sulfide on concrete sewer walls exposed to sewer air, leading to its corrosion; and
- the movement of sewer air under forced and natural ventilation conditions.

All these components have been effectively integrated in one modelling platform called SeweX.

The integrated model is able to predict the spatial and temporal variations in the concentrations of hydrogen sulfide and numerous other carbonaceous, nitrogenous and sulfurous compounds, based on which corrosion and odour 'hotspots' can be identified. The model also predicts the effects of chemical addition (eg, iron salts, magnesium hydroxide, nitrate and oxygen) and ventilation on sulfide control, which supports the optimal design and operation of these strategies.

To collect inputs for the model, existing data is analysed, including physical sewer characteristics and flow data; data on wastewater depth and flow for hydraulic simulations; sewer airflow and air pressure for airflow simulations; wastewater characteristics such as sulfide speciation for in-sewer biological simulations; gas phase hydrogen sulfide (H_2S) concentrations to fine-tune system-wide H_2S model predications, and in-sewer RH data for corrosion rate assessment of concrete assets.

Once validated, the model is used to identify hotspots or locations in the sewer network where odour release could result in odour complaints or where high H_2S concentrations could lead to an unacceptable corrosion risk. The team developed and evaluated several potential control solutions using an integrated approach that considered the biological in-sewer processes, ventilation and corrosion risk. The tools and associated guidance documents that were developed as a result of the research findings are helping utilities gather accurate field data and enabling improved designs of sewer system gas phase and treatment systems for greater optimisation and cost savings. The tools allow utilities to identify a preferred management strategy for handling corrosion and odour, after taking into account the costs, benefits and drawbacks, as well as the ability to achieve the utility's strategic objectives such as: ensuring design asset life is achieved (ie, 'acceptable' corrosion rates), lifecycle costs of corrosion and odour management are minimised and no adverse odour impacts are experienced from any network asset.

All of the major industry partners have used the tools developed as part of SCORe, and utilities around the world are already benefiting from the research completed. Notable studies have been undertaken by Sydney Water, which demonstrate how a proactive approach to sewer corrosion and odour management helped the utility achieve a considerable cost saving compared to the conventional approach. In addition to cost savings, this approach produced better outcomes in terms of sewer asset management and reduced odour impact. Other studies by South Australian Water and Gold Coast Water have also resulted in considerable savings from optimised chemical control strategies and better overall outcomes. The savings achieved to date by the partners through the use of the model already amount to several hundred million dollars.

The SCORe project has made a significant contribution to the industry's understanding of in-sewer processes and enables utilities to support strategic decisions about maintaining sewer systems. The project, recognised for its innovation, received industry recognition from the International Water Association, earning the prestigious 2014 Global Award in Applied Research. By developing a greater fundamental understanding of the in-sewer processes involved in various aspects of managing odour and corrosion, the water industry can take the research from SCORe and progress from a reactive approach to controlling odour and corrosion to a more proactive approach, which will be critical to managing the maintenance and repair costs of ageing infrastructure, as well as minimising odour complaints from communities.

CH2M Hill Australia Pty Ltd
www.ch2m.com.au

Energy generation in the water network

Unitywater is working with renewable energy producer NextEra Energy to install two micro hydroelectric generators into the water network. The pressure reduction generators (PRGs), developed by NextEra Energy, will capture lost energy and convert it into renewable electricity.

Unitywater Manager Technologies Barry Holcroft explained, "The generators are being placed within the water network where water pressure has to be reduced to ensure that it is suitable for use in local homes and businesses.

"A by-product of reducing this pressure is dissipated energy, which is simply 'burned off' in the forms of noise, heat and vibration."

By harnessing this energy for electricity generation, the project is expected to produce about 1.7 GWh per year. This is "the equivalent of powering 212 Sunshine Coast homes for a year", according to Holcroft, who said Unitywater will sell the electricity to help offset the company's energy costs.

© iStockphoto.com/Iaroslav Danylchenko

NextEra Energy CEO Paul Camilleri said the company and its investors are funding the project because of Unitywater's commitment to a long-term partnership arrangement. NextEra Energy will share a percentage of generated revenue with Unitywater, which will meanwhile assess additional locations across its network where similar technologies could be implemented.

"The opportunities for us to install these turbines within water pipelines across Australia are endless," said Camilleri. "And who knows - maybe one day the water from your taps may even be able to power your house."

Unitywater
www.unitywater.com.au

Worming into compost management

Leussink Engineering has merged its manufacturing capability with the widespread need for community recycling. With the launch of Leussink Global Worming, the company now manufactures customised compost worm farms.

"It all happened while our engineering business was putting the finishing touches to an eight-storey building in the centre of Wollongong, a site we were constructing for the ATO," said Leussink Director Jason Leussink.

"With 400 tax office people and a few dozen more occupying the ground-level retail shops, the building encompasses 6600 m^2 of floor space and right from the start was destined to churn out vast amounts of waste."

Leussink explained that the company was challenged to raise the building's Green Star rating from 4-Star to 5-Star. Leussink said they explored "all the traditional avenues for efficiency … then one of our co-directors hit the nail on the head".

"Why search in vain for tiny latitudes for improvement in the already energy-efficient utilities when you can do something about the masses of organic waste that gets trucked off to a typical commercial site every week?" Leussink said.

"With that was born Leussink Global Worming - industrial-strength worm farm enclosures sized and manufactured according to the volume of waste output of the client."

The farms house compost worms that devour paper, food scraps or any other organic-based material, proving suitable for an ATO office which constantly has paper waste. The farm also serves the retail tenancies at ground level, one of which is a coffee shop restaurant that would have placed its used cardboard and food scraps into general waste.

Leussink's system is modular; if any user requires an increase in its stocks of composting worms, another metal housing is manufactured and joined to what is already there. Likewise, the farm can be reduced in size as needed.

Before, all recyclable waste used to go to council pick-up and collection while the food scraps were collected in commercial skips for general landfill. Now, the building's organic waste is turned into a useful by-product, with the worm droppings used as fertiliser for the site's gardens.

Leussink Engineering
www.leussink.com.au

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Creating water savings in Australia's food bowl

Australia's irrigated agriculture has a vital role to play in meeting the challenges of food security in the context of climate variability and a growing global population. It is crucial to find new ways to use water more efficiently in order to increase food production while protecting the environment in the long term.

In the Murrumbidgee Irrigation Area (MIA) in NSW, irrigation modernisation has created significant water savings to benefit the environment and communities in the Murray-Darling Basin.

One of Australia's largest private irrigation companies, Murrumbidgee Irrigation Limited, has formed the MIA Renewal Alliance with GHD, John Holland Group and UGL Infrastructure to deliver a series of water-saving projects. The alliance is working closely with local communities to design and carry out irrigation infrastructure modernisation works that will improve productivity, create water savings and ensure the long-term viability of the MIA and surrounding regions.

The Lake Wyangan project is one of two current projects that aim to deliver water savings back to the Murray-Darling Basin river system. The $50 million project, funded under the Australian Government's Private Irrigation Infrastructure Operators Program, consists of increasing the capacity of the Lake View Branch Canal (LVBC), replacing 15.8 km of deteriorated lining in the LVBC, modernising the lateral canals through the installation of 13.8 km of gravity pipelines, replacing Dethridge wheels with electronic flow meters, automating flow control structures and installing remote monitoring capability for new metered outlets.

In addition, stakeholder consultation has helped rationalise farm watering requirements through a reduction of required infrastructure, removal of farm outlets and/or a reduction in the future capacity required. Installing new metering and automated flow-control technology has also made it possible to monitor and manage water usage in real time. The asset owner can use this data in the future to prioritise capital works to further reduce water wastage.

The alliance continues to work with local communities to improve productivity and create water savings.

"This is a significant project for the Australian water industry as it delivers fundamental water savings to the MIA and the Murray-Darling Basin," says Andrew Porter, GHD's MIA Renewal Alliance representative. "Additionally, it improves the sustainability of the district into the future.

"Overall, the project renews a large part of the Lake Wyangan irrigation system and assists in recovering water for the environment, while providing a modern, efficient and effective way to deliver water to irrigators in the region."

GHD Pty Ltd

www.ghd.com

Microsoft powered by wastewater

A fuel cell power plant installation, recently opened at the Dry Creek Water Reclamation Facility in Cheyenne, Wyoming, utilises renewable biogas as a fuel source to power a nearby Microsoft data centre and supply heat to the facility's wastewater treatment process. The Direct FuelCell (DFC) technology was developed by FuelCell Energy.

The project uses biogas, produced at the facility following municipal wastewater treatment, to power the fuel cell at the data plant. Anaerobic bacteria produce the biogas while stabilising solids removed from wastewater, and the fuel cell electrochemically converts the biogas into electricity to power the Microsoft IT server container. The process features the absence of combustion - so virtually no pollutants are emitted - and the almost complete absence of nitrogen oxide that causes smog, sulfur dioxide that causes acid rain and particulate matter.

The fuel cell plant is expected to produce up to 300 kW of renewable power, while the data centre will use no more than 200 kW. The data centre will thus operate completely off the grid, with the remaining kilowatts delivered back to the wastewater treatment plant to reduce its electricity bills.

Microsoft and FuelCell Energy came to Siemens with specific parameters for the project. Based on this data, Siemens engineered the power monitoring technology to provide detailed insight into the power generation process so the biogas and fuel cell concept could be shown to produce reliable energy and move the project from pilot to full-scale. The software and hardware monitor the amount of biogas being sent to the fuel cell, the conversion to usable energy and the fuel cell output to ensure that enough electricity is created to reliably power the data centre.

