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WASTE MANAGEMENT WORLD®

JULI–AUGUST 2018

Special Edition
WASTE TO ENERGY

BRICKS N WATER

ENERGY BRICK TO STORE ENERGY FROM WASTE RECOVERED AT SEA

IFAT:

Off-the-Shelf Robots with Artificial Intelligence
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THE FINAL COUNTDOWN

Years in the Making - AI Arrived in Force at IFAT

Ben Messenger Chief Editor

"THEY'RE NOT GOING TO CLOSE THE DUMPSITES, BUT ROBOTS ARE GOING TO PLAY A MORE AND MORE IMPORTANT ROLE AT MORE AND MORE MODERN MRFS."

As a journalist, it's been over 8 years that I've been focused on the waste and resources industry. Whether it be a multi-million dollar piece of infrastructure in the planning and permitting stages, or futuristic sounding technologies going from pilot stages to commercial roll-out, I've been lucky enough to be able to follow a number of developments from inception to fruition.

As futuristic technologies go, for years, self-learning robotic sorting machines with artificial intelligence have been on the horizon. While there have been a number of installations and demonstrations in preceeding years, it seems that 2018 was the year they really landed.

If you read this magazine regularly, you'll know there are a handfull of key disruptors in this market. We've been following their stories for years.

They are no longer stories. They are reality. Anyone who spent the early part of May in Munich at the mind-boggling IFAT exhibition could attest to that. The application of AI and robotics in the waste industry has left the demonstration stage. It's on the shelf, for sale to anyone that wants it. And it's selling too.

Clearly, it's not a silver bullet for many of the sector's biggest problems. They're not going to compete with waste pickers earning a few dollars a day in developing countries. They're not going to close the dumpsites, but robots are going to play a more and more important role at more and more modern MRFs. To find out more about some of the latest kit on show at IFAT from some of the biggest players in the industry, turn to p. 8.

If disruptive technology and innovation is the sort of thing that floats your boat, you might also want to check out our interview with the guys at ADGEX on p. 18.

Based in Australia, they're aiming to clean up at least some of the enormous garbage patches in the oceans, recover energy from the polluting wastes, and store it in an all new energyBRICK for distribution where it's needed. If I'm still covering the resource industry a few years from now, I hope to be reporting on how successful they've been. It's certainly a story to follow.

Elsewhere in our Waste to Energy Special Edition, on p. 28, we catch up with Amey and take a look at its recently commissioned Allerton Waste Recovery Park in Yorkshire. The facility, which features both material and energy recovery, was years in the precarious pipeling of the planning and procurement process.

On p. 24, we look at a three-stage fast pyrolysis process being rolled out by Bluefield Renewable Energy, and on p. 36 we explore the pros and cons of various bottle deposit schemes around the world.

If you're planning to go to RWM in Birmingham, UK, this September, feel free to drop me an email and let me know your plans.

See you there, and enjoy the issue.

Ben Messenger, Chief Editor

JULY–AUGUST 2018

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Every two years IFAT lands in Munich. This year, the robots came, too. AI just made the leap from niche demonstrations to off-the-shelf technology.

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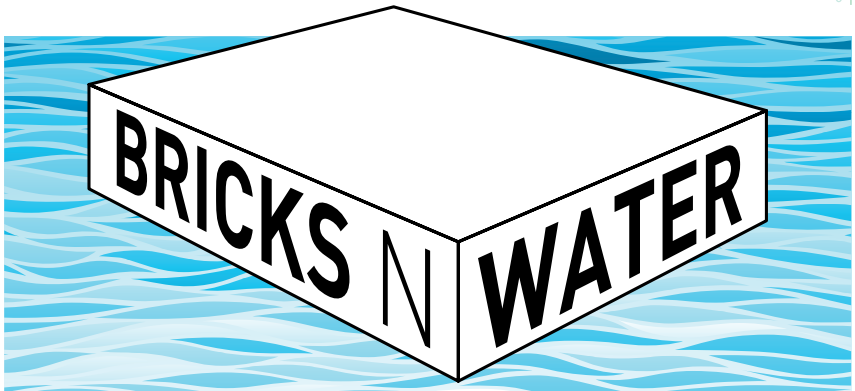

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Having recently completed final testing of its high-temperature greenBLAZE system combined with its energyBRICK storage system, ADGEX is aiming to clean up the oceans.

