Bioenergy Insight

SEPTEMBER/OCTOBER 2021
Volume 12 • Issue 5

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A decade of rapid growth in Canada

Change of heart

Winning over biomass sceptics

Regional focus: Canada

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Contents

2 **Comment**

3 **News**

16 **Plant update**

18 **Biogas**
A new decade of rapid growth for Canadian biogas

20 **Trading**
Industry insight: biomass trading

22 **Regional focus**
Canadian election gives bioenergy a chance to shine

26 **Biogas**
Poo power: an exciting co-operative biogas project has entered operation in Ontario

28 **Wood pellets**
Wasted effort: avoiding pellet degradation in production

30 **Product focus**
Introducing ARMATEC's Arma Mix HYBRID

31 **Pellets**
MÜNCH-Edelstahl and Vecoplan Midwest's partnership offers pellet solutions to the North American market

32 **RNG**
Canada's agricultural and dairy market with DMT Clear Gas Solutions

34 **Interview**
In conversation with David Palumbo of EQTEC

36 **Membranes**
UBE manufactures membranes to optimise biogas upgrading into RNG

38 **Opinion**
What can the biomass industry do to win over sceptics?

42 **Biomass**
Forest sector helps British Columbia take action on climate change

44 **Agitators**
How SAVECO's agitators helped a residual material recycling centre in Northern Germany improve its energy efficiency

46 **Accident investigation**
First-person sleuthing – destroyed gas holder roof

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August summary

52,400	33	38
impressions	mentions	new followers

TOP TWEETS

Top Mention earned 89 engagements

Lynemouth Power Ltd
@Lynemouth_Power · Aug 6

Our Managing Director, Fiona Macleod, features in this month's @bionergyinfo talking about her new role, how LPL is helping the UK transition to #renewableenergy, the site's valuable contribution to the local #NorthEast economy, and looking to the future> https://bioenergy-news.com/latest_magazine/...

8 12

Top Tweet earned 2,935 impressions

bp to purchase RNG from @CleanBay_Corp: https://bioenergy-news.com/news/bp-to-purchase-rng-from-cleanbay-renewables/... @bp_plc #RNG #biogas #renewablenaturalgas

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Spread the word

In recent weeks, news headlines have painted a mixed view of the bioenergy sector. While several innovative biogas and biomass projects have been announced, plans have also been rejected across the UK.

The reasons why a bioenergy project might not take off are complex but, in many cases, local people are simply not convinced that this is the right approach, for the region or the environment.

In the village of Kippen in Scotland, residents are concerned that an anaerobic digester planned at a nearby dairy farm could bring odour issues and a decline in air quality. The planned digester would turn slurry into biomethane, helping to decarbonise heat and transport in Scotland. According to the *Daily Record*, the local council has lodged an objection to the proposal and more than 60 locals have expressed opposition to the project.

In Barry, Wales, a biomass facility has been threatened with closure following alleged unauthorised changes to the plant's design. The Welsh Government has belatedly decided the plant is big enough to need an environmental impact assessment, meaning the public will be consulted on how the facility will impact the environment.

It's important to note, however, that other forms of renewable energy also face opposition. Residents near Stratford are reported to be "outraged" by plans to build a 147-acre solar farm on a rural site. The *Stratford-upon-Avon Herald* reported locals are adamant that the project would "blight" the countryside.

As an industry, we know all too well the enormous potential of bioenergy, but perhaps we need to focus on how to spread this message to the wider public. On P.41-43, we hear from several biomass industry experts on this very subject.

As always, in this edition of *Bioenergy Insight*, we have highlighted projects that showcase the sector's incredible progress. In the race to net zero, it is vital that we get as many people on board as possible by educating them on the benefits of bioenergy.

Dawn Stephens-Borg
Editor

Drax Power Station starts major turbine upgrade

Work is underway at Drax Power Station to upgrade one of its turbines to help drive down the cost of biomass power generation.

Over the next four months, more than 1,000 contractors will work 'around the clock' at the site in North Yorkshire to boost the performance of one of the station's four biomass units and improve its efficiency.

The work will include installing a new high-pressure turbine barrel, new pipework, and surveying the station's boilers as part of Drax's plans to reduce the cost of its biomass power generation by around one third by 2027.

The upgrade is the third and final upgrade forming part of a £40 million (€47 million) investment programme in the station's turbines, which started in 2019.

"These turbine upgrades will improve the plant's efficiency, ensuring Drax can continue to generate the reliable, renewable electricity millions of homes and businesses across the UK rely on, beyond 2027," said Mike Maudsley, Drax Group's UK portfolio generation director.

"It's also a huge boost to the region's economy, with more than 1,000 contractors working on-site during the project – that's in addition to the 6,600 jobs supported throughout Drax's supply chains in the north."

Drax Power Station has been transformed in recent years from using coal to generating renewable power with sustainable biomass – cutting carbon emissions by more than 90% since 2012, making Drax one of the lowest-carbon intensity generators in Europe.

"It's a huge boost to the region's economy, with more than 1,000 contractors working on-site during the project"

Sweetman Renewables targets biomass, green hydrogen sectors

Sweetman Renewables is targeting the biomass and green hydrogen sectors with a $4 million (€2.48 million) pre-IPO capital raising ahead of its debut on the Australian Securities Exchange (ASX) later this year.

Unlike most proposed new entrants to the ASX, Sweetman has an advantage in the form of a profitable 100-year-old sawmill business that has long-term offtake contracts in place with the Forestry Corporation of New South Wales. Sweetman is looking to leverage this timber business to become a major renewable energy player.

Timber operations generate wood waste that is often sent to landfill, due to its unsuitability for any other uses, said Sweetman, making up around 13% of materials that become landfill waste. However, this wood can be used as biomass to generate electricity.

With this new resource, Sweetman is looking to leverage on its sustainable biomass to produce green hydrogen.

Sweetman recently signed a 20-year US $90 million (€75.7 million) supply contract with a Japanese conglomerate. It is also in advanced negotiations with Verdant Earth Technologies to be the primary supplier to Verdant's $550 million (€340 million) biomass power station in the Hunter Valley, New South Wales.

The pre-IPO raise will be led by Barclay Pearce Capital, which completed successful pre-IPO capital raises for Verdant Earth Technologies and Infinite Blue Energy. ●

Equis secures funding for 50 MW biomass plant

Equis Development Pte (Equis), a major renewable energy and waste infrastructure developer in Asia-Pacific, has secured $282 million (€239 million) to build a biomass plant in Japan.

Equis will build the 50 MW Niigata East Port Biomass Power Plant on Honshu, Japan's main island. The financing was committed by 14 syndication banks and insurance companies, led by Sumitomo Mitsui Trust Bank and Daishi Hokuestu Bank.

The plant will generate electricity from sustainable wood pellets or palm kernel shells, supplied by a large Japanese trading company under a 20-year fixed quantity, fixed-price contract. The energy produced will supply around 117,000 households and save around 190 tonnes of greenhouse gas emissions annually.

Equis has issued notice to proceed with the engineering, procurement and construction work. Construction work will commence in May 2022 and the project is scheduled to begin commercial operation in October 2024. The project marks Equis' third sustainable biomass project in Japan.

Equis has divested a 20% interest in the project and formed a joint venture with Tohoku Electric Power. Tohoku Electric owns and operates 11,299 MW of thermal power stations, including the Higashi-Niigata Thermal Power Station with a gross permitted capacity of 4,860 MW, situated less than 4 kilometres from the new project site.

Tohoku will act as owner's engineer during the design and construction of the facility and will operate the project under a long-term operations and maintenance agreement.

Toyo Engineering will engineer, procure, and construct the project under a fixed time, fixed price, and turnkey contract, while ANDRITZ and Siemens Energy will supply the circulating fluidised boiler island and steam turbine, through Toyo Engineering, respectively. All three firms have experience in building biomass plants and are currently working on eight other 50 – 75 MW biomass facilities in Japan, including two developed by Equis.

"We are thrilled to be partnering with Tohoku Electric, the largest power producer in the region, to deliver a modern and clean baseload renewable power project to Niigata," said Hiroyuki Moriuchi, Equis' Japan-based investment director.

"Tohoku Electric is well respected in the region with a community-first approach as the project owner's engineer, operation, and maintenance provider." ●

CETY, Ashfield Ag Resources to co-develop $15m biomass facility

Low-carbon energy firm Clean Energy Technologies (CETY) will co-develop a $15 million (€12.6 million) renewable energy processing facility with Ashfield Ag Resources in Massachusetts, US.

The facility will use Heat Recovery Solutions' 'revolutionary' high-temperature ablative fast pyrolysis reactor (HTAP Biomass Reactor). The Ashfield facility will convert around 10,000 tons per year of clean woody feedstock into around 16,500 MWh of electricity annually. Additionally, the facility will produce 1,400 tonnes of biochar and 26,000 MMBtu of heat per year.

The project will be operated from within the newly formed company and funded through a new special purpose vehicle, Ashfield Renewable Ag Development, with equity and debt secured by the project's revenues.

Within the agreement, the parties have agreed that CETY will hold all rights to power purchase agreements revenues, feedstock site control and approved grid.

This project is the first of four anticipated renewable biomass projects by CETY and is expected to serve as a model for developing new projects to capture market share in this rapidly growing industry.

CETY also outlined a roadmap on how the company intends to further capture and finance future projects utilising HTAP Biomass Reactor technology in the rapidly growing biomass renewable energy sector. CETY's management believes it can secure additional biomass resources to deliver additional projects 10 times larger in future.

Apollo acquires majority stake in pellet producer Graanul

Apollo Global Management, together with its consolidated subsidiaries (Apollo), will acquire a majority stake in pellet producer AS Graanul Invest.

With funds managed by Apollo's affiliates, the company has agreed to invest in the largest producer of sustainable wood pellets in Europe, and one of the largest producers globally.

Since its inception in 2003, Graanul has pioneered some of the most advanced processes and technologies in the biomass and bioenergy industry and provides a critical baseload renewable energy resource, Apollo said.

Through its 12 state-of-the-art pellet production plants located in the Baltics and the US, Graanul manufactures sustainable wood pellets, enabling baseload electricity and heat generation to replace coal and balance intermittent renewable energy sources like wind and solar.

Graanul also operates six CHP plants in Estonia and Latvia and is one of the largest producers of renewable energy in the Baltic region, having generated more than 17% of all renewable bioelectricity in Estonia in 2020. The highly energy-efficient CHP plants power Graanul's manufacturing operations.

Raul Kirjanen, chairman and CEO of Graanul, said: "In Apollo, we will have a sophisticated strategic investor who is not only intimately familiar with our business but also understands the complexities and the unique value opportunities present in the bioenergy space today.

"Our operations and activities have always been — and will continue to be — designed for and dedicated to creating a globally sustainable and renewable energy system to replace fossil fuel emissions."

Czech Republic's largest district heating source to explore biomass use

The largest source of district heating in the Czech Republic is abandoning coal in favour of low-emission fuels, potentially including biomass.

By 2030, the Mělník site, which supplies Prague, Mělník and Neratovice, will produce heat solely from low-emission sources and will help ČEZ Group, as well as Prague and other cities, to achieve their environmental goals. A quarter of the total CO_2 emissions in the Czech Republic are generated from heat production.

The first step in the planned transformation is the shutdown of the largest coal-fired power plant to date, Mělník III. Its closure turns the plant into a pure heating supplier.

Simultaneously, the preparation of the construction of highly efficient steam gas sources has begun, with plans to employ other low-emission technologies in the future, such as biomass boilers, heat pumps, or equipment for the recovery of energy from waste. These sources will gradually replace the Mělník II and Mělník I lignite heating plants.

ČEZ plans to invest around CZK 30-40 billion (€1.75-1.56 billion) in transforming heating plants into low-emission sites in the coming years.

"The greening of the Mělník-based plant is one of the most important steps to achieving low-emission production, which we have set out in our Vision 2030 strategy, Clean Energy of Tomorrow," said Pavel Cyrani, ČEZ's deputy chairman of the board.

"Due to the size of the Mělník source and its importance for Prague, this is where we will direct the largest share of the planned investments in the modernisation of the heating industry."

ČEZ is considering the construction of an electric boiler to serve as a heat production source and also help regulate the transmission or distribution system. At the same time, the company is exploring the option of using other non-emission technologies in the future, such as through biomass boiler expansion, hydrogen combustion and production, as well as heat pumps with heat accumulation.

Miroslav Krpec, CEO of Energotrans, which is owned by ČEZ, said: "We value our employees; their many years of operational excellence are irreplaceable for us, so we were looking for ways to retain as many of these qualified specialists as possible.

"Employees from the decommissioned Mělník III power plant have been trained in advance for a transition to our heating plants. In this way, we succeeded in securing jobs for a vast majority of our colleagues." ●

ArcelorMittal Ghent to use biocoal from Perpetual Next

ArcelorMittal Ghent has chosen to use biocoal from Dutch company Perpetual Next in its steel production process.

The company is starting a pilot to use biocoal as a high-quality partial replacement for fossil coal. The partnership between Perpetual Next and ArcelorMittal in Ghent starts with an initial delivery of 30,000 tonnes of biocoal to the Ghent blast furnace, which can be scaled up to 350,000 tonnes of biocoal annually.

Perpetual Next's torrefaction technology converts biomass produced from Forest Stewardship Council (FSC) certified forests into biocoal, which has the same properties as fossil coal. With this technology, the raw materials are converted into biocoal through a thermal refining process. This creates a relatively affordable renewable raw material with high energy density.

The patented technology is owned by Perpetual Next, which supplies biocoal from its own production facilities, as well as the technology, including the torrefaction reactors.

Global steel production was 1.86 billion tonnes in 2020, 70% of which was produced in blast furnaces using fossil coal. Steel demand is expected to double from current levels by 2050, which could lead to a doubling of CO_2 emissions with unchanged policies, said ArcelorMittal.

This underlines the need for change: compared to using fossil coal, 2.5 tonnes of CO_2 are saved per tonne of biocoal.

"With the application of our technology for ArcelorMittal in Ghent, we are opening up a new industry to help make it more sustainable," said Martijn van Rheenen, CEO of Perpetual Next.

"The biocoal has such high-quality properties that it offers a partial replacement for fossil coal in applications such as the steel industry's production process.

"In addition to reducing ArcelorMittal's CO_2 emissions, this step gives ArcelorMittal's clients the opportunity to reduce their so-called Scope 3 emissions, in line with the EU Fit for 55 programme presented by Frans Timmermans, European Commissioner and vice-president of the European Commission, on 14 July." ●

NZ dairy co-op Fonterra's cheese plant to use wood biomass

Following the opening of Fonterra's wood pellet boiler at its Te Awamutu site, the dairy cooperative revealed plans to convert another of its sites from coal to biomass.

Fonterra, a multinational dairy cooperative based in New Zealand, officially opened Te Awamutu's pellet boiler facility with the Minister for Energy and Resources, Dr Megan Woods. At the same time, plans were revealed to convert the co-operative's Stirling cheese plant in Otago.

Once updated by August 2022, the cheese plant will be coal-free and instead utilise wood biomass. This will make Stirling Fonterra's first 100% renewable thermal energy site, a significant step towards the cooperative's goal of eliminating coal from its operations by 2037.