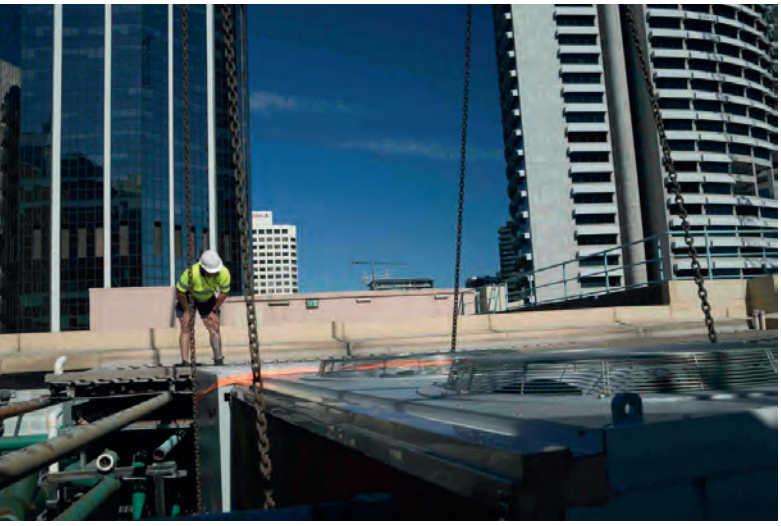
The technology includes predictive demand alert capability so data centre operators are made immediately aware of any power quality or energy demand issues. Siemens also provided environmental controls inside the data centre to manage air temperature, flow and humidity, as well as circuit breakers to deliver energy to the servers and protect power supply in cases of low or high energy levels within the container.

The project was made possible through a coalition comprising industry, the University of Wyoming, Wyoming Business Council, Cheyenne LEADS, Cheyenne Board of Public Utilities, Western Research Institute and state and local government partners. The State Loan and Investment Board approved a $1.5 million grant in 2012 to help fund the $7.6 million plant, while Microsoft covered the remaining cost.

The power plant began operating on clean natural gas in early 2014 and is now operating on renewable biogas. This project is being evaluated as a template for future potential megawatt-class data centre applications utilising renewable biogas.

Chilling out with efficient air conditioner

In the early hours of 1 March 2015, Innovative Air Solutions and Gillespie Cranes began a 15-hour operation to remove two outdated air-conditioning units from the server room of Commander, located on Bridge Street in Sydney. The units were replaced by one super-efficient magnetic bearing chiller utilising the ozone-friendly refrigerant R134a.



Con Giannopoulos, from Commander, said the company's operations are "completely dependent on the air-conditioning equipment meeting required capacity". Not only were the old units noisy and power-hungry, but they also used the ozone-depleting refrigerant R22, which will be phased out in Australia from next year in alignment with the Montreal Protocol on Substances that Deplete the Ozone Layer.

Scott Dredge is the business development officer at Innovative Air Solutions, which has maintained the air conditioning for Commander for five years. He explained that the company is "replacing the old units with an air-conditioning unit supplied by a Melbourne-based company, Powerpax, which uses an Australian-designed magnetic bearing chiller from Turbocor".

"The magnetic bearing mechanism means that the unit is super-efficient, almost silent, doesn't require oil for lubrication and reduces the drain on the power grid by almost 50%," he said. The mechanism also means that any future refrigerant replacement can easily be carried out - unlike current refrigerant replacement, which is a very involved operation that can result in gas leakages and lower efficiency.

Without reliance on oil, the chillers have a range of advantages over conventional products. A chiller's COP efficiency would typically diminish over time due to oil coating the tubes and increasing the thermal resistance between the refrigerant and the water in the tubes. The Powerpax chillers, on the other hand, have the same efficiency all the time.

Oil management issues also make it difficult for conventional chillers to run at light loads for long periods of time. The new chillers can operate continuously at 10% of full load with no operation issues and without significant drain to the power grid. This is particularly significant for Commander, which needs constant cooling in its server room.

The product features multiple compressors, so if one compressor is offline the other compressors continue to operate unaffected - even if one needs to be removed totally from the chiller. With a low rate of 5 starting amps per compressor, drain on the power grid is minimised.

The equipment upgrade was no mean feat. Bridge Street was shut down for 15 hours while a 350-tonne crane assisted with the removal and installation of the respective air-conditioning units. But the long-term impact on both the environment and Commander will be substantial, with the latter enjoying lower running costs and improved reliability as a result of the project. Innovative Air Solutions will also recycle all of the redundant equipment, including the refrigerant, in accordance with authority requirements.

Innovative Air Solutions
www.iairs.com.au

Creating resource-smart communities

The recently adopted Waste Management Strategy 2015-2020 by the Macedon Ranges Shire Council in Victoria could signal a shift in local practice.

Customarily waste management strategies have dealt with kerbside residential collection, litter and landfill systems. Their core principles have been around public hygiene and efficiency of a linear system. However, there is growing recognition that our traditional approach to waste collection undermines the value of the materials to the Australian community, industry and economy.

Recent national and state policies have been calling for a shift to a circular economy supported by improved resource recovery for re-use and reprocessing. These have resulted in a number of national and state investigations of material streams, market demand, price and opportunities.

The challenge has been in how to translate these new policies to practice. Most of the grunt work in waste and recycling is done at a local level. Local councils oversee the largest and most coordinated collection and disposal system in Australia. They carry responsibility for most landfills, clearing the litter and dealing with public education and habits. However, they have traditionally been removed from planning for material re-use and reprocessing for new product. And yet, most local councils, particularly those in regional areas, are intimately connected to issues concerning their local environment and economy. These issues include local industry and employment, land use planning, water and other resource allocations.

Integrating 'waste' management into resource management has been part of the focus of the new Macedon Ranges strategy. Macedon Ranges Shire Council is a peri-urban council on Melbourne's north-western fringe with an agricultural base and town centres such as Kyneton and Gisborne.

Like many regional councils, it is closely connected to its community, environment and the welfare of its local economy. This is reflected in the three goals which specifically call for integrated resource re-use and empowerment of the community to reduce waste and increase re-use and recovery. There are six underlying principles which include typical statements on affordable and accessible waste and recycling services, and two that aim to turn Macedon Ranges into a resource smart community:

1. "Recognise the current and future true cost of resources and waste (economic, environmental and social)"; and
2. "Manage different 'waste' streams as resources for specific markets".

These flow through to six specific goals and targets to 2020 as indicators of successful performance such as: data on materials, value and destinations is available to enable exchange and investment by community, business and government.

The strategy goes on to describe 21 recommended actions which address current and future trends with transport, local economy, population growth, climate change and resource availability. They cover typical local council waste issues of closed landfills, contract management, growing quantities of waste, litter and community education. Unusually, there are also three recommendations that involve both the Council Strategic Planning and Environment team and Economic Development Unit. These teams have responsibility for collecting data, encouraging resource efficiency and market pull for local re-use of materials.

It is hoped that this strategy places the shire in an excellent position for the long term, with accelerated resource recovery, strong local resource recovery businesses and reprocessing and lower costs through reduced waste transported to distant landfills.

The strategy prepared by One Planet Consulting (Helen Millicer with David Rako) was adopted by council in December 2014 following a period of public consultation and is available online: Adopted Strategy. Special acknowledgement is given to the professional work of the council teams, in particular Silvana Predebon, in assisting with the preparation and presentation of the plan.

For further information on the Adopted Strategy, visit www.mrsc.vic.gov.au/Waste_Environment/Waste_Recycling/Waste_Strategy_Review.

One Planet Consulting

Solar-powered medical device manufacturing

Cook Medical will power manufacturing processes at its Brisbane headquarters with the help of a 706 m^2, 99.90 kW solar panel installation.

"We have a roof and lots of sun, so harnessing solar power was an obvious solution to reduce costs for us and the environment," said Barry Thomas, Cook Medical vice president and managing director of Cook Medical Australia.

"Using alternative energy to power manufacturing still isn't mainstream, but given the benefits it's completely logical."

The passivated emitter rear contact (PERC) solar panel technology was installed in January by Positronic Solar. "We've chosen extremely efficient technology and the panels are now offsetting on average 30% of the power we use each day," said Thomas.

"The design utilises Schneider Electric inverters and WINAICO high-efficiency PERC 280 W monocrystalline modules," said John Inglis, the director of Positronic Solar. "The panels are not only efficient even in low light, but also perform very well at high temperatures - which is of course very important here in Queensland.

"When we put in our proposal we were very honest about what was achievable and the best technology for Cook Medical's solar panels. They appreciated our straightforward approach."

"The investment was significant, but even so we expect our solar panels will pay for themselves within 15 years," concludes Thomas.

Positronic Solar Data and Electrical
www.positronicsolar.com

Oil-free screw blowers increase sewage plant efficiency

Two Atlas Copco ZS 55+ oil-free screw blowers with variable speed drive (VSD) are supplying energy-efficient compressed air to process sewage at a treatment plant in Versmold, Germany. As a result, the plant has achieved energy savings of 10%, which means lower sewage fees for customers.

The plant cleans around 3 million m^3 of sewage water every year, 60% of which is industrial sewage water. The plant has a high proportion of industrial customers from the meat processing industry, which generates varying rates of high polluting loads and above-average quantities of phosphate. The cleaning technology, measuring technology, process control system and compressed air technology must be able to quickly detect the pollution level of the sewage water and respond accordingly.

Nitrification and denitrification take place simultaneously in two aeration tanks, each of which is supplied with oxygen via blowers. The control function is taken over

in each case by an Atlas Copco ZS 55+ VSD oil-free screw blower with VSD. The two machines, working together with two blowers from another manufacturer, supply compressed air between 1500 and 3500 m^3/h with a target excess pressure of 500-600 mbar. The volume flow is automatically adjusted to the exact air demand by the VSD.

"The blowers from Atlas Copco are compact and it is not necessary to make many modifications," said plant manager Khosrow Ghobadi. "The machine is simply linked to the process control system, which we did easily without any problems."

Initially, said Ghobadi, only one of the two tanks was equipped with a ZS+ blower in order to test the increased efficiency. He noted, "At the end of the test run, we were actually able to determine that the blower from Atlas Copco was 10% more efficient than our other machines."

In light of this, the second screw blower was purchased. Ghobadi said, "The two machines have run smoothly for the past two years. The only thing that we need to do is routine maintenance work."

Atlas Copco Compressors Australia
www.atlascopco.com.au

Air consumption is now metered

© fabiobertit.it/Dollar Photo Club

The consumption of power and water in the building portfolio has a central role in numerous sustainability reports. This is likewise true of investment companies, real estate developers and other players in asset management. Heat energy consumption is also closely examined. On the other hand, the issue of air consumption in air-conditioning systems only very rarely shifts into focus.

The following figures show that the aims of 'green building' and 'building sustainability' most assuredly warrant an additional focus on ventilation and air-conditioning systems:

- About 25,000 of buildings in Germany have (at least) one air-conditioning or ventilation system.
- About 400,000 of ventilation and air-conditioning systems altogether are installed.
- The total area of these air-conditioned buildings is about 350 million m^2.
- The total ventilation and air-conditioning costs are about €6 billion.
- The heating, cooling and flow of conditioned air generate an annual CO_2 emission in Germany of about 18 million tonnes.

