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No.2 October 2025

Pellets Special 11

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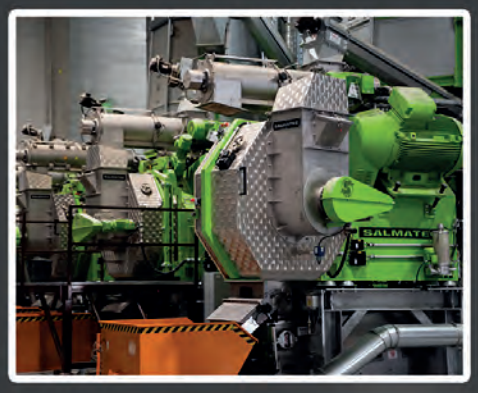

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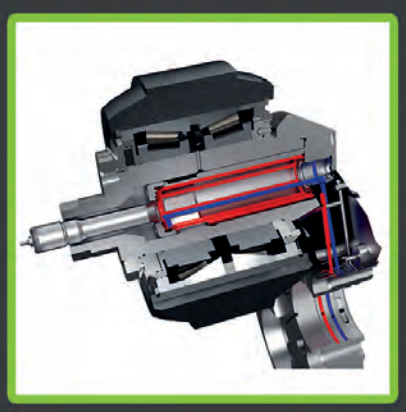
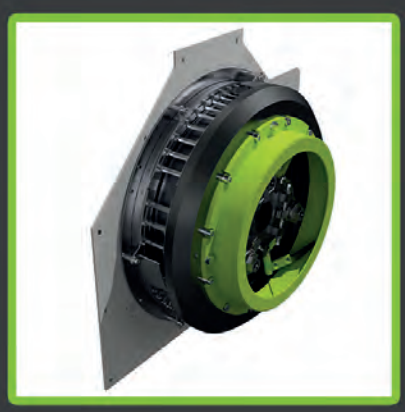


Roller Cooling System



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European Pellet Conference

25 February 2026
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2026: PELLETS – ENERGY AND MORE!

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European Pellet Conference 2026

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Largest annual pellet event worldwide

Major sustainable energy tradeshow
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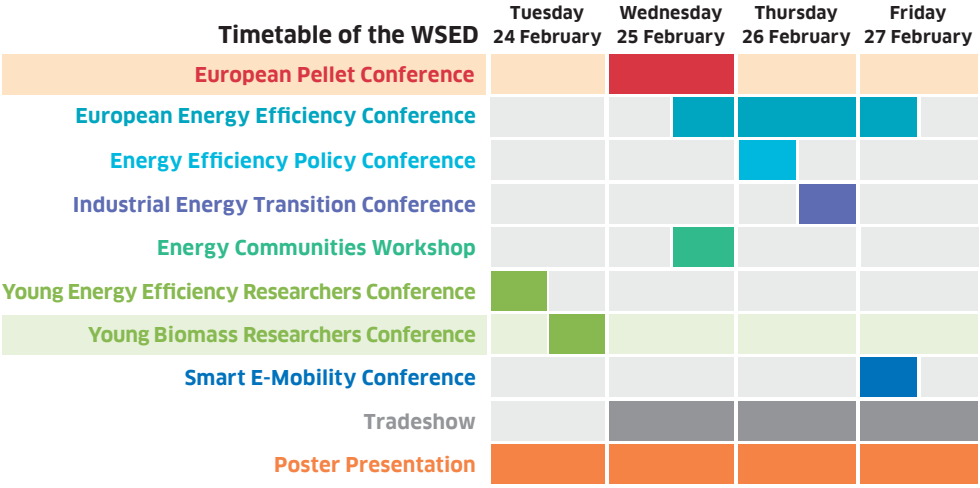
Geopolitical instabilities, high energy prices and growing global competition make one thing clear: Europe must urgently reduce its dependence on fossil fuel imports. Pellets can play an expanding role in this transformation! While facing challenges such as increasing electrification, reluctance to invest or policy uncertainties, opportunities are emerging from new applications such as BECCS, biochar and biocarbon for industry or fuels for the aviation industry.

Join us at the 2026 European Pellets Conference – the world's largest annual pellet event – to explore how bioenergy is driving decarbonisation, energy security and the circular economy for a climate-neutral Europe. The event is part of the World Sustainable Energy Days (WSED), a leading conference on the energy transition and climate neutrality.

450 participants

50 countries

40 speakers



PROGRAMME OVERVIEW

DON'T MISS OUT!
- **Policy Update**
- **Energy and more!**
- **Pellet Innovation Session**

Pellet Policy Session: Impacts of new EU policies on pellet markets: RED III, EUDR, Clean Industrial Deal, Ecodesign, ETS, EED, EPBD • Certification & emission standards • Renewable heating plans • Funding and finance

Pellets: Energy and more! New opportunities (BECCS, biofuels, biochemicals & biomaterials) and how they will affect heating and electricity markets • End consumer trends • Investment opportunities

Pellet Innovation Session: Trends across the whole pellet value chain: raw materials, pellet production, transport and storage, pellet heating and electricity, marketing, and business models • AI solutions for pellet markets • Best practice examples

Pellet Planet Session: Market insights and outlooks on European and global markets by international experts

Young Biomass Researchers Conference: Presenting the work of young researchers • Best Young Biomass Researcher Award

Poster Presentation: Displaying bioenergy projects, innovations and EU project results to an international audience

"Pellet tradeshow" (Energiesparmesse – Webuild): Leading tradeshow on renewable energy and energy efficiency • 73,000 visitors (2025) and over 100 pellet-related exhibitors

Other conferences of the World Sustainable Energy Days 2026

Energy Efficiency Policy Conference: New EU Policies (Citizens Energy Package, Grid Package, Affordable Energy Action Plan, EU funding) • Regional action • Energy security • Storage • Finance

Industrial Energy Transition Conference: EU Clean Industrial Deal • Hydrogen, energy efficiency, energy storage, PV, CCUS • Energy flexibility • Case studies

Smart E-Mobility Conference: Technology, policy and market updates • Customer experience • Electric fleets • Battery and charging innovations

Energy Communities Workshop: Boosting citizens' participation • Financing • Local and regional initiatives • One Stop Shops • Interaction with DSOs

Our audience

The entire pellet community!

- **business actors** across the bioenergy value chain: forestry, fuels, logistics, equipment, energy companies, commercial and industrial pellet users, service providers, banks etc.
- the bioenergy **research** community
- **public sector** representatives (e.g. EU institutions, national, regional and local governments, energy agencies)
- **over 450 experts each year from more than 50 countries!**

Call for Papers • Call Young Energy Researchers • Propose a speaker

You are warmly invited to get involved in the programme:

- Pellets in new application fields, pellets in combination with other renewables
- Certification, sustainability, circularity, BECCS
- Innovative technologies, products, services: raw materials, fuels, equipment, logistics, stockpiling
- Policies, programmes, standardisation, renewable heating plans
- Research results and best practice examples
- Heating, CHP, industry, digitisation and AI

More Information: **www.wsed.at/call**

Deadline: 10 October 2025

Upper Austria – a bioenergy region

Upper Austria, one of Austria's nine regions, is an ideal location for this event: More than 25 % of all automatic bioenergy boilers sold in the EU are manufactured by Upper Austrian companies and pellet heating systems are a standard solution in the region. Currently, 35 % of all dwellings in the region are heated by bioenergy (mostly pellets and bioenergy district heating). The conference is organised by the OÖ Energiesparverband, the regional energy agency of Upper Austria.

