



Bioenergy Insight

SEPTEMBER/OCTOBER 2017

Volume 8 • Issue 5



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Farmers gamble on AD

Exclusive interview

Q&A with Drax Biomass' CEO

Canadian bioenergy analysis

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In the afternoon of the first day of the main conference, 8th of November 2017, Conference delegation will also be invited to visit Biomass fired combined heat and power plant in Lisbjerg and Verdo's combined heat and power plant (KVR) in Randers.



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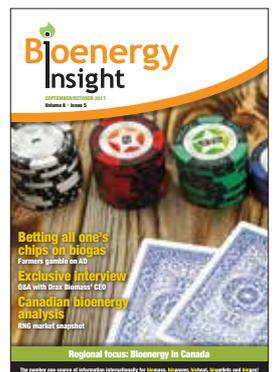
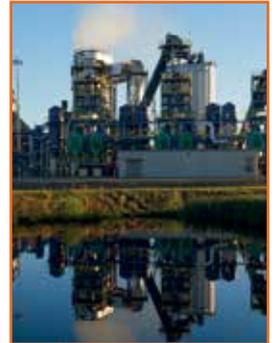
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Branching out



Liz Gyekye
Editor

3,000,000,000,000 (3 trillion). That's roughly the amount of trees on Earth today, according to a report by *Nature*. It is well known that forests around the globe are the home for 80% of terrestrial biodiversity, but what you may not know is that forests also remove 693 million tonnes of CO₂ from the atmosphere every year, and have a total carbon storage capacity of 27 times the global annual carbon emissions, according to the

World Business Council for Sustainable Development.

The forest could prove to play a central role in the future bio-economy, currently worth €2.1 million as highlighted in a macro-economic study conducted by the *Bio-based Industries Consortium (BIC)*.

The history of our relationship with the forest is a topic for popular debate.

Since the dawn of humanity, trees have been helping us to build shelters for protection. They have provided humans with innovative tools such as fishing rods, bows, spears and axes for hunting, gathering and farming. From the forest, we have created large buildings to sustain the growth in population. It has helped to build tools such as carts and ships that made it possible for us to travel and settle over the globe.

Somewhere along the line standards started to slip and humans started relying on fossil fuels, including oil and coal to help them progress. Now, the world is going back to its roots and realising the benefits of the forest again by turning to it to produce

wood pellets in order to use it for renewable energy.

In fact, many power stations are now turning away from coal and using compressed wood pellets to produce electricity. Last year, power giant Drax produced 16% of the UK's renewable electricity. In an exclusive interview, *Bioenergy Insight* caught up with Drax Biomass' (a US subsidiary of the Drax Group) CEO Pete Madden. In this issue, he gives his insights and perspectives into the current biomass market and where the industry is headed in the future.

Elsewhere, there is still time to get your tickets for *Bioenergy Insight Conference & Expo 2017*. This promises to deliver two days of essential learning, a chance to network with bioenergy heavyweights, and an opportunity to sharpen your knowledge and improve your skills. I look forward to seeing you there. Visit: http://www.bioenergy-news.com/conference/17_register.php

Best wishes,
Liz

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Drax presses ahead with biomass plans

UK power giant Drax has announced that it is pressing ahead with its biomass plans as new figures show the company produced about 17% of the UK's renewable electricity in the first half of 2017.

The company, which runs a coal and biomass plant in North Yorkshire, UK, published its half-year results for the six months ended 30 June, 2017, in July.

Three of the company's six generating units are currently powered by compressed wood pellets and receive support from Renewable Obligation Certificates (for two units) and a Contract for Difference (CfD) (for one unit).

Dorothy Thompson, chief executive of Drax Power, said transformation



Drax biomass domes

plans were progressing to help convert an existing coal unit to biomass.

She said: "In line with our strategy we continue to explore future options for our 'Generation' business. This includes continued engagement with government to make the case for further

biomass upgrades of coal units.

"During H1 2017 we have been running a trial on one of our coal units to examine the feasibility of a low-cost solution for fuelling it with 100% compressed wood pellets using existing co-firing infrastructure.

"The unit has performed well but there is further work to do to ensure that it delivers high output reliably and safety on a sustained basis, which we believe is achievable. In view of this, we will continue our trial through the summer, but have decided to return the unit to coal fuelling this winter to ensure high availability through the colder months."

The plans for conversion to gas come after years of unsuccessful lobbying for the government to offer more renewable energy subsidy contracts to support the conversion of further units to burn biomass. ●



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Philippines firm to expand bana grass production for 'green coal' conversion

Philippines green technology firm Mackay Green Energy will grow more bana grass in order to convert it into a biomass fuel, according to media reports.

Bana grass can be made into biocoal and biodegradable plastics.

Malaya Business Insight reported that Mackay Green Energy is already exporting bana grass to Japan and Korea from Zamboanga, where an initial 200 hectares has been planted on idle lands.

The firm owns lands in the Philippines. It has already planted bana grass in Negros with 3,000 hectares, Leyte with 1,000 hectares, Nueva

Ecija with 130 hectares, according to the *Philippines News Agency*. The group will now expand its lands to a further 2,000 hectares this year.

The bana grass, once fermented, produces lactic acid and various other valuable enzymes. The lactic acid is being used in the production of biodegradable plastics, specialist car parts and high value chemicals.

Mackay Green Energy said it has secured the world's best technologies to enable the conversion of the bana grass to green coal. It has superior qualities to fossil-based coal and can be co-fired in existing coal power plants without the need to make drastic changes.

"It is a key factor for power plants since the greenhouse gas emissions can be directly reduced," James

Mackay, chairman and CEO of Mackay Green Energy, told reporters.

The company focuses on the development of various renewable energy systems designed to efficiently convert biomass to energy and fuels.

According to Mackay, plans are being finalised for the installation of two 3MW green coal power plants, where the gas from the bana will provide fuel to run the power plant and at the same time produce 100 tonnes per day of green coal.

Biomass or green coal production will be increased to supply both the local and international markets.

Mackay said the first green coal production will start in the last quarter of 2016, according to *Malaya Business Insight*. ●

New research into producing hydrogen from biomass

Researchers at the Technical University of Vienna (TU Wien) are developing a process in which biomass can be used to produce a hydrogen-rich gas that can then be

employed in various ways in the iron and steel industry.

In a statement, the University said the long-term vision of the project is a renewable energy source, firmly anchored in the design of an integrated

iron and steel works.

The process developed at TU Wien converts biomass at high temperatures to produce two gas streams, a hydrogen rich producer gas and a CO₂ rich waste gas. Known as a biomass reforming process, it is made possible

by the use of lime in a special fluidised bed system.

In an integrated steel works combining the many production and finishing steps from pig iron to the finished steel product, it would be possible to use the hydrogen-rich production gas at various production stages, offering an environmentally-friendly alternative to natural gas. At the same time, research is also being carried out on the waste gas stream. Under the new process, the CO₂ that it contains is enriched and can thus be efficiently separated out or subjected to further processing.

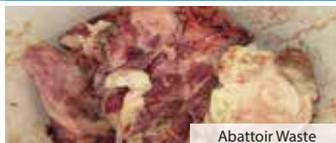
"From a chemical point of view, the important reactive step in the blast furnace process is the reduction of the iron ore," explained Johannes Schmid, project manager at TU Wien's Institute of Chemical Engineering. "In the natural ore, iron is present in the form of iron oxide, so the oxygen atoms first need to be separated from the iron atoms." ●

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Pan-African food and non-food biomass expert network unveiled

The “first” pan-African expert network on food and non-food biomass has been launched by African and German researchers.

BiomassNet aims to ensure that food security and environmental sustainability are not compromised in the development of new biomass uses. The scheme’s developers claim this will help to strengthen the emerging African bioeconomies.

The scheme was launched by Germany’s Center for Development Research (ZEF) and the Ghana-based Forum for Agricultural Research in Africa (FARA). The project was also developed within the German Federal Ministry of Education and Research (BMBF) funded scheme BiomassWeb.

Under the umbrella of the BiomassWeb project, German and African scientists have addressed the question of how biomass can be used more

effectively and efficiently in Africa.

“Africa, especially south of the Sahara, needs biomass both as a source of food and as a source of energy and industrial raw materials,” said Manfred Denich, director of the BiomassWeb project at the Center for Development Research at the University of Bonn (ZEF).

He added: “In view of the scarcity of agricultural land, this is hardly possible at the same time. “In order to provide solutions to this problem, we need an improved exchange of knowledge and experience, as well as discussions with local partners. Scientists, politicians, businesses and civil society must work together.”

According to estimates by the United Nations, almost two billion people will live in sub-Saharan Africa by 2050. This is almost a doubling compared to 2010. Considering the large population growth and the already noticeable impact of climate change, most countries in Sub-Saharan Africa are not able to produce enough food. ●

Glennmont completes £150 million refinancing of biomass plant

Glennmont Partners has completed the £150 million (€160m) refinancing of the Sleaford Renewable Energy plant.

Located in Lincolnshire, UK, Sleaford REP is a 40MWe straw-fired biomass plant. In operation since 2014, the plant is operated by Burmeister & Wain Scandinavian Contractor (BWSC). It provides free heat to the local community under long-term offtake contracts.

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New technique could cut production time for biomethane in half

Researchers at the University of British Columbia's Okanagan campus have found the key to speeding up the production process of biogas, according to an article by *Phys.org*.

The new research from Cigdem Eskicioglu, associate professor with UBC Okanagan's School of Engineering, and her team, could hold the key to biogas that is cheaper, safer and much faster to produce, the *Phys.org* article claimed.

"Methane is a biofuel commonly used in electricity generation and is produced by fermenting organic material," Eskicioglu told *Phys.org*. "The process can traditionally take anywhere from weeks to months to complete, but with my collaborators from Europe and Australia we've discovered a new biomass treatment technique that can cut that production time nearly in half."