By switching to wood biomass, the Otago site's annual emissions will reduce by 18,500 tonnes of CO_2 — equivalent to taking more than 7,000 cars off the road.

Richard Gray, Fonterra's general manager of operations for the Lower South Island, said this is another "huge decarbonisation milestone" for the co-operative. ●

Terravesta wins government funding for Miscanthus project

A project to facilitate more planting of Miscanthus has been awarded over £150,000 (€174,000) of UK Government funding.

Miscanthus specialist Terravesta received the funding through the government's Biomass Feedstocks Innovation Programme, to help contribute to 2050 net-zero targets.

Terravesta was successful in its bid to secure Phase 1 funding for its OMENZ project, which stands for 'Optimising Miscanthus Establishment through improved mechanisation and data capture to meet Net Zero targets'.

According to Terravesta, success in Phase 1 of the project will enable up-scaling to contribute to the recommendation from the Climate Change Committee's Sixth Carbon Budget in Phase 2. To meet planting requirements, at least 30,000 hectares a year will be planted by 2035 so that 700,000 hectares are planted by 2050.

"The OMENZ project will pave the way for more perennial bioenergy crops to be planted, by developing the technologies and infrastructure needed," said Michael Squance, Terravesta's science and technology director.

"Currently, there are around 7,000 hectares of Miscanthus in the UK, and even less short-rotation willow coppice and short rotation forestry. We need to ensure more biomass feedstocks are available to meet the growing demand for decarbonisation of agriculture and the rapidly emerging bioeconomy.

"Ultimately, there has to be market-ready technology to scale it up successfully and this is what this project will help to enable."

The Biomass Feedstocks Innovation Programme was launched this year by the Department for Business, Energy and Industrial Strategy (BEIS) and has now awarded £4 million (€4.6 million) of funding for the project development stage of the programme, with up to £200,000 (€233,000) allocated per project.

The funding enables organisations including start-ups and small and medium-sized enterprises to develop strong project proposals that will deliver commercially viable innovations in biomass production.

Jason Kam, Terravesta's head of R&D, commented: "The OMENZ project will take six months to complete, and will analyse field preparation, machinery, technology and planting techniques to identify areas which can deliver gains, efficiency and cost reduction.

"If successful in Phase 2 of the BEIS-funded programme, Terravesta's project then aims to trial a range of new technologies, including automated systems and drone-linked machine learning, using an integrated data capture and analysis platform to gain insights into crop performance."

bp to purchase RNG from CleanBay Renewables

bp will purchase poultry litter-derived RNG from CleanBay Renewables under a 15-year agreement.

Through this agreement, bp's trading and shipping team will sell the fuel to its customers, initially in California. There is strong demand for RNG fuel in the state due to incentives from its Low Carbon Fuel Standard.

The RNG will be processed from poultry litter — a mixture of manure, feathers, and bedding — and sold as fuel for the US transport sector.

RNG-fuelled vehicles are estimated to result in up to 95% lower greenhouse gas (GHG) emissions than those fuelled by petrol or diesel on a life-cycle basis, according to a study by the US Department of Energy.

"Working with innovative companies like CleanBay will be key for bp to reach our net-zero ambition," said Michael Thomas, vice-president of biogas origination at bp.

"As one of the largest suppliers of RNG to the US transportation sector, this agreement will help us continue delivering competitive, reliable energy solutions."

Thomas Spangler, executive chairman of CleanBay Renewables, commented: "By collaborating with bp, we continue taking steps to positively impact our environment. Not only will our process improve the air, soil, and water quality around our agricultural facilities, but our RNG is a sustainable, environmentally-friendly way to help reduce GHG emissions."

CleanBay is actively exploring sites for future facilities in the Mid-Atlantic, Southeast, and California. Its goal is to establish a portfolio of RNG and power facilities that reduce local emissions and provide farmers with an alternative use for their poultry litter and a fertiliser to increase their food production.

Each of the 30 proposed CleanBay facilities is expected to generate enough sustainable energy to power 9,200 cars per year by recycling more than 150,000 tons of poultry litter annually.

Manure-to-energy installations at Smithfield's MO sites complete

Monarch Bioenergy, a joint venture (JV) between Smithfield Foods and Roeslein Alternative Energy (RAE), has installed manure-to-energy technology on nearly all of Smithfield's Northern Missouri hog finishing farms.

The new technology, completed ahead of the JV's 10-year anniversary, captures methane emissions and converts them into carbon-negative RNG to power homes, vehicles and businesses.

Construction of the approximately $150 million (€127 million) project officially started in 2014, three years after RAE and Smithfield first decided to embark on the JV. The proprietary processes that emerged from the project create carbon-negative RNG at a rate of around 800,000 dekatherms annually.

In addition to generating renewable energy, the partnership has planted hundreds of acres of prairie grass, providing ecological services and wildlife habitat for monarch butterflies across the state. The companies are also exploring harvesting prairie plants to create biomass for RNG production.

"Our Monarch Bioenergy manure-to-energy projects are making a significant environmental impact and remove 25 times more emissions from the atmosphere than are emitted during the clean energy's end-use," said Kraig Westerbeek, vice-president of Smithfield Renewables for Smithfield Foods.

"Because of this, there are key projects in our Smithfield Renewables portfolio of innovative renewable energy and carbon reduction efforts across our operations."

Collectively and independently, the companies have embarked on additional manure-to-energy projects across the country in Arizona, California, Colorado, Iowa, North Carolina, Texas, Utah, and Virginia.

AD 'dangerously overlooked' as immediate climate solution, WBA warns

The World Biogas Association (WBA) has responded to the latest Intergovernmental Panel on Climate Change (IPCC) report, stating that anaerobic digestion (AD) is 'dangerously overlooked' as an immediate climate solution.

The WBA has renewed its call for the potential of the biogas industry to be 'urgently unlocked' so that it can help deliver the "rapid reductions in greenhouse gas (GHG) emissions and, in particular, methane" that the IPCC says is needed to address the climate emergency.

The IPCC's warning amplifies recommendations made by the UN Environment Programme (UNEP) and Climate & Clean Air Coalition (CCAC) that said tackling methane emissions was the most immediate and cost-effective way to avert climate catastrophe. They identified AD as a readily available low-cost technology that can help reduce these emissions. The International Energy Agency (IEA) has also recognised the value of biomethane in decarbonising the energy sector, while the EU has embraced it in its Methane Strategy.

"Research from the WBA and other biogas trade bodies and UNEP, CCAC, and the IEA, has demonstrated our industry's potential to deliver a huge reduction in global GHG emissions, especially methane, within the next few years," said Charlotte Morton, chief executive of the WBA.

"Crucially, AD, the technology that produces biogas — also known as RNG or biomethane — as well as a biofertiliser, bio-CO_2 and other valuable bio-products, is ready to deliver on that potential now. What is badly missing is the political will to remove policy barriers to the growth of the sector — both at global and national levels.

"As the UK prepares to host a particularly critical COP26, and given the widely recognised opportunity to address methane emissions through AD, the UK Government must show the leadership required in speedily committing to an integrated strategy that will deliver the full potential of AD in the UK by the end of the decade, and in ensuring that all other countries follow suit.

"Without AD fully deployed, it will simply be impossible to keep below 1.5˚C by 2030, nor to achieve net zero by 2050. Such commitments need to be in each country's Nationally Determined Contributions to the Paris Agreement — almost all of which are still failing to deliver on the targets set in 2015.

"With its latest report, the IPCC has just issued its starkest warning yet of the danger of climate change and of the need to act urgently. We are today issuing our own warning to world governments that it is dangerous to overlook the recognised power of AD as an immediate solution.

"With the right policy framework in place, AD can cut emissions by 10% by 2030. The global biogas industry has already made a public commitment to play its role to deliver on this potential. Now it is down to the world's politicians. We're here, we're ready — we're waiting for your commitment, and the world needs it now." ●

BioCarbonics seeks AD operators to explore green CO_2 opportunities

AD plant operators are being offered a new opportunity to benefit from an 'innovative' carbon capture and utilisation (CCU) model, proposed by BioCarbonics.

The UK-based green CO_2 company has created a new channel to market for the biogas industry to enable CO_2 captured from biogas facilities to be taken to market.

Green CO_2 produced from biogas has a higher reliability of supply and is a more sustainable product than traditional CO_2 derived from fossil fuels. In addition, capturing and utilising this CO_2 contributes to the Renewable Heat Incentive sustainability criteria for AD plants and can boost the bottom line with long-term offtake agreements, said BioCarbonics.

"We work with biogas owners to capture and process their CO_2 stream to produce a food and beverage quality liquid CO_2, for use by local businesses," said Christopher Carson, BioCarbonics' managing director.

"Because we have a growing number of highly reliable plants operating around the clock, with a managed maintenance schedule, we are the only business that can offer continuity of supply to customers and no hidden surcharges.

"Our carbon capture model is totally unique in that we support plant owners from conceptual design through installation and start-up of their CO_2 plants, and work with them to install and operate quality systems and equipment that ensures their product meets the food and beverage quality certification.

"We are actively seeking biogas owners who inject renewable methane [biomethane] into the gas grid to work with us and expand our sustainable supply model further."

Hereford biogas plant owner, Nicholas Layton of STL Energy, has been working with BioCarbonics for several years and said there are many benefits to capturing CO_2 from biogas installation, including preventing CO_2 from being released into the atmosphere and supporting food and drinks producers.

"We didn't have the expertise or knowledge required to enter into the CO_2 business on our own," said Layton, "and BioCarbonics gave us the support and training we needed to be able to do this successfully."

STL Energy works with UK cider-maker Westons Cider, which supplies its biogas plant with apple pomace — a by-product from apple pressing. The company uses BioCarbonics' CO_2 to carbonate its drinks.

"Before working with STL Energy and BioCarbonics, we had CO_2 supply issues," said Maddy Spencer, purchasing manager at Westons Cider.

"Now, from the circa 29,500 tonnes of cider apples we press annually, around 5,500 tonnes of pomace will be turned into CO_2 and used to carbonate our products."

Biogest enters Greek market with two biogas projects

BIOGEST will build its first biogas plants based on agricultural and food waste in Greece.

The first project, on the island of Rhodes, will be a 500 kW Biogest PowerRing® plant, designed to run on olive pomace, oil residues, food residues from hotels, and by-products from the food and beverage industry. The facility will be able to supply around 1,300 households with electricity every year.

The second project, a 1 MW Biogest PowerRing® plant in the region of Thessaly, will mainly receive waste from local farmers keeping pigs, cows, and sheep to produce enough electricity to cover the consumption of 2,400 households annually.

"Greece has a huge market potential for biogas from agro-industrial residues," said Martin Schlerka, CEO and managing partner of Biogest. "Moreover, we have observed an increasing pressure in some Mediterranean areas to process the residues coming from olive oil production, for which we have the capacity to offer different solutions."

Biogest has also entered into a new cooperation agreement with Greek firm Break Even, for representation tasks in the Greek and Cypriot markets. The company, led by Dr Marco Margaritis, is a reference business in the engineering and renewable sectors and already generates 'significant synergies'.

Following the renewable energy targets, Greece has developed an ambitious energy strategy, including attractive conditions for biogas plant development, which is supported by its large raw material potential across the country.

Biogest has experience with similar residues from the Mediterranean agro-industry in the Italian biogas market, such as olive pomace, where several projects are under development and construction. The transformation of olive oil mill residues into biogas and fertiliser opens up new opportunities to provide a solution for a problematic residue while creating products with high added value.

HGV driver shortage could impact renewable energy production

The Association for Renewable Energy and Clean Technology (REA) has called for a change to immigration rules to allow the waste and recycling sector to recruit heavy-goods vehicle (HGV) drivers in the face of severe shortages.

The REA's call follows major concerns over the reduced frequency or even suspension of food and garden waste collections by councils UK-wide. These include councils in Buckinghamshire, Essex, Kent, Reading, Doncaster, Cumbria, Milton Keynes, Hampshire, Bournemouth, South Ribble, Brighton and Hove, Derbyshire, Exeter, and Surrey.

The Department for Transport has already announced some measures intended to alleviate the crisis, including allowing drivers to take one test to drive both an articulated and rigid lorry to increase the availability of test slots, and temporarily relaxing drivers' hours rules. However, with a current estimated shortfall of 100,000 HGV drivers in the UK, solutions that address the scale and immediacy of the problem are required, said the association.

Failure to collect and treat these resources means that the opportunities to produce renewable energy, biofertilisers and soil improvements are being wasted, the REA believes. This will, in turn, impact the government's net-zero goals.

"The measures recently introduced by the government should be welcomed, and this will help train the next generation of HGV drivers," said Jenny Grant, head of organics and natural capital at the REA.

"However, it is going to take time to see the effect of this change translate into increased driver numbers. Our industry, and others, need solutions that meet both the scale and immediacy of the crisis we are facing.

"That is why HGV drivers must be recognised as an important shortage occupation with a two-year derogation to the points-based immigration rules for trained HGV drivers. This will help to alleviate the problem in the short- to medium-term and allow employers to recruit the number of drivers required to continue to effectively deliver their services and contribute to the government's net-zero ambitions.

"This is not just a necessity for our sector, but a crucial change needed to protect supply chains across the economy — from waste collections to food supplies and retail. As we head towards Christmas, the impacts on our everyday life could deepen unless this situation is resolved."

Ocado to open UK CNG refuelling station with Gasrec

Online supermarket Ocado Group has signed a deal to open another CNG refuelling station in the UK, using a higher biomethane blend.

In January 2019, Ocado became the first UK retailer to self-fund the purchase of an on-site grid-connected gas refuelling station at its depot in Hatfield. The new facility, at the firm's Dordon Customer Fulfilment Centre in Warwickshire, is due to open in Q2 2022 and will be designed and built by Gasrec.

The new CNG station will fuel the 10 CNG tractor units already running from the site and allow for the remaining Dordon tractor fleet (70 in total), to transition from diesel to blended biomethane.

"The results we have seen since beginning our switch to gas have been fantastic and shown that we are on the right path to a cleaner, more environmentally-friendly future," said Graham Thomas, fleet operations manager at Ocado Group.

"This new facility at Dordon will allow us to get more gas trucks on the road and access delivery routes further up the country with our CNG fleet."

The facility at Dordon will be a tanker-fed operation, with Ocado signing a 10-year supply agreement with Gasrec. With 60 natural gas-powered trucks operating from Hatfield and Dordon, this latest development will allow Ocado to more than double its total CNG units over the next three years, with over two-thirds of the fleet running on natural gas.

Gasrec currently supplies a minimum 50% biomethane blend to Ocado, meaning significant CO_2 reductions — up to 68% across the fleet calculated from the total amount of biomethane used. Going forward, the mix of biomethane is being increased, making further inroads to cleaner transport.

James Westcott, chief commercial officer at Gasrec, said: "Ocado continues to take great strides in reducing the carbon footprint of its transport operation. We have built a fantastic working relationship with them over the past few years and are delighted they have chosen us again to build and deliver the new refuelling site in Dordon." ●

> "This new facility at Dordon will allow us to get more gas trucks on the road and access delivery routes further up the country with our CNG fleet"

Plant update: Canada

StormFisher

Alternative fuel:	Biogas
Location:	Ontario
Date:	July 2021
Feedstock:	Food waste
Development:	**Plant opening**

StormFisher has opened a $20 million (€13.5 million) resource recovery facility in Ontario. The project, developed in partnership with sustainable infrastructure company Generate, provides food waste recycling services to handle packaged organics and divert waste from landfills. StormFisher's new facility in Drumbo will enable more municipalities, restaurants, supermarkets, and food manufacturers to achieve their environmental goals by reducing food waste while producing renewable energy and organic fertiliser. The plant will be able to process over 100,000 tonnes of food waste annually.