With the World Sustainable Energy Days, Upper Austria – a leader in the energy transition – is the meeting place for sustainable energy. Europe has set itself the ambitious target of becoming the first climate-neutral continent. We present and discuss solutions to practically implement the energy transition quickly. With energy efficiency and renewable energy, we will ensure competitiveness and decrease energy costs!

Markus Achleitner, Regional Minister for Economy and Energy, Upper Austria

CONFERENCE INFORMATION

Date:
25 February 2026

Venue:
Stadthalle Wels
Pollheimerstrasse 1
4600 Wels, Austria

Registration:
online at
www.wsed.at

Conference fees

245 € Pellet Conference (25 February)
420 € all WSED conferences (24 - 27 February)

All fees plus 10 % VAT
For student fees see www.wsed.at

Conference languages

English, German (simultaneous interpretation)

How to reach Wels?

- by railway: direct connections from Vienna and Vienna airport, Linz, Salzburg, Munich, etc.
- by car: A1 and A25 motorways
- by air: airports in Linz (17 km from Wels), Vienna (222 km), Salzburg (110 km), Munich (247 km)

Organiser and conference office

OÖ Energiesparverband, Tel. +43/732/7720-14386
office@esv.or.at | www.wsed.at

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Federal Ministry Innovation, Mobility and Infrastructure Republic of Austria

Federal Ministry Economy, Energy and Tourism Republic of Austria

European Pellet Conference 2026

25 February 2026, Wels / Austria
www.wsed.at

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Tradeshow: 100 pellet-related exhibitors

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Austrian hospitality

New business opportunities

Networking

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COVER PHOTO

An timber A-frame wood pellet storage warehouse at a pellet plant. Self-heating in pellet storage is a topic covered in this issue of Pellets Special, the first Bioenergy International issue under the ownership of Wodinna (photo Alan Sherrard).

HIGH TIME TO SHARE LESSONS LEARNED

In late July 2025, the pellet industry was tragically reminded that biomass pellet manufacturing is inherently a potentially hazardous business. The Horizon Biofuels blast and fire in Fremont, Nebraska, fatally injured three people – a father and his two young daughters – who were in the facility at the time of the incident. While the United States Chemical Safety and Hazard Investigation Board (CSB) investigation into the exact cause is still ongoing, given the nature of the incident, wood dust and its accumulation are likely to feature in the report.

Another related, and potentially devastating, phenomenon, if not properly monitored, is the self-heating of pellets in storage. This was a timely topic that headlined a well-attended value chain workshop in Copenhagen, Denmark, in September 2025. As reported in this issue, the initiative was led by global pellet industry consultants FutureMetrics and Danish energy utility Ørsted, which experienced two major pellet storage self-heating incidents in 2022 and 2023, respectively, and was organized by the Wood Pellet Association of Canada (WPAC). WPAC is an industry organization that has, for almost two decades, demonstrated foresight and leadership on pellet industry health and safety issues, and deserves to be commended and supported in these efforts.

Indeed, as this issue is being finalised, the 11th Pellets Special and first under the "Wodinna" banner, firefighters have been called out to a blaze at a pellet storage facility in Härnosand, Sweden. As it happens, the Härnosand facility is a pellet industry pioneer and one of the largest and oldest wood pellet production sites in the country. But it is also a reminder that decades of operational experience in itself are no guarantee against incidents. To quote Frank Huess Hedlund and Øssur Jarleivson Hilduberg, authors of a paper "*Fatal Accidents During Marine Transport of Wood Pellets Due to Off-Gassing: Experiences from Denmark*" published in 2017, "having paid the price of an accident, we should use the opportunity to learn from it. The benefits of such learning are obvious—to avoid repetition and to share the lessons learned in order to minimize the number of times the same lessons have to be learned. What is not so obvious, however, is how to make this seemingly simple and straightforward idea work in practice."

Perhaps this could be done by forming and developing an interdisciplinary forum on pellet industry health and safety issues, such as dust, off-gassing, and self-heating, to continue the crucial type of conversations that were had in Copenhagen, Denmark, with the sharing of experiences, best practices, and identification of critical knowledge gaps across the value chain. The core objective of such a forum would be to try and prevent incidents from occurring, not just at the pellet plant but along the entire value-chain, mitigate the damage if they occur, to preserve life and property – in that order of priority.

The biomass pellet industry is expanding with new players, new geographies, and new feedstocks. The World of Pellets Map 2025 that accompanies this issue puts the global installed production capacity estimation in 2024 at just over 72.5 million tonnes per annum (excl. Belarus and Russia), spread across 1,292 operational biomass pellet plants in 72 countries. EN*plus* has become the undisputed technical quality certification for pellets used in (European) consumer markets, while sustainability certifications such as SBP have grown for industrial and utility markets. A biomass pellet for cooking market is emerging in India and sub-Saharan Africa, the latter discussed in more detail by Dr Christian Rakos, President of the World Bioenergy Association (WBA).

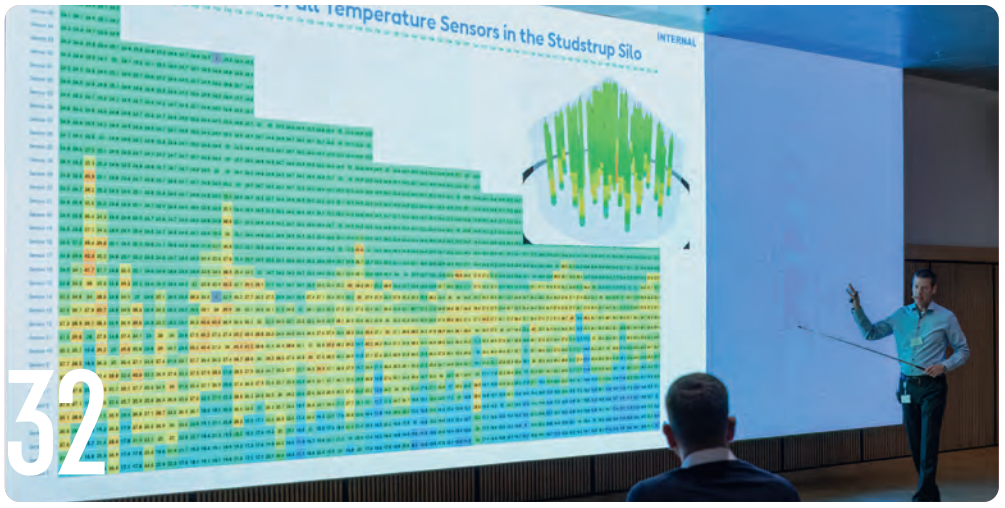
With this growth, there is an increasing inherent risk that, despite what we already know from previous hard-learned lessons, dust explosions, carbon monoxide poisoning, and self-heating incidents will repeat themselves because of a failure to communicate and use the available knowledge. The industry cannot afford media shifting, whereby biomass pellets are a positive benefit for the circular bioeconomy and climate, but come at the cost of being an occupational or consumer hazard. Therefore, it is incumbent on all in the value chain to share knowledge and best practices; we all want to come home safely after work. Health and safety are not competitive trade secrets but a license to operate. A license that can all too easily be revoked by heartbreaking headlines and fiery footage, as public perception and legislators have an unspoken limit on the number of times that the same lesson can be learned.