Focusing on methane produced from materials found in agricultural and forest waste, such as wheat straw and corn husks, Eskicioglu and colleagues compared traditional fermentation processes with their new technique, and discovered that Douglas fir bark in particular could produce methane 172% faster than before.

The process developed by Eskicioglu and colleagues pretreats the initial organic material with carbon dioxide at high temperatures and pressures it in water before the whole mixture is

fermented. Significantly, the process uses equipment and materials that are already available and in use on an industrial scale. This means retrofitting existing bioreactors or building new, miniaturised ones could be done cheaply and easily.

"The potential to more efficiently harness the energy from forestry waste products like tree bark can open a world of new opportunities," Eskicioglu explained to *Phys.org*. "The new fermentation process would be relatively easy to implement on site and because the bioreactors could be much smaller, the costs could be kept low."

Eskicioglu suggested that as well as speeding up the biogas production process, the new technique could also make the process safer.

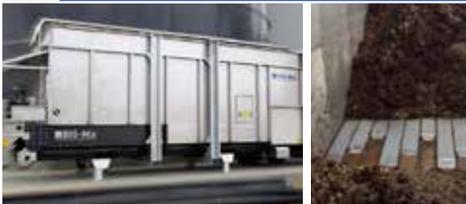
"Unlike traditional biomass pretreatment for bioreactors, our method doesn't require the use or generation of toxic chemicals. We still have some work to do to move it to an industrial scale, but our results so far are very promising."

The research is set to be published in the upcoming edition of the journal *Water Research*. ●

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US researchers have found the key to speeding up the production process of biogas

SFPUC invited to take out loan for biogas upgrade project

The US Environmental Protection Agency has invited the San Francisco Public Utility Commission (SFPUC) to apply for a \$625 (€525m) million Water Infrastructure Finance and Innovation Act (WIFIA) loan.

SFPUC's project focuses on wastewater treatment system upgrades. San Francisco's 60-year-old solids treatment facility will be replaced with upgraded infrastructure that will produce higher-quality

biosolids and maximise biogas utilisation and energy recovery. The project will also capture and treat odours more effectively.

"With the help of the federal government's low-cost loan program, we're going to upgrade our City's sewer infrastructure while realising significant savings for ratepayers," said Harlan L. Kelly Jr., general manager of the San Francisco Public

Utilities Commission. "The rebuild of our biosolids digesters will help modernise our sewer system and provide us with an opportunity to create good, high quality jobs in the parts of the City that need them the most."

The EPA received 43 letters of interest from public and private entities in response to its 2017 WIFIA notice of funding availability. After a review process, the WIFIA

selection committee chose 12 prospective projects to submit applications for loans, including SFPUC's.

\$2.3 billion (€1.9bn) is the total amount of funding available to public and private entities in the 2017 selection round. In total, WIFIA will support \$5.1 billion in water infrastructure development around the US, impacting 20 million people in nine states. ●



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Italy's 'first' municipal waste to methane plant inaugurated

A new plant for the production of biomethane and carbon dioxide has been inaugurated and started operation in Montello, Italy.

The biogas upgrading plant is the 'first' in Italy able to produce biomethane and carbon dioxide exclusively from the treatment of municipal solid waste.

The new facility has been created by Tecno Project Industriale (TPI), a company in the SIAD Group.

Biogas, the product of the anaerobic digestion of municipal waste, is broken down at the plant into its two main components: carbon dioxide (40%), and methane (60%). The carbon dioxide will be used for industrial processes. ●

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EnviTec breaks ground on Philippines biogas plant

A ground-breaking ceremony has been carried out for EnviTec's first biogas project in the Philippines.

The Germany-based biogas specialist will construct a 1.2MW biogas plant in Candelaria, Quezon province.

"In addition to this project under construction, we are planning to develop and replicate more projects to help the local farmers address the chicken manure disposal problem as well as the environmental issue associated with the burning of rice and corn straw," said Andy Alquiros, president of First Quezon Biogas Corporation (FQBC), the association of local poultry farmers which developed the project in partnership with Singaporean co-investor Yamato Technologies.

Poultry manure has become an increasing problem in Quezon, tonnes of it accumulating each year. First Quezon Biogas and Yamato approached EnviTec to address the issue, leading to the ambitious waste-energy project.

"The current project benefits from the subsidies of the Renewable Energy Act passed by the government in 2008," said Marcello Barbato, EnviTec Southeast Asia sales manager.

Regularly suffering from energy shortages, the Philippines has long had a need for an affordable, reliable energy supply. Energy prices in the archipelago state average \$0.23/kWh, the most expensive in Southeast Asia and in fact

comparable to 'highly-developed' countries such as Japan, according to market analysis carried out by the German-Philippines Chamber of Commerce and Industry (GPCCI).

The Philippines therefore offer significant potential for the use of biomass and biogas. Alongside animal waste, sugarcane and rice production in the region offer potential feedstocks for energy production. The GPCCI study suggests that the waste from sugar mills, rice and coconut farms presents potential production capabilities of 90, 40 and 20MW.

Meanwhile, climate legislation in the Philippines states that by 2030 total capacities for renewable energies are to be increased to 15,304 gigawatts, thereby contributing to the country's energy security. This corresponds to a three-fold increase on 2010 capacity. ●

Mexican scientists convert prickly pear cactus to biogas

Scientists in Mexico have developed a method to convert the prickly pear cactus into biogas, AFP reports. The distinctive, bright green cactus is farmed on a massive scale in Mexico, for use in drinks, medicines and shampoo.

In May 2017, a pilot project was launched at Milpa Alta's cactus market, which produces up to 200,000 tons a year of prickly pear cactus. Up to 10 tons of this cactus ends up as waste on the market floor each day.

Mexican green energy start up Suema decided to develop a biogas generator to turn the waste into energy. According to the AFP report, the generator will ultimately be able to process three to five tons of waste a day, in turn producing 170m³ (45,000 gallons) of biogas and more than a tone of compost.

This will be enough to produce 175 kilowatt hours of electricity, enough to power 9,600 low-energy light bulbs.

The \$840,000 project has been funded by the Mexican government. In 2015, Mexico vowed to reduce its emissions by 2050. In 2016, green energy made up 15.4% of the country's energy mix, although only 0.1% of this came from biogas. ●



Scientists in Mexico have developed a method to convert the prickly pear cactus into biogas, AFP reports



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Metsä's new bioproducts mill up and running

A new, next-generation bioproducts mill is up and running in the town of Äänekoski, Finland.

According to a statement from Metsä Group, who built and operate the mill, pulp deliveries to customers will begin in early September 2017.

Within a year of start-up the mill will

achieve its full nominal capacity. It will produce 1.3 million tonnes of pulp per year as well as other bioproducts such as tall oil and turpentine.

New bioproducts that already complement the product concept include product gas from bark, sulphuric acid from the mill's odorous gases, and biogas and biofuel pellets from sludge. ●



Sumitomo acquires stake in Pacific BioEnergy

Japan-based Sumitomo Corp. has acquired 47.6% of the shares of the British Columbia-based wood pellet manufacturer Pacific BioEnergy Corp (PBEC), and made its entry into the wood pellet manufacturing business in Canada.

Demand for biomass power generation is rising not only in EU countries but in Japan and the rest of Asia as well, and demand for wood pellets is also expected to expand. Wood pellets have attracted particular attention in Japan as a means of improving power generation efficiency to achieve the full-year 2030 energy mix formulated by the Japanese government in 2015.

PBEC, through its own and affiliated manufacturing facilities, currently markets in excess of 550,000 tonnes of industrial grade wood pellets per annum and is Canada's second largest wood pellet manufacturer. ●

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Pellets help Helsinki Airport go carbon neutral

Helsinki Airport has been awarded the international Airport Carbon Accreditation certificate (ACA) to verify its carbon neutrality.

“The ACA certificate awarded to Helsinki Airport is an important milestone in the implementation of Finavia’s accelerated climate programme at our airports. Our climate programme comprises a number of different measures, but Helsinki Airport plays a key role in the reduction of emissions,” explained Mikko Viinikainen, sustainable development director at Finavia, the company which operates Helsinki Airport.

A range of renewable energy sources are being used to keep the airport’s carbon emissions low, including biodiesel and bioenergy.

Pellet fuels, alongside geothermal energy, are being used as heat sources for the airport. Airport vehicles, meanwhile, are being fuelled with



renewable diesel. The buses travelling between the terminal and aircraft are fuelled by biodiesel produced entirely from waste and residue.

Solar and wind power, as well as an increase in LED lighting, are also contributing towards keeping the airport’s carbon emissions low.

Launched in 2009, the AQA certificate for carbon neutrality is globally recognised. Its aim is to support airports in their environmental efficiency drive in a bid to achieve the emissions

targets set for the aviation industry.