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England is following Scotland's footsteps with plans to implement a deposit return scheme. Around the world, these schemes have been in place for years.

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Ignition at Amey's Allerton Energy Recovery Facility

For Amey's Allerton Waste Recovery Park in the north of England, the journey has been a long one. But for the company, good things come to those who wait.

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Vasily Muzanov, project manager at ADGEX

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"We opted for a combination of treatment technologies to allow us an opportunity to improve the recycling performance."

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"It is fair to say we were close to despair at times."

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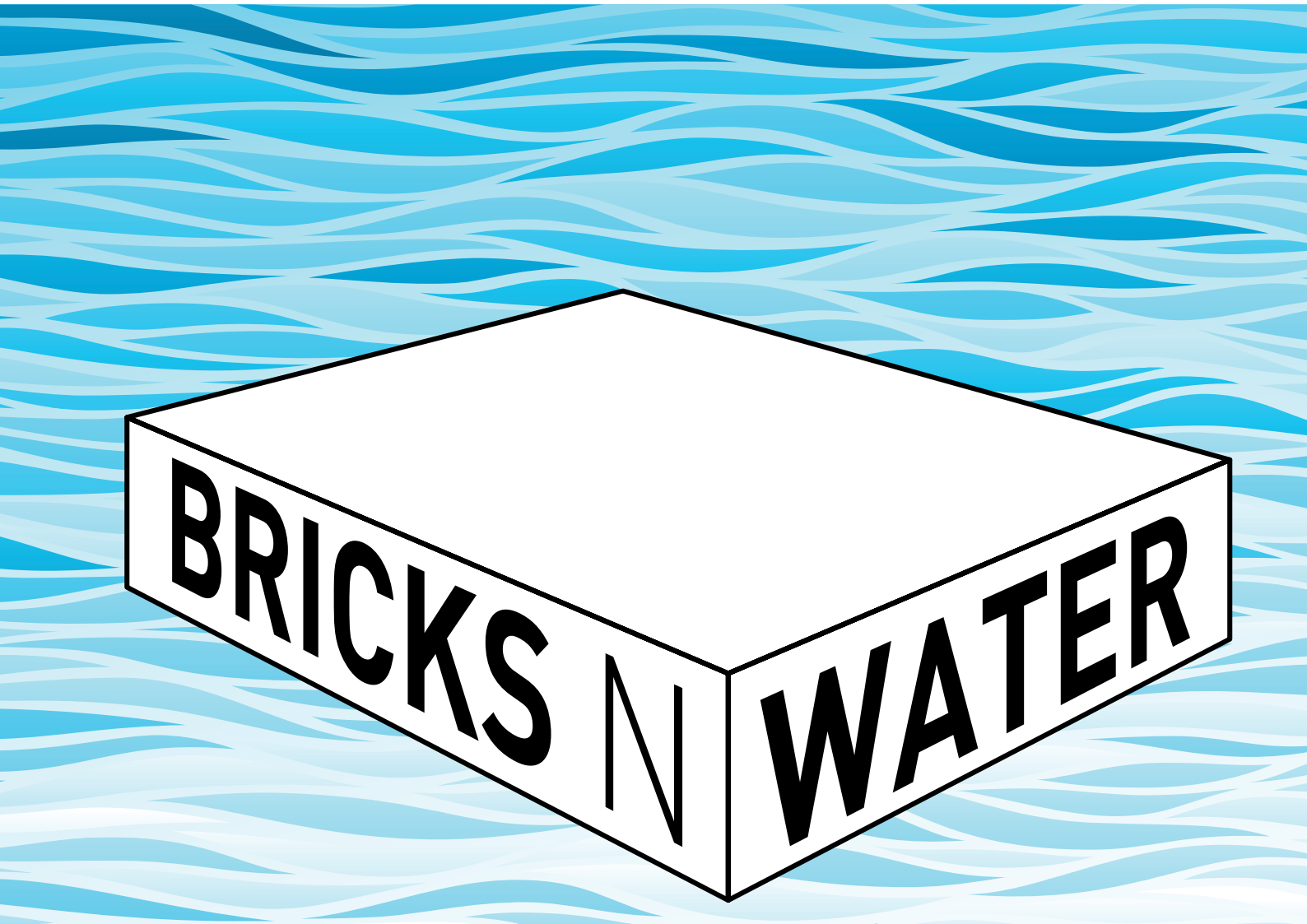
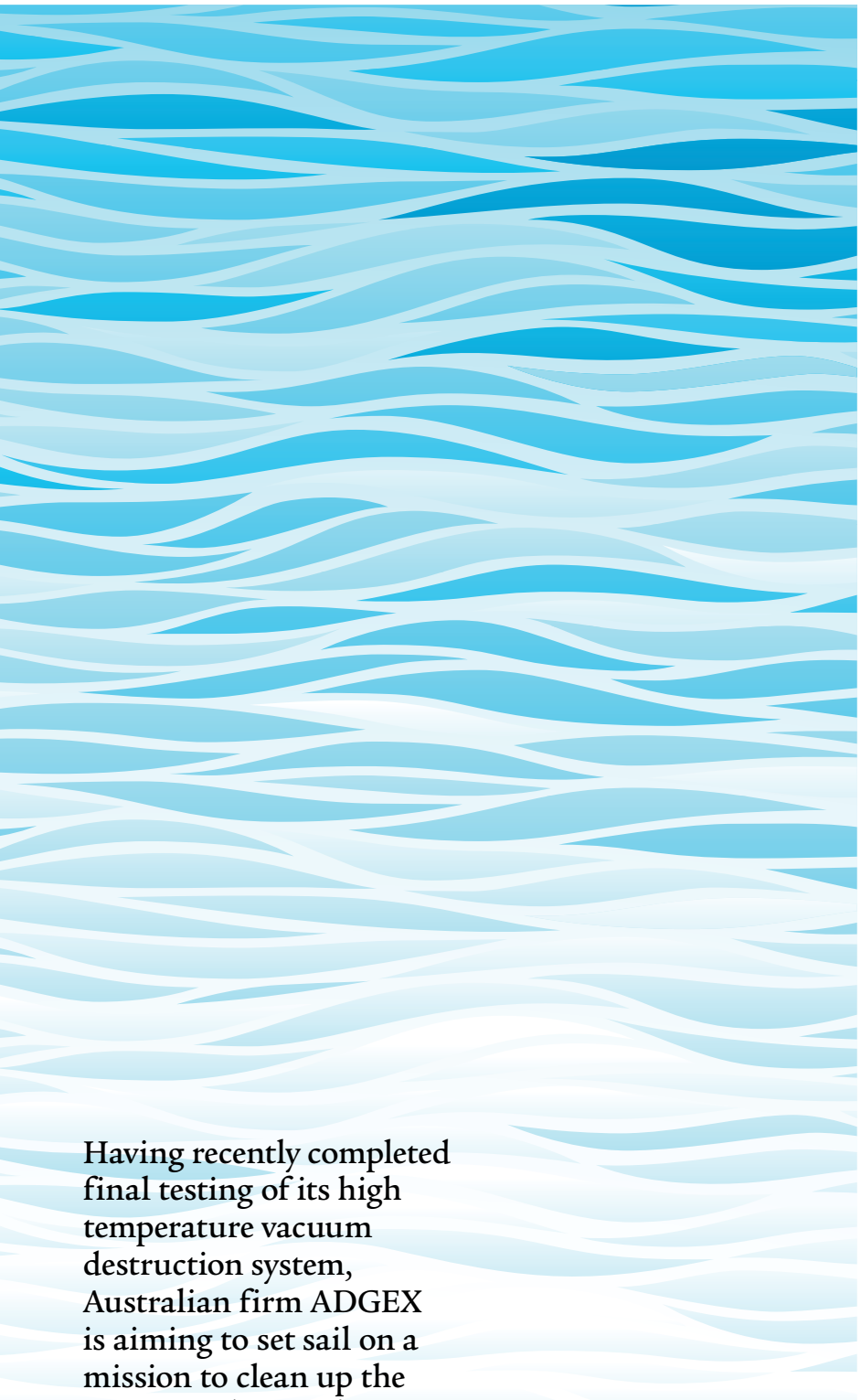