Alan Sherrard

"Biotrio" Dorota Natucka-Persson, Alan Sherrard and Jeanette Fogelmark

CONTENT 2-2025

Pellets Special 11



Pellet storage

Stakeholders from across the pellet industry value chain gathered at Ørsted's corporate HQ in Copenhagen, Denmark, for a workshop on Safe Wood Pellet Storage: Preventing, Detecting, and Managing Self-Heating.

Technology

Biomass fuels serve as a flexible, carbon-neutral energy source. However, this versatility comes with challenges, particularly concerning moisture content.

Pellets

TG2 has completed its first test shipment of steam-treated black pellets to a energy utility in Japan that has conducted co-firing tests with coal.

Biocoal

Joensuu Biocoal, the biocoal production facility developed by Taaleri Bioindustry, has begun production, and the first deliveries to customers have been made. The production capacity is 60,000 tonnes of torrefied biomass, also known as biocoal, and is the largest-of-its-kind single biocoal production unit in Europe.

Market

Wood pellet demand in 2025 has continued its upward trajectory from 2024.

Pellet plant

Bioburn Energy Solutions Ltd is bringing “clean, affordable energy to homes and industries” in Uganda.

Technology

A Mantex Biomass Analyzer is the latest technology addition to Arctic Paper Grycksbo.

Pellet plant

In January 2022, HS Timber broke ground on Acon Timber, a greenfield softwood sawmill and wood pellet plant in Argentina, marking the Group’s first venture in Latin America

Technology

Dr Christian Rakos, President World Bioenergy Association (WBA) provides an update on projects and reflections on a rapidly developing market space for biomass pellets – clean, green cooking.

Biochar Plant

In Canada, Airex Energy Inc., Groupe Rémabec, and SUEZ have jointly inaugurated "Carbonity”, the country's first industrial-scale biochar plant.

ADVERTISERS

GLOBAL WOOD PELLET DEMAND RECOVERED IN 2025, BUT THE FUTURE IS UNCERTAIN

Wood pellet demand in 2025 has continued its upward trajectory from 2024, with growth seen across major consuming regions in both the heating and industrial markets. However, emerging headwinds in Europe create an uncertain medium-term outlook as Rachael Levinson, Associate Director, Hawkins Wright reports.

IN 2024, INDUSTRIAL PELLET DEMAND IN EUROPE recovered to 2020 levels, though it did not quite reach the peak of 2021. This upward trend has continued into 2025, with European demand expected to reach around 17 million tonnes this year. The resurgence has been driven primarily by the UK (see chart), where both Drax and Lynemouth increased generation in 2024 and again in 2025. Meanwhile, the UK's MGT Teesside power plant, which began operations in 2023, has been gradually ramping up output. After facing operational challenges last year, it has maintained stable generation through most of 2025. As of end of September, its generation was up +31 percent year-on-year.

A changing electricity mix in Europe is reshaping how biomass power plants operate across the continent. Operations have become significantly more seasonal. The rise in renewable generation has heightened volatility in European power prices, creating new opportunities and challenges for biomass plants.

Outside of the UK, France's Albioma operates several coal-to-biomass conversions in the French overseas territories. Its industrial demand has increased from around 0.5 million tonnes in 2023 to over 1 million tonnes in 2025.

On the supply side, investment activity targeting the European market has been slower in 2025. Uncertainty over demand beyond 2027 (see below) has removed the need for new industrial capacity to serve Europe. The only notable development is Enviva's 1.1 million tonnes per year pellet mill in Epes, Alabama, which is due online imminently.

A key development in recent years has been the growing abundance of Asian pellets sold into the European market. In the first six months of 2025, European users imported 400 thousand tonnes of pellets from Asia. Around half went to Albioma's island power plants, while the rest went mainly to the Netherlands. A similar volume was imported during the first half of 2024, compared with only 188 thousand tonnes over the same period in 2023.

It had been speculated that the introduction of the EUDR in December 2025 — now likely delayed until 2026 — would impact the Asian trade flows. However, current indications suggest that imports from Asia will continue beyond EUDR implementation, with suppliers and end-users confident the material will comply.

The Asian industrial pellet market has grown strongly over the past decade, recording a compound annual growth rate of 23 percent. As the last remaining Japanese power plants come online, growth is expected to slow, though not before Japan surpasses the UK to become the world's largest pellet market in 2026. Pellet demand in South Korea is also expected to peak next year.

In Europe's heating pellet market, demand growth has also slowed in recent years. In 2025, European heating demand is expected to reach 19 million tonnes, up 4 percent year-on-year.

Heating pellet demand in Europe has not materialised as expected in recent years. Boiler and stove sales across much of Europe fell sharply in 2023 and 2024 after reaching record highs in 2022. Government subsidies are less generous than before, but heating pellets remain competitive against fossil fuels. In most countries — aside from Austria and Poland — appliance sales remain subdued in 2025. Moreover, a series of mild winters across Europe has further dampened demand. Early weather forecasts suggest another mild winter in Europe this year, particularly in northern regions.

Heating market activity picked up in late summer as winter approached. A disruption to trade from Brazil prompted renewed buying interest for European pellets. Brazil has become an increasingly important exporter to Europe's heating pellet market in recent years, particularly to Italy. In the first half of 2025, Europe imported 267 thousand tonnes from Brazil— similar to 2024 and 2023 levels. However, since the US imposed tariffs on Brazilian goods, raw material availability in Brazil has tightened, affecting pellet producers reliant on residues from the wood products sector.

New heating pellet mills continue to come online in Europe to support the anticipated steady demand growth. Around 1.5 million tonnes of capacity is currently under construction or financed. However, raw material availability continues to challenge many producers. The struggling global economy has reduced demand for sawnwood, which in turn has limited the availability of sawmill residues.