Nowadays, these contributions to costs and the environment are only examined more closely in the rarest instances. Among other things, this is due to the fact that ventilation and air-conditioning systems use other media to help them provide the desired temperatures and volume flows. This results in ventilation consumption being lumped together with the costs for power, water and heating and 'disappearing':

- Air flow is produced by fans. They use electric power.
- Air conditioning requires refrigeration systems that consume electric power and which are monitored separately.
- Air is mainly heated via heating circuits, the costs of which show up in the 'heating budget'.

It is thus no exaggeration to describe ventilation costs as 'hidden costs'. In many buildings, there is no separate designation of these important cost components. Ventilation costs are determined in other buildings by taking the deduction of investment costs, maintenance costs and pro rata power, water and heating costs into account.

However, this total cost is then allocated to the individual tenants according to the percentage of real estate surface they have rented. Such an allocation by area is felt by many to be unfair. On the other hand, individual tenants do not have consumption transparency and thus have no incentive to save. The fairness question is asked in particular by those commercial tenants who require less ventilation than their neighbours or who have few cooling loads per area because of the type of use or location in the building.

In the meantime, there is a remedy. Measuring technology manufacturer halstrup-walcher has introduced the P26, an 'air meter' that is installed right in the air entry duct of any leased area. Individual consumption is thus recorded in the same manner as an electricity or water meter. The consumption values can be read directly on the meter. Moreover, they can also be transferred to a central metering point. The total ventilation costs can thus be distributed easily; adapted for each tenant's share of consumption.

Along with the consumption-based invoice, recording air consumption also results in an effective saving incentive. Displaying consumption is said to lead to savings of 20-30%.

In today's competitive building market, innovations are more crucial than ever. Ideally, these should be the kinds of innovations that simultaneously and sustainably lower costs and consumption and increase the property's attractiveness from the tenant's point of view.

Bestech Australia Pty Ltd

www.bestech.com.au

Cleaning contaminated soil at Point Cook

In 2012, Enviropacific was appointed as a remediation contractor for the clean-up of the former fire training area at RAAF Base Williams, Point Cook. Due to firefighting and other activities, the underlying soil and groundwater of the area were contaminated with organic hydrocarbons, providing risks to the environment and to human health.

Enviropacific installed and commissioned a direct thermal desorption (DTD) plant, with a soil processing line from the USA. The line included a desorber to dry the soil and drive off organic contaminants and an oxidiser to render the contaminants suitable for discharge to the atmosphere. Each item was supplied with a burner which was capable of an output exceeding 50 GJ/h.

Hurll Nu-Way was awarded the contract to design, manufacture and supply the gas trains and the burner management panels for each of the burners. It also installed the gas trains and was responsible for liaising with Energy Safe Victoria over system approval and carrying out the burner commissioning and start-ups.

One of the difficulties in the construction of the plant was its location - near the coast of Port Philip Bay, opened to harsh weather conditions and under an active airfield. The plant's components therefore had to be rugged and reliable, so Hurll Nu-Way supplied the equipment with the following features:

- Filters and pressure regulating equipment with overpressure shut-offs (OPSOs). Independent pilot gas rate regulators with OPSOs were installed in the pilot lines to ensure reliable pilot ignition on start-up.
- Pneumatically operated, double-block, safety shut-off valves were included in each gas train, with a valve proving system to check their effectiveness prior to each start-up and after each shutdown.
- Self-checking ultraviolet flame detectors were fitted to each burner to operate in conjunction with the panel-mounted Siemens LGK ignition and flame detection programmers in a system designed to operate 24 hours a day, six days a week.
- Control of the firing rate of each burner was performed through motorised linked valves - a butterfly valve in the air line and a square port valve in the gas line assembled in tandem and positioned by a Honeywell motor.
- The linked valves option controls the burners at a fixed air/gas ratio and so are less flexible than alternative schemes using independent actuators, but offer reliable and repeatable control.

The burner systems are monitored and controlled by the plant's PLC control system, but the burners' ignition and safety system is hardwired as required by current Australian codes.

Enviropacific incorporated safety features beyond those required by a strict interpretation of the Australian Code. Hurll Nu-Way assisted in interlocking two burners by the overall control system. Although the burner systems are independent of each other, the overall control ensures that the oxidiser burner is started first and its chamber reaches a preset operating temperature before the desorber burner system can be started.

Products of combustion together with water vapour and volatiles from the soil are drawn from the desorber and through the oxidiser. The temperature in the oxidiser chamber is maintained between a minimum of 7500°C and a maximum of 11,000°C, with excess oxygen present in the process stream to ensure the total destruction of the contaminants. The pressure inside the processing line is maintained below the atmospheric pressure to prevent any leakage of the process stream to the atmosphere.

Exhaust gases being delivered to the stack are continuously monitored for oxygen, carbon monoxide, NO_x and SO_x to ensure complete destruction is achieved. NATA registered testing was regularly carried out to analyse the gases for a comprehensive suite of parameters, including VOCs, SVOCs such as dioxins and difurans, metals, acid gases and particulate matter.

The plant was constructed allowing for the possible relocation in the future; the gas trains and panels were designed to allow their transport by road to new sites, while the burners, currently running on LNG, can operate with natural gas, LPG or oil. The plant is currently remediating 20-25 tonnes of soil per hour, with circa 60,000 tonnes of contaminated soils and 18 ML of contaminated groundwater successfully treated and re-used on-site.

Hurll Nu-Way Pty Ltd
www.hnw.com.au

Mine rehabilitation project

Energy Resources of Australia (ERA), the operator of the Ranger open-cut uranium mine, has reported a major milestone in its progressive rehabilitation program. Since open-cut mining finished at Ranger in 2012, ERA has committed to a closure plan to achieve full rehabilitation.

Tim Eckersley, general manager operations for the Ranger mine, explained that Ranger's two former open-cut pits are being converted into permanent repositories for the mine's tailings. Waste from the site's milling operations has now been transferred directly to the mine's last open pit, Pit 3, following careful preparation to ready the pit for storage.

"So far Pit 1 has been backfilled with tailings and preliminary rock capping put in place," Eckersley said. "As of last month, Pit 3 began receiving tailings directly from our processing mill for permanent storage.

"In a couple of months we are scheduled to commission a dredge and infrastructure to transfer dredged material from the Tailings Storage Facility into Pit 3. We are also scheduled to begin brine storage in Pit 3 from the Brine Concentrator."

ERA's Brine Concentrator is treating process water from the site's Tailings Storage Facility to reduce the operation's water inventory. Brine, which is the residue from the treatment, will be moved to Pit 3 for permanent storage.

"Last year we completed the initial backfill of Pit 3, with more than 33 million tonnes of waste rock placed into the base of the pit, and the installation of in-pit drainage and an extraction pump system to convert the pit into a storage repository for brine and tailings," Eckersley said.

"We've installed extensive drainage works across the floor of the pit, while a water extraction bore system has been installed to transfer water removed from the pit to the Tailings Storage Facility.

"Later this year we are scheduled to commission a custom-designed, stainless steel dredge built in Queensland to dredge tailings from the Tailings Storage Facility for containment in Pit 3."

Once all waste material is moved to the pits for final long-term storage, the pits can be capped with rock and ultimately revegetated. The project will mark the latest achievement in ERA's $378 million Ranger rehabilitation program.

Energy Resources of Australia
www.energyres.com.au

Wastewater treatment and biogas production at US dairy

A new US dairy processing plant features wastewater treatment technology that improves biomass recovery, effluent quality and harnesses green energy from waste streams.

Dairy farmers collective Cayuga Marketing constructed the Cayuga Milk Ingredients (CMI) plant to reduce its milk-hauling

costs, transport emissions and carbon footprint. It selected Global Water & Energy (GW&E) - the US branch of Global Water Engineering - to design, build and start up its new wastewater treatment facility, specified to achieve good effluent discharge qualities while producing biogas for future utilisation and electricity production.

"We determined that the ideal solution for wastewater treatment from a dairy plant such as Cayuga was provided by GWE's Flotamet system," said GWE engineer Natascha Janssens. "This unique GWE system offers high-rate anaerobic treatment with GWE's Anamix reactor (completely mixed continuous flow stirred tank reactor, CSTR) followed by biomass recovery in a combined sludge separation system consisting of GWE's Supersep-CF followed by GWE's dissolved biogas flotation (DBF) unit Superflot-Biogas."

The Cayuga plant is designed to treat 950 m^3/d of wastewater and 95 m^3/d of whitewater, together resulting in a total COD load of 6000 kg/d. Approximately 80% of the COD load and 85% of the BOD load is removed in the Flotamet system, with the waste removed converted to biogas. This results in the production of up to 1900 Nm^3/d (at 75% CH4) of biogas, with an energy content of 590 kW.

Janssens says the biogas will be used partially to heat up the wastewater in order to ensure optimal anaerobic digestion. As such, the anaerobic treatment plant does not create an additional energy demand to the factory for heating purposes. The aim is to use the remaining biogas to generate electricity in order to meet CMI's goal to further decrease the carbon footprint of the factory.

CST Wastewater Solutions
www.cstwastewater.com

Safe solar for service station

The Oasis Service Station in Tuncurry, NSW, operates from the early morning until late into the night each day, draining electricity along the way. With load spikes in the morning and at night, owner and operator Stan Wilson turned to solar as a way to cut the station's ever-rising expenses and hired Solar PV Commercial as his installer.

When working with a petrol station to design a suitable solar solution, safety is the highest priority.

"The system is located on top of the 30 x 15 m canopy, directly above the fuel dispensing facilities, with a 5000 L above-ground LPG gas tank close by," Wilson explained. "There is also large underground storage for the petroleum products, which have to be vented to the atmosphere.

"I felt that standard single inverters posed a potential safety risk due to the high DC voltages being carried in the cables from the panels to the inverter. Then Solar PV recommended Enphase microinverters, and I knew it was a much safer alternative."