MOBILE WASTE TO ENERGY SYSTEM **COULD CLEAN THE OCEANS**



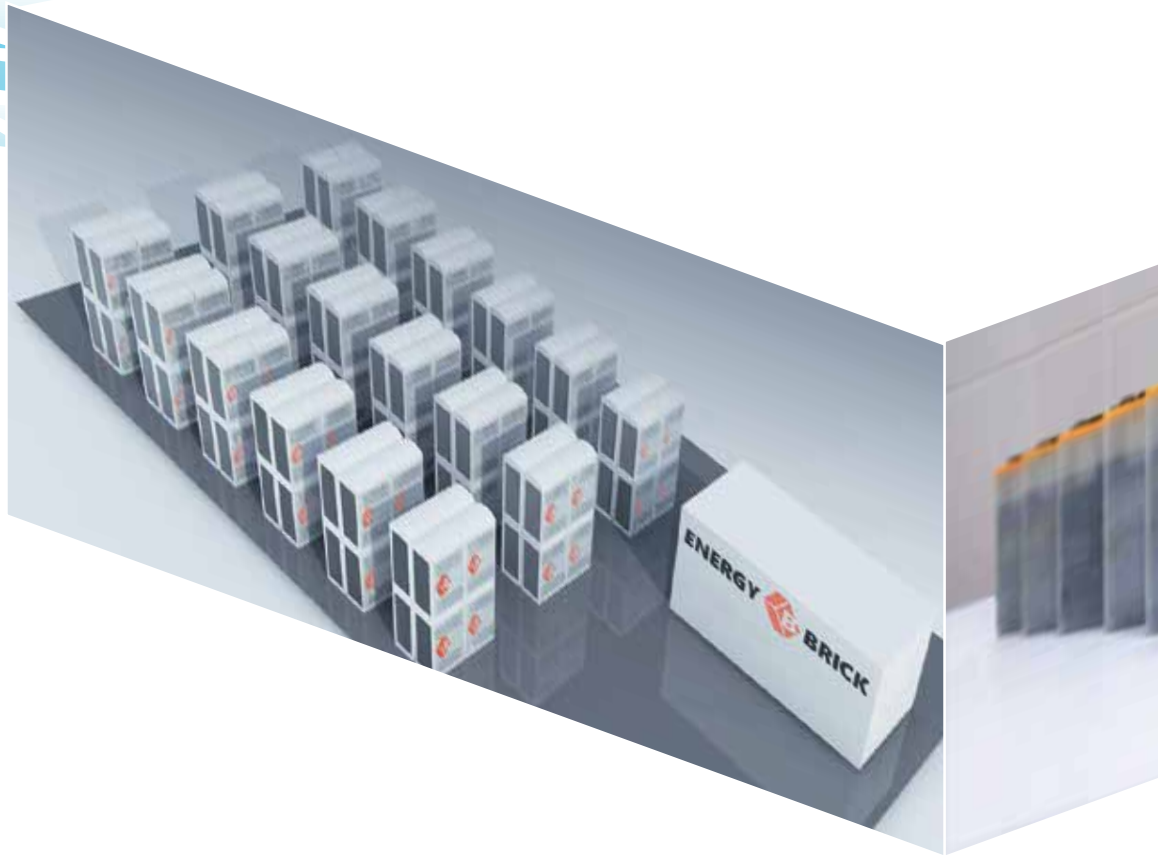
Having recently completed final testing of its high temperature vacuum destruction system, Australian firm ADGEX is aiming to set sail on a mission to clean up the oceans and store electricity using its energyBRICK technology.

By Ben Messenger

Founded by intellectual property specialist Victor Uzlov in Sydney back in 2012, ADGEX, an abbreviation of Advanced Green Expertise, sees itself as very much being in the disruptive mould. Australia was chosen firstly because of its corporate law, which opened up opportunities for capitalisation of the firm's technologies and the establishment of a multinational business. The second reason was the country's size and isolated location.

In the six years since its inception ADGEX has developed technology in a number of key areas including a mobile waste gasification system and a new battery system for high density energy storage. Dubbed 'greeenBLAZE' the firm's waste to energy conversion system is based on high temperature vacuum destruction technology. According to ADGEX, it is able to process all carbon-containing materials, including both solid and liquid wastes, and generate up to 4 MWh of electrical energy from 3 to 5 tonnes of feedstock.

"We can process all types of organic wastes with moisture levels up to 85%," says Vasily Muzanov, project manager at



A modular structure allows the combination of any number of energyBRICK units into a an energy storage facility to optimise a power management system and avert power blackouts and outages.

"WE WILL HAVE FLOATING PLATFORMS BASED ON SHIPS. SUCH A SHIP WILL CRUISE AROUND THE OCEAN AND COLLECT THE WASTE AND STORE THE ENERGY."