Future Outlook

Looking ahead, considerable uncertainty remains around demand for the coming years, particularly in Europe's industrial market. It was

"In 2024, industrial pellet demand in Europe recovered to 2020 levels, though it did not quite reach the peak of 2021. This upward trend has continued into 2025, with European demand expected to reach around 17 million tonnes this year."

RACHAEL LEVINSON, ASSOCIATE DIRECTOR, HAWKINS WRIGHT

welcome news that Drax secured heads of terms with the UK government in February to continue receiving subsidies beyond 2027. However, the structure of the new support means Drax's demand will fall sharply from 2027. Lynemouth remains in negotiations with the government, and support for either plant will still require parliamentary approval.

The UK government remains supportive of BECCS but has yet to confirm funding for the Drax and Lynemouth projects.

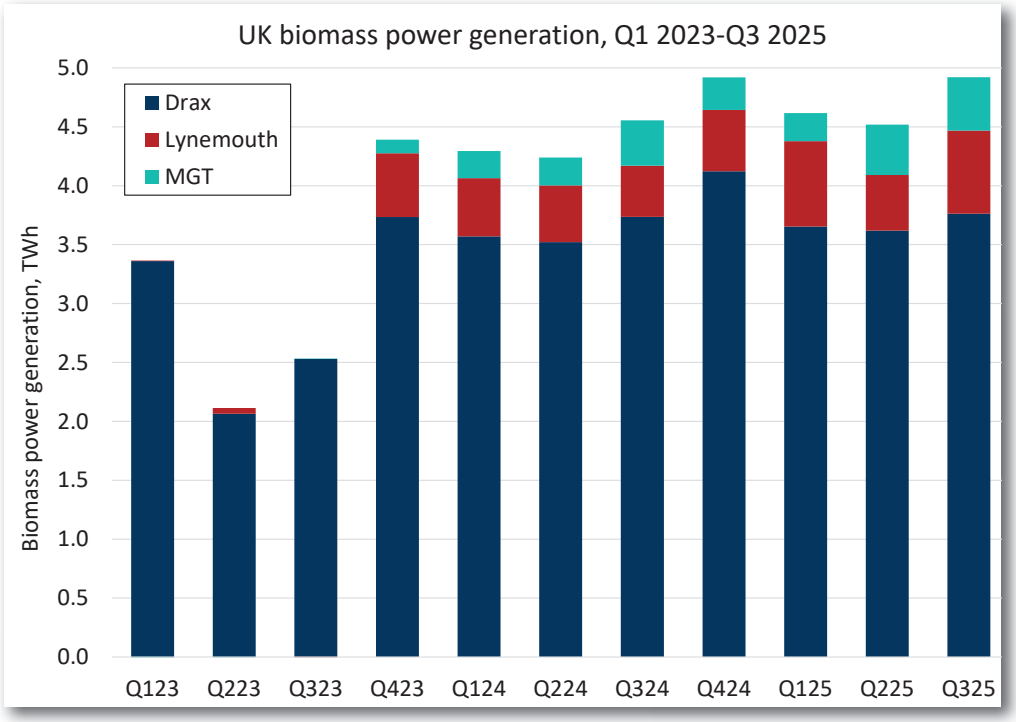
The Dutch government, by contrast, remains firm in its position not to support large-scale BECCS. However, the recent Climate and Energy Outlook from Dutch agency PBL highlights that the Netherlands is on track to miss its 2030 climate targets, making later targets even harder to achieve. The subsidies currently supporting wood pellet use at the three Dutch power plants will expire in 2026 and 2027, which could lead to increased coal use at the two cofiring plants thereafter. These coal plants are relatively new, and their owners are exploring options to extend operations beyond the subsidy period, with BECCS being one consideration.

The changes in subsidy support mean we forecast a 4 million tonne decline in European industrial demand between 2025 and 2028 in our central scenario. However, upside opportunities remain, including unsubsidised merchant power sales, dependent on future power and carbon prices. There is strong interest from heavy industry in pursuing decarbonisation, though waning global sentiment and lower energy prices have tempered momentum. Anticipated increases in European carbon prices next year could help reinvigorate interest.

There are also growing signs that Poland may increase its biomass use, potentially including wood pellets. The capacity market mechanism requires greenhouse gas (GHG) emission reductions at coal plants, which can be achieved through biomass cofiring.

While growth in the Asian industrial market is likely to level off over the next few years, pellet demand could strengthen again toward 2030. Japan's energy-efficiency mandate for coal power plants, taking effect from 2030, is expected to support some biomass use. This is a major driver of growing interest in the black pellet/biocoal market in the region.

For more information and analysis about global wood pellet markets, contact Hawkins Wright, a publisher of a range of multi-client reports offering up-to-date news, supply and demand analysis, forecasts, spot prices and commentary, price outlooks, and cost assessments.



The resurgence in European industrial pellet demand has primarily been driven by the UK.

Text & graphic: Rachael Levinson
Photo: Alan Sherrard
PS11/7518/AS

HAWKINS WRIGHT

Biocoal and biocarbon market review

The market for biocoal and biocarbon – torrefied, steam-treated, pyrolysed, and hydrothermal carbonization – has been showing signs of a resurrection in the past couple of years, supported by the global phase-out of coal and the need for heavy industry to defossilize. In particular, the emergence of demand from heavy industry, including the metallurgical sector, is changing the outlook for the biocoal and biocarbon markets.

Different market requirements

The requirements are different from those needed to replace coal in heat and power generation, such as carbon content, energy content, chemical composition, and densification form. Different technologies are being developed to serve the different end-use markets, but there is still some confusion as to who is doing what, where, and when. In the past, biocoal and biocarbon technology, often referred to as black pellets, has struggled to gain a foothold, but there are now numerous commercial-scale production plants in the pipeline. These will be key to the biocoal and biocarbon industry finally establishing itself in the wider biomass market. A new Hawkins Wright report, "A review of the commercial status of the global biocarbon and biocoal markets", presents an introduction to the different technology types available. It also identifies the key suppliers today and projects in the pipeline, as well as their target markets, in time for the annual European Biocarbon Summit in Amsterdam, the Netherlands.

PS11/7523/AS

ENPLUS AWARDED EUROPEAN COOPERATION FOR ACCREDITATION RECOGNITION

After undergoing an evaluation process, the "EN*plus*" certification scheme for wood pellet quality, has successfully passed the acceptance verification for accreditation by the European Cooperation for Accreditation (EA) according to the requirements set out in the document EA 1/22 A-AB 2023 "EA procedure and criteria for the evaluation of conformity assessment schemes by EA accreditation body members".

THE EUROPEAN COOPERATION FOR ACCREDITATION (EA) is a not-for-profit association, and formally appointed by the European Commission in Regulation (EC) No. 765/2008 to develop and maintain a multilateral agreement of mutual recognition, the EA MLA, based on a harmonized accreditation infrastructure.