Metro Vancouver, FortisBC

Alternative fuel:	Biogas
Location:	British Columbia
Date:	March 2021
Feedstock:	Wastewater treatment
Development:	**Plant construction**

Metro Vancouver and FortisBC have joined forces to achieve regional climate action goals in British Columbia and introduced a new biogas plant at a wastewater treatment plant (WWTP) in the region. The new Lulu Island RNG facility located in Richmond, BC, at Metro Vancouver's Lulu Island WWTP site, now allows the unused biogas to be cleaned, stored, and sold to purchasers such as FortisBC. The facility will produce enough RNG to heat more than 600 homes.

Corix Utilities

Alternative fuel:	Biomass
Location:	British Columbia
Date:	June 2021
Feedstock:	Wood waste
Development:	**Plant operational**

A new biomass plant is providing heat and hot water to Simon Fraser University's (SFU) Burnaby campus and around half of the UniverCity community. The plant has drastically reduced GHG emissions at the university. Developed in partnership with Corix Utilities, a developer and operator of district energy systems, the $33 million (€22 million) high-efficiency plant utilises wood waste, once destined for landfill, into a low carbon energy source providing heat and hot water. The fuel is made of clean wood waste, such as wood chips and shavings, from harvested log processing, local urban wood waste and construction projects.

Quadrogen Power Systems

Alternative fuel:	Biogas
Location:	British Columbia
Date:	December 2020
Feedstock:	Landfill waste
Development:	**Plant commissioning**

Quadrogen Power Systems has installed its innovative biomethane (RNG) generation project utilising landfill gas from the Vancouver Landfill in Delta, British Columbia. FortisBC has also received approval from the BC Utilities Commission to purchase up to 60,000 GJ of the RNG annually for injection into its natural gas infrastructure, enough to power around 700 homes.

EverGen

Alternative fuel:	Biogas
Location:	British Columbia
Date:	April 2021
Feedstock:	Agricultural waste
Development:	**Acquisition**

EverGen, Canada's RNG infrastructure platform, has acquired Fraser Valley Biogas in British Columbia. Fraser Valley Biogas has been in operation since 2011 and is the 'original' RNG project in western Canada; it was also the first project to produce RNG into FortisBC's network. The facility combines AD and biogas upgrading to produce RNG, primarily by converting agricultural waste from local dairy farms.

FortisBC operates the interconnection facility at Fraser Valley Biogas, monitoring gas quality and connecting this source of RNG to its customers. The facility produces over 80,000 GJ of RNG annually — enough to heat around 1,000 homes for one year. EverGen plans to expand the project, boosting RNG production to over 125,000 GJ per year.

Enbridge

Alternative fuel:	Biogas
Location:	Ontario
Date:	October 2020
Feedstock:	Landfill waste
Development:	**Plant construction**

A major RNG facility in Niagara Falls, Canada is in the pipeline. Expected to generate enough clean renewable energy from landfill waste to heat 8,750 homes across the country, the Niagara Falls RNG facility will be the largest of its kind in Ontario. It is hoped the plant will reduce GHG emissions by 48,000 tonnes. The $42 million (€27.1 million) Niagara facility will capture biogas generated by decomposing organic waste and transforming it into RNG.

Waga Energy

Alternative fuel:	Biogas
Location:	Quebec
Date:	June 2021
Feedstock:	Landfill waste
Development:	**New contract**

Waga Energy has secured a contract with Brome-Missisquoi Intermunicipal Waste Management Board to produce biomethane (RNG) at a landfill in Québec. Waga Energy will build a WAGABOX® purification unit on-site at Cowansville landfill to transform the gas into biomethane, which will then be injected directly into Énergir's gas grid.

Cowansville landfill treats 75,000 tonnes of waste annually. Designed to recover 1,000 cubic metres per hour of gas, the WAGABOX unit will produce 30 GWh of biomethane per year and supply 1,750 households with renewable gas. The WAGABOX unit will be commissioned at the start of 2023.

*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 dawn@woodcotemedia.com

Canada is now home to more than 270 biogas plants. Here, the Canadian Biogas Association delves into the reasons behind the industry's impressive growth

A new decade of rapid growth for Canadian biogas

After a record-setting decade that saw the number of biogas projects in Canada grow by nearly 50%, Canada's biogas sector is bracing for another decade of rapid growth.

The torrid pace of 2011-2020 has resulted in now more than 270 biogas projects operating across Canada. These projects are producing reliable and clean energy for communities, farms, homes and businesses. How much energy exactly? The Canadian Biogas Association's Canadian 2020 Biogas Market Report[1] found that in 2020, the Canadian biogas sector produced 6 million gigajoules (GJ) of energy through RNG, 260 Nm^3 of biogas for heat and direct use, and 196 MW of clean electricity capacity. Put together, that's the equivalent of roughly 400,000,000 m^2 of solar panels or more than 13 large hydro dams. Plus, there's more coming online soon.

Research shows there is room for significant growth. Canada is only tapping into 13% of its easily accessible biogas potential, meaning that Canada could efficiently generate more than eight times more energy from biogas and RNG. How do we get there? With strong government policy and favourable market conditions designed to maximise this proven, successful, and shovel-ready solution.

Canadian governments at both the federal and provincial levels are increasingly embracing this role. At provincial level, Canada's three largest provinces — British Columbia, Ontario and Québec — continue to advance opportunities for biogas and RNG.

The Government of British Columbia's CleanBC climate plan has committed to a minimum of 15% renewable gases in the province's total gas supply by 2030. In June 2021, British Columbia amended the Greenhouse Gas Reduction Regulation (GGRR) to increase the production and use of renewable gases in the province, allowing utilities to increase the amount of renewable gas they can acquire and supply from 5% to 15% of their total annual supply of natural gas and allowing the current price cap of $30/GJ (€20/GJ) that utilities can pay to acquire the fuels to increase with inflation.

In September 2020, the Ontario Energy Board (OEB) approved Enbridge Gas's proposal to establish a voluntary $2 (€1.30) monthly RNG charge. This move allows Enbridge Gas to start procuring RNG as part of its system gas portfolio on behalf of its customers. Such approval was granted on a pilot basis until the OEB issues a further decision on the programme. Requiring natural gas utilities to implement a voluntary RNG option for customers was one of the Made-in-Ontario Environment Plan initiatives, along with consulting on a proposal to phase out food and organic waste from landfills by 2030.

In November 2020, the Québec Government unveiled its 2030 Plan for a Green Economy (PGE), which includes an aim to require a 10% share of RNG in the natural gas network by 2030 and a 50% increase in bioenergy production by 2030. Québec also recently enacted a regulation that requires the natural gas distributor (Énergir) to increase the quantity of RNG to 2% in 2022, and 5% in 2025.

Énergir buys RNG from producers with pricing based on the production capacity of the project, ranging from $7-22/GJ (€4.70-14.70/GJ). The Québec Government also offers funding support for biogas facilities and recently introduced a strategy to promote organic material diversion.

In December 2020, the Government of Canada

Ontario's first RNG-fuelled bus

published the Proposed Clean Fuel Regulations in the Canada Gazette, Part I. These regulations will require liquid fossil fuel primary suppliers (producers and importers) to reduce the carbon intensity of their fuels used in Canada from 2016 levels by 2.4 gCO_2e/MJ in 2022 increasing to a 12 gCO_2e/MJ reduction in 2030. The regulated parties can meet these reduction requirements by undertaking projects that reduce the lifecycle carbon intensity of fossil fuels or switching from fossil fuels to lower-carbon fuels. Unfortunately, the new regulation removes requirements to reduce the carbon intensity of gaseous fuels, which is a major blow to biogas and RNG opportunities. However, it still holds promise for advancing projects by allowing the biogas and RNG to generate gaseous credits to be used to meet compliance in the liquid stream.

The Government of Canada also supported biogas and RNG development in 2021 with two significant funding programmes. On June 21, Seamus O'Regan, Minister of Natural Resources, officially launched the $1.5 billion (€1 billion) Clean Fuels Fund, the largest ever funding programme for renewable fuels. Through this fund, Natural Resources Canada is supporting the production of clean fuels across the country, establishing sustainable biomass supply chains and addressing gaps in essential codes and standards.

> "Canada is only tapping into 13% of its easily accessible biogas potential"

On 4 June, the government announced the new $165 million (€110 million) Agricultural Clean Technology Program. Under the scheme, farmers and food processors will have access to funding to help develop and adopt the latest clean technologies to reduce greenhouse gas (GHG) emissions and enhance their competitiveness. This is an important opportunity for the biogas industry with a dedicated carve-out of $10 million (€6.7 million) over the next two years for clean energy projects.

Notable projects emerging in 2020 and 2021 highlight the diversity of the Canadian biogas sector and the potential for biogas to be a solution for many applications from directly decarbonising industry, providing negative-emissions public transportation, and increasing renewable options for natural gas customers.

On 31 August, 2020, General Motors of Canada (GM) unveiled a $28 million (€18.7 million) cogeneration project at its St Catharines operation that uses landfill gas from the Walker Environmental South Landfill to generate 6.4 MW of electricity. Under a 20-year supply contract, the landfill gas travels through a 3.5-kilometre pipeline to supply four Caterpillar 1.6 MW engines. Using landfill gas instead of natural gas to run the engines reduces the carbon footprint by 77%. The electricity provides 35% of the plant's energy needs and the heat generated will be used to heat the domestic hot water supply for the buildings making the GM plant in St Catharines the greenest propulsion facility in its global fleet.

On 4 March, the City of Hamilton and Enbridge Gas publicly announced the first RNG-fuelled bus in Ontario. Hamilton Street Railway is now the first public transportation authority in Ontario to use RNG to transport customers. Ontario's first carbon-negative bus will divert 450 tonnes of organic waste from the landfill, the equivalent of 138 garbage trucks, while displacing CO_2 emissions from 36,000 litres of diesel consumed in a year. The bus is fuelled by 100% RNG produced by the StormFisher facility in London, Ontario.

In August, FortisBC announced its third source of RNG from outside of British Columbia. The Lethbridge Biogas facility, the largest agriculturally-based biogas facility in Western Canada, signed an agreement to provide FortisBC with up to 350,000 GJ of RNG annually. Lethbridge Biogas has been operating its biogas facility since 2013 with a processing capacity of 100,000 tonnes per year. From 2020 to 2021, Lethbridge added an upgrading system to produce RNG for grid injection. Lethbridge Biogas' contribution to FortisBC's RNG supply further contributes to reducing the natural gas utilities customers GHG emissions.

While the last decade saw enormous biogas growth in Canada, most signals point to the 2020s being an even more impressive decade for Canada's biogas sector. Clear market signals and policy alignment among the federal and provincial governments will ensure Canada can benefit from its full biogas potential by transforming organic waste into an economically viable, circular, net-zero-emissions energy resource.

References:

1. biogasassociation.ca/resources/canadian_2020_biogas_market_report

For more information:
Visit: biogasassociation.ca

Andrius Smaliukas, CEO of Baltpool, talks to *Bioenergy Insight* about biomass trading, SBP certification, and sustainability

Industry insight: biomass trading

Baltpool International Biomass Exchange (Baltpool) is an online trading platform, where buyers and sellers meet to trade in biomass and timber products.

Currently operating in Lithuania, Latvia, Estonia, Poland, Denmark, Sweden, and Finland, Baltpool, founded in 2010, is rapidly growing. The organisation currently has more than 450 participants and has celebrated exciting milestones in sustainability.

In May, Baltpool announced it now sells SBP-certified biomass on its platform, which the company says is in high demand in the market. Exchange participants can trade in biomass that meets the requirements of sustainability and has a SPB certificate, which is particularly relevant to Scandinavian and Baltic companies.

To find out more about Baltpool's vision and future sustainability goals, Bioenergy Insight caught up with the company's CEO, Andrius Smaliukas.

"Baltpool's vision is to become the number one choice for sustainable biomass trading in Europe," said Smaliukas. "We can clearly see the trend in Europe that only sustainable biomass should be used for heat and electricity production.

"The European community understands that if it wants to achieve goals related to climate change, it's necessary to promote sustainable biomass.

"Of course, sustainability requirements create additional needs for biomass

Andrius Smaliukas, CEO, Baltpool

users and producers. We want to help market participants to meet these needs and make the process of trading in sustainable biomass as easy as possible. This way, we hope to become the natural first choice for sustainable biomass trading."

Smaliukas has managed the company since 2016 and devoted his career to the development of regulated markets. Before working in the bioenergy sector, he worked at the Central Bank of Lithuania, where he was responsible for stock exchange market supervision.

Now, Smaliukas wants to combine his valuable experience in the stock exchange with the important task of building an efficient biomass market in Lithuania and beyond.

"Our task is to meet the rapidly growing demand for biomass in this country, after the government's decision to convert the district heating sector from gas to biomass," he commented.

So, how does it work?

For those not directly involved in the biomass trading sector, Baltpool is all about regulation. All participants follow the same rules. Whoever a company makes a contract with, the same standard contract conditions always apply, meaning businesses only need to read the rules once before trading.

The platform is highly accessible; when an order is placed in the trading table, it will be visible to all users on the platform.

"This way, with one click of a button, you can reach the entire market, not only those 10-15 players you usually make contracts with," said Smaliukas. "Today, we have more than 450 participants in seven countries."

Of course, not everyone using Baltpool's platform will have Smaliukas' industry experience, so the exchange has been designed to be as straightforward as possible.

"Our goal is to provide clients with simple solutions for complicated issues related to biomass delivery: security of supply, sustainability requirements, and settlement procedures. We automate all those processes so that our members can be sure that all of the technical details related to biomass purchase and sale process will be taken care of and they can focus on their main activities: energy production and biomass production."

Let's talk money

When it comes to pricing, Baltpool provides all market participants with instant access to market information. The company calculates and publishes the market prices. This way, participants, simply by checking Baltpool's biomass price indexes, can know exactly what the current market situation is and what can be expected in the near future.

Baltpool recently highlighted that the last heating season saw biomass prices in the Baltics reach their lowest since 2012. Bioenergy Insight asked Smaliukas why this occurred and how much of an impact it had on the industry.

"A few circumstances came together that led to extremely low prices last heating season," he said. "These included warm winters during the previous two heating seasons, which led to unused biomass storage in the region; and the problem of the bark beetle and consequent damage to large areas of forest, which flooded the market with cheap raw materials.

"But, we forecast that these were temporary conditions. We can already see that biomass prices will return to the average level in the next heating season."

Sustainability goals

One of Baltpool's biggest recent announcements is its addition of SBP-certified biomass to the platform. SBP is one of the most respected biomass sustainability standards in the biomass market currently. With this in mind, Baltpool has worked closely with SBP to include the standard on the exchange.