Typical string inverter systems can carry voltages of up to 600 VDC down the cables to the inverters. Enphase microinverters receive extra-low DC voltages of around 30 VDC on a sunny day, with a maximum of 48 VDC, from each single module. From the microinverter onwards, standard AC voltage is carried through the cables to the main switchboard, no different than other electrical components on-site.

While string inverters increase safety risks by requiring high-voltage DC cables to be run across the roof surface, Enphase microinverters are designed with an all-AC approach to reduce

voltage and require a lower level of external wiring and cabling insulation to further minimise hazardous safety risks. The company's simple plug-and-play design makes it easy for Wilson to expand his system and add more microinverters in the future.

The 20 kW Enphase system will deliver roughly 50% of Wilson's daytime energy needs from solar power. Furthermore, Enphase Enlighten, connected with E Gauge monitoring, provides a way for him to track performance of the system. Through Enlighten, Wilson can adjust the station's power consumption patterns to get maximum benefit from his solar investment, relying on grid-supplied power only when necessary.

Enphase Energy
www.enphase.com/au

The sweet smell of success

When producing specialty meat products and fresh food it is common for odours to be generated in the production cycle. This was the case at the Illawarra Meat Company where hams, sausages and other smallgoods are processed. The business is now using an Australian-invented technology to reduce odours and enjoying the sweet smell of a new kind of success.

"Being located in an industrial estate, we were determined to take responsibility, be a good corporate citizen and address any odour concerns," explained Richard Hutton, managing director at Illawarra Meat Company.

Two years ago, Hutton went into 'research mode' looking for a technology to tackle odour. His search led him to the technology called BioGill, which is used for the biological treatment of wastewater. The technology was developed in the research laboratories at the Australian Nuclear Science and Technology Organisation (ANSTO), which is based in southern Sydney.

BioGill produces above-ground, non-submerged bioreactors that deliver a low-cost, low-energy solution for treating wastewater from food processing. The bioreactors effectively provide the ideal habitat for microorganisms, nature's best recyclers, to consume nutrients out of the waste stream and quickly deal with the fatty acids and sulfur compounds that cause odours.

"We've just come through our peak production time prior to Christmas and I am pleased to report the BioGill technology performed exceptionally well.

BioGill newly manufactured nano ceramic membrane (left) and membranes colonised with biomass (right).

"Using BioGill bioreactors has been a win-win situation with the technology being good for the local vicinity, good for the environment by halving our use of chemicals and good for the bottom line with the subsequent savings in chemical costs," explained Hutton.

The company plans to install more BioGill units this year to further improve the quality of its wastewater.

BioGill Operations Pty Limited

www.biogill.com

Artesian heating and cooling for Christchurch airport

As part of Christchurch International Airport's $237 million Integrated Terminal Project, engineering consultant Beca designed and delivered an innovative artesian heating and cooling system. The system helps the terminal building's temperature to remain constant, improving the experience of the millions of passengers who pass through the airport each year.

The essence of the system is the use of artesian water that flows beneath the city of Christchurch and the Canterbury Plains. Easily accessible through wells, the artesian water provides the airport with a cost-effective, long-term heating and cooling solution and an efficient, sustainable energy source.

Chillers, which act as geothermal heat pumps, provide both mechanical cooling and heating, and 12°C artesian water is used for direct cooling. The system enables artesian water to heat or cool the building, or do both, at any one time. It also has the ability to recover and redistribute heat energy.

The system has now received industry recognition, winning International Project of the Year at the 2015 CIBSE (Chartered Institution of Building Services Engineers) Building Performance Awards. Presented at the Grosvenor House Hotel in London, the awards recognise engineering excellence in the built environment, with an emphasis on energy efficiency.

Justin Hill, Beca's technical director and Christchurch building services manager, was in London to accept the award. He said the project "epitomises excellent engineering in almost every aspect of the design and construction" and believes Beca's "holistic approach to the system design played a major role in the project's success".

"Cost-effectiveness, energy efficiency and future flexibility were high on the priority list," added Hill.

The CIBSE award is just one of many that the system has won over the past year. It also won the Building and Construction category at the 2014 New Zealand Engineering Excellence Awards and a Gold Award of Excellence at the 2014 ACENZ (Association of Consulting Engineers New Zealand) INNOVATE New Zealand Awards.

Beca

www.beca.com

Energy efficiency improvements for NZ operation

Orora, a manufacturer of packaging for various food and beverage brands, aims to save up to 15% of its energy as part of a three-year plan developed with the support of New Zealand's Energy Efficiency and Conservation Authority (EECA). The initiative will target annual energy savings of 11.8 GWh - the equivalent annual energy use of about 1130 households.

"We know that our customers are looking for suppliers that take sustainability seriously," said Orora CEO and Managing Director Nigel Garrard. "Improving our energy efficiency is a key area where we can make an impact.

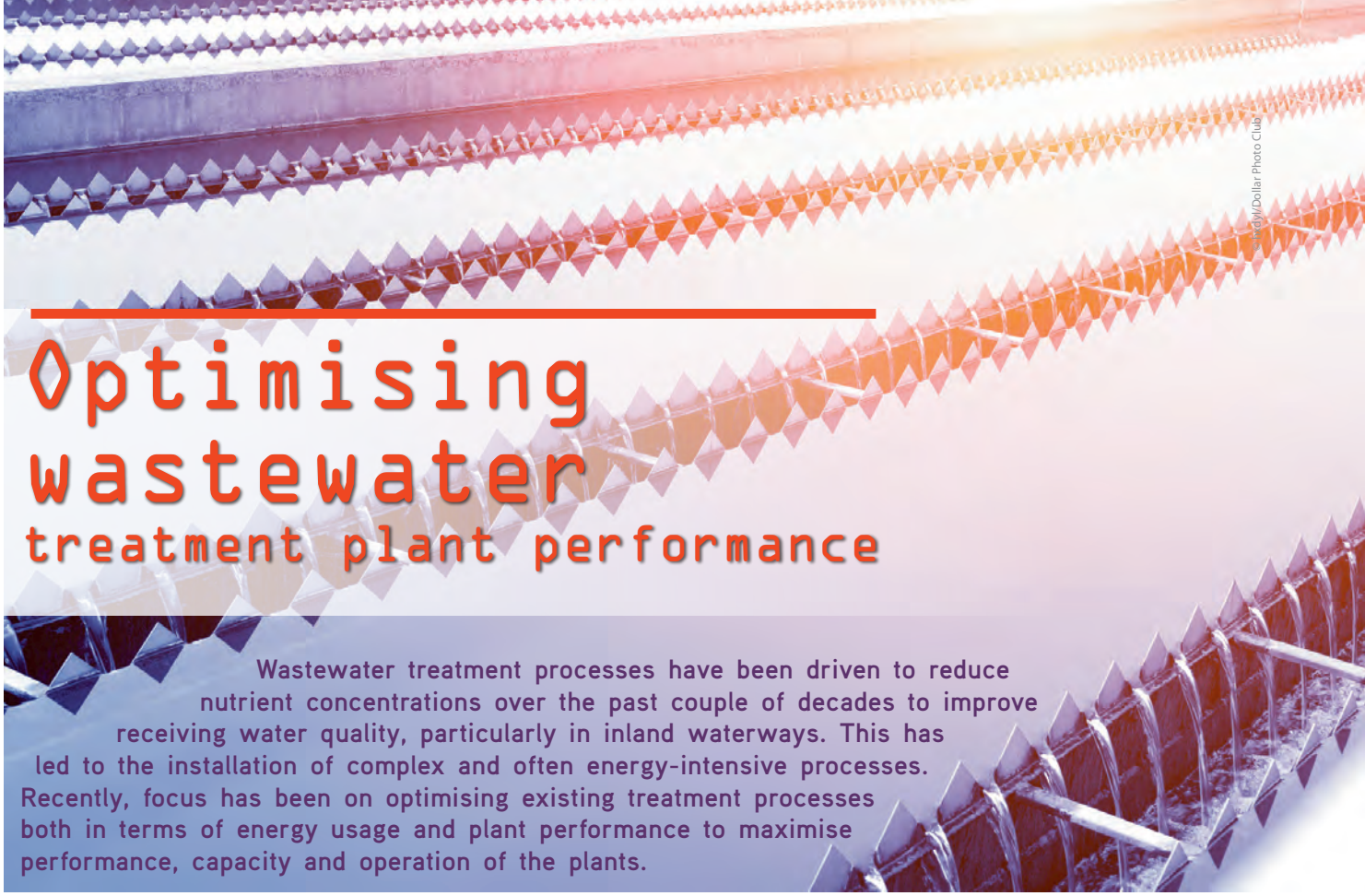
Garrard noted that Orora has "already invested heavily in energy-efficiency improvements in our Australian operations". As well as resulting in savings on energy costs, other benefits included "increasing output, improving working environments and greater engagement with staff", he said.

As part of the New Zealand initiative, Orora will invest approximately $2 million towards optimising energy used for compressed air, warehouse lighting and motorised systems, as well as reducing energy used in process and space heating. The program is expected to reduce annual carbon dioxide emissions by 1600 tonnes - comparable to the annual emissions of about 580 cars.

Orora's energy-efficiency team is currently conducting energy audits of each New Zealand manufacturing plant to identify energy-saving opportunities, both operational and technical. The company will introduce a training program to improve energy-efficiency procedures and awareness amongst its 700+ staff, which are expected to provide a more productive working environment.

EECA Chief Executive Mike Underhill said a group-wide energy management agreement can help organisations to establish a comprehensive energy management plan that makes energy work harder and smarter for their business. He added that Orora will be "one of a growing number of New Zealand large companies signed up to group-wide energy management agreement with EECA".

www.energywise.govt.nz ***www.eecabusiness.govt.nz***



Optimising wastewater treatment plant performance

Wastewater treatment processes have been driven to reduce nutrient concentrations over the past couple of decades to improve receiving water quality, particularly in inland waterways. This has led to the installation of complex and often energy-intensive processes. Recently, focus has been on optimising existing treatment processes both in terms of energy usage and plant performance to maximise performance, capacity and operation of the plants.

Aurecon Associate - Water & Wastewater Treatment Susan Kitching will be presenting a paper on optimising Sydney Water's wastewater treatment plant performance at Ozwater'15 on 12-14 May in Adelaide. The paper discusses a program of work that commenced in 2011 with Aurecon to audit 11 anaerobic digestion facilities. Following successful results from this program, a second program was established to assess the capacity and capability of their water and wastewater facilities focusing on the performance of the system and operation and maintenance. The objectives of the program are to:

- standardise operations where possible on good practice to optimise maintenance requirements;
- consistently comply with effluent and biosolids land application guidelines/standards;
- improve biosolids and effluent quality; and
- improve operational efficiency.