Unique recognition

The EA MLA exists to facilitate fair trade, ensure product and service quality, and reduce technical barriers to trade, and EN*plus* is currently the only wood pellet quality certification on the market to receive such recognition. ACCREDIA was the home accreditation body that conducted the assessment of EN*plus* by collecting comments and feedback from all National Accreditation bodies, members of the European Cooperation for Accreditation (EA). As a result of the recognition, all certification bodies listed by EN*plus* will now be required to be accredited specifically to the EN-plus standard, rather than to a general pellet ISO standard as they were previously.

Over 13.3 million tonnes certified in 2024

According to a statement, EN*plus* has certified over 13.3 million tonnes of wood pellets in 2024. Germany is the leading country with almost 3.7 million tonnes of EN*plus*-certified pellets produced in 2024. Austria comes second with a slight increase, reaching a total of 1.7 million tonnes of certified pellets. France is third with 681,000 tonnes of certified pellets. The 2024 EN*plus* top five also includes Spain and Poland, the latter country, which hosted a well-attended third edition of the European Pellet Forum (EPF) in Gdynia, Poland.

Fraud management milestone

The past year was a significant one for the fraud management team which further developed the scheme´s blacklist database by exposing not only fraudulent entities but also misleading websites and contact details to be avoided by users. The scheme follows strict procedures, approved by lawyers, to be executed in cases of infringement and lack of cooperation. EN*plus* has reached a total of 1,300 identified and resolved fraud cases, an achievement that speaks to the scheme's ambition to remain relevant and protect its users.

A dedicated mobile application (app) was also released this year. It enables pellet professionals and consumers to verify a supplier's certification, scan a bag of pellets to check its approval status, and easily report fraud. The app has already been downloaded by thousands of users from Europe and beyond.

Seized pellets in Italy

For example, in Italy, the Legnago (VR) division of the Guardia di Finanza seized more than 400 tonnes of fraudulent EN*plus* pellets, with transgressions ranging from the lack of Italian-language information on the pellet bags to fraudulent trade stating unrealistic calorific values and counterfeiting of the EN*plus* trademark by non-certified companies. In collaboration with the EN*plus* Head Office in Brussels, Belgium, the EN*plus* Italy Office – the national licenser AIEL – is assisting the Customs and the Guardia di Finanza in the fight against the trafficking of counterfeit pellets marketed through numerous intermediaries of many national and foreign companies, and then offered at prices that distort the usual market dynamics.

According to EN*plus*, this pellet supply chain track and trace is made possible thanks to the rigorous international application of EN*plus* standards. The approval of individual bag designs for each certified supplier, the introduction of approval number of the bag designs themselves, the compulsory serial number printed on each bag, and the meticulous verification and archiving activities of the EN*plus* national licenser AIEL as well as all other stakeholders involved in the scheme provide for such efficient actions.

Updated ST 1001 and ST 1003 standards

The certification scheme has also released updated versions of the EN*plus* ST 1001 and EN-plus ST 1003 documents, marking "a step forward in the continuous improvement of the EN-*plus* certification scheme and its key role in the pellet market" to deliver more "clarity, better consistency, and optimised efficiency" when it comes to the needs of certified companies.

While the changes are described as "minor", companies have until the end of 2025 to comply with them during a three-month transition period as January 1, 2026 is the entry-into-force date for the second editions. The new editions of the documents introduce refined definitions for trademark use, producers, and bulk pellet trade, along with updated normative references.

The second edition of EN*plus* ST 1001 presents structural changes that define requirements for multisite companies and clarify outsourcing agreements, especially for the cases involving non-certified service providers. Technical enhancements detail calibration protocols for measuring devices, and refine procedures for big bag filling and self-monitoring.

The product requirements for traders with bagging activities have been simplified, as these companies will no longer need to ensure mechanical durability compliance. According to EN*plus*, delivery documentation has been "streamlined, with clearer distinctions between producer and trader responsibilities", while updates to complaint management and reference sample handling, along with revised tables and visuals, round out a more robust and user-friendly standard.

The revised EN*plus* ST 1003 introduces a range of targeted updates aimed at improving the precision and usability of the standard. Notably, the definitions of key terms such as producer, on-product use of trademarks, and bulk pellet trade without physical contact have been clarified to eliminate ambiguity. Provisions related to trademark usage—especially concerning logo placement, bag design permissions, and translation requirements—have been revised to "better support consistent branding and international communication."

Text & photo: Alan Sherrard
PS11/7516/AS

Pallets of bagged pellets awaiting collection at a wood pellet plant. A new EN*plus* app enables pellet professionals and consumers to verify a supplier's EN*plus* certification by scanning a bag of pellets to check its approval status.

Dr Christian Rakos providing a hands-on lecture on the principles and benefits of cooking with biomass pellets and woodchips using improved cookstoves during the Youth Day at the 12th GBEP Bioenergy Week conference in Kampala, Uganda.

BIOMASS PELLETS AND CLEAN COOKING IN SUB-SAHARAN AFRICA

Sub-Saharan Africa (SSA) is seeing a significantly growing number of biomass pellet cooking-related projects, something that the 12th Global Bioenergy Partnership (GBEP) conference in Kampala, Uganda, held at the beginning of July, was a testament to. In this article, Dr Christian Rakos, President of the World Bioenergy Association (WBA), provides an update on projects and reflections on a rapidly developing market space for biomass pellets – clean, green cooking.

ORIGINALLY DRAFTED AS A REPORT BRIEF BY **WBA** for the International Energy Agency (IEA), this article is based on that report, which in turn is based on numerous people directly involved in the emerging African biomass pellet sector sharing data with WBA on their projects. According to the WBA, the combined annual production capacity of the biomass pellet plants, both planned and operational in Sub-Saharan Africa (SSA), is already in excess of 500,000 tonnes, which would suffice to supply cooking fuel for more than 5 million persons.

– There is a fundamental lack of data and statistics in this ever-evolving area, so this is by no means a complete or even accurate description of the situation but it is a start, remarked Dr Christian Rakos, adding that production of most pellet plants is below the installed capacity, which is based on the assumption of operating at nominal capacity for 5,000 hours or 320 days annually.

– Actual pellet production can, of course, differ considerably from capacity for any number of reasons – single shift operation, lack of demand, lack of feedstock, intermittent electricity supply, waiting for spare parts, just to mention a few, Dr Christian Rakos said.

Clean cooking with a difference

On the demand side, pellet consumption per household in SSA – defined as five persons – is usually reported at about 1 kg per day. Oftentimes, pellets are not the only cooking fuel used in a given household. Furthermore, there are also a few examples of pellets being used for industrial process heat applications. According to Dr Rakos, the reason for the rapidly expanding interest in cooking with pellets is based on several factors that distinguish pellet cooking from other clean cooking solutions available on the market.

– Pellet fuel for cooking is cheaper in terms of delivered energy costs than all other alternatives due to the combination of high efficiency of the cookstove and the low cost of the fuel. Pellet stoves are already at Tier 4 requirements in terms of efficiency and emissions and are clearly aligned with the requirements of a modern cooking solution, explained Dr Rakos.