Recent discussions surrounding climate change, accelerated by events such as the forest fires in southern Europe and Canada, and the severe flooding in Germany,

have forced biomass into the spotlight, not necessarily in a good way. While broadly there is public support for biomass, serious questions have been raised by environmental campaigners and indeed governments regarding its sustainability and role in a net-zero future.

We asked Smaliukas whether he was concerned about the recently highly-publicised conversations surrounding biomass sustainability, and what his message would be for those who are doubting its potential.

"That is a really important question," he said. "We believe that the doubts about the sustainability of biomass arise from fear and a lack of information. Fear that wood suitable for the production of other products might be used for biomass production. Fear that the development of biomass burning facilities could lead to deforestation. But these doubts could be greatly reduced if transparency in this sector is further increased — if it would be made clear that only materials which cannot be used for other purposes are used for biomass production.

"Biomass market participants need a tool to disclose to the public exactly what they're using and its origin."

Smaliukas believes that, at least in Europe, the vast majority of biomass is produced sustainably, even today.

"First of all, this is determined by economic conditions - material used by other industries (construction, furniture, paper industries) is higher in price compared to biomass materials. Therefore, forest owners primarily sell their raw materials to those industries first and only what remains (for example, forest and industry residues), becomes biomass feedstock.

"Therefore, our main goal is to create a tool that would help our participants to collect and publish data on the biomass supply chain transparently, to prove its sustainability for the public."

What's next for Baltpool?

Having already made a name for itself in the bioenergy industry, Baltpool aims to become the number one choice for sustainable biomass trading in Europe.

To achieve this, in the near future, the company will focus on several key areas: continuous development of the trading system to make it more comfortable for participants to conclude and execute contracts; the introduction of a biomass sustainability tool that allows buyers to trace the origin and type of biomass supplied, which will help biomass producers and sellers to collect all the required information about deliveries.

"We believe that those efforts will make trading within the exchange much easier and more convenient than other methods, especially in cross-border trading," Smaliukas concluded.

Watch this space.

> "...with one click of a button, you can reach the entire market"

For more information:
Andrius Smaliukas will be speaking at the International Biomass Congress & Expo in Brussels in March 2022. Visit: bioenergy-news.com/conference/biomass/biomass_index_2022.php and baltpool.eu/en

Increased forest fires have led to a more in-depth discussion on Canada's forests and the role of biomass

Canadian election gives bioenergy a chance to shine

The decision by Canadian Prime Minister, Justin Trudeau, to call a snap general election was initially billed as an opportunity for his minority liberal government to cash in on good polling figures. By challenging voters to choose who they want to finish Canada's fight against COVID-19, he clearly believed a majority was there for the taking. Politics is rarely that simple, however.

At the time of writing in early September, the election contest was pretty much level pegging between the Liberals and the Conservatives with the New Democratic Party (NDP) holding a healthy third place.

While Canada's handling of COVID-19 was the early flashpoint for voters, climate change and the state of the environment has been steadily gaining traction as the campaign debate has gathered momentum. This has placed renewables and bioenergy at the heart of the campaign, particularly with COP26 in Glasgow, Scotland, to be negotiated by the winning party leader.

Record heat and forest fires

Election Day is 20 September, not much more than a month before world leaders gather in Glasgow to debate the next round of climate change targets and commitments. Whoever ends up leading Canada's COP26 team, the country's voters will be looking for action, with the recent memory of temperatures having reached a record 47.9°C in British Columbia at the end of June adding to the urgency of their demands for solutions to be found.

Forest fires are also very much in Canadian minds at present with the number of fires being 'well above average' for this time of year. That's according to the Canadian Government's National Wildland Fire Situation Report for 1 September.

The chance to talk big about future action on climate issues is always easy for opposition parties in the run up to an election. It's less straightforward for the 'government in residence' whose policies have already been tried, tested and, in some cases, found wanting in recent months and years.

In this context, the ruling Liberal Party's climate change pledge is for 'more jobs, less pollution, and cleaner communities'. In terms of detailed plans, the party's pledge centres on making zero-emission vehicles more affordable and accessible for Canadians, building 50,000 more charging stations across the country, requiring that at least half of all passenger vehicles sold in Canada are zero emission by 2030, and that all vehicles are zero emission by 2035.

There's also mention of utilising Canadian minerals and manufacturing expertise to build the batteries needed for zero-emission vehicles and other clean energy solutions and doing so in a way the attracts investment and positions Canada as a world leader in this space.

Carbon tax differences

The Conservatives' frontline comment is that the party, if elected, will fight climate change, and protect the environment, but not 'on the backs of working Canadians or by hurting the economy', adding that Canadians cannot

afford Justin Trudeau's carbon tax hike. The party has, therefore, set its carbon tax ceiling at $50 (€33), pointing out that the Liberals are willing for it to go to $170 (€113), which is the level the tax is scheduled to reach in 2030 under current government policy.

Of specialist interest to bioenergy businesses, the Conservatives say they will introduce a Renewable Natural Gas Mandate, requiring 15% of downstream consumption to be based on renewables by 2030.

"Capturing methane from organic sources such as farms and landfills reduces carbon emissions and creates a renewable source of energy," it is stated in the party's 15-page climate change plan. "That means the gas we use in our power plants, furnaces, water heaters, dryers, stoves and other gas appliances will have less impact on the environment, and that the methane which is currently wasted from agriculture, sewage and landfills will be significantly reduced."

Climate change bank

The NDP, with its possibly crucial third place, says that Canada has huge untapped renewable energy potential and that, if elected, it will seek to power Canada with net-zero electricity by 2030, moving to 100% non-emitting electricity by 2040.

"To drive this progress, we will establish a new Canadian Climate Bank that will help boost investment in renewable energy, energy efficiency, and low carbon technology across the country," it added.

Central, of course, to many of Canada's climate change discussions is forestry, with the country containing just short of 367 million hectares of forest land, according to the Forest Products Association of Canada (FPAC). It's a hugely valuable resource which is constantly required to be 'all things to all people'. That means being home to many wild species, a massive recreational facility for people to enjoy, and a provider of raw materials for wood products, paper and pulp, building supplies, and a wide range of biomass and energy functions.

With so many competing demands, it's impressive that the area of forestry actually harvested each year amounts to just 0.2%, or around 750,000 hectares (ha). At the same time, deforestation is kept at 0.01%, around 34,000 ha.

For all that Canada's forestry management strategies are proving to be so efficient at controlling the planned use of this most precious national resource, keeping a hold on the impact of climate issues in woodland areas is less successful. Fire, for example, removed more than 1.8 million ha of Canadian forests in 2019, equivalent to 0.5% of the total resource. The latest fire situation report, in addition, revealed that more than four million hectares of the country's forests have been affected by fire already this year, against

a 10-year average of 2.5 million ha — and the threat of further fire damage is far from over for 2021.

Even more destruction is being caused by insects, however, whose feeding habits were recorded as having taken out a staggering 16.39 million ha of forestry as recently as 2018.

"Just in the last few weeks, fires in Western Canada alone have affected more than five times the area that we would harvest sustainably in a year," said Derek Nighbor, FPAC president and CEO. "Combining that with the insect damage, we're seeing significant natural disturbances that are affecting forest health and the future of forests in Canada. If that's not a call to action, then I don't know what is."

On biomass interests, in particular, he added that the Canadian Government's commitment to establish a net-zero carbon economy by 2050 had been an eye-opener for operators in the steel and cement sectors, many of whom are now looking to woody biomass and wood residuals to lower their own carbon footprints.

Declaring that Canada's Net Zero 2050 policy is a huge opportunity for the sector, he pointed to possible gains linked to the displacement of household products and wood fibre-based bioplastics, the increased use of wood across the building sector, and as a means of helping other industries lower their own production emissions.

"There is a real sweet spot in all this for us," he said. "We're seeing a renaissance in the wood building space, responding to building code changes, alongside an increase in attention towards forest biomass and making the economics of that sector work."

Pellet sector success

Canada's vibrant wood pellet industry fits well into the country's pattern of forestry management, of course, with all the sector's fibre being drawn either as a direct by-product from the lumber industry, or from the 'purposeful extraction of dead, diseased, damaged, or low-quality trees'. That's according to Gordon Murray, executive director of the Wood Pellet Association of Canada.

"By creating a valuable energy product from material that once went to waste in Canada's highly integrated forest sector, Canadian wood pellet producers are proud to supply our global customers with responsible, low carbon energy," he said.

Do voters understand?

How much all of this registers with the average Canadian voter, however, is another question. When this point was put to Derek Nighbor during a recent webinar hosted by the Australian Forest Products Association, he admitted that around half of Canadians didn't understand what was being done in terms of forestry management and resource use.

"We recently did some polling to inform our election input and found that overall understanding is more positive than not," he said, although the picture is definitely patchy.

"For those who know forestry, their understanding is overwhelmingly positive. For those living in downtown Toronto and other cities, however, there is still a general lack of awareness. People in these areas were stunned that we are planning in 200-year cycles. A lot didn't even know that we were replacing what we are harvesting.

"The truth is that we in this industry do a great job of talking to ourselves. Reaching out to urban centres and the families who live there is going to take some different tactics."

No doubt, as with the US having the capacity to survive the odd 'less helpful' president, so Canada's 200-year approach to its forestry resource will survive whatever result emerges on 20 September. Having said that, it would clearly be beneficial to have strong Canadian leadership ready and prepared to help arrest the world's climate change decline when COP26 begins in a few weeks' time. ●

For more information:
This article was written by Colin Ley, a freelance contributor

Coming up in the November/December issue

Regional focus: Asia & Africa

Engineering and construction

Air emissions/odour control

Biochar

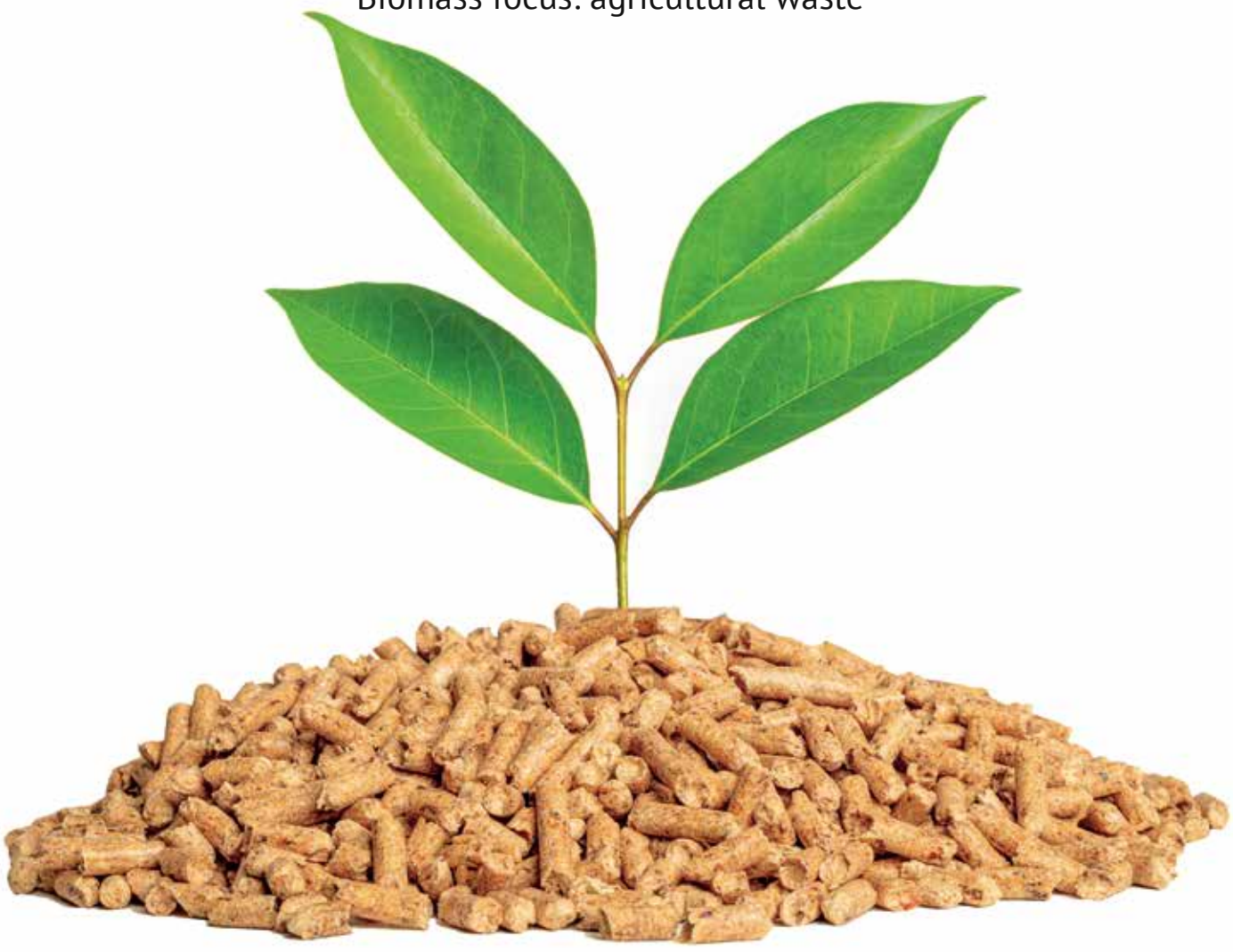
Transportation/logistics

Gasification

Project development (finance, planning, permitting)

Silo and bulk storage

Biomass focus: agricultural waste



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Poo power

In Ontario, Canada, an exciting partnership has built a biogas facility generating power from zoo animal waste and food waste

Daniel Bida, director, ZooShare

In Ontario, Canada, an interesting project has just come into operation.

ZooShare Biogas Co-operative, formed in partnership with Toronto Zoo, developed a biogas plant designed to process animal manure and food waste to produce renewable energy.

The journey began with Daniel Bida, who previously worked as a financial analyst covering the energy sector. A self-proclaimed nature enthusiast, Bida found himself drawn to renewable energy technologies. In 2009, keen to make a positive impact on the world and tired of his job, Bida began to explore starting his own company to develop green projects in Ontario.

"This was at a time when the Province's Feed-in-Tariff programme was about a year old and many individuals and companies were motivated the same way," said Bida. "Looking to differentiate myself, instead of focusing on solar and wind projects, I got into biogas — mainly because of how it dealt with waste while generating energy and fertiliser.

"The closed-loop, or circular economy aspect of it, seemed practical, logical, and impactful. Since that time, I have worked in the sector, learning as much as I can from my engineer and scientist."

Toronto Zoo already had plans in the pipeline for a biogas plant, when it connected with Bida. The plans were to build a plant on the land where the zoo was composting manure for the last 30 years or so.

In 2010, the zoo issued a request for proposal to build a facility that would process as much as 100,000 tonnes of organic waste annually and was hoping to secure a developer to make happen. Unfortunately, no companies submitted a response and the zoo was left unsure of its next steps. Enter — Bida.

"I put together a group of professionals working in the sector and we submitted a proposal to build a smaller biogas plant that would be financed by the community," commented Bida. "Once the zoo gave us the green light to proceed, we formed the ZooShare Biogas Co-operative and started the development."