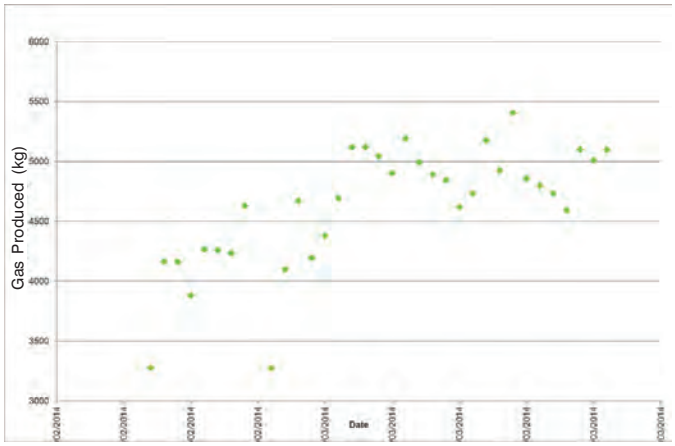


Figure 1: Gas produced as a result of recuperative thickening

Case study: Liverpool Water Recycling Plant

One of the plants that was audited within the anaerobic digestion audits is Liverpool Water Recycling Plant (WRP). The plant treats wastewater from the South Western Suburbs of Sydney around Liverpool.

The plant consists of an inlet works, primary sedimentation and secondary treatment in a conventional activated sludge plant. Solids are collected from the primary and secondary treatment and treated in anaerobic digesters prior to dewatering and being taken off-site for beneficial re-use.

The Liverpool WRP audit and BioWin modelling identified a number of short-, medium- and long-term modifications to improve digester performance. From these findings a number of modifications have been made to the plant to trial some of the recommendations, specifically that relating to recuperative thickening.

The initial changes resulted in improvements to biosolids product quality, increased gas production and a reduction in operating costs. Following on from the initial success, between October and early 2014, the recuperative thickening has been optimised on-site to stabilise the thickening performance and hence the digester operation within the limits of the existing equipment. The increase in gas production can be seen in Figure 1 (approximately 30%).

Conclusion

The auditing process as applied to Sydney Water treatment plants allows understanding of influent characteristics, overall plant mass balance and process unit performance. Examination of these, alongside operations and maintenance practices, and comparison to good practice can lead to optimisation of treatment facility assets and maximising available treatment capacity.

Aurecon Pty Ltd

www.aurecongroup.com

Sweden importing garbage for energy

Sweden is taking waste management to a whole new level, recycling and sorting its waste so efficiently that less than 1% ends up in landfills. Furthermore, the country burns about as much household waste as it recycles - over 2 million tonnes - and converts this to energy. In fact, Sweden's 32 waste-to-energy (WTE) incineration plants can handle even more waste than is produced domestically. So when it runs out of its own garbage, it offers a service to the rest of Europe: importing excess waste from other countries.

Göran Skoglund of Öresundskraft stands beside imported British waste, ready to be incinerated for energy at the Filborna plant, Helsingborg. Image courtesy of Sweden Sverige under CC BY-NC-ND 2.0.

"We import approximately 800,000 tonnes yearly, and we sell a service," said Anna-Carin Gripwall from Swedish Waste Management. "It's mainly from Norway, the UK, Ireland and Italy."

WTE provides district heating to 950,000 Swedish households and electricity for 260,000 households. In Helsingborg, in the south of Sweden, about 40% of households get their district heating from garbage incinerated at the new Filborna plant run by Öresundskraft.

"Three tonnes of waste contains as much energy as one tonne of fuel oil ... so there is a lot of energy in waste," said Öresundskraft Press Officer Göran Skoglund.

In some parts of the world, the incineration of waste is seen to have negative environmental impacts, but Gripwall rejects this idea.

"When waste sits in landfills, leaking methane gas and other greenhouse gases, it is obviously not good for the environment," she said. "Waste-to-energy is a smart alternative, with less environmental impact, taking into account both by-products of incineration and emissions from transport. Plus, recovering energy from waste exploits a resource that would otherwise be wasted.

"At the same time, it is important that waste has been source separated before it can be considered for energy recovery," added Skoglund. "Metals have been sorted out, glass has been sorted out, as well as foodstuffs. It also must not contain hazardous waste such as batteries, light bulbs or other electrical waste. Nor should it contain packaging or newspapers. These should be sorted out and left for material recycling ... before it can be used for energy."

Until other countries are able to adopt better recycling practices and infrastructure, Sweden can help do its part by making use of other countries' waste.

"The world has a garbage problem, there is no doubt about that," said Skoglund, "but in the meantime, waste incineration and extracting energy from the waste is a good solution."

Feeding extra solar PV into the Alice Springs grid

The Australian Renewable Energy Agency (ARENA) has revealed that up to 10 MW of extra solar photovoltaic (PV) could be installed in the Alice Springs grid without adversely affecting supply stability.

ARENA CEO Ivor Frischknecht stated, "One of the challenges involved in increasing grid-connected solar power in Australia is how to best manage the local weather impacts, such as cloud cover." With this in mind, ARENA provided over $200,000 towards a study which "investigated the impact of large amounts of solar PV on electricity grids and how to effectively manage it", he said.

Northern Territory engineering consultancy CAT Projects "used a network of solar monitoring stations to estimate the maximum number of solar power generators that can be connected to the Alice Springs electricity grid without energy storage", Frischknecht explained. The study found that dispersing solar PV across geographical locations can effectively counteract its variability within a network.

"The study shows that building a larger number of smaller installations and spreading them out, ideally 3-5 km apart in Alice Springs, can reduce the impact of local cloud cover and smooth overall solar energy output," Frischknecht said. The additional PV would make a sizeable difference to the Alice Springs grid, which currently has 4.1 MW of solar and a peak load of almost 55 MW in summer.

"This analysis is very relevant to solar projects currently being planned in the NT and elsewhere in Australia, and could allow network planners to increase the amount of solar PV that can be connected to the network," Frischknecht said.

"The findings should also allow performance-based power purchase agreements to be more accurately formulated, potentially lowering the cost of renewable energy generation."

www.arena.gov.au.

New products created from lobster leftovers

South Australian researchers are working with Adelaide-based lobster exporter Ferguson Australia in a bid to generate new products from lobster offcuts, thereby reducing wastage of the premium seafood product. The team, from Flinders University and the South Australian Research and Development Institute (SARDI), has so far developed prototypes including lobster essence oil, protein powder and chitin.

Flinders PhD candidate Trung Nguyen, who is working on the project, said the extraction of lobster compounds uses cutting-edge advanced manufacturing processes such as supercritical CO_2 extraction and microwave-assisted extraction, which produces a product that is of high purity while also being cost effective and environmentally sustainable. He said products such as lobster oil and protein powder could be used as functional ingredients in a range of foodstuffs, from stock bases to crackers, while the chitin could have a wide range of applications, from food and cosmetics to biomedicines, agriculture and the environment.

"The lobster-derived chitin, chitosan, could be used as a food preservative, a wound dressing to speed up the healing process or as a surgical glue to bind cuts and wounds," he said.

Flinders Centre for Marine Bioproducts Development Manager Raymond Tham said the products can be created "in very large quantities using sustainable technologies". The manufacturing process therefore provides "a real opportunity to make sure none of our high-value seafood is ever wasted", he said, enabling the production of new products that "currently do not exist on the global market".

Ferguson Australia Managing Director Andrew Ferguson added that the process will allow the company to reduce its waste management costs and improve environmental and resource sustainability. Sending lobster waste to landfill carries a high cost for both business and the environment, he said - now, the products created from such waste will have "a higher retail value and longer shelf life to reach wider export markets".

Solar-powered tomato greenhouse

Sundrop Farms has selected Frazer-Nash Consultancy to provide Owner's Engineer support to the construction of a landmark 20-hectare greenhouse in Port Augusta, where tomatoes will be grown with solar power and desalinated seawater.

Crops will be grown in greenhouses using the proprietary technology Sundrop Farms has developed to address the water and food security issues typical to arid regions. Concentrated solar power will be used to provide heat, power and water to grow high-quality produce all year round.

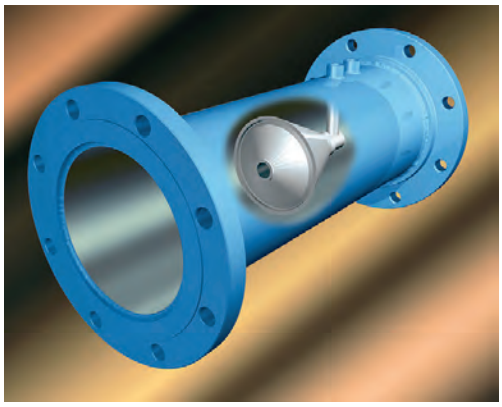
The $150m+ project will see the Sundrop Farms complex expand from a 2000 m^2 pilot greenhouse to a 20-hectare commercial facility, producing 15,000 tonnes of fresh vegetables annually.

Greg Pope, business manager at Frazer-Nash, said: "We have provided independent technical due diligence to Sundrop Farms' investors and partners since 2013. As the project moves into the next phase we will be able to provide further technical and engineering guidance to ensure the project's success."

Dr Ian Watson, systems engineering lead at Frazer-Nash, said: "Our engineers frequently apply their skills at the cutting edge of technology development in the energy, resources, transport, industrial and defence sectors; the team is thoroughly enjoying the challenge of applying their world-class engineering skills to growing tomatoes."

Philipp Saumweber, Sundrop Farms CEO, commented: "Frazer-Nash's engineering capabilities and the diligence, transparency and thoroughness of their analysis has been invaluable to the project to date; we are delighted they will provide Owner's Engineer support to us over the next two years."

Frazer-Nash will be providing practical and technical guidance to the design, testing and acceptance of the project during construction and commissioning through into operations. The role draws on Frazer-Nash's engineering expertise supporting major capital projects in Australia and the UK.