Furthermore, biomass pellets can be produced locally using residual biomass materials, creating a new value chain, thus contributing to local economic development.

– This is an especially crucial aspect to take into consideration. There has to be an alternative employment for those currently engaged in the typically informal charcoal production, distribution, and retail value chain. Biomass pellets can offer that, along with all the other health and environmental benefits, Dr Rakos emphasised, adding that this independence from volatile global energy markets and fluctuating exchange rates makes pellets a safe financial choice for households that have a fundamental need for affordable energy to cook food.

Need to develop market infrastructure

– The key challenge of building pellet cooking infrastructures in SSA is the need to both build up a market for pellet cookstoves and, simultaneously, provide the needed fuel. Or, to put it differently, to invest significant resources into a pellet plant without an existing proven market demand. To overcome this dilemma, companies engaged in this business needed to develop complex business models that include both cookstove sales, pellet production, and distribution, Dr Rakos explained.

As a consequence, projects are struggling with challenging economic conditions and serious funding issues. These typically lead to underinvestment in pellet plants, resulting in lower-than-expected production and supply issues while demand grows.

Furthermore, the lack of experience with pellet production and its technical intricacies presents a problem for many start-ups that needs to be addressed.

– What the emerging African pellet sector would need more than anything else is companies experienced in producing pellets, that can avail of the necessary capital to invest in proper industrial standard production equipment, and that have the means to invest in necessary promotion to rapidly build up the market, said Dr Rakos.

Other challenges that have hindered the development of an African pellet sector in the past are the lack of industrial processing facilities for different biomass types. For instance, there are no larger sawmills and only a few large processing plants for agricultural products that have residual biomass readily available for pellet production.

– An exception is sugar mills, some of which – due to the lack of cogeneration units – landfill large amounts of bagasse that could be used as raw material for pellet production, said Dr Rakos.

Poor road infrastructure and transport logistics present both a challenge for procuring raw material for pellet production and for distributing the fuel. Current efforts to disseminate pellet cooking are focused on urban- and peri-urban areas.

– Here, people are used to purchasing small quantities of fuel on a regular, even daily basis, not just because they lack the financial means but also for logistical reasons. High transport costs are also hindering pellet imports, which could provide an interim solution for building up markets until local production becomes viable, said Dr Rakos.

Poor and unreliable electricity supply is another major challenge that, in some cases, keeps pellet production from operating consistently.

– A plant reported they got no more than an average of seven hours of power a day. Sudden unplanned interruption of electricity supply creates considerable problems with pelleting equipment, and plants ideally need backup power systems, but due to lack of resources do not have that, said Dr Rakos.

Enormous market potential

On the other hand, there are opportunities and a clear economic scope to produce pellets for a potentially very large market. According to FAOSTAT "*Forestry Production and Trade*" (2019), 34 million tonnes of charcoal were used in 2018 for cooking in SSA, mainly in urban settlements, and could partly be replaced by pellets.

While charcoal has about twice the energy content of pellets per kg, traditional charcoal stoves are about half as efficient as gasifier pellet cookstoves; thus, one kg of pellets can replace about the same amount of charcoal. And that is without considering the inefficiencies and losses associated with typical charcoal production.

– This makes pellets a cheaper choice than charcoal, but even more so compared to liquefied petroleum gas (LPG), ethanol, or electricity, which are about twice as expensive in terms of delivered energy cost, said Dr Rakos.

As mentioned, pellet imports could be a way of reducing the risk of in-

A biomass pelleting unit installation in progress for Tru Biomass at a site on the outskirts of Kampala.

A mini-moto pellet gasifier stove in operation.

A pile of sawdust. Numerous small sawmills around Kampala process plantation grown eucalyptus and pine for local construction and furniture markets.

Cut to length, air-dried slabs and edgings from local sawmills, are sold as fire-wood for the cooking market.

A mini-truck with charcoal caught in Kampala's inbound daily Jam. From large transfer points outside the city, these form the local distribution to retailers.

A local neighbourhood charcoal retailer. The charcoal is sold by volume in three ocular based qualities, denoted by the colour of the plastic bag.

vesting in a pelleting plant before a substantial market has been established.

– Interestingly, there is no evidence of imports playing a relevant role in African pellet cooking projects. To some extent, this may be explained by the high transport costs – particularly to areas far from sea ports, noted Dr Rakos.

On the other hand, large volumes of pellets are being traded internationally, and it should be easy to import some of these volumes from reasonably close producers such as Cameroon and South Africa, but also from Brazil and Vietnam at costs that would likely be lower than those of locally produced pellets.

– Somehow, this opportunity seems overlooked or has been rejected due to the commitment to support local economies. Yet other fuels that are almost exclusively imported, such as ethanol or LPG, seem to raise less concern about these aspects, remarked Dr Rakos.

Diverse available feedstock

There are significant opportunities for biomass from invasive species, which in many African countries present a significant environmental threat, and could be used as raw material for pellet or woodchip production at low cost.

Abandoned tree plantations, such as overgrown eucalyptus, offer another, and in some cases, very abundant source of raw material. A sustainable supply of feedstock for pellet production can also be secured from dedicated biomass production by fast-growing grasses (Miscanthus, Napier Grass, Bamboo, or Energy Cane) or dedicated fast-growing short rotation tree plantations. Some producers are already pursuing this route.

Woodchips, a bridge to pellets

According to Dr Rakos, the use of woodchips instead of pellets could represent an important stepping stone for establishing an African pellet economy. Gasifier stoves also work well with dry woodchips. However, they need to be larger to accommodate sufficient fuel for the required cooking times, as woodchips have a lower energy density.

– Woodchips are much easier to produce than pellets and require a much lower upfront investment for fuel production. The bottleneck is currently that most gasification stove producers have so far only offered models for pellet cooking, Dr Rakos explained.

Investment needed for pellet production infrastructure

Getting consistent data on the cost of pellet production infrastructure is difficult, as prices of equipment show a very significant variation.

– An experienced investor quoted a figure of US$1 million for a production capacity of 15,000 tonnes-per-annum, Dr Rakos said.

The production capacity of pellet mills is typically described by the production capacity per hour, with annual production capacity a function of operating hours. Experiences show that these also show considerable variations depending on local conditions.

– An economically successful pellet plant should aim to reach 5,000 hours of operation per year, thus a mill with a pelletizer capacity of 3-4 tonnes per hour would produce between 15,000 and 20,000 tonnes per annum under good conditions, Dr Christian Rakos said.

A colourful variety of LPG bottles. Pushed by oil and gas majors as a "clean" cooking fuel, LPG is an expensive fuel, beyond the means of many households.