Joining forces

The ZooShare Biogas Plant, operational since April this year, is co-owned by the Co-operative and EnerFORGE, a subsidiary of Oshawa Power and Utilities Corporation. Many vendors and stakeholders were involved in the project from the start, too many to name; Bida highlighted Toronto Region Conservation Authority, Parks Canada, Bullfrog Power (education sponsor), Octaform Systems (tank sponsor) and Loblaw Companies, one of the Co-operative's main feedstock suppliers.

"The collaborative process was both challenging and rewarding," said Bida. "Certainly, it can be difficult to make decisions when you have over 800 co-operative members and key stakeholders like the Zoo and the City of Toronto, who held a lot of power with regards to the land use and lease agreement. These challenges added time and periodic stress but also created room for more input that resulted in a stronger project with stronger relationships.

"Given our location at the end of the Rouge National Urban Park, it was and continues to be critical that we work together with these stakeholders to ensure our long-term success."

> "Certainly, it can be difficult to make decisions when you have over 800 co-operative members and key stakeholders..."

Getting into the details

The plant processes 2,000 tonnes of zoo manure and 15,000 tonnes of inedible food waste annually to produce 500 kW of electricity, which is exported to the grid, and all the power and heat the plant itself requires. It also produces a nitrogen-rich fertiliser, which is spread on nearby farmland twice a year.

"We use a continuous mix wet digestion process, where all the feedstock is pasteurised before digestion," noted Bida. "Our digesters are equipped with self-cleaning equipment as well, that regularly removes sinking and floating contaminants from the digester tank while it is in operation, which has the benefit of eliminating periodic shutdowns to clean out the tanks while maintaining digester capacity."

While the plant is not owned by Toronto Zoo, the plant will positively impact its environmental goals, as a result of the manure being used for anaerobic digestion and renewable energy generation rather than composting, or, in the worst scenario, ending up in landfill.

The lease fees generated by the project will go back to the zoo to help fund its other conservation initiatives, while the project itself and the related biogas education programmes will help to educate visitors as to the "power of poop", as Bida puts it, and the true value of organic waste.

So, what's next for ZooShare?

"First, we will look to optimise our operation through the addition of some complementary equipment that will reduce our trucking and disposal of residuals and digestate. We are also hoping to grow the facility over the next few years to increase throughput and begin the production of RNG."

For more information:
Visit: zooshare.ca

A look at how to reduce fines — the broken pieces of wood pellets — and improve pellet quality, with Biomass Engineering & Equipment

Wasted effort: avoiding pellet degradation in production

It's no secret: fines lower pellets' value. Too many fines can result in a customer or port authority rejecting a supply of pellets altogether. These concerns are why manufacturers do their best to screen their pellets. But, the necessity for screening bellies an underlying problem: that is, what creates the fines. By addressing what creates fines, pellet manufacturers can reduce waste and run their business more profitably.

The first step to reducing fines is to identify where pellets receive damage. The best way to determine where fines originate is to sample the pellets across the pellet handling system and compare the level of fines from place to place. Components within the pellet handling system include conveyors, elevators, silos, reclaim machinery, metering equipment, and load-out equipment.

After determining where the damage occurs, pellet manufacturers can begin analysing the cause of the damage. Shattering is a concern, because pellets are brittle — they can break when they strike a hard surface. Pellets are, therefore, likely to break at transfer points, where pellets drop between machinery or into a silo. So, the fewer transfer points there are, the fewer opportunities there are for pellets to break.

Shortening the distance pellets must fall during transfer is also a viable way to reduce fines. Reducing the distance decreases the energy pellets carry when they impact a surface and lowers the likelihood of breaking. Reducing the angle of the fall, such as with an angled chute, likewise reduces damage by limiting the vertical velocity of the pellets.

BioDynamics of Oregon silo conveyor

In seeking to shorten transfer distances, there is no need to go to extremes. When the transfer distance between conveyors is too close, it can become difficult, if not impossible, to monitor plug formations, because there is little or no room to place a monitoring device. We recommend a transfer distance of at least 45 cm between conveyors.

Short transfers can also be problematic in systems where pellets fall onto a belt conveyor, when the belt runs significantly faster than the incoming pellets' horizontal velocity. In these situations, pellets can bounce around the conveyor's tail, ricocheting off each other and the conveyor's panels until they pick up enough momentum in the direction of the belt. Not only are the pellets damaged in this process, but if too many gather in the tail, they can plug the inlet and damage the preceding conveyor. Manufacturers can avoid this problem by increasing the transfer distance and adding a horizontal chute, which allows the pellets to pick up speed in the direction of the belt before contacting it.

> "Pellets are likely to break at transfer points, where pellets drop between machinery or into a silo"

Pellets also receive significant damage as they initially enter a silo and drop to the floor. This damage, of course, decreases as pellets line the floor and pile toward the inlet. Of more concern in silos are crushing and shearing forces. As the pellets pile, they place great force on those beneath them. Inevitably, some are crushed.

There are several things pellet manufacturers can do to minimise pellet damage within a silo. It is theoretically possible to utilise a helical chute, which would enable pellets to

slide, rather than freefall, to the bottom of the silo.

Replacing a tall silo with multiple, shorter silos may minimise damage, too, as would horizontal-style storage. Both reduce the height pellets fall and lessen the crushing forces the pile exerts. Of course, manufacturers would need to weigh such a sizeable investment against costs associated with continuing to run a screener and return conveyors.

Besides transfer points, pellets can receive significant damage from conveyance machinery. Certain types of conveyors — screws and pneumatic systems particularly — always damage pellets heavily. Screw conveyors crush pellets as they slide them along. Pneumatic systems blow pellets violently through conduits and cyclones, which breaks them apart. Centrifugal-style buckets elevators also damage pellets, as they toss them at high speed against the inside of the hood. Cheap box-and-chain conveyors are notorious for damaging pellets, as well. These machines grind pellets under the chains and paddles.

Screw conveyor

It's worth noting that not all chain conveyors damage pellets to the same extent. There are premium models that handle pellets gently by keeping the chains out of the material path. Belt conveyors and continuous-style bucket elevators also generally handle pellets gently.

If manufacturers discover their conveyors are damaging pellets, their only option is to replace them. Doing so not only reduces the fine volume in the material stream but may decrease operating costs. Consider that if a conveyor is grinding up pellets, it's inevitably experiencing much wear — wear that sucks up time and resources from maintenance teams and can result in unscheduled downtime.

While it is impossible to eliminate fines, it is possible to minimise them so that screening becomes unnecessary, though such an outcome depends on the volume of pellets produced and their properties. But whether screening can be eliminated or not, decreasing fines increases the efficiency of operations and saves costs related to energy and maintenance. Ultimately, it makes operations more profitable. ●

For more information:
Visit: biomassengineeringequipment.com

Introducing the Arma Mix HYBRID

Agitator, pump and tank accessory supplier ARMATEC has launched a new agitator, the Arma Mix HYBRID

ARMATEC is a well-established supplier of agitators, pumps, and additional tank accessories for the biogas, wastewater, and industrial sector.

Founded in 1965, Armatec started out inventing pumps and agitators. Nowadays, the company also supplies other products like cutters and separators. The advantage for potential customers is that they have only one contact person for these different kinds of machinery. With around 30 diligent employees, Armatec is equipped to meet individual customer requirements around the world.

With all the different types of tanks, substrates and agitators on the market, it can be difficult to find the right solution with a high agitating performance while ensuring energy efficiency.

To meet all the important requirements, Armatec invented a new agitator which combines all advantages of a long shaft agitator as well as the advantages of a submersible mixer. One of the engineers at Armatec simply described it as "the long shaft submersible mixer".

The height can be adjusted through hydraulic or electric regulation. With the electric drive version, the agitator can be aligned to all different filling levels automatically via the control system, preventing floating layers. Additionally, sedimentation at the wall or the agitator itself is prevented, thanks to the aerodynamical mounting position and the generous distance to the tank wall.

There is no interference of the flow circulation due to ropes, masts or cables which lead to an even lower energy consumption and better performance overall. The lack of the cable and rope also reduces wear and tear. All electrical connections are protected in the support tube.

Though the durability is commendable, if servicing is required, the process is easy because the agitator can be dismounted and mounted laterally without having to open the membrane cover, also helping to ensure reduced gas loss.

For more information:
Visit: armatec-fts.com/en

MÜNCH-Edelstahl and Vecoplan Midwest's partnership offers pelletising solutions to the North American market

Pellet partners

Searching for ways to reuse, repurpose, and recycle material that has traditionally been sent to landfills is nothing new. Pelletising wood is also not new, but creating pellets from different types of waste or scrap has become more common over the past few years.

The development of pelletising solutions in the wood, biomass, and feed industries in the US and Canada led to a partnership established in 2009 between Vecoplan Midwest, based in New Albany, Indiana, and MÜNCH-Edelstahl, based in Hilden, Germany.

Vecoplan has been supplying size reduction and pelleting equipment in the wood and biomass industries for over 30 years. It is an integrator of pelleting equipment and packaging systems, which include custom control panels made in the company's High Point, North Carolina UL Listed Panel Shop. Vecoplan also provides spare parts from its New Albany warehouse to provide quick service to customers. The wood team has a combined 75 years of experience in practical, hands-on experience operating pellet mills, offers system start-up services and operational training, as well as ongoing spare parts and maintenance/repair services.

Münch-Edelstahl is a prominent company in pelleting technology, placing an increased focus on the topic beginning in 1981. The company has a global presence to offer customers an extensive portfolio of machines, main components and other high-quality accessories and spare parts,

all made to meet its German quality standard. In addition to Vecoplan Midwest, which is Münch-Edelstahl's exclusive distributor in North America, the manufacturer has partnered with 14 other companies spanning 12 countries.

The Vecoplan-Münch partnership began in 2009 when Vecoplan Midwest's chief operating officer Bill Miller met Peter Münch at the LIGNA 2009 fair in Germany. Miller was searching for a mill he could sell and install to his domestic customers and the rest is history.

Since the partnership was established, the team has installed over 30 pellet mills within its integrated plant systems, including conveyors, feeders, storage, dryers, and packaging lines.

Together, Münch-Edelstahl and Vecoplan design, test and implement customised pelleting solutions for customers. Feedstock materials span from wood, hemp, animal manure, cornstover and straw, and feed. The resulting pellets are used for residential heating fuel, fertiliser, animal feed and animal bedding. In a non-traditional application, Vecoplan has one customer that pelletises hard-to-recycle plastics to make alternative fuel for a global petroleum producer. The North American customer base reaches from British Columbia to Ontario, Canada, down to the heat and humidity of Florida and west to the Midwest region.

Vecoplan Midwest has recently increased its field team to support the acceptance and growth of converting waste to pellets. The Vecoplan-Münch partnership strives for customer satisfaction, regardless of whether the customer needs a single pellet mill or a multi-mill plant. Each customer's situation, goals, feedstock and climate are considered when designing the mill size, system, and components. As waste diversion continues to be the long-term goal in North America, Vecoplan Midwest and Münch-Edelstahl continue to apply the latest technology in pelletising to provide new solutions to the market.

For more information:
Visit: muench-gmbh.net

With more than 150 biogas and RNG systems worldwide, DMT understands Canada's potential and will continue to develop its RNG market

Industry insight with DMT Clear Gas Solutions

Canada's agricultural and dairy market

Today's Canadian biogas and RNG market holds much promise. Since 2010, Canada has accumulated 12 RNG projects with 16% of the total biogas and RNG projects using agricultural feedstock[1]. With the country only tapping into 13% of its biogas potential, by far the biggest growth opportunity is in the agricultural sector, where crop residues and animal manure make up two-thirds of the country's easily available biogas resources.

Growth in the dairy RNG industry

As a major technology supplier for Canada, DMT has been actively developing the agricultural RNG market for some time now. This past summer, DMT replaced a water wash system with its membrane separation technology for a mid-size dairy farmer in British Columbia (BC) that wanted to focus more on farming and less on operating a RNG facility. Later this year, DMT will complete another biogas upgrading system for a large dairy farm in Ontario.

So, how does a country with only 12 RNG projects suddenly get two RNG projects within a year? Essentially, the groundwork was already laid. By working on projects in the US, DMT reduced lead times, perfecting a standardised, pre-engineered model. Additionally, the development of its extensive network of local vendors and partners in the last six years has improved project execution overall.

A standardised approach immediately benefited DMT's presence in the dairy RNG industry both in the US and Canada, because it offers versatility and wide application to dairy farms, regardless of size. For dairy farmers or project developers, this model is a huge incentive as one can be online quicker, selling RNG sooner, and generating immediate revenue. For example, the BC dairy farmer was able to complete installation, commissioning, and start-up, using only DMT remote support, with this 'plug and play' model. This was not initially planned but proved effective to maintain project timelines during the pandemic.

Canada's potential

What's held back the agricultural biogas sector in Canada? For one, most of the anaerobic digesters thus far are on mid-size dairy farms (approximately 250 milking cows) that co-digest dairy manure with off-farm organic waste. With the average Canadian dairy farm holding 89 milking cows, limited farm size makes it difficult for these projects to achieve feasibility for RNG production[2].

A mid-size dairy farm in British Columbia replaces a water wash system with DMT's Carborex® MS, a membrane separation system, to extract CO_2 from the methane (CH_4) stream

Additionally, other factors known very well in the biogas industry to hold back RNG projects in general, such as distance to the natural gas pipeline, feedstock ratio, and price of RNG, have also affected the market's potential — but not for long.

The RNG industry eagerly awaits the finalisation of Canada's Clean Fuels Standard (CFS) later this year. Coming into regulatory effect in December 2022, the goal of the CFS programme is to reduce emissions, accelerate the use of clean technologies and fuels, and create jobs in a diversified economy. It will do so by obligating liquid fuel suppliers to reduce the amount of carbon created in the production of their fuels. Thus, these regulations will provide an incentive to develop RNG projects that would otherwise struggle to compete in today's energy markets. According to Environment and Climate Change Canada's estimates, the liquid-class CFS will reduce greenhouse gas emissions by more than 20 million tons in 2030 — equivalent to taking 5 million cars off the road each year[3].

Furthermore, Canada's Minister of Agriculture and Agri-Food announced in March funding of up to $116,800 (€78,400) for the Canadian Biogas Association (CBA) to accelerate sustainable agricultural development[4]. If Canadian policy mimics the US Renewable Fuel Standard, dairy farms will offer low carbon intensity scores and increased RNG prices. These revenue opportunities create a strong business case and incentivise all projects, small or large in scale. But until the new regulations take effect, Canada will continue to rely on a combination of exporting RNG to the US and utility incentive programmes.

Regarding small-scale dairy farming, a model to overcome the scale-related economic barriers that project developers encounter is the adoption of clusters. In a cluster, multiple farms contribute feedstock to a centralised anaerobic digester facility. A study conducted by the CBA found a high RNG price, 50-50 feedstock of manure and off-farm organics, or an average cluster of four dairy farms spark farm clusters with a high probability of producing RNG in a financially viable way[5]. DMT has installed several dairy RNG facilities in the US using this cluster model. ●

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For more information:

This article was written by Missy Lee, marketing manager at DMT Clear Gas Solutions. Visit: dmt-cgs.com

Bioenergy Insight speaks to EQTEC's CEO, David Palumbo, about gasification, the green recovery, and hydrogen's role in a net-zero future

In conversation with David Palumbo

David Palumbo

Could you tell our readers about yourself and your background in the energy industry?