FLOWMETER

McCrometer's V-Cone flowmeter is an innovative system for differential pressure flow measurement. Designed for mild to harsh operating environments and for a wide variety of fluids, the flowmeter is claimed to outperform traditional DP devices and other flow technologies, offering better accuracy and repeatability, wider rangeability, installation flexibility and reduced maintenance.

The flowmeter provides repeatable accuracy of up to ±0.5% of rate even under difficult flow conditions. The meter is accurate over a wide range, from very low to extremely high Reynolds numbers. Whether measuring swirling fluids or low pressure flows, the unit is said to deliver the accuracy and reliability other devices achieve under laboratory conditions. It also has low headloss when compared to other dP technologies.

The flowmeter's enhanced performance is due to the shape and position of the cone in relation to the measurement ports. This allows the unit to act as its own flow conditioner by disrupting all centralised flow disturbances. This fully mixed and conditioned flow results in a low-amplitude, high-frequency signal with little signal noise. Readings are precise, even in low-pressure flow situations.

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

ENERGY STORAGE SOLUTION FOR LARGE POWER USERS

Powerstar Virtue is an energy storage system suitable for large energy users in industries including commercial, industrial, retail, educational and government. The product harnesses the excess voltage supplied from the grid, stores the excess and deploys it at times when the cost of power is at peak tariff.

According to the company, because most buildings receive power from the grid at 247 V and most electrical equipment is designed to work most efficiently at 220-230 V, the result is 'wasted' energy which the system can store and deploy. The technology allows users to become a virtual power station, forecasting how much power will be available at all times and enabling decisions to be made on when stored energy should be used.

The system can be integrated with on-site renewable energy generation such as solar and wind. Sites will benefit from reduced harmonics, voltage phase balancing, improved power factor and reduced maintenance costs of electrical equipment.

EMSc Australia Pty Ltd
www.powerstar.au.com

SOLAR INSTALLERS PROGRAM

Yingli Green Energy Australia, the PV module manufacturer known as Yingli Solar, has announced the partner program Yingli4You, which aims to raise the quality benchmark for Australia's solar PV industry.

The Yingli4You Partner Program is designed as an integrated educational, incentive, technical and project-management package to support authorised Yingli Solar installers in raising quality standards within the solar PV industry. It offers a competitive advantage for participating installers with tools and support to increase their productivity, efficiency and competitive advantage. Business and residential customers will have the assurance of working with installers who will receive a high standard of training, as well as increased supplier support and back up from Yingli Solar.

Yingli Solar will introduce an iPhone app (known as Y4U) with a corresponding website which acts as an integrated digital storage tool for all technical and site information and photography, facilitating streamlined project management. Installers will be able to maintain a database of installations, add location-based tags to installation images and orientation and pitch image grabs. Installers can also log Yingli inventory used through a barcode reader and verify the compliance of a solar PV installation against Clean Energy Council (CEC) standards.

The website and app will allow installers to process product warranties online and to verify the authenticity of Yingli Solar PV panels.

Yingli Green Energy Australia Pty Ltd
www.yinglisolar.com

VARIABLE SPEED DRIVE COMPRESSOR

Atlas Copco has introduced a compact oil-injected rotary screw compressor from 7 to 37 kW: the 7-37 GA VSD+. The product offers improvements of up to 12% in free air delivery. High-quality electronic components, together with the new drive train, add up to energy savings of 50% on average compared to a traditional idling compressor of the same type.

Offering a variable speed (frequency controlled), the compressor will be suitable for most industries and aims to contribute significantly to the green economy needs. The variable speed drive compressor is said to achieve better performances even at full load than a comparable idling compressor. This will enable all compressor users to switch over to variable speed drive compressors.

The compressor features low noise levels, an efficient fan and a robust air intake system, eliminating blow-off losses. The product is said to be 15% more efficient than Atlas Copco's current variable speed drive compressor (the GA 7-37 VSD). A full-feature version with an integrated dryer is available as an option.

Atlas Copco Compressors Australia
www.atlascopco.com.au

COMPOSITE SLURRY PUMP

The Pentair Southern Cross SX40 composite slurry pump is designed as a lightweight unit for the transfer of light slurries and being a 100% composite vessel material allows for pumping of extremely aggressive and corrosive slurry products.

Recently, Pentair Southern Cross conducted a field trial of its SX40 Solids Vacuum pump in conjunction with its regional authorised reseller M/s Hydroflo Solutions, Cardiff at the Steel Mills in Mayfield, NSW.

The task at hand was to provide a simple and safe solution to emptying several sumps containing steel scale within the mill process plant. Up until the time of the field trial, the steel mill operators were manually transferring the scale and were starting to experience workplace health issues.

The SX40 air-operated pump provided the solution to emptying the sumps. Requiring only 80 cfm of air at an operating pressure of 100 psi, the site personnel were able to use the stainless steel pick-up wand to suck up the scale product and transfer into a mobile hopper for discharge off-site. Due to the lightweight and portability features of the pump, it can be deployed at several of the steel mill's problem sumps.

Pentair Australia
www.pentairwater.com.au

ULTRASONIC LEVEL SENSOR

The Model ULSM Ultrasonic Level Sensor provides non-contact, continuous ultrasonic level measurement of fluids for medium-range applications.

Ultrasonic technology paired with automatic temperature compensation provides accurate measurements in almost all conditions. Suitable applications include dirty, corrosive or sticky fluids; bulk containers; and sump and process tanks.

The product has failsafe logic that is easily configured to custom applications via free software, removing the need for target calibration. Using the software, the sensor can be programmed to transmit an output signal as well as set the four relays for control applications.

Other features include selectable deadband, narrow beam width and short deadband. The rugged design comes with a NEMA 6P submersible enclosure rating to ensure a long-lasting unit.

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

The benefits of solar air collection in buildings

Eamon Corless, Director, Solair

A building's air-conditioning system is typically responsible for around 50% of the base building's energy consumption. The other 50% typically includes other services such as common area lighting, domestic hot water, lifts, etc. As such, any reduction in air-conditioning energy consumption or efficient energy utilisation will offer significant savings in total building energy consumption and carbon emissions.

Night purging, displacement ventilation, positive input ventilation with 100% fresh air intake (solar air collectors), high thermal mass materials and a co-generation plant could significantly contribute to the health of occupants, as well as the reduction of carbon dioxide emissions and energy consumption of the building. The use of all these initiatives will reduce carbon emissions to 44% of a 4.5 star building under the Australian Building Greenhouse Rating scheme.

Building loads determine the heating and cooling requirements of a building and come from sources such as occupants, equipment, lighting and the sun. A typical large-scale building can have hourly energy loads up to the following: lighting - 95 kWh; occupants - 45 kWh; equipment - 155 kWh (summer solar 60-110 kWh, mid-winter 30-65 kWh). On a monthly basis, this could lead to a mean usage of between 60,000 and 80,000 kWh.

Using a thermal (solar air collector) panel system for both night flushing for cooling and daytime solar absorption for heating introduces 100% fresh air into the building, thereby flushing out all contaminated air without mixing. This increases air quality, wellbeing and productivity of all occupants. Following this, maintenance costs are reduced due to minimal hourly use of boilers/chillers.

As most large-scale buildings are built on concrete and other reasonably good thermally absorbing materials, they are capable of storing and releasing large amounts of energy (sensible heat). In summer, the building will store the coolness of the night and use it to cool the building during the day. In winter, the building will attain the solar heat energy and use it to maintain higher core temperatures at night.

"Thermal mass, correctly used, moderates internal temperatures by averaging out diurnal (day/night) extremes," says Chris Reardon et al on the Australian Government website YourHome. "Poor use of thermal mass can exacerbate the worst extremes of the climate and can be a huge energy and comfort liability."

The intent of a 'green' building is to minimise the emission of greenhouse gases, namely carbon dioxide emissions, through efficient energy usage. This will be dependent on energy utilisation between sources such as electricity, gas, solar, wind, a cogeneration plant, etc.

United Nations Secretary-General Ban Ki-moon has stated, "Leaders must act. Time is not on our side." He says that quick, decisive action will build a better and sustainable future, while inaction will be costly.

"The buildings of our cities are our businesses, the businesses of our cities are our leaders and it is time for simple, cost-effective change."

In the state of Victoria, gas has a CO_2 co-efficient of 0.21, which is much less than the 1.34 co-efficient for electricity. This

> Using a thermal passive input ventilation system with 100% fresh air can improve longevity and cost-effectiveness of the system.

means that electricity pollutes about 6.4 times more than gas and electricity usage is most undesirable.

Using a thermal passive input ventilation system with 100% fresh air can improve longevity and cost-effectiveness of the system. The system offers advantages such as:

Reduced carbon emissions. CO_2 emissions are reduced to 40% of a 4.5 star building.

Air quality. The system provides 100% fresh, non-recycled air, as well as using the benefits of continuous ventilation to flush warm contaminated air out instead of mixing it within the space.

Equality of access. All occupants have access to the cool ceiling above, and floor vents are evenly distributed to passively prove a more even temperature throughout the space.

Increased productivity. Through the reduction of noise, the increase in air quality and the even distribution of cool air, occupants are healthier, more comfortable and more productive, with an increased state of wellbeing.

Maintenance. This is reduced for a chilled night flush system as there are fewer moving parts.

Increased life span. The chilled night flush system has an increased life span because of reduced plant loads and fewer maintenance problems.

Space savings. Thermal heat and night flush (solar air collectors) systems eliminate the need for additional internal high-volume ductwork, minimising ceiling void requirements and increasing opportunities for refurbishment as well as increasing net leasable areas opportunities. All solar air collector systems can be retrofitted and adapted to existing air ventilation systems.

Energy efficiency. Friction losses and lagging are eliminated by the system and the building fabric contributes to the cooling system.

De-humidification. With solar air collectors, all daytime air has the benefit of dehumidification, reducing the possibility of increased condensation.

To improve a building's energy savings even more, apply secondary external shading to northern/western walls and external screening/shading to glazed areas, and utilise thermal (light-coloured) paints.

Solair
www.solair.com.au

NMI-APPROVED ENERGY METERS

Control Logic now offers the Itron ACE2000 type 292 single-phase and the EM214 type 900 three-phase energy meters that are NMI-approved.

The ACE2000 single-phase meter with integral real-time clock is a compact meter offering complex tariff functionality. It can handle up to six tariff registers and can calculate and display maximum demand for each tariff. Thanks to batteries, the LCD display is available without mains power.