“It is increasingly important that companies set an example in reducing emissions. Finavia is committed to working hard to ensure that our airports will not increase their carbon dioxide emissions in 2020. In addition to minimising our own emissions, this also means that we are committed to reducing emissions in countries struggling with environmental problems, such as in India, through offset mechanisms,” said Viinikainen. ●



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A summary of the recent major explosions, fires and leaks in the bioenergy industry

Date	Location	Company	Incident information
9/8/17	Oldbury, UK	Innovative Environmental Solutions	<p>A man in his fifties was killed, and two other people seriously injured, following an explosion at a recycling plant.</p> <p>The Health and Safety Executive is aware of the fire, and is currently investigating.</p>
02/08/17	East Tamaki, New Zealand	N/A	<p>Fire crews contained a large fire at a waste management plant in East Tamaki, New Zealand.</p> <p>19 fire crews were called to the site, as well as a Hazmat team.</p> <p>Although nobody was reported injured, emergency decontamination had to be set up for the crews at the site.</p>
26/07/17	Cornwall, UK	Greener For Life	<p>PJL Construction, the contractors who built a biogas plant in Cornwall, have been ordered to pay close to £300,000 (€326,284) in fines over the avoidable death of a worker during the plant's construction.</p> <p>Ionel Soci died from a heart attack when he was crushed by a heavy piece of steel being used to direct the flow of concrete, while working for a sub-contractor on the project at Penare Farm, Higher Fraddon, in June 2014.</p>
20/07/17	Novo Mesto, Slovenia	Ekosistemi	<p>A major fire broke out at a waste processing plant in Zalog, near Novo mesto.</p> <p>No hazardous waste was involved in the fire.</p>
11/07/17	Sompangkha, India	Privately-owned biogas tank	<p>A rampaging elephant damaged a portion of a cottage wall and window, as well as the property's adjacent biogas tank.</p>



Plant update Canada

Sustane	
Location	Halifax, Nova Scotia
Alternative fuel	Clean burning fuels
Feedstock	Municipal solid waste
Construction/ expansion/ acquisition	The Canadian government is set to invest into Sustane, a Halifax, Nova Scotia based waste-to-energy company. Sustane claims to have developed a new process which converts municipal solid waste into clean burning fuel and other recycled products. The investment will be used to scale up Sustane's technology, supporting the creation of a demonstration facility in Chester, around 65km southwest of Halifax. The facility will transform solid waste from landfill into recyclable materials as well as high value fuels that burn cleaner than fossil fuels
Investment	CAD\$2.6 million (€1.7 million)

Pacific BioEnergy	
Location	British Columbia
Alternative fuel	Wood pellets
Capacity	550,000 tonnes of industrial grade wood pellets per annum
Feedstock	Dried wood fibre
Construction/ expansion/ acquisition	Japan-based Sumitomo Corp has acquired 47.6% of the shares of the British Columbia-based wood pellet manufacturer Pacific BioEnergy Corp (PBEC), and made its entry into the wood pellet manufacturing business in Canada
Project start date	July 2017

Greenlane Biogas	
Location	Burnaby, British Columbia
Alternative fuel	Biogas
Capacity	Capacity to treat 3,000 standard cubic feet per minute (SCFM) of biogas
Feedstock	Biogas upgrading
Construction/ expansion/ acquisition	Greenlane Biogas has extended its biogas upgrading equipment line-up. In a statement, the company said that it had expanded its Kauri upgrading system to help provide solutions for large-scale projects. Greenlane said: "The 'Kauri' has twice the capacity of our next largest biogas upgrading system and offers the proven scalability, productivity and performance of our water scrubbing based biogas upgrading systems whether it is for a 150 SCFM (250 Nm ³ /h) or 10,000 SCFM (16,000 Nm ³ /h) project"
Project start date	July 2017



Yukon's Teslin Tlingit Council	
Location	Yukon, Canada
Alternative fuel	Biomass heating
Capacity	Ten community buildings
Feedstock	Woodchip
Construction/ expansion/ acquisition	The territorial government of Yukon, Canada, has given \$150,000 (€140,000) in support of a First Nation community's biomass project. As well providing energy for heating, the woodchip fuelled boilers will offer employment to the First Nation
Project start date	April, 2017
Completion date	Project estimated to last approx. 12 months
Investment	\$150,000 (€140,000)
Comment	Brad Stoneman, who is on the Teslin Tlingit Council's project team, told CBC: "It provides the opportunity, a local opportunity, for entrepreneurs to provide the wood chips under contract, for example to the project. "We are not too sure just how we will measure it at this point, but it provides that local opportunity"

Agnico Eagle Mines	
Location	Nunavut Territory
Alternative fuel	Combined heat and power
Capacity	28MW
Feedstock	Natural gas
Construction/ expansion/ acquisition	Finnish technology group Wärtsilä will supply a 28MW combined heat and power (CHP) plant to the Meliadine Gold Mine project in Canada, owned by Agnico Eagle Mines. The order includes five Wärtsilä 34DF dual-fuel engines running on light fuel oil (LFO) or natural gas. Wärtsilä's scope includes the power generation and CHP equipment supply, plant commissioning and training.
Designer/buildier	Wärtsilä
Project start date	March 2017
Completion date	First quarter 2019

Airex Energy	
Location	Bécancour, Quebec
Alternative fuel	Biomass torrefaction to create biocoal
Feedstock	Biomass residues
Construction/ expansion/ acquisition	Canada-based firm Airex Energy officially inaugurated its biomass torrefaction plant, located in the La Prade industrial park in Bécancour, Quebec. Airex Energy's torrefaction process transforms biomass residues into biocoal pellets, a clean and renewable fuel that can replace coal and oil. Biocoal's unique properties allows it to easily disintegrate, so it can be ground up and combined with bituminous coal in thermal power stations producing electricity, without major changes to existing systems for handling, storing, and grinding coal
Investment	CAD\$10 million (€14m)

Mercer International	
Location	Friesau facility in Germany
Alternative fuel	Biomass power plant
Capacity	Annual production capacity of approximately 13MW of electricity and 49.5MW of thermal energy
Construction/ expansion/ acquisition	Canadian pulp manufacturer Mercer International has agreed to buy one of Germany's largest sawmills and a biomass power plant
Project start date	February 2017
Investment	CAN \$55.1 million (€39.7m) plus defined working capital of approximately \$9 million
Comment	CEO David M. Gandossi said: "We are pleased to enter the European lumber sector, with the acquisition of one of Germany's largest sawmills. The proposed acquisition also expands our existing presence in the bio-mass based electricity market and is in line with our long-term growth objectives



Hawthorne Capital and Katalyst	
Location	Middle Sackville, Nova Scotia
Alternative fuel	Biomass power
Capacity	3.7MW
Feedstock	Wood
Construction/ expansion/ acquisition	Canada-based Hefler Forest Products has sold its 3.7MW biomass power plant in Middle Sackville, Nova Scotia, the first sale of its kind in Canada. The new owners, Hawthorne Capital and Katalyst Wind, are considering having a third party operate the sawmill on site. Kevin Bromley, a PricewaterhouseCoopers partner, told The Chronicle Herald the sale is the first of its kind in Canada
Designer/builder	Hefler Forest Products
Project start date	February 2017

Southern Ontario Water Consortium (SOWC) wastewater demonstration facility	
Location	Guelph
Alternative fuel	Renewable energy
Feedstock	Wastewater
Construction/ expansion/ acquisition	GE's Water & Process Technologies is collaborating with a Canadian university on a research initiative to maximise renewable energy generation and simultaneously produce a pathogen-free biosolids fertiliser. The new pilot is located at the Southern Ontario Water Consortium (SOWC) wastewater demonstration facility adjacent to the city of Guelph wastewater treatment plant, and operated together with the government, the University of Guelph, and GE
Designer/builder	GE's Water & Process Technologies and the University of Guelph
Project start date	January 2017
Investment	CAD\$1.5 million (€997,392)

Gaz Métro	
Location	Quebec
Alternative fuel	Biogas
Capacity	140,000 tonnes of CO ₂ equivalents
Feedstock	Landfill biogas
Construction/ expansion/ acquisition	Canadian Gaz Métro has entered into multi-year agreements with WSP Canada to purchase offset credits generated by the reduction of greenhouse gas (GHG) emissions. The emission reductions are reached through landfill biogas collection and destruction systems operated by WSP, a professional services firm, at the Mont-Laurier, Saint-Raymond, Rivière-Rouge, and Saint-Flavien landfills
Project start date	November 2016

*This list is based on information made available to *Bioenergy Insight* at the time of printing. If you would like to update the list with additional plants for future issues, email liz@woodcotemedia.com

Q&A with Drax Biomass' pre

Drax Biomass, a North American subsidiary of UK-based Drax Group, is led by president and CEO Pete Madden. In this role, he oversees the company's operations including manufacturing facilities in the Southeastern US, ensuring they are environmentally sound, safe, and professionally managed to meet the market demand for compressed wood pellets. Here, he talks to *Liz Gyekye* about the biomass market and the company's outlook.

You have been working in the forestry industry for the last 30 years. You must have seen some major changes. Would you like to talk me through these changes?

I started in 1988, working for Westvaco Corp. in South Carolina. I was a forest technician, so, I did all the field work, the cruising of timber, painting boundary lines, operating heavy equipment, welding, and all that sort of fun stuff. It has been fascinating to start out and still be in the same industry after 30 years. It has also been an exciting time for the US South.

We have seen many changes over the years. The companies that owned huge, large, vertically-integrated pulp and paper mills, which were operating on acres of land, went through a huge consolidation phase. They consolidated and bought each other. During that time, they invested heavily into their own land and they increased the yield of their working forests. They invested billions of dollars making sure they could grow the pine trees, which feature predominantly in the

South, as fast as possible. It's been interesting to see the industry consolidate and see the evolution of different landowners.

We have also seen the decline of the paper industry, as electronic media and the rise of the internet have come on board. As a consequence, we have seen some paper mills closing their doors in some rural locations. That's where we have seen the demand dropping off.

Drax's model has been, "let's look at these rural areas where we are seeing permanently closed paper mills that were consuming millions of tonnes of pulp wood and put our pellet plants in that same location". So, the resource and trees in that area are still growing and they are growing very fast. The landowners are looking for a new market to provide an opportunity for them to manage their land and have a market for their low-value thinnings or wood. Therefore, we have seen that evolution take place over the last 20-plus years. The pellet

industry has only been very active in the South, at the scale that it currently is, in the last eight to ten years.

What do you think of the bioenergy story so far?

The UK is leading the global way in bioenergy. 16% of the UK's renewable electricity is now generated by wood pellets. That's a great story. The UK has been leading the way and identifying the important role that biomass can play and also achieving its renewable energy targets. In addition to this, I think the rest of the world is learning from the UK and figuring out the complexity of the supply chain and the dynamics of that and making sure that everything is based on sustainable forestry.

The story is a great story because not only are you driving out carbon emissions, but you are also basing that on sustainable forestry, which has been around a long time. In the South, great institutions like the University of Georgia and Mississippi State University support the

sound forest science. The US Forest Service is another great example where the science of sustainable forestry supports the industry.

Have you made any new acquisitions?