Over the last 15 years, I have founded and co-founded several companies across various industries, particularly in finance and technology. In the last six years, I've been completely focused on clean technologies. My background is in private equity, venture capital, and asset management. While I worked in private equity, my focus was on real assets and energy infrastructure. I embarked on my career in business with the foundation of a BSc and an MSc in electrical engineering.

How does EQTEC's advanced gasification technology work?

Gasification is a process which thermochemically converts waste feedstocks including refuse-derived fuel (RDF), agricultural and forestry biomass, and industrial waste materials and plastics into synthesis gas (syngas). The syngas is then used as an intermediate fuel to generate (mainly) power and heat, or as a commodity, to produce transportation fuels, synthetic natural gas (SNG) and hydrogen.

Our syngas, specifically, has an extremely high level of purity, making it very versatile for many high-value applications. Our technology is patented, proven and proprietary and overseen by a team of highly specialised gasification experts, with three PhDs among them.

For the communities in which our small plants are situated, we actively first look to source local waste with clear benefits to the environment on local, national and international levels: ultra-low environmental impact in the waste-to-energy sector; no toxic dioxins and furans; no fly ash containing poisonous metals; total 10-year CO_2 25-30% less than incineration energy-from-waste methods; and 69% more energy-efficient than the 'next best' waste-to-energy option.

Going back to the point I made earlier, we are more than a waste-to-energy technology company; we combine our operational disciplines and commercial acumen to develop sustainable projects in the EU, UK and US. We leverage expertise from our ecosystem partners with project funding, ancillary technologies, engineering (mechanical, electrical, civil), procurement, construction management, commissioning and operations & maintenance (O&M). We often fulfil some or all of these roles across the project lifecycle to bring them to commissioning and into operations.

Our business, projects and technology support rather than conflict with a net-zero economy, reducing landfill, and reusing waste by converting it into valuable products.

Several projects have been announced in recent months involving EQTEC's Advanced Gasification Technology in Greece, Croatia, and the UK, to name but a few. Which project are you most excited about and why?

That's a difficult question because, at this stage, each of them has strategic importance to establish our footprint and credential in our key markets.

From a technology point of view, we are particularly excited about the RDF-to-energy project in Deeside, Flintshire, UK, in partnership with Logik Developments and the biomass-to-bioenergy project in Shannon, Ireland, in partnership with CarbonSole Group. Both projects will enable us not only to deploy our technology in two of our three core markets but also soon, the potential to showcase our ability to deploy our disruptive technology to produce advanced biofuels and/or hydrogen.

EQTEC's plant, Belišće Market Development Centre (MDC), in Croatia

Can you summarise EQTEC's top priorities for our readers? What is the company focusing on in 2021/22?

As an international business, our overarching priority is the high-standard and consistent execution for developing all the existing projects in flight. In our 2020 annual report, we committed to building beyond our excellence in technology and innovation to establish a solid, sustainable platform for further commercial growth. We are all working well as a team to create and deliver repeatable excellence, in partnership with qualified, dependable partners and we will look to continue these efforts as we grow.

We will continue to progress our projects across Italy, Croatia, Greece and the US (all biomass-to-energy projects) and in the UK (all RDF-to-energy projects) as we secure financing, appoint EPCs and provide a cleaner way for communities to make better use of their waste. We will also be collaborating with Carbon Sole in Ireland to develop biomass-to-bioenergy projects there.

Finally, we continue to invest in our Innovation, R&D work-stream which supports the commercial projects we create. Over the next two quarters, our technical centre team will work with leading certifications agency TÜV to achieve certification for hydrogen-linked technologies; they will test several types of RDF material with the Université de Lorraine in

France and then carry out Fischer-Tropsch gas-to-liquid tests, subject to pending health and safety approvals.

EQTEC recently acquired a 1 MWe waste-to-energy plant in Italy, with plans to recommission the facility. What can you tell us about this project?

We are leading a consortium to repower, own, and operate the plant we are calling Italia Market Development Centre (MDC), which was originally commissioned in 2015 and has our technology already in situ. We expect the facility to be recommissioned and operational by the second quarter of 2022, so it can transform around 7,000 tonnes of straw and forestry wood waste from local farms and forests into green electricity and heat for use in the local community.

I'm particularly excited about the local nature of the plant. We've committed to ensuring all our projects have a positive local impact, from sourcing, treating, and converting local waste through to the generation of clean energy in the local area. In Italy, we appointed an Italian EPC contractor, COSMI, as we seek to hire local workforces wherever viable.

Most recently, we have placed orders for the manufacture of equipment and our technical team has been to visit the site, undertaking engineering surveys, and meeting our local partners and stakeholders. The site will also be the first of our MDCs, which will showcase our technology in a fully operational, commercial setting.

We also recently announced that we are targeting the recommissioning of a very similar project in Belišće, Croatia — more details coming soon.

What will the green economic recovery look like, in your opinion?

I believe we are on the cusp of the fastest and deepest disruption of the energy sector in modern times; this disruption will be driven by the convergence of several clean technologies whose costs and capabilities have been improving and will continue to improve at a faster pace.

Disruptive new technologies will not simply replace old ones. Instead, disruptions tend to disproportionately replace the old 'status quo' with a new system that has dramatically different potential and capabilities.

Trillions of dollars for new energy infrastructure are required. Supported by public policy and incentives, sovereign and institutional capital will be attracted to finance these developments. This will create new jobs, not only directly, but also in ancillary industries.

Entirely new business models to service the demand will emerge to seize opportunities and create value within the new system architecture.

EQTEC's plant, Italia MDC, in Italy

How much of a role will hydrogen play in the energy transition? How will EQTEC be involved in this development?

Well, we are now hearing hydrogen talked about more and more among policy-makers across the globe. The overriding challenge currently is cost, as only electrolysers are now the prevalent technology for green hydrogen. Costs are slowly reducing, but then the next — and I would argue, equal — challenge, is that commercial demand is not there yet to further support an accelerated push using hydrogen as a commercial economy and energy alternative.

When that market structure, investment case and political support all align, we will be in a good position, since syngas is primarily $CO+CH_4+H_2$. If you have high-quality syngas such as ours and can control the ratios, then extracting the hydrogen through steam reforming is possible. I believe this could be much more cost-efficient for certain applications than electrolysis.

Further, if the source feedstock of this syngas is, for example, organic, and not derived from fossil fuels, the resulting hydrogen could be certified as green and with lower carbon content. The UK is expected to remove colour definitions and classify hydrogen by carbon intensity levels — something we support as it aligns with an outcomes-based approach.

I am not sure hydrogen will be the magic bullet that some claim since there are other factors to consider like transportation, usage demand and type, the still relatively carbon-intensive production process and more. We are certainly watching with active interest.

Is there anything else you would like to add?

I believe that gasification has strong environmental and economic benefits and we are seeking to make an impact on reducing the volumes of waste and generating cleaner energy. Many countries are making strides to increase the 'reduce, reuse, recycling' part of the waste hierarchy and the time is right from the technology, investment case, and policy perspectives to accelerate how gasification is a better way to create energy from waste.

There is increasing legislative and fiscal pressure with global and local policy-makers, lobbying groups and civil initiatives, and it is time for alternatives, including gasification and anaerobic digestion/biogas, within the waste hierarchy, to be applied after recycling and before incineration.

As policy-makers' understanding of clean technologies improves, more effective legislation will come into place to encourage more effectively the adoption of clean technologies that are viable today, including ours. Furthermore, greater collaboration between the public and private sectors could create and accelerate the market demand required for further innovation. ●

For more information:
Visit: eqtec.com

UBE manufactures membranes to optimise biogas upgrading into RNG

Pure and simple

UBE's first CO_2 separator was installed in 1989 at a landfill gas purification pilot plant in Germany. Since then, UBE has accumulated multiple CO_2 separator references worldwide.

The company's installed gas separation membranes are still performing with excellence, demonstrating their important role in generating sustainable energy.

UBE´s gas separation membranes are made with hollow fibres, which are produced with a high performance polyimide. Designing polyimide hollow fibres to meet sophisticated application requirements is one of UBE's areas of expertise, since it also manufactures the polyimide itself. This combination results in an excellent chemical, mechanical, and thermal resistance, contributing to a long lifetime of the gas separation membranes.

UBE's high-performance polyimide hollow fibres also have high permeability that increases capacity, and high selectivity that allows for high separation efficiency of the treated gas components, i.e. high CH_4 recovery.

Another main advantage of UBE's membrane is the H_2S acceptance; up to 3 vol% in feed flow without any damage.

Apart from the technical benefits, another merit of UBE's gas separation membrane technology is its size. The compact size of the whole unit is possible by applying UBE's 8-inch size modules and a sophisticated configuration out of UBE's wide range of grade line-up. Besides, membrane technology offers a very simple operation is an eco-friendly technology, as there is no need to use and treat water or chemical products. The membranes also provide a reduced investment (CAPEX) and savings on the equipment´s operation (OPEX).

How does the membrane work?

When compressed biogas flows into the hollow fibres, molecules with higher permeability rates for the membranes, such as CO_2, H_2O, O_2, and H_2S, permeate the membranes more easily than gases with lower permeability rates, such as CH_4. The result of the differences in permeability rates is that highly purified CH_4 is obtained after flowing through UBE's CO_2 separator. It is worth mentioning that the biomethane generated by membrane separation is already pressurised and dehydrated, making it very suitable for gas grid injection application.

UBE's CO_2 separator can work using an inlet pressure from 3 barG to up to 24 barG and temperatures that can go up to 60°C. The high-performance polyimide, used to make the hollow fibres, also guarantees great durability when exposed to fluctuant operational conditions.

After going through the UBE CO_2 Separator, the final RNG can be purified with up to 99.5% of CH_4 content, with CH_4 recovery that reach 99.8%. The optimised combination of different characters of membrane grades that UBE has developed makes it possible to reduce the numbers of membrane modules. Every project is meticulously analysed by the experts that propose a unique process solution in order to reduce CAPEX and OPEX regarding the membrane configuration.

Case study

UBE's CO_2 Separators are installed in WAGABOX® unit in the Les Ventes-de-Bourse landfill, in northern France, to upgrade landfill gas into grid-compliant biomethane (RNG). The WAGABOX® unit combines a CO_2 Separator to separate CO_2 from landfill gas and cryogenic distillation to separate CH_4 from N_2 and O_2. The unit treats 450 Nm^3/h of landfill gas and generates 20 GWh per year of biomethane, injected directly into the local gas grid.

WAGABOX® unit of Les Ventes-de-Bourse. Commissioning: 15 January 2020

UBE CO_2 Separators in WAGABOX®

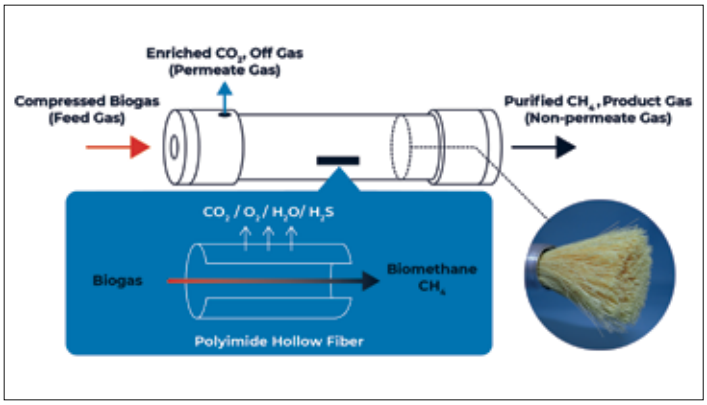
So, why is it so important to separate CH_4 from CO_2?

Each country has its own regulation for biomethane quality standards. The two major biogas components are CO_2 and CH_4. CH_4 has a superior heat power than CO_2; additionally, CO_2 is very corrosive. So, transforming biogas into biomethane is necessary to reduce the amount of CO_2 in the biogas. By reducing the amount of CO_2 and other components, biogas is transformed into biomethane or RNG and UBE´s membranes are the heart of this process.

According to the European Biogas Association, the use of membrane technology on newly installed biogas upgrading plants has dramatically increased in Europe, as shown in Figure 1.

This membrane technology

The first reference of UBE CO_2 Separator in 1989 in Germany



Showing UBE CO_2 Separator functions

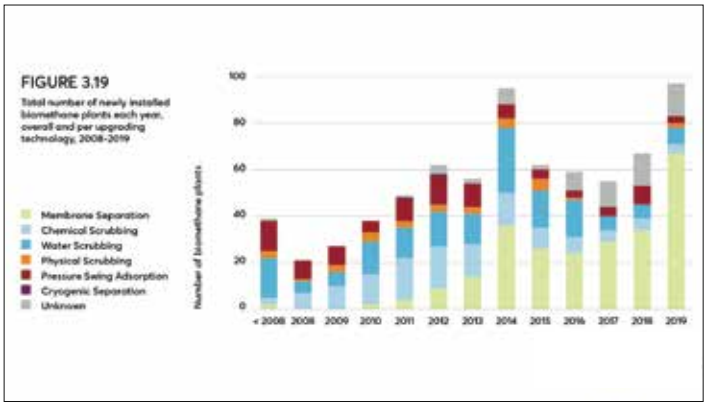


Chart showing the number of newly installed biomethane plants in EU per year for each upgrading technology. Source: EBA Statistical Report 2020

can offer an affordable total cost and the simplest solution for various cases because of its flexibility and scalability to the process, due to its module configuration.

It is well known that biogas and biomethane plants are essential to fulfil natural gas demand, working, for example, as an energy source for industries; automobile, residential and commercial use, among others.

In many countries, the use of biomethane is regulated by national bodies. Normally, these regulations establish the rules for quality and the specifications of biomethane that can come from landfills, sewage treatment stations, animal and agricultural rejects.

To fulfil to the market's needs, UBE offers modules for different capacities and various applications. UBE's CO_2 Separator line-up covers pilot projects and industrial requirements. These technologies, based on established expertise, are aligned with three important market needs: energy matrix diversification, the optimisation of available process, and reaching decarbonisation targets set by countries and companies globally. At such an uncertain time, knowing that there are technologies able to fulfil these needs is an important step to the sustainable development of many industries.

For more information:
Visit: ube.es/products/gas-separation-membrane

Bioenergy Insight asked experts from the UK Pellet Council (UKPC), the Association for Renewable Energy and Clean Technology (REA), and the US Industrial Pellet Association (USIPA)

What can the biomass industry do to win over sceptics?

Mark Sommerfeld, head of power and flexibility at the REA

For the last few years, public support for biomass, and its use within renewable bioenergy production, has remained stable. Over the past three years, the UK Government's public attitudes tracker has consistently demonstrated that over two-thirds of respondents either support, or strongly support biomass use. While such support suggests the public does understand the role biomass has to play in decarbonisation, it also highlights the need for industry to continue to do more if it is to enjoy the same levels of support seen by other clean technologies. To do so means continuing to show strong commitments to high sustainability governance arrangements, transparent carbon accounting and ensuring energy generation projects benefit the communities they are based in.

Sustainability remains a complicated issue and is not easy to engage with within the limitations of short press article or social media post. As a result, the public debate tends to become polarised, with some detractors making blanket statements around biomass sustainability, despite the complexity of the issue. Given sustainability governance is all about avoiding the risk of environmental damage, it becomes easy to focus on the extremes. This is especially true where statements around theoretical carbon debts or forest losses, based on worst case assumptions, are used to drive headlines and public reaction.