The EM214 type 900 is a compact three-phase meter with internal tariff control. The meter is easy to install, test and read. It also has strong anti-fraud features - the meter cover is sealed for life and there is a log book of past events.

Both the DC meters are rated at 100 A.

Control Logic Pty Ltd
www.control-logic.com.au

CHLORINE SENSORS

Sensorex's FCL Series chlorine sensors use amperometric measurement technology to provide accurate monitoring of free chlorine in process applications. The sensors are suitable for use in drinking water disinfection and distribution applications, and are compliant with EPA method 334.0 for measuring drinking water. They are also suited to providing free chlorine monitoring in cooling tower water, an important application for industrial water treatment system providers.

With three models available covering the 0-2, 0-5 and 0-10 ppm ranges, the series meets a broad range of performance requirements. Its membrane design features a mesh reinforcement clamp for increased stability and added durability. The integral 4-20 mA isolated signal output is enhanced to eliminate ground loop errors, reduce noise and block high-voltage transient surges.

For real-time free chlorine monitoring, the sensors interface directly with PLC, SCADA and other process control systems via the 4-20 mA output. A large electrolyte reservoir with an easy-to-replace membrane cap and electrolyte solution reduces maintenance intervals and maximises sensor life. A specialised acrylic flow cell is available to provide a controlled flow environment for measurement stability.

Envirosensors Pty Ltd
www.envirosensors.com.au

DIAPHRAGM PUMPS

The Air Dimensions single- and double-head diaphragm pumps have now been certified with an IP56, EExd 11C Zone 1 IECEx rated flameproof motor. The pumps are often used in the movement for air and gases in the waste and water treatment industries.

The product is available with Teflon-coated and stainless steel heads for flows to 12 L/min, pressures to 12 psig and vacuums of 45 kPa. Increased performance comes with series or parallel head connections, with power for 115 and 230 VAC.

Australian Dynamic Technologies Company Pty Ltd
www.austdynatech.com.au

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* Feb 2015 research by Markets and Markets

Energy efficiency
to slash greenhouse emissions and bills

A new City of Sydney master plan for energy efficiency will show businesses and residents how to slash greenhouse pollution and save more than $600 million in energy bills by 2030.

The plan could make Sydney one of the world's most energy-efficient cities and provide a major contribution to achieving the City's goal of reducing carbon pollution 70% below 2006 levels by 2030.

The draft Energy Efficiency Master Plan includes a comprehensive analysis of all buildings in the City of Sydney area and shows how energy use in homes and offices could be reduced by more than 30%.

The analysis, conducted by pitt&sherry, shows how to improve the efficiency of buildings - including the City's own properties - commercial office space, and residential blocks and accommodation.

The action would slash nearly two million tonnes of carbon emissions a year city-wide by 2030, a 33% reduction from 2006 levels and nearly half of the reduction the City is committed to in Sustainable Sydney 2030. The City will send the plan to all other Australian capital cities so that they can use it as the basis for similar plans.

Lord Mayor Clover Moore said the time for action on climate change is now and while many governments are doing little, the City is already delivering and demonstrating significant action.

"Cities make up 2% of the earth's surface but they account for 80% of carbon emissions, so action in cities is essential. In the face of inaction from the federal government, we're calling on other Australian cities to pick up our plan and help us get on with the job of tackling climate change.

"By improving energy efficiency through the actions and technologies outlined in the plan, our residential and business communities can also reduce costs. The research in the plan shows building owners and their tenants just how much can be saved on power bills by reducing energy use. This would save millions of dollars and improve economic growth while significantly reducing greenhouse gas emissions."

The plan aligns with the NSW Government's NSW Energy Efficiency Action Plan to improve energy productivity and remove the barriers preventing people from saving energy.

In developing its Energy Efficiency Master Plan, the City conducted a detailed analysis of energy use and greenhouse gas emissions for the city's buildings. The research offers a detailed and practical understanding of current energy performance and aims for a low energy future through a range of actions. These include:

- safeguarding energy and emissions savings by maintaining existing core programs and standards;
- improving compliance of building standards and codes;
- providing education and training for planners, property owners, tenants, building managers and assessors;
- improving energy efficiency in buildings through retrofit and tune-up programs;
- making it easier to access finance and incentives for improved energy efficiency;

The BBP is reducing emissions and bills.

- developing new energy-efficiency ratings;
- increasing minimum performance of new buildings;
- improving equity by advocating on behalf of low-income households; and
- show by doing, through best practice for City-owned buildings.

The City has already retrofitted 45 of its properties to reduce electricity and water use and generate operational savings of over $1 million a year.

"We have the most ambitious emissions reductions target of any Australian government - to cut emissions by 70% by 2030, based on 2006 levels, and take significant action on climate change," the Lord Mayor said.

"We are getting our own house in order by retrofitting swimming pools, community centres and libraries for optimum energy efficiency. These upgrades have reduced greenhouse gas emissions across the City's buildings by 29% - we now want to see these savings expanded across the entire city.

"The City is already taking action and working with businesses to reduce emissions through programs including Smart Green Business, CitySwitch and the Better Buildings Partnership. We are also working with residents to inspire and educate them through workshops and programs.

"Improving energy efficiency is an important and cost-effective area for climate action and this plan recognises opportunities for energy efficiency across the city's total building sector."

Energy has already fallen 5% since 2006 despite significant growth in jobs, the economy and new developments - this plan could achieve almost half of the City's emissions target.

The Energy Efficiency Master Plan has been prepared with input from government, the building sector, the energy sector and community groups to provide the City with a detailed understanding of current energy performance.

TransGrid Managing Director Peter McIntyre applauded the City of Sydney's decision to support and expand the energy-efficiency market.

"This plan aligns with TransGrid's investment in projects to reduce peak electricity demand," McIntyre said.

"Energy-efficiency activities have the potential to reduce the 'peak' amount of electricity demanded from electricity networks.

"If energy-efficiency activities can deliver reliable demand reduction at particular times of the day, for example, in the late afternoon on a hot summer's day when the electrical network may be approaching capacity, the net result could be reduction in network costs for electricity bill-payers.

"Energy efficiency just makes sense, saving consumers money while conserving resources in a carbon-constrained world."

The plan forms part of the City's suite of green infrastructure plans including renewable energy, advanced waste treatment and decentralised water. Together, the plans create a road map for delivering Sustainable Sydney 2030.

The draft plan, on exhibition from 2 March to 4 May, is available for feedback and viewing at: sydneyyoursay.com.au.

FLUE GAS ANALYSER

The Rosemount Analytical 6888 In Situ Flue Gas O2 Analyzer has been enhanced with new diagnostics that help maintain optimum oxygen levels in flue gases, thereby optimising the combustion efficiency of large boilers and industrial furnaces. The enhancements help decrease maintenance requirements and improve measurement accuracy.

The product incorporates a 'calibration-recommended' diagnostic with gas-switching solenoids embedded within the probe electronics, making automatic calibration easier. The embedded diagnostic reduces the cost of providing and installing a separate solenoid box, and also reduces the effort to wire and pipe between the probe and electronics. Additionally, the calibration-recommended diagnostic removes the need to conduct calibrations on a schedule. The analyser also includes a 'plugged diffuser/filter' diagnostic for applications that have fly ash or other particulate entrained in the flue gases.

Another feature is a variable insertion option, which permits ideal placement of the probe into the flue gas duct. With standard length probes from 0.5 m to 3.65 m in horizontal or vertical installation, the probe can be adjusted at any time online to characterise stratification across large ducts.

Easy to use and integrate, the product is fully field repairable. All active components can be replaced, including the diffuser/filter, sensing cell, heater and thermocouple and all electronics cards. The device offers HART and Foundation fieldbus digital communications and can be configured with the optional Smart Wireless THUM adapter for wireless operation.

Emerson Process Management
www.emersonprocess.com.au

PNEUMATIC VALVE CONTROL UNIT

Designed as a more compact version of the type 8690, Burkert's 8697 pneumatic control unit with position feedback and LED status indication is available as a pneumatic unit or feedback for Element valves with 50 mm actuators - as well as a pneumatic control unit for Classic valves with actuator sizes 40, 50 and 63 mm. The head can also be used as a feedback for Classic actuators of all sizes, from 40 to 225 mm.

The type 8697 replaces the type 1062, which previously offered position feedback (but no pilot) for Classic valves. It also offers original advancements such as an integrated pilot valve with manual actuation and LEDs for indicating device status. Integrating this head offers a simplified way to create a decentralised automation device, improving overall process speed and allowing independence and therefore creativity in process design, leading to optimised systems.

Using the product as a pneumatic control unit eliminates the need for a control cabinet with hoses leading to the respective valve. This simplifies system design and minimises the control air consumption for drive switching.

Combining the type 8697 with a process valve from the Element series results in an efficient process with an EHEDG-compliant valve system - with high-level IP protection, as well as an integrated control air supply with additional spring chamber ventilation. The device is aimed at the hygienic and water segments; however, its dynamic design allows it to be used in the general process industry.

Burkert Fluid Control Systems
www.burkert.com.au

DIFFERENTIAL PRESSURE TRANSMITTER WITH DOUBLE SENSOR

Keller is launching the Series PRD-33 X, a differential pressure transmitter suitable for measuring the levels in liquefied gas tanks safely. The product has two independent sensors and measures the line pressure as well as the differential pressure.

The transmitter achieves its high accuracy level of up to ±0.05%FS due to its calibration over the entire pressure and temperature range. The mathematical model calculated in this way corrects all repeatable errors. The floating assembly of the sensor unit provides protection from external forces during installation.

The closed systems of pressure tanks require two measurements to determine the level: one for the tank pressure and one for the liquid pressure. Due to its two sensors, the product achieves this in one measurement process. All transmitter parts that come into contact with the medium are made from high-quality materials such as stainless steel AISI 316L, silicone, gold and silicon. The device is therefore suitable for use with (liquid) oxygen, argon, nitrogen, helium and carbon dioxide.

With cryogenic liquefied gases, tanks that are smaller than 3 m can have a differential pressure range of 200 mbar and a line pressure of up to 32 bar. This is overcome by the transmitter's line pressure compensation of 0-40 bar. When the tank is being filled or the valve is being used, the tank pressure can hit one side of the differential pressure transmitter. The product copes with the resulting 32 bar uneven overloading with its overload resistance of ±35 bar.