We have recently purchased the LaSalle plant from German Pellets, which is based in Urania, Louisiana. This is a great addition to the overall Drax family. We are still working hard to hire employees there. It is a great wood basket, in that there is a lot more growth of the trees than there is demand. It's also in an area where just down the road there was a big paper mill owned by International Paper near Pineville, Louisiana, which closed permanently. This is another area where former paper mills are based and landowners are looking for new markets. We are really excited about the Louisiana addition and it is a great addition to the portfolio of our assets. All that volume is going to go down to our existing port facility near Baton Rouge, Louisiana (based at the highest navigable point on the Mississippi). There is a lot of synergy that we appreciate.

Similar to our other plants, there might be around 60-70 jobs created there. When you go to these rural environments where there has been a large paper mill that has permanently closed, it literally vaporises those local communities. It is not just about the direct jobs, but it is also about the indirect jobs. You have to consider the people that are working in the woods, the loggers, the haulers, the truck drivers and even the people that work in the local



Pete Madden, Drax Biomass president and CEO

President and CEO Pete Madden

diners or local healthcare facilities. All of these employees are impacted. So, when we go to these local communities it's almost as if we are being welcomed with open arms because we are bringing in new capital and new jobs in areas that are hungry for attention.

We work closely with the local legislators and local town councillors and we take a pride in being part of that. It's almost like we are adopting these local areas in which we work in. That's where the bioenergy industry can really play a critical role in helping these local communities which are looking for support.

What tonnage do you handle on a yearly basis?

In terms of our two existing pellet plants [Morehouse BioEnergy and Amite BioEnergy], we handle around 450,000 metric tonnes for each plant. We are making some additional capital investments in both of those plants. We think we can bring both of those plants to 525,000 metric tonnes each. We think the addition of the LaSalle plant could be in that 450,000 metric tonne range. All in all, we think we are in the one million and a half metric tonnes range with all those three facilities. Our capacity through our port of Baton Rouge terminal is around two million tonnes of throughput. So, bringing on the LaSalle plant will maximise the throughput capacity at the Baton Rouge port.

Essentially, safety is number one. We want to make sure that we leverage the best practices across the industry and leverage the best practices that we have

learned from our own power station in northern England. This enables us to bring those best practices of safety over to the US at our own plant.

This is all based on the bedrock of the foundation of Drax Biomass, which is sustainable forestry. We are certainly certified to all the leading global sustainable forestry certifications, including the Sustainable Biomass Partnership (SBP), as well as the PEFC, and SFI (chain of custody). We take this very seriously. In

Last year, the Drax power plant produced 16% of the UK's renewable electricity. That's enough to power 4 million homes. That's a big deal

fact, we have just finished our external audit. We are independently audited and all those results are made available on our website.

How would you answer critics that say you are "just burning trees" to produce electricity?

Personally, I think there is a misconception of what a working forest is and to a greater extent how pellets are produced. It's very clear what a farmer does to produce corn. He has an acre of land, he plants the corn and he harvests it. It is not too different to what a tree farmer does. We have a great programme in the States called the American Tree Farm Association, where private small landowners are provided with the tools for them to manage their tree farms. It seems like there is a misunderstanding about what

a tree farmer does. However, it's really basic and simple.

The biomass industry is supplying these sustainable wood pellets and is playing an important role in that forestry sector. We are taking the low-grade material, including the treetops, the limbs and sawdust from sawmills, misshaped and diseased trees that are not suitable for any other use. The farmers take small trees that are removed to maximise the growth of the forest. It's almost like you are weeding the garden. You are

forest. Those forests are growing each and every day. Whether the markets are there or not, those forests continue to grow. Those landowners are continuing to try and maximise the yield and growth of those forests. This is because the typical landowner looks at this like an investment. It's another crop, similar to a crop of corn. So, they have to make sure they make the best use of that forest land and this will provide them with the return that they need.

How are you finding the market at the moment?

At the moment the biomass market is being driven by Europe, particularly the UK. The UK is the largest importer of wood pellets in the world. In relation to the heating market, we have seen warmer winters over the last couple of years. Therefore, we've seen an oversupply in the market where we had heating pellets going to the industrial sector. So, this issue coupled with the changes in the currency exchange rate between the US dollar and the UK British pound and Euro has brought some pressure to US South-based suppliers. This was especially the case for the ones who didn't have long committed offtakes with where their pellets were going.

Hence, some of those suppliers have had some issues. However, I think we are seeing a little bit more of a balance now. We are seeing and reading more about the Asian markets getting more engaged into this space, in particular, Japan and South Korea. I think it makes more sense to make sure that material for this market comes out of Western

Canada, just from a freight and logistics perspective.

Consultancies Forisk and Hawkins Wright provide good market analysis on the sector. They are both in agreement that the UK is still going to be the largest importer of wood pellets going forward. They think that there is going to be growing trend over the next ten years in the UK. Even though you hear reports of demand picking up in Asia, I think Europe will still be the predominant player in the market. Therefore, we are pretty optimistic – we really are.

Will the Asian market provide new opportunities for the US export market?

I think there might be. It boils down to the question of “can you provide a low-cost solution to these markets?”

A lot of that has to do with the cost of the supply chain. We are a commodity-based business, not only do we have to provide a high-quality product to a customer specification, but we have to do whatever we can to drive down the cost for that entire supply chain. That’s where you will see a lot of suppliers focus their attention for now and certainly for the future. That is what we are trying to do at Drax Biomass. We want to capitalise on our safe, reliable and flexible operations.

How are prices for wood pellets at the moment?

All of our wood pellets end up at the Drax power station. Drax Biomass is a subsidiary of the Drax Group. We are the largest power plant in the UK.

I think that we are in an exciting time. The UK has been the leader in bioenergy and at Drax we are transforming our coal power plant to produce renewable energy. It’s going to continue. We are going to advance and see innovation and continue with cost-saving efficiencies.

As more countries start understanding the potential



Drax Biomass' Morehouse BioEnergy plant

of biomass, the industry will be ready to make a mark. We are a cost-effective, low-carbon alternative to fossil fuels. That’s what it is all about. We are driving out the carbon emissions using biomass as renewable energy. That’s where it is most exciting to me. Wood pellets can reduce a coal-fired power plant’s carbon dioxide emissions by 80%. It can also help governments around the world to advance

the carbon emissions from those coal-fired power plants.

I believe the greatest source of renewable energy is trees and (our ones) are coming from sustainably managed forests that are supporting the local economy.

Why hasn't the national media caught on to this positive story?

We haven’t done a good enough job explaining our position. We haven’t done

do a better job explaining that a productive forest is a healthy forest. In order to provide these landowners with an opportunity to continue to invest and continue to regenerate the forest, they need to have these markets in order to be able to take this low-value wood and cultivate their land and to advance the growth of the remaining trees to produce high-value products.

I think the whole world is looking at the UK and realising that 16% of the country’s renewable energy is now generated from wood pellets. That’s a great story. Drax has played a critical role in its entire transformation, not only with its power station but across the whole supply chain.

In the US, Asia and Europe, policy makers are looking at bioenergy as a critical component for our future long-term energy mix. It’s going to supplement the other renewable energies like wind and solar. It’s an exciting time for the industry and more and more countries are beginning to understand the potential for biomass as a renewable energy source. ●

We are a commodity-based business

the low-carbon economy by reducing our collective dependence on fossil fuels.

Last year, the Drax power plant produced 16% of the UK’s renewable electricity. That’s enough to power four million homes. That’s a big deal. That is going to benefit our children, grandchildren and future generations because you are driving out

a good job communicating and educating the general public. I think we need to make a clear case for biomass and continue to explain our business. Not everyone can visit a productive, working forest and see its growth and its long-term benefits. If you live in the rural South you understand these issues. As an industry we have to

Time with Belfaconstruct's owner Bert Boonen



Belfaconstruct's owner Bert Boonen

Belfaconstruct, a Belgium-headquartered concrete and steel tank specialist, is pushing ahead with its investment plans. The company is helping to provide tanks for a new biogas plant in Skogn, Norway, which will be producing liquefied biogas and double the Norwegian renewable energy capacity. Here, *Liz Gyekye* interviews Belfaconstruct's Bert Boonen.

Talk me through how you got started?

I launched Belfaconstruct in 2011. I initially started out alone, but soon hired two workers. We soon started to build concrete tanks as a subcontractor. Belfa not only builds the tanks, but insulates them as well and as a final touch we install steel cladding on the walls. The concrete tanks we build are mainly for biogas production and wastewater treatment plants.

Our initial focus lay on Belgium and the Netherlands. However, it soon became clear that France was a really important market for us and our neighbour – we couldn't ignore France.

Since 2011, our clients have seen France as a growing market and we have sailed along with them. Belfa is Belgian, so the French language is not a barrier.

Therefore, I started building concrete tanks in France as well and in 2013 we had our first projects with steel tanks – insulation and cladding of big glass-lined steel tanks. After two years pouring the concrete to make the tanks, together with

the workers, I decided it was time to focus on extending and organising the business.

In January 2014, we opened our division in France. A permanent representation (local office) and payroll (to locally hire workers) enabled us to work in a flexible way towards our clients – the main tank building companies of Europe.

One of our key assets is being locally organised. When we see an interesting market with promising volumes of work, we move towards a local representation. As a consequence, Belfaconstruct has regional offices in France, the UK, Norway, Belgium and the Netherlands. We have all payrolls added together, 85 employees building concrete tanks (in Benelux and France) and insulating steel tanks (all over the world).

How did you get involved in the biogas Skogn project?

The Skogn (a village and former municipality in Nord-Trøndelag county, Norway) project came along because one of our clients worked on this project. We worked on the project together with them in order to get the biggest biogas plant in Scandinavia built. The fact that Belfaconstruct has had an office in Oslo since 2015 made us a preferred partner from the start. Our competitive price, combined with our flexible way of working made us the best contractor for the job.

How much did you invest in the Skogn project?