The biomass industry needs to further develop its abilities to actively demonstrate and communicate the sustainability governance that is already in place. For example, much of the biomass industry rightly rely on independent certification schemes to demonstrate their compliance with the highest levels of sustainability practice. However, just displaying a certification mark is not enough. It is through the real-world demonstration of what these sustainable practices achieve that we build public confidence. This is done by providing transparent data on emissions and supply chains, proving real world outcomes rather than allowing the debate to focus on worse case scenarios.

There are, of course, already strong examples of data being pushed out by industry. At the largest scale, companies like Drax have committed to regularly reporting on its feedstock sources and life-cycle emissions, as well as developing innovative remote sensing projects to offer further transparency around their supply catchment area impacts. Similarly, Enviva's Track and Trace technology provides a fully traceable program for biomass from where it is sourced, processed, and ultimately used. Public commitments to providing this level of data is important for building public understanding of how biomass supply chains work.

However, along with this transparency, biomass sites also need to be able to demonstrate the benefits they bring to the UK. As a sector, we need to make more of the connections between bioenergy and the growth of a vibrant and sustainable UK bioeconomy. The Climate Change Committee has indicated that we need 23,000 hectares of bioenergy crops and 30,000 hectares of trees planted each year by 2050 to achieve net zero. Such growth is only achievable with strong offtake markets, such as bioenergy, to deliver returns for investors and developers.

Along with this growth comes jobs and investment. The REA has demonstrated that the bioenergy sector in 2018/19 contributed £9.2 billion (€10.7 billion) to the UK economy and provided over 54,000 jobs. This is projected to grow to between 100,000 to 120,000 jobs by 2032. In addition, given the predominantly rural application of bioenergy and feedstock cultivation, jobs are well dispersed across the UK, especially benefitting rural communities, and helping to further cement a positive public opinion.

Building public support for biomass beyond its existing base today requires the industry to continue to commit to transparency, regular reporting, and demonstrating its value to the UK. In doing so, we enable the public debate to become more nuanced while allowing the public to better understand the technology and the crucial role it must play in decarbonisation. In return, the public will keep holding the industry to account, pushing for continued sustainable growth as part an energy transition that much of the UK public clearly actively support.

Neil Holland, UKPC director and managing director of Y Pellets

Biomass, in particular wood pellets, has thousands of contented end-users, especially across the UK and Europe who are often the industry's best sales people, helping to dispel some of the barriers to ownership.

Questions like 'is it dirty?', 'what about the ash?', 'is it difficult to get the fuel?' as well as the major misconception surrounding deforestation and the part biomass plays (or doesn't play) on a global scale are often

> "... biomass boilers will last approximately 15-20 years while significantly reducing carbon footprint"

thrown around; however, this couldn't be further from truth.

Innasol, the UK's largest distributor of biomass boilers, conducted a recent survey with results showing that almost 95% of customers were satisfied with their biomass heating systems. However, to convince other audiences and the wider public as we move towards a net zero, low-carbon future, we must examine some objections to their use.

A common belief is that biomass means the cutting down of forests on a worldwide scale, whereas multiple studies have proved that biomass actually encourages sustainable forest growth and a healthy woodland cycle when well managed. In Austria, for example, a recent report demonstrated how 'since the beginning of the Austrian Forest Inventory in 1961, the forest area has increased by 330,000 hectares. The forest growing stock has increased by 50% since the 1960s, leading to a record level of almost 1.2 billion cubic meters today'.

Understanding that forestry is actually a crop, similar to barley or potatoes, only slower growing, which the landowner will only plant and maintain if there's a market for the wood at the end of the process, is essential for the wider public to realise.

In 2019, approximately 5.2% of the forestry harvested in the UK was processed and used as wood pellets. Much of that came from residues from milling operations, but it also demonstrated the very real opportunity we have to produce a lot more.

Creating a new market for sustainable forestry means more trees will be grown, not more lost, and since wood pellets must come from virgin forests, that process is already enshrined in the biomass heat industry's supply chains. This will also attract new investment and help create new green jobs, many of which in rural areas, while supporting the Department for Environment, Food and Rural Affairs' England Tree Action Plan.

'Aren't the boilers low tech?' is another assumption but again, quite the opposite is true. Modern pellet boilers are far more advanced and technology-driven, with customers able to view performance from their iPad or smartphone. Analysing flue gases and adjustments to air and fuel mix can be seen on a continuous basis when their previous measurement experience may have involved a brush handle dipped into an oil tank.

Finally, 'the systems are very expensive' is another mistruth when considering it's a sophisticated heating system. Of course, in comparison with more basic oil and gas boilers, which are manufactured in the millions, biomass boilers can seem a little more costly, but biomass boilers will last approximately 15-20 years while significantly reducing carbon footprint.

We are in the midst of a global climate emergency which must be tackled quickly. If governments start with the biggest carbon emitters, then rural and hard-to-heat properties using the dirtiest fossil fuels (i.e. oil and coal) should be prioritised for replacement.

If the 'polluter pays' principle was applied to fossil fuel systems by removing subsidised lower tax rates on usage, then the true costs of using these fuels would be clear for members of the public to see. With wood pellet boilers, we have a ready-made solution available now for the many thousands of UK rural and hard-to-heat properties, which cannot be addressed by other renewable technologies still in their infancy.

When the UK has over 64,000 homes still using coal as their primary heat source, it is incumbent on our own industry as well as the government to explain and support the implementation of biomass. We need to replace the worst offenders as soon as possible, the vast majority being located in rural areas, and do this while electricity networks are reinforced and gas networks potentially converted to support urban decarbonisation measures. Biomass is, therefore, the solution which can deliver today.

Seth Ginther, executive director, USIPA

Forging consensus within countries and among the community of nations may be the greatest challenge to tackling the climate crisis. Ultimately, the compromises and collective actions needed for meaningful progress must be underpinned by public support, and fortunately, global attitudes are moving in the right direction[1].

As the biomass industry continues to grow and contribute to national climate plans around the world, it must also help educate and build trust among the public whose ongoing support is essential for biomass to reach its full potential.

This outreach, unfortunately, is made more difficult by anti-biomass activist groups that perpetuate myths and spread fear-based misinformation. However, it's important to understand that environmental NGOs, while well-funded and active, do not represent the public at large.

Perhaps there is no better example of this divergence than a recent survey conducted by the Dutch Statistics Office[2]. The Netherlands is at the epicentre of anti-biomass campaigning, and is a hotbed of frequent, harsh, and one-sided media criticism. But even within this environment, 38% of surveyed Dutch citizens believe biomass use should remain at the same level or increase, while only 13% think biomass should not be used at all.

This is a strong testament that science, backed by real-world data, offers the most persuasive arguments. Sustainable biomass is endorsed by the Intergovernmental Panel on Climate Change (IPCC), has displaced millions of tons of fossil fuels and contributes to healthy and expanding forests. These are the facts as demonstrated by the past decade of operations and scientific inquiry, and the industry must continue to communicate this success story to all stakeholders, including the public.

Scientific support

The IPCC is unequivocal that sustainable biomass is an essential solution for mitigating climate change and a key technology in its modelled pathways that achieve the Paris Agreement. In its Sixth Assessment Report, the IPCC's most optimistic scenario of keeping global warming below 2°C requires the removal of about 5 billion tons of CO_2 a year by mid-century

and 17 billion by 2100.

The vast majority of these negative emissions are attributed to bioenergy with carbon capture and storage (BECCS), which the IPCC considers the most promising method of CO_2 removal. BECCS is a proven technology and is in the process of being scaled up. Projects are already underway in the US, Sweden, Denmark, and the UK.

Biomass is displacing fossil fuels at scale

Bioenergy is the EU's largest source of renewable energy, accounting for almost 60% of total consumption. It has underpinned decarbonisation of the energy sector, directly displacing coal while providing on-demand, renewable power contributing to a massive expansion of intermittent wind and solar capacity.

It is also one of the only scalable and readily available alternatives to fossil fuels for combined heat and power (CHP) plants, and plays an important role in supplying commercial as well as domestic heat for over 50 million European households. Because of its versatility, sustainable biomass is increasingly sought as a renewable feedstock in the industrial sector to replace fossil-based chemicals and plastics.

Supporting healthy forests

Researchers have well established that demand for sustainable bioenergy supports forest growth, because income from wood markets incentivises landowners to regrow trees and invest in active forest management. This finding was recently confirmed once again by a group of researchers at the University of Missouri who examined the changes in forest structure and carbon stocks within a 50-mile radius of wood pellet mills across the region[3].

Their study analysed over 38,000 forest inventory plots from 2005 to 2017, a period when regional production capacity increased from about 200,000 tonnes to more than 10 million tonnes. Notably, the data showed a net increase in carbon stocks in procurement areas surrounding large-scale facilities, a key measure of biomass sustainability.

The story is similar across the EU, where between 1990 and 2015, the total forested area increased by 90,000 square kilometres — an area roughly the size of Portugal. This did not happen because there was a decrease in wood demand. To the contrary, sustainable bioenergy use has increased by 20% since 2000[4]. These beneficial trends are due, in large part, to a combination of modern forestry practices and strong markets for wood, paired with effective regulations.

Decades of scientific research across multiple fields show that sustainable biomass is an indispensable climate tool, while real-world data confirm its benefits for the climate and environment. It is clear the industry has the winning arguments, and we must effectively convey them to maintain and grow public support. ●

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Steve Kozuki, executive director of the Forest Enhancement Society of BC, explains how the organisation is supporting the utilisation of forest residual fibre

Forest sector helps BC take action on climate change

Steve Kozuki

The Forest Enhancement Society of BC (FESBC) has funded the utilisation of 4.8 million cubic meters (m^3) of forest residual fibre in British Columbia (BC), Canada, between 2017 and 2022. As of March 2021, 3.2 million m^3 of fibre had already been successfully delivered to secondary fibre-consuming facilities around BC, such as wood pellet plants. Almost all of this biomass was logging waste piled in slash piles that would have otherwise been burned on-site. Given the experience of using uneconomic forest fibre in BC, what are the lessons learned so far?

FESBC has implemented processes to reduce the burning or abandonment of slash piles created after timber harvesting and operations related to post-wildfire stand rehabilitation, pre-commercial thinning, and certain wildlife habitat enhancement projects. When biomass is utilised instead of burned or wasted, greenhouse gas (GHG) emissions are reduced, thereby contributing to the achievement of BC's climate action goals under the CleanBC Plan, as well as Canada's international commitments on climate change.

FESBC has contributed to driving down the cost of treatments over time. In the early days of FESBC, wildfire risk reduction projects averaged about $8,000/hectare (ha) (€5,300/ha). The current estimated average cost is now $2,100/ha (€1,400/ha) as a result of shifting from hand treatments to using mechanised methods, increasing economies of scale, choosing appropriate equipment, and dove-tailing treatments with commercial timber harvesting operations. FESBC has also seen the cost of incremental fibre utilisation projects go down over time for similar reasons.

Hog fuel. Credit: FESBC

Historically in BC, many forest management activities were conducted by major forest licensees. FESBC's funding of new and emerging participants, including Indigenous peoples, has led to a significant increase in the number of non-traditional participants who are not major licensees. Consequently, the organisation has fostered an increase in diversity of participation in BC's forest economy, with a total of 63 of its 269 funded projects led by First Nations, and an additional 23 having significant First Nations involvement.

Atlantic Power residual fibre utilisation. Credit: FESBC

As overall timber supply decreases in BC, sawmilling facilities produce less residual hog fuel, sawdust, shavings, and wood chips. These residual products are the primary fibre for pulp mills, pellet facilities, and green energy production facilities as well as several emerging bio-product technologies. The reduction of sawmill residual fibre available to secondary manufacturing facilities means there must be a corresponding increase in utilisation of logging waste and residue in order to maintain employment levels, support community transition, accelerate the growth of BC's bioeconomy, and to meet climate action goals.

Increasing the use of fibre from logging residuals instead of burning on-site or wasting it is good public policy; however, depending on the location of the fibre, it can also be some of the most expensive fibre available. The end-products (hog, bio-

Roadside grinding. Credit: FESBC

logs, pulp logs) have well-established economics and the cost to transport fibre to the end-product facility can be a financial barrier. Fibre outside of the economic range will not be utilised and would likely continue to be burned or left to rot. However, as the logging industry gains experience and pioneers innovative fibre recovery processes, the cost of recovery drops and the economic recovery limit is pushed out, thereby increasing the volume of economic fibre available on a go-forward basis. FESBC funding has contributed significantly to improving the economics of fibre recovery in BC and increasing the volume of residual fibre available to be utilised.

The portion of the fibre cost supported by FESBC is only the uneconomic portion

Pellets. Credit: FESBC

of the total fibre cost, often specifically the transportation cost to get the fibre close enough to the market to be economic. Industry pays the full market value of the fibre. The determination of the actual amount of FESBC support is very case specific for the operational circumstances and market conditions at the time of utilisation. Prior to approval, the FESBC staff carefully review each project to ensure that fibre recovered under this programme is truly incremental to existing supply and that no competition for that fibre is displaced.

For the four years ending March 2021, across all regions of the province and all fibre types and market conditions, the average FESBC 'top up' contribution has been $12.22/m^3 (€8.18/m^3) over and above the average market value of $39.06/m^3 (€26.15/m^3). Therefore, the ratio is three industry dollars for each FESBC dollar.

Supporting the further transition to normalisation of higher residual fibre utilisation will allow the Province to implement policy goals while at the same time providing a good financial return-on-investment.

The work done by FESBC:

- Supports the transition of the forest sector to a larger bioeconomy;
- Assists the Province and Canada in reducing GHG emissions, contributing to achievement of the CleanBC Plan, Canada's Low Carbon Economy Leadership Fund, and international climate action targets. GHG modelling in accordance with international carbon accounting standards indicates that the average net benefit is 0.17 tonnes of CO_2 equivalent for each m^3 that is used instead of slash burned, after accounting for all carbon expenditures for the transportation and manufacture of the fibre to make pellets, pulp, and green energy. The FESBC cost per tonne of avoided emissions for CO_2-equivalent is $71.88/tonne (€48.12/tonne) CO_2e ($12.22/m^3 [€8.18/m^3]). The current BC carbon tax is $45/tonne (€30/tonne);
- Contributes to employment and community stability;
- Provides a financial return to the Province (based on data from BC Stats and econometric analysis reviewed by economists):
  - Total economic output (which includes BC multiplier effects and contribution to BC's GDP) is $1.44 (€0.96) for each FESBC dollar expended;
  - Tax revenue to the three levels of government (direct and indirect) is $0.14 (€0.09) for each FESBC dollar expended;
  - Employment of 8.5 person-years (direct, indirect, and induced) for each $1 million (€669,000) of FESBC contribution;
  - The financial returns to government expressed above are magnified by $3 (€2) of private industry expenditures for each FESBC dollar.

On average, for every $1 (€0.66) allocated by FESBC toward increased utilisation, the Province sees additional financial expenditures by forest industry partners at a ratio of 3 to 1, i.e. $3 (€2) additional expenditure for every $1 (€0.66) of FESBC contribution.