The unit can be supplied with various electrical connections and has a digital RS485 interface that provides information such as pressure ranges, filter settings and the serial number. The supplied software enables the transmitter to be configured and controlled and data to be saved easily.

KELLER AG für Druckmesstechnik
www.keller-druck.com

SCRUBBER MONITORING SYSTEM

Many wastewater treatment plants have air scrubber systems to help control odours from hydrogen sulfide emissions. MSA offers both in-situ sensors for large diameter pipes and pre-engineered sample draw systems for those applications that require higher detection ranges up to 500 ppm. Both products can also be used in chlorine scrubber applications with a range of 0-25 ppm.

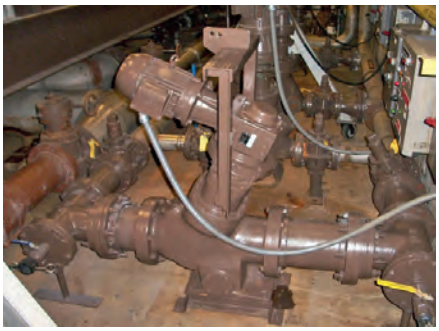
The MSA Scrubber Monitoring System is a pre-engineered system that is compatible with most wet or dry scrubbers. The system operates within a closed loop so that no gas vents to the atmosphere. Built to withstand harsh outdoor environments, the unit is housed in a heated NEMA 4X enclosure.

Maintenance and calibration are simple procedures. If an obstruction occurs in the sample line, the unit provides flow failure indication. Calibration can be performed with an IR calibrator, eliminating the need to open the system's front door.

The system ensures the user's scrubber functions and meets EPA requirements. It indicates breakthrough for carbon bed scrubbers and controls chemical feeds for wet scrubbers. It also conserves expensive chemicals.

MSA Australia Pty Ltd
www.msa.net.au

TWIN-SHAFT GRINDER



Designed for the efficient maceration of abrasive sludges, the CT203 Muncher from NOV Mono is a twin-shaft, slow-speed, high-torque grinder that macerate the solids within a flow. The product is suitable for a wide variety of pump protection and other industrial duties.

The twin shafts feature a series of interleaving cutters and spacers which create a 'positive displacement' grinding action, with the differential cutter speeds pulling apart any fibrous material, cropping and shearing plastic items into small pieces and crushing any brittle material. A cantilever shaft design removes the need for bottom bearings and seals and so significantly reduces the number of wearing components, while the pull-back cutter stack allows removal without disturbing the pipeline.

A built-in trash trap set below the cutter stacks catches any rejected material and so prevents damage to the cutters, while clean-out ports allow the rejected object to be removed easily. The range includes pipeline or channel models, with optional high-flow side rails to increase capacity.

Mono Pumps Australia Pty Ltd
www.monopumps.com.au

LED LIGHTS

Brightgreen has launched Loomi Tru-Colour LED lights for everyday illumination. Where regular LEDs illuminate only eight colours, Tru-Colour lights illuminate 14 key colours. As a result, they produce a white light that is made up of almost all of the colours of the visible spectrum.

The lights generate bright light with high efficiency. They have a life span of at least 35,000 h, which equates to 15 years of daily usage. The first product in the range is the 12 W ceiling light, which is designed to replace a regular 50 W halogen light.

Brightgreen Pty Ltd
www.brightgreen.com

STAINLESS STEEL FILTER REGULATOR

The Midland-ACS 3525 Series Compact Filter Regulator is a 316 L stainless steel combined unit for filtration and regulation of compressed air and gases. The product is used on air, sweet natural gas and inert gases.

The compact, lightweight filter regulator weighs 0.675 kg, which is said to be 62% lighter than competing products. This is reflected in exporting/shipping savings.

The product features a self-relieving manual drain with a pressure range of 0.5-8 bar (20 bar supply), as well as a mounting bracket. The filter element is easy to remove from the control panel for cleaning, which reduces maintenance. The company says the life expectancy of the filter regulator is 10-15 years.

Rotork Australia
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Solar 2015

Over 4000 solar enthusiasts are expected to converge on the Melbourne Convention & Exhibition Centre to attend the 53rd Annual Australian Solar Council Industry Conference & Exhibition (Solar 2015).

The event, to be held from 13-14 May, features free-to-attend conference streams focusing on Australian renewable industry and innovation; market intelligence; policy and future direction; investment potential; installer best practice; innovation and research; latest products and technologies. It will deliver expert analysis and opinion and display the latest products and technologies, with a focus on energy storage, efficiency, solar hot water and efficient lighting.

The conference hosts a continuous stream of presentations from industry experts, covering diverse topics from current policy and market analysis to financing of projects and industry case studies, along with government representative updates. Professional development and training sessions will meanwhile be presented by leaders in their field.

Co-located with Solar 2015 is the free-to-attend Energy Storage Exhibition, which will showcase emerging ingenuity; the exciting world of energy independence; technology that transforms the energy sector; and the latest storage technology solutions. For more information, visit www.energystorage.org.au.

Solar 2014 attracted a record 3200+ registered delegates from 25 countries over the two days. Delegates had the opportunity to view 70 exhibitors and attend three concurrent conference streams focused on industry and policy; scientific and research; and solar installer professional development training. This year the Australian Solar Council will be organising the event independent of any international partners.

What: Solar 2015 Exhibition & Conference
When: 13-14 May 2015
Where: Melbourne Convention & Exhibition Centre
Website: www.solar2015.com.au

Australian Energy Storage Conference and Exhibition

Will energy storage be the catalyst to changing from centralised to decentralised power systems? The Australian Energy Storage Conference and Exhibition seeks to answer this question from 3-4 June at Australian Technology Park, Sydney.

The conference will feature a diverse range of energy storage projects and case studies from across Australia and from overseas. Presentations from over 40 speakers will range in topic from affordable battery storage for the evolving grid, to off-grid telecommunications solar plus storage projects, to grid resiliency and microgrid lessons learned in the US from MW-scale flow battery deployments. Also featured will be grid implications of electric vehicle (EV) charging and innovative thermal energy management for buildings.

The comprehensive program includes experts from ABB Australia, Aquion Energy, Bloomberg New Energy Finance, Enphase Energy, Ergon Energy, Lend Lease, Tritium and other key industry companies. For example, Duncan Macgregor from Enphase Energy will explore the battery storage and energy management solutions currently and soon to be in market, including the Enphase AC Battery. Donald McPhail from Ergon Energy will meanwhile discuss the company's corporate strategy for facilitating the uptake of battery energy storage systems (BESS) on its network, especially working with the existing regulations and coordinating connections through standards and policies.

The event also includes a free trade show of industry suppliers who will be of interest to energy storage stakeholders at all levels - including utilities, energy businesses, building management and the emerging electric vehicle markets. Exhibitors such as Century Yuasa Batteries, Panasonic, Regal Electro, S&C Electric and many more will feature their latest products and services.

The exhibition is free to attend and early-bird rates are still available for the conference. The event is expected to attract over 1000 visitors.

What: Australian Energy Storage Conference and Exhibition
When: 3-4 June 2015
Where: Australian Technology Park, Sydney
Website: www.australianenergystorage.com.au

Trends and challenges facing water utilities in Australia

Water utilities have a well-deserved reputation for being quiet achievers.

They are constantly being challenged to adapt to climate variability and meet sustainability targets. They must ensure they deliver the highest quality service but always within 'value for money' parameters expected by their customers.

Behind the scenes they work exceptionally hard and as efficiently as possible to deliver guaranteed, high-quality water direct to the consumer at an affordable price.

And, in keeping with their reputation of being quiet achievers, much of this outstanding work can go unnoticed. This is particularly true for wastewater plants where the increased use of technologies such as energy recovery and biological processes are really quite remarkable.

Energy recovery units have become more affordable and smaller, which means more are being implemented, especially on wastewater plants using biogas to generate power. As advanced biosolid process technologies mature, they too will become widely used in Australia.

However, it has been the advances in SCADA control and communication systems that have possibly had the most significant impact on water utilities over the past couple of years.

Today, we can monitor and measure parameters, leakage rates and quality of water over greater distances with reduced costs. We can run treatment plants remotely, improve load distribution, maximise the use of lower power tariffs, predict abnormal events and implement fixes before problems occur.

All of this was simply not possible before we had good control systems. This has made a remarkable difference to the management of the entire water process.

We can trend just about everything on the plant and this is helping us drive overall efficiency. There is also a continuous push for energy efficiencies and optimisation of chemical usage in the treatment plant.

It's rare to see extraordinary leaps in water technology; instead we typically see incremental advances to the efficiency of designs of some water technology products.

Great advances in the energy recovery units on desalination plants have meant those constructed in Australia are highly efficient, with energy consumption relatively low by world standards.

There are a variety of opinions, especially from the public, on the positives and negatives of different water sources. I believe the public will come to appreciate desalination plants in the future, when the inevitable drought returns and desalination plants provide the one source of water that is guaranteed.

However, we don't want to rely too heavily on one source of water. Desalination has to be part of an overall mix.

In terms of climate variability, we are seeing more frequent floods and severe weather events. Water utilities have to adapt in order to mitigate the impact of these. This can be quite a challenge and may involve a number of mitigation techniques.

With an increased prospect of future flooding, we are seeing a renewed appreciation of the functions of dams as they serve a dual purpose - they store water and can also provide flood mitigation. But, this creates another challenge - who pays and who is responsible?

> **"I believe the public will come to appreciate desalination plants in the future, when the inevitable drought returns and desalination plants provide the one source of water that is guaranteed.**

One important message not always communicated is that when a city runs out of water, it is not possible to ship in enough water to keep the city going.

Climate variability is resulting in more frequent changes, yet there is no quick solution. The water industry needs long-term investment and this is a major challenge.

Ultimately, the best outcome is the result of a trade-off and a mix from multiple sources to ensure security of water for Australia's future.

TRILITY is dedicated to the delivery of water, wastewater and re-use solutions across Australia's municipal and industrial sectors. Francois Gouws was appointed managing director of the company in October 2010 and leads its executive leadership team. With over 20 years in the water industry, he has held senior engineering, project and business management roles and directorships, and has delivered major projects throughout Australia, Africa and the United States.

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