Dr Rakos also noted that there are considerable price differences between Chinese and European or North American equipment manufacturers. The entire machinery needed for a pellet plant with a capacity of 2 t/h or 10,000 tonnes per annum (tpa) has been offered for as low as US$270,000 by Chinese manufacturers. Factoring in costs for land, transportation, building, storage, and infrastructure in the same order of magnitude is the lower limit of production infrastructure cost, while with European or North American machinery, the cost could be triple.

Financing pellet production facilities and stoves

When it comes to funding pellet cooking projects, so-called Development Financial Institution (DFI) funding has, up to now, been critical. The experience so far has been that funding has often not been sufficient to ensure sustainable economic operation, mainly, as mentioned, due to underinvestment in the pelleting plant itself.

– Only a few projects have so far managed to get significant funding from equity investors, Dr Christian Rakos said.

High interest rates in Africa make capital expensive and increase the perceived risk of investing in an emerging market. The main source of funding for gasifier cookstoves has so far been the Modern Cooking Facility for Africa (MCFA), a funding program set up in late 2021 by the Nordic Green Bank (NEFCO) and the Swedish International Development Agency (SIDA) to support the development and scale-up of clean cooking technologies in SSA using a Results-Based Financing approach. This organisation alone has been funding approximately 120,000 gasification cookstoves and is in the process of closing a further round of major pellet cooking projects.

cont. p. 15

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Cookstove production infrastructure

There are three main cookstove producers in South Africa – Ekasi Energy (Pty) Ltd, EGA Solar (Pty) Ltd (trading as Ener-G-Africa), and Rocket Works (Pty) Ltd – that both produce gasifier pellet cookstoves, and Improved Cook Stoves (ICS), the latter of which typically use conventional biomass such as firewood, and charcoal.

Located in Paarl, Ener G Africa can produce up to 40,000 units annually, while Rocket Works has a facility in New Germany producing cookstoves in considerable volumes. Located in Stellenbosch, Ekasi Energy has developed a series of Forced Air Biomass Stove (FabStove) gasifier stove models that are distributed as kits for assembly in local markets. It has also developed the "FabTainer", a containerised turnkey biomass pellet production unit with a capacity of around 400 kg per hour.

BURN – said to be the first vertically integrated modern cookstove company in SSA – is a well-known producer of ICS in Nairobi, Kenya. It is also perhaps the largest stove producer with a capacity to produce 400,000 units per month. The company currently produces a range of wood, ethanol, charcoal, LPG, and electric cookstoves, though not pellet cookstoves. Yet one might add. The company plans to launch five new products, expand sales into several Central- and West African countries, and expand monthly production capacity to 1 million units.

In Uganda, there are stove production companies located in Uiri (Code Ltd), and Masooli, Gayaza (Tru Biomass), each with a capacity to produce 6,000 stoves per annum. In the Apac district, Clean Energy Partnership for Africa (CEPA Ltd) has a production facility for 9,000 units.

– For this facility, infrastructure costs of US$970,000 were reported. As CEPA is also producing pellets at this location, it is not clear if this sum also includes the costs for pelletizing equipment, noted Dr Rakos.

Most other pellet cookstoves, such as the Ecosafi cookstove, the Mimi Moto, and the SSM stoves, are being produced in China. In terms of quality, pellet cookstoves from SSM, Mimi Moto, Eco Safi, FabStove, and Supamoto (Rocket Works) are all at Tier 4 emission and efficiency values.

– In terms of manufacturing, gasification cookstoves are actually fairly simple devices that can be produced with limited investment. As Dave Lello, CEO of Ekasi Energy and developer of the FabStove pellet cookstove, mentioned, the laser cutting machinery and all auxiliary technology to produce the pieces needed for 20,000 gasifier cookstoves per annum would cost approximately US$50,000 on a single-shift production, explained Dr Rakos.

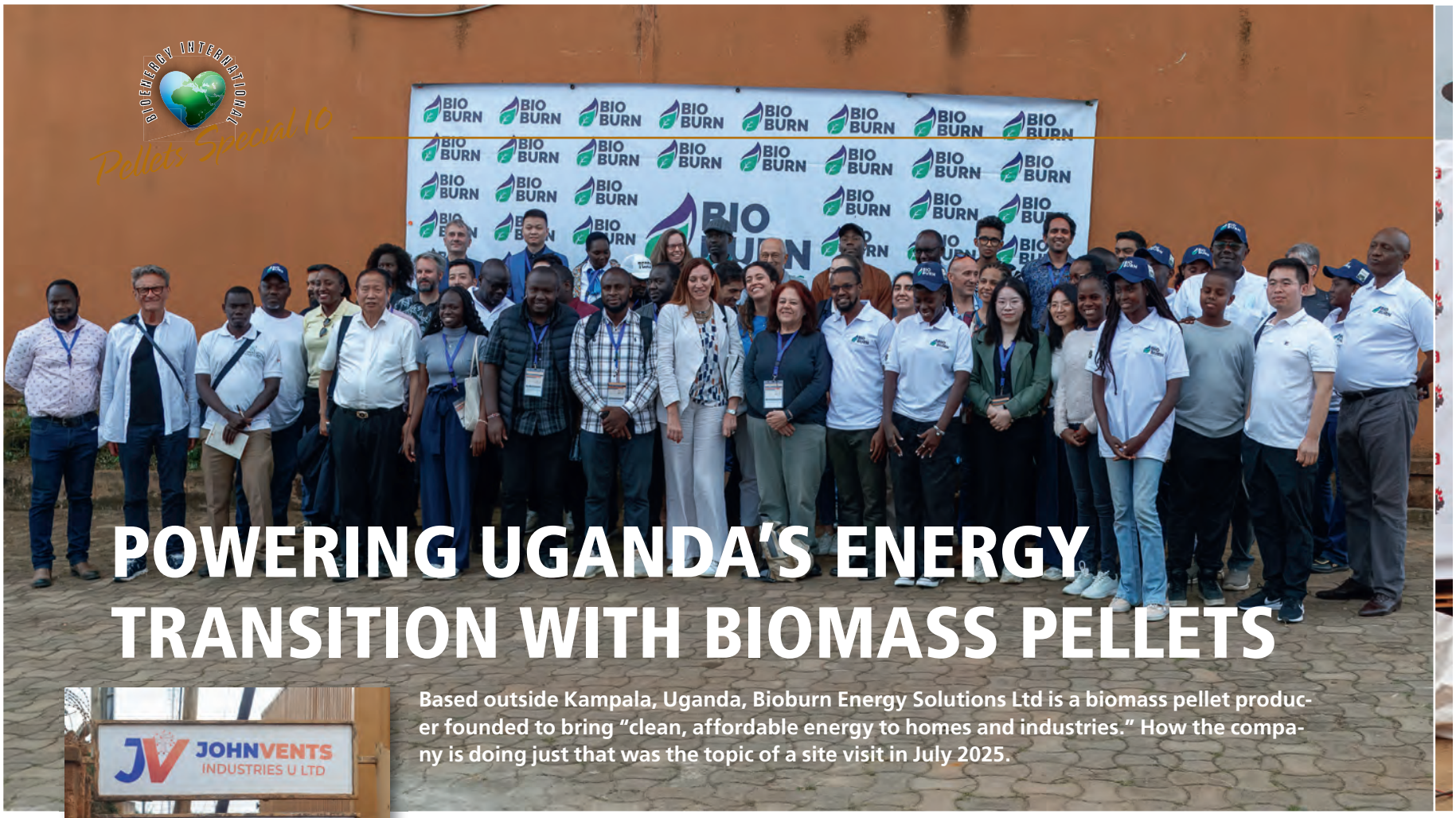
Ekasi Energy has established a system of centrally cutting sheet metal, delivering the flat-packed pieces to local assembly shops where the stoves are assembled. The investment cost into tooling for such a local assembly shop has been in the order of magnitude of US$5,000.