We have our own scaffolding. We never rent scaffolding and we have enough scaffolding to cover tanks up to 25 metres in diameter and 23 metres high. We have permanent scaffolding in France, Belgium and Scandinavia. With the Skogn project we extended and invested in even more scaffolding. We are very proud of the fact that all of our workers are intensively trained to work at height and all have VCA certificates, as well as yearly-renewed certificates to work at height in order to put up scaffolding. In each of our teams, we have at least one member who has a first aid diploma. The training of our team is a constant investment.

So, our investment has not been small and as the Skogn project will take up to

a year to complete, we were obligated to make these investments and show that we could handle projects of this size.

Elsewhere, we are building 15 concrete tanks in Belgium for a brand new biogas plant. The plant is the same size as the Skogn project. This is to show how we can multi-task with working on big projects.

How do you work and what is your unique selling point?

We try to work in a very transparent way. Our clients have access to all of their documents in relation to their projects online via a unique website login. They also have access to a live view of all of the works going on.

This means that a client with an office in Germany can follow the daily construction works happening with a project in Sweden. Our team leaders make daily photos with their phones. Through the Belfa app they upload them and immediately we have them available on the customer zone. This allows us to move quickly and solve issues accordingly. It saves at the project management stage, but it also creates huge confidence for the clients. They can follow up on a daily basis and see the quality of the work we deliver. If, for example, an inspection takes place and certain documents are required, our client can always find everything online. This helps us also to work flexibly and not glued to the office.

The fact we are organised in different markets allows us to be flexible and jump in quickly once a project is approved. We almost always have the possibility to move teams around. This is greatly appreciated by our clients.

What is set to be big in 2018 and what are your future plans?

Steel tank projects in South America are set to be big. Our first projects there will be to insulate steel tanks. We predict that France will also be booming in 2018. That will be the biggest job for us. France has started focusing on growing its biogas sector. So, many concrete tanks will have to be built. As a subcontractor we have eight teams all over France building these digesters. France has become our second home. ●

Get smart with plant design and separation to reduce risk, prevent losses and maintain affordable premiums

Biogas: Cut risk, not corners

Over-economising at the plant design stage can compromise safety and insurability long term, says renewable energy insurance broker, Duncan Gordon.

Good plant design and separation of equipment may help prevent losses and maintain reasonable insurance premiums. Up-front savings on project development can be necessary to retain a competitive edge when seeking a higher rate of return on investment, but they must be coupled with risk mitigation not being overlooked.

A project owner might believe it's an acceptable level of risk to live with. But insurers may think otherwise,

based on the claims they pay. Biogas plants risk business closure if faced with uninsurability, inadequate plant design means procuring the

appropriate coverage can be difficult after a claim occurs, which can cause difficulties to meet lender insurance requirements.

Alternatively, coverage is maintained but the impact on insurance premiums increases well above operational budget estimations. Then, the future investment return of the business comes into question.

“The consequences of plant damage can be widespread,” explains Gordon. “There are effects to your income streams and your business

breakdown and the associated lost revenue covered by a business interruption cover.

Risk mitigation

By reviewing the risks prior to construction, then building a plant taking these mitigations into account, it is more likely the plant will be viewed favourably by insurers. Considering risk mitigation during the design phase can avoid the eventuality of large damage losses entirely. For example, if you have wide separation between key plant items, you may save your plant from total loss by allowing the fire brigade to get to the site in time. It is easier and cheaper to replace an engine, for example, rather than the entire plant.

While all good engineers will undertake to design and build a suitable plant, often, little consideration is given to plant design should a fire occur.

“In the UK, fire risk assessments are concerned with personnel safety, and workers' ability to escape a fire,” explains Alan Fitzpatrick, a risk engineer with commercial insurance provider, CNA Hardy

Fitzpatrick adds: “This often causes confusion when an engineering insurance company reviews a biogas facility in construction and operation, with the aim of trying to reduce exposure to building and machinery losses from fire.”

The majority of build and

Biogas plants risk business closure if faced with uninsurability



Good plant design and separation of equipment may help prevent losses

maintenance contractors recognise that it is good practise to build biogas plants using experienced contractors; to install well-recognised plant and machinery with a proven track record, and to manage risks with, for example, good operational housekeeping.

A specialist engineering insurance company takes into account the hazards within a design and considers how to reduce the exposure. Additionally, it looks at the following:

- Do the buildings have a two-hour fire resistance?
- Is the separation between the buildings and plant of sufficient size to reduce the chances of fire spreading?
- If the worst happens, how quickly can the fire brigade arrive, and what fire water supplies are on site?

“Often, biogas site buildings

are not constructed from two-hour fire resistant materials, a fact recognised by insurers,” adds Fitzpatrick. “The guidance then is to increase the separation between buildings and plant.”

One basic rule is that buildings should be separated by a distance of 30m. If the building construction is of two-hour fire resistance, this distance can be reduced to 15m.

However, with investors wanting good returns, increasing separation can be a hard decision. Currently, most biogas sites do not comply.

Gordon deals with the fallout regularly when biogas companies prioritise commercial decisions.

“Normally, in the event of a claim after a fire, an insurance company will pay the claim. But then the plant becomes difficult to

insure, as the terms and conditions are altered by insurers to reflect the lack of separation,” adds Fitzpatrick.

A specialist insurance broker can find alternative terms. But the premiums, deductibles and insurance conditions become a challenge without appropriate separation, and this can make a biogas plant unprofitable.

Other concerns raised by insurance companies include:

- The building materials having no fire resistance. For example, the digester insulation [shown in the picture below] is a foam material. Fitted mineral wool insulation would have been preferable. Foam construction has no fire resistance, so if there were a fire in the area caused by hot works or a nearby engine fire, the digester would be lost to fire.
- The use of wood batons in building design: A recent fire safety circular issued by CNA Hardy*, highlighted the use of wood batons in building design. Batons are a design feature; they serve an aesthetic purpose only. In this instance, the batons increased the fire combustible load and so increased the size of the loss.

“Being prudent is the key to saving money in the long term,” says Gordon. Try to avoid doing the bare minimum in order to meet regulatory requirements. Schedule detailed conversations with

your architects, engineers and contractors as early as you can and try to form plans with risk mitigation at the core of the approach.

“Fires are a known risk in the biogas sector. They happen when you least expect them. It is often valuable to take guidance from the insurance company at the design stage; this will help the plant obtain insurance at a reasonable cost.

“It’s crucial that plants get the separation right. It can be expensive – and often impossible due to site limitations – to implement it later on.”

Follow the IMIA guidelines

What points should you consider, when implementing safety measures?

For guidance, look to the IMIA Underwriting Risk Assessment Guide, on its Working Group Paper 85(14).

The 33-point checklist covers seven risk assessment categories, including explosion and fire protection, and site and building. ●

For more information:

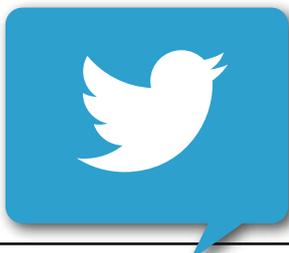
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*AD Plants Carbon Filter Safety Alert, issued October 2016



Foam digester insulation (pictured) has no fire resistance

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More and more companies are finding that biogas and farming go hand in hand

Betting all one's chips on biogas

Located in Southwestern British Columbia, Canada, the Fraser Valley with its rich soils, moderate climates and market proximity is a region naturally-made for farming. It is here that Heppell's can trace its origins as a potato and dairy farm to the early 1920s. Driven by the core value that there is always a better way of doing something, Heppell's has never shied away from new ventures offering both financial and environmental gains.

When Heppell's was supplying potatoes to a local chip factory, they ended up buying the business with an eye on using the second-grade potatoes to reduce farm waste. Things didn't go as planned as the quest for the perfect chip required the best potatoes. The factory succeeded in making a great chip, but did nothing to reduce waste, it instead created more waste.

Faced with waste from two operations – the farm and the chip factory – Heppell's was in search of something that was better than allowing discard potatoes to rot in the field and reject chips to be sent to the landfill.

Potatoes to energy

That something was the acquisition of Fraser Valley Biogas, a start-up biomethane plant in nearby Abbotsford. The first of its kind in Canada,



Greenlane Biogas has supplied and installed more than 100 biogas upgrading systems worldwide to purify biogas from organic waste

the plant under Heppell's ownership and operation, produces tens of thousands of gigajoules of renewable energy each year – enough to heat more than 1,000 homes – all

from organic waste that would normally be taken to landfills.

According to Brendan Van Biert, general manager for Fraser Valley Biogas, the plant “processes 70 to 100 tonnes

of waste each day as feed for the anaerobic digesters to capture biogas”. The waste is a mix of on-farm organics such as culled potatoes and vegetables, animal manure



The 'Rimu' biogas upgrading system from Greenlane Biogas utilises water scrubbing, a simple and robust technology

and the occasional fruit spoilage from Heppell's and other farms, and off-farm organic material such as fats and oils from the chip factory and other sources.

"We have a retention time of approximately 50 days," states Van Biert, for the waste to remain in the digesters where it is broken down in an oxygen-free environment. The result is two products: a digestate and raw biogas made up of about 60% methane. Van Biert says the "digestate has a higher nutrient value than regular manure" and is used as fertiliser on all Heppell's crops while "the biogas at this point is piped into a biogas upgrading unit".

Designed and supplied by Greenlane Biogas, the 'Rimu' biogas upgrading system has a capacity of 155 to 500 cubic feet per minute and utilises only water to purify the biogas. The system starts by compressing the raw biogas for processing after which it enters the bottom of the scrubbing vessel. Inside the vessel the biogas is showered with water and as the biogas pushes upwards,

the water preferentially absorbs the more soluble impurities, allowing the cleaned gas to exit the vessel.

This treated gas is called biomethane and has a methane purity greater than 98%. The biomethane is then dried

and compressed for injection into the local pipeline.