Vasily Muzanov
project manager, ADGEX

the firm. "We don't care about the composition, we can work in any place with any type of materials. From the viewpoint of performance, if the carbon level is low and the moisture content is extremely high, the process time is increased. If you load one tonne of waste with a moisture content below 85%, it will take around an hour, above 85% the performance level would tend to be different."

In April this year, the company conducted final tests of the system in its production laboratory in the city of Tomsk, Russia. The tests were designed to obtain initial feedstock volume parameters and effective power conversion indices. ADGEX says that the results proved its expectations of the system's capabilities.

"It's not about which type of waste we load, it's about the carbon that's contained in the waste," Muzanov adds. "You can load 1 tonne of solid waste with 60% carbon, or a couple of tonnes of other waste where the carbon content is lower."

"In either case the machine will automatically adjust to the feedstock which is loaded. We have several chambers," he tells WMW. "The air pressure is increased little by little in each chamber and the temperature by a specific number of degrees, so it will automatically understand which type of feedstock has been loaded and will adjust automatically. After the feedstock passes all the chambers we have a syngas which will be converted into electric energy or fuel, it depends on what exactly the customer needs."

According to the project manager, while the most dangerous toxic substances, dioxines and so on, are totally destroyed at a temperature of 1000° C already, the greenBLAZE system operates at around 1600° C.

"Even if there is something left as a residue, we destroy it – all toxic substances and materials," he says. "The only residue is a type of ash which can be used for construction purposes. We don't need any waste sorting. We can take any waste or even any liquids, mix it and put it through the processor at the same time."

Depending on the configuration, the technology is also able to generate liquid fuels, including non-freezing "ARCTIC" diesel and/or synthetic gasoline with an octane rating of 98-100.

MOBILE

One of the key features of the greeenBLAZE system is that it's mobile and fits into a 17-metre truck or a 20-tonne container. "It occupies about 25 square me-

Facilities can be deployed at any location and, if required, disassembled and relocated to meet any energy challenges.

TECHNOLOGY

The energyBRICK's SEVA technology uses modular cells to form the core of the units. The accumulating method is based on a volumetric porous nickel frame to optimise capacity and efficiency. Several SEVA cells are combined into integrated energyBRICK units to reach the required capacity. The units are placed together and interconnected, forming one large energy storage complex. If needed, such complexes can be scaled up to "infinite capacity" by adding additional units According to ADGEX its energyBRICKs can be charged with high amperage currents in a matter of minutes using any traditional or alternative power sources. They can also be fully discharged to "zero" and safely stored in such a condition.
Additionally, the system is also claimed to be able to absorb any peak electrical shocks and fluctuations while providing a high level of stability and self-sufficiency. There's also no need to obey the "golden rule" and charge the units from zero to full to extend the battery's life, they can start taking the charge from any level without compromising their 25,000 charge cycle lifetime or reducing the charging efficiency.

tres, so you can fit it into a standard cargo container," says Muzanov. "You can take it from one place to another place, so it's very convenient. You could just take this unit to a landfill and convert all the waste from the landfill into the product you need and put it back on a truck and move it, for example to another landfill. That's the highlight – it doesn't require any external power and it's fully autonomous. It means that in less than 24 hours we can deliver it to a desert or a remote village. We use propane to start it up. One bottle is enough for five or 10 start-ups. It's not a problem to deliver a tank of propane to anywhere in the world."

One of the interesting applications that mobility and automation open up is to mount the units in a specially adapted ship. The vessel would then cruise the ocean cleaning up the now infamous marine debris, much of which is discarded plastics. You might ask what the practicality of harvesting energy from waste on-board would be, but that's where the firm's second technology comes in – the energyBRICK.

A NEW TYPE OF BATTERY

Utilising alkaline SEVA battery cells, a universal accumulating module for energy storage, ADGEX has developed a high-capacity portable system allowing energy to be delivered in the form of a self-contained energyBRICK. At the end of December last year, it initiated commercial testing of an upgraded SEVA cell. According to the firm, the first results were very positive and proved the viability of commercial production.

The upgraded SEVA cell can be charged with 500A current instead of just 250A in the previous version. At the same time, discharge current is now 800A under continuous load against 500A before. The energyBRICK itself has a number of units consisting of several accumulating cells. To reach the required capacity, the cells are combined.