FLNRORD* Area	Actual FESBC Top Up Contribution	Biomass Utilised, Not Burnt on Site (m^3) Actual	Market Value of Fibre Purchased by Industry	Volume Weighted Ratio Private $ to FES $
COAST AREA	$1,178,264 (€789,000)	61,080	$3,566,647 (€2,388,300)	3.03
NORTH AREA	$10,799,895 (€7,231,000)	1,179,172	$43,820,268 (€29,344,000)	4.06
SOUTH AREA	$27,454,742 (€18,383,500)	1,986,019	$78,622,544 (€52,644,700)	2.86
PROVINCIAL TOTAL	$39,432,901 (€26,404,100)	3,226,270	$126,009,459 (€84,376,800)	3.20

Table 1. FESBC data source FESIMS March 31, 2021. Subset — not including rehab or wildfire risk reduction projects. Actual incurred spending — not including current plans with existing funding

*Forests, Lands, Natural Resource Operations & Rural Development Area

Supporting data

FESBC has prepared a robust dataset based on over four years of residual fibre utilisation. Table 1 illustrates the calculation of the above noted ratio.

For more information:
Visit: fesbc.ca

How SAVECO®'s agitators helped a residual material recycling centre in Northern Germany improve its energy efficiency

Energy-efficient agitators in a robust innovative shape

One of Northern Germany's most well-known co-fermentation plants is the disposal and recycling centre in Molbergen, part of the Münsterland Residual Material Recycling Centre (MRV) run by Jürgen Bahlmann and Gerd Peek.

The two shareholders have been operating biogas plants in the greater Cloppenburg area for over 20 years and are now working for companies throughout Germany and the Benelux countries.

"We dispose of and recycle all types of organic waste — from solid to liquid and substances from the processing industry, the food industry and from insurance claims such as shipping and freight traffic," said Peek.

"This also means that we unpack the material, which is often wrapped, on-site and return it to the recycling system. Only organic residues end up in the biogas digester."

The biogas produced is converted into electricity and heat in the company's own CHP plants.

"We can use almost all of the heat in our CHP unit," commented Peek. "Anything that is not used to heat nursery schools, schools, churches, or private households flows into the operating system"

The digestate, in turn, is used in agriculture, exclusively as high-quality nitrogen, phosphorus, and potassium fertiliser. This is chemically far less aggressive and odour-intensive than raw liquid manure and scores with better nitrogen availability.

The structure of the co-fermentation plant at the MRV is not unlike that of a renewable energy plant. The material is accepted and homogenised in the reception hall with two pre-pits, 400 m^3 each. To obtain an even liquid mass, submersible agitators are used to stir the organic material thoroughly. Then, germs like salmonella are made harmless in the sanitisation process at 70°C. Only then does the material enter the fermenter, where the actual biogas production takes place.

The major challenge when operating this system is the mix of materials to be processed with its extremely low pH value. The material is so aggressive that it attacks the seals of the agitators in the respective containers and eats its way through their casings. In the past, this meant that the technology had to be replaced after just 12-16 weeks — an immense cost factor, given the large number of agitators required in the feed pits (2), fermenter (4) and repository (2). The costs are not limited to repairing or replacing the agitator but also all direct (labour and material costs) and indirect

(gas loss) costs in connection with opening the fermenter must be taken into account.

In addition to long idle times, every plant manager looks for excellent mixing results. Samuel Volz, operations manager in Molbergen, summed it up: "We want to interfere as little as possible with the system in operation," he said.

"The agitator has to start effortlessly with us, run for a total of five hours during the day, and generate enough thrust and circulation so that even heavy, coarse material is well mixed – ideally without having to replace the agitator within a year."

The expectations for agitators were accordingly high when MRV decided to test SAVECO®'s CHIOR® SE Submersible Agitators. SAVECO is part of the WAMGROUP®, a global company based near Modena, Italy, whose German subsidiary is located near Mannheim, in Altlußheim.

SAVECO agreed to provide two submersible agitators with 15 and 18.5 kW power and 350 rpm each for extensive tests. Both machines were used in the pre-pits in 2019, where they have been in use since then, without any breakdown. Volz found that the CHIOR® SE agitators provided more thrust and achieved a greater circulation rate – this enabled the stirring times to be reduced by approximately 25%. SAVECO attributes the better values primarily to the innovative geometry of the three-blade stainless steel propeller in combination with the highly efficient drive. SAVECO specifies up to 5,960 newtons for the thrust and 16,580 m^3/h for the circulation rate for the full range of agitators.

To the delight of Volz, lower power consumption was also measured in the comparison tests with other agitators in the same container. The innovative shape of the propeller also increases energy efficiency and saves energy costs.

Three months after the installation, MRV was convinced and decided to replace more agitators. In the meantime, the centre operates a total of five CHIOR® SE agitators in receiving pits, fermenters, and repositories.

"Of course, we were convinced by the performance data," said Volz. "At the time of the next purchases, we didn't know how long the agitators would last without maintenance. The clear selling point was the modular structure."

This ensures that the propeller, gearbox, and motor components can be exchanged quickly and easily. Klingspohn, a dealer and specialist in liquid manure and digestate technology from Westerkappeln, keeps enough spare parts in its warehouse in Northern Germany to be able to quickly put the agitators back into operation.

Peek sees the ideal location for CHIOR® SE agitators in renewable energy systems.

"Of course, every system benefits from cost reductions," commented Peek, "however, as the economic efficiency of renewable energy systems compared to co-fermentation systems still depends more on the energy consumption of the system, an increase in the energy efficiency of agitators helps operators tremendously. It is certainly not inconvenient for them that costs are further reduced due to longer downtimes." ●

For more information:
Visit: saveco-water.com

Torsten Fischer of Krieg + Fischer Ingenieure discusses an accident investigation involving a destroyed gas holder roof on top of a digestate storage tank at a biogas plant in Germany

First-person sleuthing – destroyed gas holder roof

Torsten Fischer, founder and managing director at Krieg + Fischer Ingenieure, has been an expert legal witness for more than 10 years, covering 120 cases, and wrote his first report about a biogas plant accident more than 15 years ago. In this personal account, Torsten discusses an investigation into an accident at a biogas plant, exclusively for *Bioenergy Insight*.

Setting

The biogas plant with agricultural input substrates was built in 2008, including a digester tank, a secondary digester tank, a storage tank for digestate, and a CHP with 500 kWe. The storage tank was originally covered with a single membrane gas holder roof. Back in 2012, this was damaged and substituted by a high-quality double membrane gas holder roof, which was in operation for four years. In 2016, the whole gas holder roof came down, the centre column crooked, and the mixers blocked as seen in Figure 1.

My reaction

Massive damages; I had no idea how this could have happened.

Visit and initial site assessment

Retrospect 2012: the switch from the single membrane to the high-quality double membrane gas holder roof required a centre column.

Retrospect 2012-2016: according to the statements of the operator, the new gas holder roof never worked properly. As soon as the operator took biogas for the CHP out of the gas holder roof from the digestate tank, the CHP stopped working. This was due to low methane concentrations. Conclusion from the operator: there must be cracks in the inner membrane. According to the statements of the operator, the new roof never worked properly.

Figure 1: Looking into the digestate storage tank. The gas holder roof membranes already removed. Belts, net, crooked centre column. Background right hand side: secondary digester tank with double membrane gas holder roof

Figure 2: Fully visible centre column, crooked, with massively deformed stainless steel construction on top. Tank still filled with about 1 m of digestate. Net and some belts lying in the digestate

Initial thoughts

It is no surprise that the change from a single membrane gas holder roof to a double membrane gas holder roof on a digestate storage tank with a diameter of 34 metres (m) caused difficulties. As the storage tank here is the largest tank in diameter and significantly bigger than the digester and the secondary digester tanks, the whole biogas pressure situation is defined by the pressure underneath the new gas holder roof on top of the storage tank.

As a result, in every such case, the new pressure balance needs to be found and it is part of the process to have test-runs and to adjust all the pressure and the biogas flows to the gas engine anew. This was not done in 2012. The situation was not satisfactory and in 2013 and again in March 2016, the supplier showed up again to resolve the issues.

During spring and summer 2016, the operator tested the submerged mixers – there are three of them in the storage tank. It was interesting to learn how this was done. As there was no possibility to start/stop the mixers on site, each mixer was first moved into the highest position and was visually inspected. Then, the worker went to the central process control system and turned on the mixer. Walking back to the mixer site, investigating the situation with the mixer being above the substrate and in operation, returning to the process control room and turning off the mixer took a few minutes each time.

In mid-August 2016, accidentally, the flexible pipe that delivered air from the air support in between the two membranes of the gas holder roof on top of the digestate storage tank slipped out of place. As a result, the outer membrane laid down onto the inner membrane. In this situation, it could be observed

by the operator that the centre column was no longer standing upright and was significantly reduced in height. After repairing the air support connection, it was no longer possible to inflate the outer membrane. We received an order to investigate the case.

On site, the situation was a mess. With the two membranes already being removed, the situation that we found showed the centre column with its unique design was crooked (see Figure 2); dozens of belts from the roof's under-structure were either cracked or hanging loose or lying in the digestate (see Figure 3); the net from the roof's under-structure was torn, partly hanging at the tank wall and partly hanging loose, (see Figures 1-3).

Our job was to determine: what was the reason for the breakdown and what was the result? Could it be that the centre column was the starting point and it broke and tore the roof's under-construction down, which cracked the belts? Or was it the opposite and the roof for whatever reason came down and broke the centre column?

Accident Investigation

Rain and storm winds were excluded almost immediately.

The correct approach of the supplier back in 2012 would have been to communicate with the operator to find out the basis for forces and moments during assembly and operation. From an operating point of view, the hazard assessment defines the operation modes and its risks: gas pressure, safety valves, and flow-rates, for example. In real life, none of this happened. The operator, as well as the supplier, ignored every kind of safety aspects.

Figure 3: Tank wall with belts still fixed at the wall. Most belts in this area cracked and hanging into the digestate. Left hand side: overpressure/vacuum valve with related outflow pipe (in orange) and mast for submerged mixer next to it

Result and reason

The key pieces of the puzzle were as follows:

1. Figure 3 shows the outflow pipe for the overpressure/vacuum device, with the lower part of the pipe entrance being well underneath the tank wall level. At least once in its lifetime the tank was overfilled and the pipe flooded. We could not verify that the functionality of the overpressure/vacuum valve was given afterwards.
2. There are 52 regular belts and 104 belt fixing points at the tank wall, equally distributed over the tank perimeter. Each one of these belts was fixed at one side of the tank wall, then passed via the centre column to the opposite site tank wall and fixed there.
3. On top of the centre column was mounted a 1.40 m high stainless steel construction, shaped like a mushroom. The 52 belts were led over the mushroom head but not tightly fixed, (see Figure 9).
4. While the centre column broke close to its foot and was bent to one side, the stainless steel construction was massively deformed and bent to the opposite site, (see Figure 1). Many belts were cut. One of the

Figure 4: Belts wound around submerged mixer. Top left hand side: belt package with cable tie. For more details details, see Figure 5

Figure 5: Belt package fixed with cable tie – located directly next to mixer mast. Belt fixed at wall. Snap hook for fixing net

Figure 6: Belt plate, half broken out of the tank wall

fixing plates of a belt was torn out of the tank wall. A significant number of such plates was deformed but still in place, (see Figure 6).

5. In all three submerged mixers we discovered belts wound up (see Figure 4).

We scrutinised the structural calculations. The concrete works on its own clearly followed the assumptions in the calculations. But something was different: in Figure 8, five belts can be seen fixed at the stainless steel construction, with the sixth being buried underneath the bent steel construction on the left hand side. What are these six belts? No such belts are included in the structural calculations, nor in any other documentation. Our best guess was that these six belts were used during assembly. After the centre column had been built, these six belt connections were the first ones assembled and they stabilised the whole construction during further assembly.

Such additional belts had been fixed fairly well and there was hardly any slack span. This may end up in extra horizontal forces that are effective into the stainless steel construction. Such forces are not included in the structural calculations and every kind of forces that are introduced by the regular 52 belts are also to be taken by the additional six belts. As these six belts are less than half as long as the regular belts, they can absorb lengthening to a significantly lesser extent.

The investigation finally led us to the submerged mixers. What if the belts being wound around the mixers were the starting point of all the construction's breakdown and the mixers in operation tore down the construction? Then again, how could it happen that any such belt could be 'caught' by the mixers?

We found another key detail: originally, the belts were too long for the diameter of the tank. Instead of cutting the excess length, during assembly, the workers rolled them up and fixed the rolls with cable ties, (see Figure 5). The overlength was about 3 m for each of the regular belts, and somewhat shorter for the six additional belts.

Cable ties are not supposed to be used in a biogas atmosphere or in such tanks, as they age and embrittle. As a result, after years, the cable ties break, the belt package unfolds, the belts hang around loose. Of course, it could also be that not all belts had been wound up properly, some may not have been wound up at all.

As a matter of fact, many cable ties broke as many belts hung around loosely, (see Figure 3). Due to the geometry in the tank, it must have been one of the additional six belts that was first caught by the mixer. The final result was that during the minute-long test of each of the mixers outside and above the substrate in the tank, back in spring and summer 2016, vibrations led to the failure of the cable ties and the loosening of the belt-ends. During the test-run, the mixer tore the fixing plate of the (first) additional belt out of the wall, rolled up the belt and tore the centre column towards the mixer. Next, the two additional belts opposite the mixer were torn apart. Slowly, the stainless steel structure with the mushroom head was deformed and began to bend down. Due to the (over-) stretching and relaxing of the belts and rasping over the concrete structure or scratching along sharp steel parts, the belts were — finally — cut. The ongoing stressing of the whole structure, regular belts and additional belts including plate connections at the tank wall, forces that take effect on the centre column, torn belts that fall down and are caught by the other mixers, and so on — led to the final picture of the accident.

The fine print

We could never identify perfectly how the breakdown process proceeded; however, once the mechanism was discovered, in principle, there was clear evidence that the mixers were the starting point and the loose ends of the belts and additional belts linked to the centre column.

Lessons learned

How could it happen that an experienced operator plus an experienced supplier ended up with such a mess? Bad craftsmanship came together with a poor documentation. Years of operating a non-operational gas holder roof combined with ignoring the most simple formal aspects (test-run, commissioning), came together here and resulted in high costs. ●

Note: not all details have been presented in full and some elements have been simplified.

For more information:
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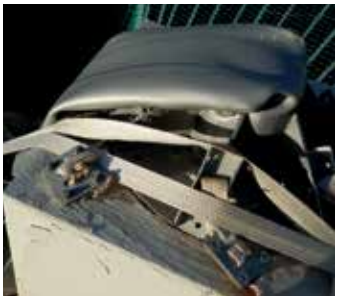

Figure 7: View on the top of the centre column. Massively deformed stainless steel construction. 'Mushroom' bent over to the left. Cracked belt visible on top left of the concrete head of the column

Figure 8: Fixing of the 'additional belts' that have been used for mounting the belt and membranes of the roof structure. Visible are five such belt connections to the stainless steel construction with the sixth one being buried underneath the bent steel structure

Figure 9: Mushroom head of the stainless steel structure. Bent over the centre column and deformed. On top of the steel structure are visible the sticks that have been used as guidance for the 52 belts laid over the mushroom head

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