The interconnection facility at Fraser Valley Biogas is owned and operated by FortisBC, a gas and electric utility serving more than one million customers. This facility monitors the biomethane to ensure it meets utility specifications and connects to the existing natural gas system. FortisBC sells biomethane to its customers through its voluntary Renewable Natural Gas ("RNG") program.

"Fraser Valley Biogas accounts for a significant portion of our supply and the gas coming into the system has been very reliable," says Scott Gramm, manager of the Renewable Natural Gas program at FortisBC. "Two of the four operating projects

in BC use Greenlane Biogas technology and these systems continue to perform well."

A green and profitable solution to waste

By making use of the organic waste from their farming and chip operations and using the digestate back on the land to grow more crops, Heppell's is "trying to close the loop on waste," said Van Biert. And in doing so, achieving many benefits.

Recycling their organic

waste to produce biomethane has enabled Heppell's to diversify their revenue stream with income from farming, the chip factory and now renewable energy sales. At the same time, they have reduced farming costs by using the nutrient rich digestate as a fertiliser.

Biogas in this case also supports the local farming community. Fraser Valley Biogas takes waste from neighbouring farms and/or sells them digestate. Van Biert says "we have arrangements where we take one load of waste in exchange for one load of digestate" and for a new dairy farm starting out, "we've taken their waste to help them out."

And as a biogas producer, Heppell's diverts waste from landfills and in the process, captures methane that would otherwise contribute to greenhouse gas emissions. Van Biert sees the methane slip of 1-2% with the Greenlane Biogas upgrading system as the better way to go over composting.

When it comes to biogas, Van Biert asks, "Why wouldn't you do it?" And it seems more and more people agree. Since FortisBC launched their program in 2011, Gramm says subscriber numbers have grown each year and they now "have over 8,000 residential customers and businesses choosing carbon-neutral biomethane." Heppell's and the chip factory being two of them.

Van Biert believes biogas "is the right thing to do" to reduce waste and find a use for it. Managing wastes to produce optimum gas and nutrients is his everyday challenge. His advice for anyone developing a biogas project? "Don't plan small on the upgrading side." ●

For more information:

This article was written by Brent Jaklin, managing director, and Antonio Saavedra, business development director at Greenlane Biogas. Visit: www.greenlanebiogas.com

Recycling their organic waste to produce biomethane has enabled Heppell's to diversify their revenue stream

Supportive policies increasing biogas and RNG development in Canadian provinces

Canadian biogas and RNG market snapshot

Momentum is growing nationally for biogas and renewable natural gas (RNG) in Canada. Provinces that represent more than 86% of Canada's population are making commitments to support biogas and the production of RNG driven by the necessity to reduce greenhouse gas (GHG) emissions and achieve a low-carbon economy. Biogas is the only renewable energy technology that captures and destroys methane, a potent short-lived climate pollutant with a global warming potential (GWP) 86 times greater than carbon dioxide over 20 years, from organic waste. Due to its high GWP, reducing methane emissions today can make an immediate beneficial

impact on climate change. Currently, Canada has more than 100 biogas facilities generating electricity and by the end of 2017 there will be 11 operating RNG projects. RNG is interchangeable with natural gas and can be injected directly into the grid, or used to fuel fleets with natural gas vehicles. As

amendments to the Greenhouse Gas Regulation under the Clean Energy Act that enables FortisBC, a provincial natural gas utility, to increase the supply and use of RNG through programmes funded by the utility. Referred to as the Renewable Portfolio Allowance for RNG, the public utility can procure RNG up to 5%

including residential organics and agricultural anaerobic digestion, landfill gas capture, and wastewater facilities.

Quebec

On 26 June, 2017, the Ministry of Energy and Natural Resources in Quebec rolled out their 2017-2020 Action Plan that sets a target of 5% RNG by 2020 and financial assistance for RNG projects to achieve a 50 Mm³ increase in RNG production by 2020. Gaz Métro, the main distributor of natural gas in Quebec, has been actively involved in facilitating the development of RNG projects in municipalities. Gaz Métro has an agreement with the City of Saint-Hyacinthe for the purchase and injection of renewable natural gas more than 20 years. Saint-Hyacinthe will be Quebec's first municipality to generate RNG from its organic waste for fleet fuelling, local use, and grid injection. The facility is expected to be in operation later this year.

On 12 July, 2017, Gaz Métro submitted a package of measures to the Régie de L'énergie that would further increase the competitiveness of RNG production and the development of RNG projects in Quebec. This included recommended prices for purchasing RNG between \$7-22/GJ depending on RNG production capacity. The position of the Régie de L'énergie on these recommendations will become clear over the course of the next year.

Canada has more than 100 biogas facilities generating electricity

a versatile, low-carbon, 100% renewable fuel, RNG is the current focus of using biogas in many Canadian provinces.

British Columbia

In March 2017, the Government of British Columbia announced

by volume per year and may pay up to CAD\$30 (€20.29) per GJ for that supply.

FortisBC currently has five RNG suppliers that produce a total of 295,000 GJ of RNG annually, which is enough energy to heat more than 3,200 homes a year. In their most recent project, FortisBC partnered with the City of Surrey to produce RNG at the Surrey Biofuel facility. To help Metro Vancouver achieve its regional waste diversion objectives, biogas generated from kerbside organic waste will be upgraded to RNG to power the City's fleets and feed the City's District Energy System. The Surrey Biofuel facility is currently online and expected to be in operation later in 2017. FortisBC has also received approval from the BC Utilities Commissions for two additional RNG purchase agreements with the projects expecting to proceed over the next two years. Their suppliers encompass a variety of RNG sources,



Provinces that represent more than 86% of Canada's population are making commitments to support biogas

While British Columbia and Quebec are setting the stage for RNG adoption, industry players in Ontario and Alberta are awaiting action from the provinces on policies that would provide market certainty and spur development.

Alberta

The Bioenergy Producers Program that allocated \$60 million in funding in Alberta will be concluding on 30 September, 2017. Alberta is currently undertaking a third-party review to develop long-term policy that will work towards a self-sufficient bioenergy industry. The programme benefited eligible biogas producers by providing producer credit rates of \$0.06 per kWh for electricity from biogas, and \$2/GJ for RNG. Producer credits will cease in the fall

and programme participants currently do not know what type of policy will replace the programme to foster a sustainable bioenergy industry.

Ontario

Ontario unveiled its Climate Change Action Plan in 2016, announcing a commitment of up to \$100 million in Cap and Trade proceeds over four years to establish a low-carbon content for natural gas and support the introduction of RNG. Work continues to develop and finalise these aspects of the plan. While municipalities are considering RNG as a technology to increase organic waste diversion and generate fuel, currently Ontario has only one RNG facility injecting into the distribution system, the Woodward Avenue Wastewater Treatment plant in Hamilton.

On 16 December, 2016, the

Minister of Energy issued a letter to the Ontario Energy Board (OEB) encouraging them to move forward in a timely manner to include RNG as a potential fuel that could help reduce GHG emissions as part of the gas utilities' supply portfolio. On 16 March, 2017, the OEB announced an initiative to develop a Framework for the Assessment of Distributors Gas Supply Plans that considers strategies to include RNG in distributors gas supply plans to reduce GHG emissions. An initial draft of the Framework is expected to be completed by fall 2017, with the Framework completed by the end of 2017.

As demonstrated by the activity in British Columbia and Quebec and growing developments in Ontario and Alberta, to increase RNG capacity and achieve deep GHG reductions, developers need certainty to attract the

capital necessary to finance new private sector plants.

The Canadian Biogas Association is supportive of developing policies that create predictable market demand in the form of a renewable content requirement with RNG targets of 5% by 2025 and 10% by 2030, and revenues on the order of \$21/GJ for RNG and \$0.18/kWh for renewable electricity. With these elements in place, Canadian provinces can continue to create sustainable business models to increase biogas and RNG production that in turn can offer solutions for waste management, climate change and renewable energy. ●

For more information:

This article was written by Sarah Stadyk, manager of Business Development and Communications, at the Canadian Biogas Association. Visit: www.biogasassociation.ca

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The case for precision in online moisture measurement for the wood pellet manufacturing process

Made to measure

Moisture measurement in the production process of wood pellets for bioenergy is an important parameter for a number of reasons. Firstly, it allows for the production process to be optimised through energy saving during the drying stage, and by reducing waste. Secondly, knowing the right moisture content at each step avoids damage to production equipment (presses) and stabilises the entire production process.

The right moisture content of the end product is obviously important for product transportability as well as for pellet quality (burning efficiency). Moisture measurement is prescribed in various norms (i.e. EN 14961-2). Online moisture measurement is recommended

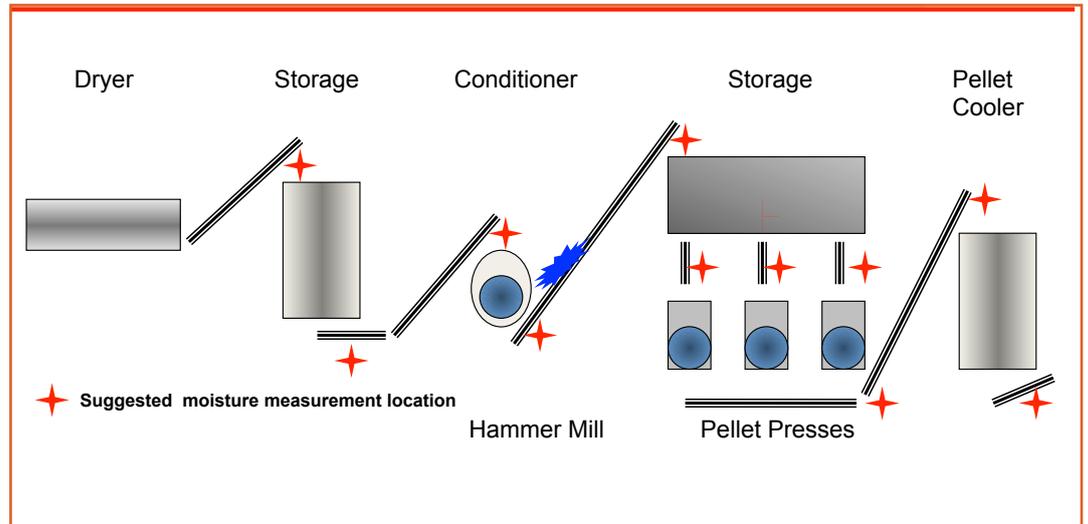


Figure 1: + = typical moisture measurement points in pellet production process

for process control.