Importantly, for use in tandem with an off-grid greenBLAZE setup, the battery technology also offers low levels of self-discharge - no more than 5% per year. This could allow the mobile waste to energy plant to generate energy from any suitable feedstock in any location, even on board a ship, and store that energy for use in remote areas, disaster zones, or as backup power.

"We will be able to process waste directly on the ship. We will eliminate the costly process of transferring the waste

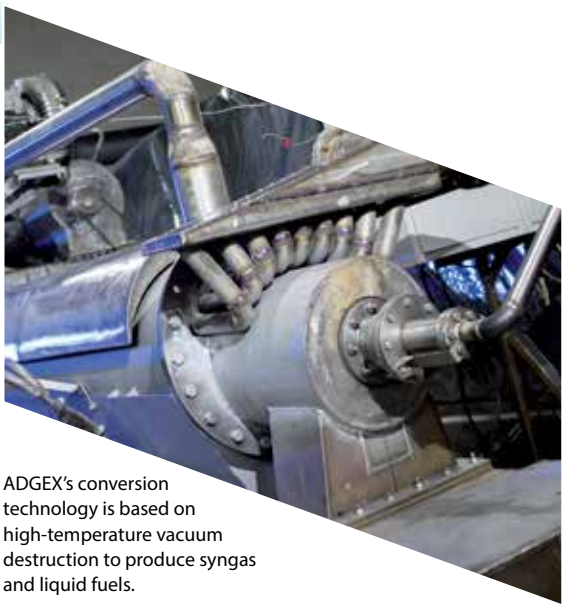
ENERGYBRICK STATS

25 000
charge-discharge cycles

NO MEMORY EFFECT
can be fully depleted

15-25 YEARS
lifetime

50°C TO +90°C
Operational temperature range



ADGEX's conversion technology is based on high-temperature vacuum destruction to produce syngas and liquid fuels.

The capacity of the system to produce synthetic liquid fuels is not standardised and is determined by the qualitative composition of the feedstock.

from the ocean. The system is quite simple. The waste is captured and converted into energy on the ship, which is stored in the energyBRICK unit, which is delivered to the end customer who could be anywhere. All the processes are carried out on the ship," explains Muzanov. "We will replace empty bricks with full ones. Our technology is based on a zinc material, so transportation is less of a problem. We've conducted negotiations with companies and proved that traditional transportation methods are not a problem. In terms of energy density, we use about 5 kg per 1 kW."

NEXT STEPS

In its home country of Australia, ADGEX is participating in a government program run by the State of Queensland.

"What we're going to do is bring a couple of units to Brisbane where we're going to do a demonstration to the public for a month," says Muzanov. "After that we're going to start a campaign as an international operator. We're going to make greenBLAZE an end user product and have a franchise model in Australia. At the same time, our global model is to start cleaning up the ocean. In September, we're going to launch the social project which incorporates greenBLAZE technology and energyBRICK technology."

ADGEX believes that cutting the cost of a waste treatment system, lowering CAPEX and effectively reducing OPEX at the processing stage makes its technology attractive in a number of markets. The next priority for greenBLAZE development is commencement of mass production. The company is also working on the launch of a mass production line for energyBRICK units.

"Basically our business model is a platform for fostering sustainable technologies. For more than six years, we've combined eight lead technologies in different industries. We operate with different partners, but all the technology is owned and developed by us," Muzanov adds.

In the longer term he sees big opportunities for the company to bring its technologies together.

"The concept of our company is to combine technologies to develop sustainable cities. We have many technologies. They can and they will be combined together to form fully sustainable cities including green transportation. We can use greenBLAZE to power that transportation. Step by step we're going to commercialise and roll out other technology. Finally, we will be able to provide turnkey infrastructure," he concludes.

That's a big ambition from a small but growing company. Stay tuned to WMW to find out how the next of those steps goes as the demonstration in Brisbane gets underway. —

GREENBLAZE TIMELINE

2010 Production of pilot prototype

2011 Testing and proving the technology

2013 Upgrade of the technology following 2years

2015 Adjusting the technology with recovery of pre-planned light fractions of carbonaceous products

2016 Introduction of greenBLAZE processor to Australian government

2017 Commencement of production of commercial greenBLAZE-200 processors to be delivered to Brisbane, Australia