As a general rule online moisture measurement is best achieved in homogenous product flow conditions. There are many factors which can degrade homogeneity, including excessive dryer speed variations, particle

size mix and variation, and short storage dwell times. The more homogenous the product the more accurately moisture will be measured.

Some of the best and most meaningful moisture measurement locations in the production process

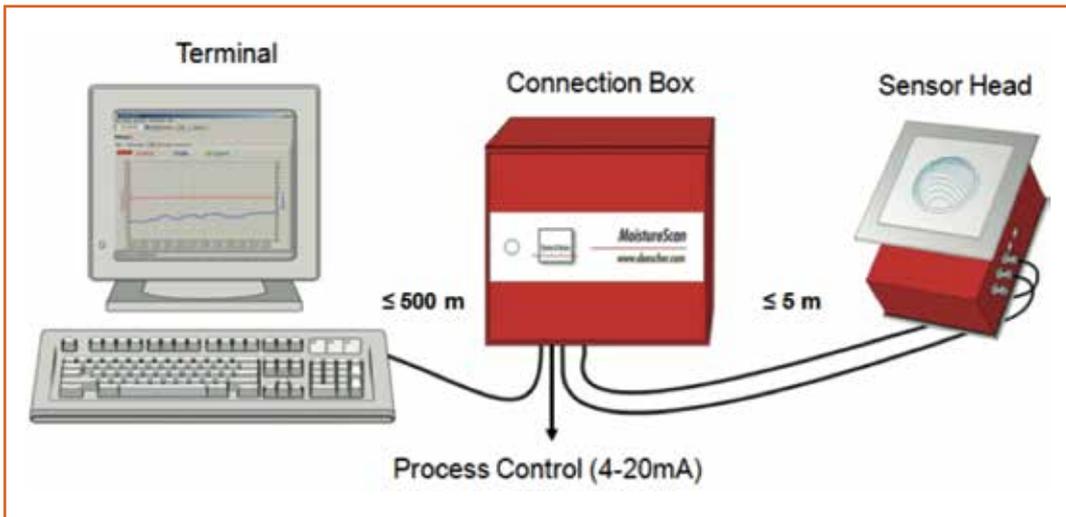
are indicated in the below general process flow diagram (figure 1).

Conventional moisture measurement technologies

Traditionally, one of three methods is employed to



2-PMR moisture sensors installed in chain conveyors downstream of dryer



Typical 2-PMR moisture measurement system configuration

measure moisture online: near-infrared, microwave, or capacitance. Their respective pluses and minuses are summarised as follows:

- Capacitance: product functions as the dielectric of a capacitor. The measurement accuracy is thus sensitive to variations in temperature, conductivity (salt content) and density.
- Near-infrared: measures the reflection of near-infrared light off the product surface. It is a non-contact measurement. However, moisture is measured primarily on the surface and not through the entire core. The accuracy is influenced by colour, surface structure and product surface contamination.
- Single-parameter

microwaves: sets water molecules – contained inside the product sample – into oscillations. Electro-magnetic field energy loss

mentioned single-parameter method) was introduced in order to eliminate or reduce the negative influences of temperature and density

Moisture control optimises the wood pellet production process by saving energy

is measured and becomes a proxy for water content. The accuracy is dependent on product temperature as well as product density.

Further development in measurement technology

A 2-Parameter Microwave Resonance (2-PMR) method (as opposed to the above

variations. The 2-PMR technology works as follows: water molecules (inside the product) are dipoles and thus follow polarity changes of an applied alternating electro-magnetic field. These polarity changes require energy, which is drawn from the electromagnetic field. This loss of energy, which depends on the number of water molecules, is detected. Furthermore, variations in density (via product compression or differing product material densities) lead to changes in the propagation speed of the electromagnetic waves. This change in propagation speed is also detected and compensated for. The 2-PMR measuring technique allows for the determination of the moisture content of materials independent of their density.

A practical example

A US-based wood pellet manufacturer with focus on

the export pellet market experienced unreliable readings in their moisture values during their production process. Their existing online moisture measurement method (NIR = near infrared) was tested against the above described 2-Parameter Microwave Resonance technology (2-PMR). The 2-PMR method proved to measure tighter (= less scatter) and with better precision across the entire moisture range. A summary of the results can be viewed in figure 2.

Installation and system configuration

2-PMR moisture meters are installed in chutes, chain conveyors, screw conveyors, silos and similar, typically at angled surfaces to ensure a constant product flow covering the entire sensor surface.

In summary

Moisture control optimises the wood pellet production process by saving energy. Live moisture values also protect production equipment and avoid waste. The 2-Parameter Microwave Resonance technology applied to on-line measurement in wood pellet manufacturing is a proven method for increased reliability in moisture control. As a key feature to ensure accuracy it is able to compensate for density variations. Moisture of up to approximately 20% can be detected with a precision comparable to drying ovens. With a measurement rate of up to 600+Hz, moisture values are available without the delays involved in laboratory settings. ●

For more information:

This article was written by Claus Huebel, North America representative at Doescher Microwave Systems. Visit: www.moisturemeter.eu/home

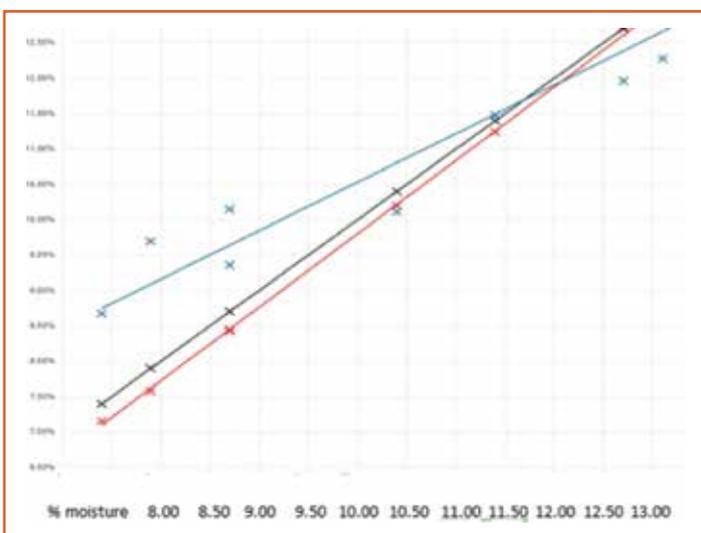


Figure 2 - Legend: all straight lines: average values — black: reference method/blue: near infrared/red: 2-PMR microwave/ X X X = actual measurements/vertical: gauge readings



Global demand for biomass fuel is on the rise, which presents both newfound challenges and opportunities for wood shredding operators worldwide. Here, Peter Streinik, head of the waste division at shredding specialist UNTHA, talks about how to maximise the profitability of this crucial feedstock preparation technique

The evolving 'world' of biomass fuel preparation

Biomass is regarded as a very modern-day energy source, and rightly so. It is just one of many feedstocks produced from the sophisticated transformation of materials that a number of people would simply consider 'waste'. And, the retention of the inherent value of this waste, to produce a clean alternative fuel, is incredibly supportive of the circular economic model that so many nations are striving to achieve.

However, this doesn't mean that the intelligent re-use of wood is a new phenomenon. As one of the world's oldest materials,

this sustainable resource has been proudly recycled or repurposed by mankind for thousands of years. But the ways with which it has been processed have continued to change extensively.

In many parts of the world, wood, forestry residue and other types of waste are used as a primary source of raw domestic energy. This can be said for 89% of the population in Kenya and Niger for example, 85% in Tanzania and 78% in the Democratic Republic of Congo¹ where even the simplest of scraps can help generate much-needed heat.

On the other hand, the refined processing of

waste wood to produce a specified biomass fuel for the commercial market makes up a very different geographical picture.

According to an article by Power Engineering International, global demand for biomass pellets is expected to nearly double to 53 million tonnes by 2023². Approximately 60% of this requirement is predicted to come from the EU and Asia, with European nations such as Germany, Sweden and Latvia reported to be consuming around 74% of the world's pellets. It must be noted however, that Japan and South Korea look set to experience significant

growth too, which may eventually tip the statistics.

Watch this space

Yet potential exists elsewhere as well. In the US and Canada for example, pre-consumer wood waste has been virtually eliminated, but the level of wood debris in MSW (municipal solid waste) and C&D (construction and demolition) streams shows there is still room for improvement. There are at least 30 million tonnes of such recoverable material available in North America, per year, for example³. Wood isn't, as yet, being best utilised in this respect, but awareness of the opportunity

is mounting. At the start of August, for instance, the state of Massachusetts was considering the move to formally classify wood pellets as renewable energy⁴. It's a case of 'watch this space'.

Even this small handful of examples shows that, globally, we're faced with a very fragmented – yet arguably very lucrative – market. Admittedly, a lack of uniformity surrounding analysis methods means it's difficult to paint a conclusive picture of wood recovery worldwide. However, on the whole, wood is increasingly being acknowledged as a

In many parts of the world, wood, forestry residue and other types of waste are used as a primary source of raw domestic energy

valuable resource that needs to be comprehensively salvaged and processed.

Perhaps it is because of these market forces that there has been a notable increase in the demand for flexible wood shredders. Some manufacturers have long claimed to engineer 'universal' machines capable of handling varied waste streams, but

investment in a 'one size fits all' solution has often meant the need for operators to compromise on results.

Technological innovation, however, has brought about the ability to design truly flexible shredding systems that can proficiently handle wood before being reconfigured – in as little as 0-2 hours – to process other, very different waste streams. In Thailand, for example, wood shredders are also being configured to handle rubber tree chips. Such versatility may prove crucial for some operators during periods of market value fluctuation, not to mention the evolving nature of the waste landscape on the whole. Few organisations now stand still in terms of the wastes they produce, which means recycling and recovery firms need to adapt too. If they can, the commercial attractiveness of this market could be exponential.

For fuel manufacturers that are not yet able to capitalise on the evolving market, the focus should still be on how to maximise margins. Technological advancements in slow-speed shredding mean it is possible to reduce fines and yield up to 20% more saleable

biomass material per tonne, for example – often without the need for additional screening systems. The shredder therefore becomes an even greater revenue-generating asset, whilst the disposal costs associated with these unwanted outputs is also reduced.

High torque drives help boost capacity too whilst reducing dust generation and the consequential risk of fire, which protects both the throughput and safety of a plant in turn, and keeps insurance premiums down.

In summary, the world of biomass feedstock preparation is evolving faster than ever before. It can, understandably, feel a challenge to keep up, at times. But with careful research and industry awareness, the opportunities to thrive have also never been so great. ●

Footnotes:

- 1 - <http://www.worldatlas.com/articles/20-countries-burning-the-most-waste-and-biomass-for-energy.html>
- 2 - <http://www.powerengineeringint.com/articles/print/volume-25/issue-2/features/biomass-taking-a-new-fuel-to-market.html>
- 3 - http://www.dovetailinc.org/report_pdfs/2013/wood_reuse_and_recycling/current_state_wood_reuse_recycling_namerica.pdf
- 4 - <https://cleantechnica.com/2017/08/09/massachusetts-considering-plan-classify-wood-pellets-renewable-energy/>

For more information:

This article was written by Peter Streinik, head of the waste division at shredding specialist UNTHA. Visit: <http://www.untha.com>



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Torrefaction moving forward: Business models currently implemented

Transforming biomass

Biomass, independent of species – be it wood or agricultural biomass, farmed grasses or timber industry by-products – can be significantly upgraded in quality by roasting in an oxygen depleted atmosphere.

Torrefaction is a thermal pre-treatment technology used to upgrade lignocellulosic biomass to a higher quality and a more attractive biofuel. In the torrefaction process, biomass is heated to a temperature between 250-350 °C in an atmosphere with low oxygen concentrations, so that all moisture is removed. During the torrefaction process, the biomass partly devolatilises leading to a decrease in mass, however the initial energy content is preserved so that the energy density of the biomass becomes higher than the original biomass. Consequently, transportation of torrefied pellets is much cheaper than wood pellets.

Below is a list of key characteristics and advantages that torrefaction offers:

- Significant cost reductions in transport and handling as a result of the substantial increase in energy density and water resistance
- Broader feedstock basis – both

geographically and in types of raw material

- Close to zero biodegradation of product when stored
- Significantly increased grindability
- Large variety of applications
 - Superior water resistance to wood pellets
 - Combusts cleanly, gasifies more easily

- Fuel Specs can be adjusted to meet clients' requirements in a number of parameters
 - Reduced CO₂ footprint along the supply chain
 - Helps develop the biomass market towards commoditisation
 - Various applications outside energy
- In the last decade, several companies have taken up the challenge to lead by example and develop technologies and 'first of its kind' production plants. Currently, a number of companies in Europe and North America have successfully developed and transformed a roasting process into a

fuel producing technology, supplying torrefied biomass in the form of pellets, briquettes and fuel-dust.

Concrete offers

The business models implemented currently by the companies in torrefaction lead to at least three very concrete offers to the market:

- Large volume long-term fuel supply contracts
 - Technology licenses or technology component supply
 - Fuel supply for regional decentralised consumption
- So, who are the companies implementing business in the sector of torrefaction?



American Biocarbon product stored in the open yard



A typical representative of the first group of companies, offering long-term, large volume fuel supply contracts is American BioCarbon, which is an advanced renewable fuels company that produces a carbon-neutral, drop-in coal replacement for power generation and district heating. The business approach focuses on feedstock supply and partners with agricultural processing plants and sugar mills to ensure a long-term supply of renewable and secure feedstock.

The company's first commercial operation is located at the Cora Texas Sugar Mill in White Castle, Louisiana. The proprietary technology for managing and processing feedstock utilises otherwise problematic agricultural waste to produce a torrefied biomass coal substitute that offers several advantages compared to other biomass fuels currently available.

American BioCarbon's Louisiana-based facility can be readily replicated at other sugar mills and agricultural processing plants in the US, and internationally. The plant's patented full commercial-scale material separation process has been completed and operated throughout the 2016 harvest season and validated the value proposition both to the sugar mill and the business model. American Biocarbon currently operates a fully integrated demonstration facility to produce torrefied briquettes for commercial-scale testing. The full scale facility to be commissioned in late 2018 will produce 200,000 metric tonnes per year of torrefied briquettes to co-fire or directly replace coal in power generation and heating.

Owners of feedstock such as wood or agricultural by-products might be interested in creating value from their residues, and hence, will be more focused to implement

advanced torrefaction technologies on their own. Here, companies like CEG, Bioendev, Airex, TSI, CMI Nesa, River Basin Energy, Torr-Coal or Blackwood Technology are on the radar.

All of them have been involved in torrefaction technology development and optimisation for sometimes more than a decade and have not only several demonstration plants in operation, but have signed first supply or license contracts for industrial installations.

The Torr-Coal Group is a Dutch renewable energy

continuous torrefaction process for different types of raw material.

The process centres around a rotary drum reactor with a state-of-the-art process control system which guarantees safe operation and production at the optimal process conditions.

The volatiles released during the torrefaction process are burnt in a thermal oxidiser and provide the required heat for the torrefaction process and the drying of the biomass.

The Torr-Coal torrefaction technology is very flexible with respect to the particle

of ISO/TS 17225-8:2016.

In their industrial demonstration/production plant, in operation since 2010, they have produced large quantities of torrefied powder and pellets for large scale co-firing and gasification in power stations.

This production plant is also used for the testing of different raw materials as well as collecting the necessary data to optimise both product quality and the design of the industrial-scale production plants.

Torr-Coal performs feasibility studies and test programmes for different raw materials. They are able to deliver turnkey torrefaction plants worldwide, but also a torrefaction technology licensing package.

Blackwood Technology ("Blackwood") is a Dutch cleantech company as well which has developed a cutting edge torrefaction process for the production of high value solid bio-fuel from woody biomass. The company was originally backed by RWE, a leading European utility.

Blackwood's award-winning torrefaction technology has

The process centres around a rotary drum reactor with a state-of-the-art process control system which guarantees safe operation

company, founded in 2005 to develop a torrefaction technology for pure and impure biomass. Torr-Coal Group has developed a partly patented,

size of the wood chips and to different types of raw material, and produce a torrefied product with excellent fuel properties meeting the requirements



Torr-Coal production plant in Dilsen Stokkem (Belgium)



Blackwood pellets at coal yard of Amer power station

been proven at industrial scale in a demo plant operated in the Netherlands from 2010-2014. Torrefied pellets produced at that plant have been successfully co-fired on a large scale by multiple European utilities, such as RWE and Helen, as well as South African utility Eskom. These co-firing tests unambiguously confirmed the benefits of Blackwood pellets over regular wood pellets.

In 2016, Blackwood announced a strategic partnership agreement with Eskom for the roll-out of torrefaction plants in the SADC region. The first step in such a roll-out is the construction of a torrefaction plant in the South African province of Mpumalanga, 200 kilometers away from Eskom's Arnot coal-fired power station. The Arnot power

station will be the off-taker of the torrefied pellets from this new torrefaction facility.

In other parts of the world, Blackwood is currently negotiating partnerships to set up supply chains of torrefied pellets and to create a market for this new solid bio-fuel.

CPL Industries and Arigna Fuels are companies oriented in production, trade and supply of their regional markets with torrefied products.

Arigna Biofuels, located in County Roscommon in Ireland, has built the only commercial-scale biomass torrefaction plant on the island with an estimated output of 20,000 tonnes per annum. Torrefied biomass products are destined for local and international markets for domestic home heating and will mitigate the annual emission of

approx. 56,000 tonnes CO₂. Raw materials designated for the torrefaction process are sustainable agricultural residues.

Recent concerns over increased biomass combustion being directly linked with high levels of atmospheric pollutants have been highlighted as many consumers are moving away from traditional coal-based domestic fuels. Within the coming year, there is an expected ban on smoky (bituminous) coal in the Republic of Ireland, following recommendations outlined in the DCCA report 'Conclusions on the Clean Air Dialogue with Ireland', published 13th March 2017. In this regard, torrefied biomass fuels have superior combustion properties than their biomass parents, with increases in energy content

and therefore heat output, but also have outstanding environmental credentials in terms of reduction of particulates, smoke, volatile organic compounds (VOC's) and carbon monoxide. They also provide a homogenised product with predictable combustion qualities well suited to modern solid fuel stoves, whilst being renewable and sustainable.

Arigna Biofuels continues to lead research into the next generation of solid fuels, working alongside global academic institutions and industrial partners. The first commercial products are due online in Q4 2017.

All of the named companies are members of the International Biomass Torrefaction Council (IBTC), an industrial association of the performers in torrefaction consisting currently of 22 members, a number continuously increasing. The platform allows the discussion of common interests not under competition and facilitates company synergies to overcome the barriers that hinder the market development.

The main objective of IBTC is to promote the use of torrefied biomass as energy for the power and the heat market, undertake studies and projects to increase the depth of knowledge, gain permissions eventually needed for the trade of torrefied products and to spread the concerns of the industry to the outside world. ●

For more information:

This article was written by Michael Wild, president of IBTC. IBTC is coordinated by Cristina Calderón of the European Biomass Association (AEBIOM). Visit: www.biomassstorrefaction.org

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