– Five people can assemble 50 stoves per day in such a workshop, so about 1,000 pieces per year. This approach significantly reduces costs due to import tariffs when the stoves are exported, as import tariffs for finished products are typically much higher. Also, providing local assembly employment opportunities enhances market acceptance for the stove, concluded Dr Christian Rakos.

Dave Lello, CEO of Ekasi Energy and developer of the FabStove pellet cookstove.

Text & photos: Alan Sherrard
PS11/7517/AS

A eucalyptus plantation on the outskirts of Kampala. A fast growing introduced species, it provides sawlogs, and poles processed by small local sawmills and used in local construction and furniture markets. The slabs and sawdust residues are used as firewood, and pellet feedstock respectively.



POWERING UGANDA'S ENERGY TRANSITION WITH BIOMASS PELLETS

Based outside Kampala, Uganda, Bioburn Energy Solutions Ltd is a biomass pellet producer founded to bring "clean, affordable energy to homes and industries." How the company is doing just that was the topic of a site visit in July 2025.

HELD IN KAMPALA, UGANDA, a key focus of the 12th Global Bioenergy Partnership (GBEP) Bioenergy Week was on how to build, both at the regional and national level, an enabling environment for just and inclusive energy transitions, and the potential of bioenergy to contribute to the United Nations' Sustainable Development Goals (SDGs). More specifically, SDG7, on modern energy access and clean cooking.

With four out of five people in sub-Saharan Africa relying on health-hazardous, inefficient, and environmentally detrimental cooking fuels and methods, modern clean cookstoves and biomass fuels have a critical role to play in the clean cooking transition. Founded by directors Jaime Byaruhanga and Ahmed Abdirahim Warsame, Bioburn Energy Solutions is one such company that aims to bring biomass-based "clean, affordable energy to homes and industries."

– Inspired by local challenges with firewood and charcoal, we began producing eco-friendly energy pellets from agricultural waste. From our facility here in Bweyogerere, we deliver reliable, high-quality fuel that supports both the environment and the local economy, said Jaime Byaruhanga, addressing the GBEP delegation that visited the plant on the post-conference tour.

Formidable task

As the GBEP conference provided testimony to, the task at hand is Herculean, compounded in the greater Kampala context by challenging logistics and infrastructure, very apparent in an expansive capital city like Kampala. World Population Review pegs the population of Kampala at around 4.2 million (2025), over double the United Nations' 1.9 million (2024) estimate in the city's five districts, and up to 6.7 million when counting in the surrounding peri-urban hinterland.

Rapid informal urbanization, coupled with the notable absence of paved roads, and the rolling hillside landscape, makes travel an arduous, slow-moving moving and, depending on the weather, a dusty or muddy affair. Especially during the morning commute into the city and out again in the late afternoon – the Jam, as it is called, and for good reason. Indeed, the quickest and most inexpensive mode of transport is by motorbike taxi, known as boda-bodas, that carry passengers, their luggage, and all manner of goods.

With these first-time visitor observations in mind on arrival to the site, it is an achievement in itself to set up and operate a biomass pellet plant with around 15,000 tonnes per annum nameplate capacity. Located in Bweyogerere, Kira municipality, about 12 km from Kampala city, Bioburn Energy Solutions is sited close to the Kampala Business and Industrial Park, a major industrial site near the Kampala-Jinja Highway, which connects Kampala with Jinja, the country's second largest city, and the Kampala Northern Bypass Highway.

In other words, the site is about as good as it can get in terms of strategic location – a bonus for sports fans is proximity to the Mandela National Stadium.

Developing the chicken and the egg

Bioburn Energy Solutions is also an example of a biomass pellet company developing both ends of the value chain, simultaneously, providing pellet burner technologies and the biomass pellet fuel. In the sub-Saharan Africa context, the company is perhaps unusual in that it is targeting industrial- and institutional end-users as its primary markets, while developing the cookstove market, as Jaime Byaruhanga explains.

– We are producing up to 40 tonnes of biomass pellets per day on two shifts, which is ideal for supplying directly by truck to industrial and institutional clients. In contrast, the household pellet cookstove is not in any way ubiquitous, nor is the pellet distribution or business model developed for that market, said Jaime Byaruhanga.

Jaime Byaruhanga, Director and Co-founder addressing GBEP delegates.

(Top left) The obligatory group photo of Bioburn staff and GBEP delegates. (Above) The visit included live demonstrations of different types of Improved Cook Stoves (ICS), ranging from a barbecue fired on biomass briquettes to pellet gasifier stoves, and larger canteen kitchen stoves.

Pellet burners and cookstoves

The company has a portfolio of its own and third-party pellet burners and cookstoves. The largest is a 3 MW pellet burner for industrial process heat or steam, while institutional cookstoves and burners start at 50 kW.

– We supply manufacturing industries and the larger institutional kitchens found at prisons, schools, hospitals, and police barracks with a burner or cookstove solution and fuel supply. In these markets, we can demonstrate total cost of ownership savings of 30 to 40 percent with our burner/cookstove–pellets solution compared to heavy fuel oil, diesel, or LPG typically used, said Jaime Byaruhanga.

This is not insignificant

According to the International Energy Agency (IEA), Uganda is entirely dependent on oil product imports, with 95 percent of the country's total energy imports (2023) from oil products. At 67 percent, transport accounted for the lion's share of total final consumption of oil products, industry 20 percent, agriculture and forestry just over 7 percent, while power generation was just 2.6 percent.

Thus, reducing dependency on oil product imports by switching to unused domestic biomass residual resources has tangible environmental and circular bioeconomic effects. Yet, despite these positive benefits, public verification and communication of them is difficult.

– When it comes to private industry, everything is compounded by non-disclosure agreements and generally being secretive about activities. This is unfortunate for us as we would like to use references and generically quantify environmental and financial benefits. In contrast, the public household cookstove space is far more communicative on these matters, Jaime Byaruhanga said.

For household pellet cookstoves, the company is looking to license cookstove production from a third-party manufacturer, several of which attended the GBEP conference.

– There are already pellet cookstove manufacturers that have state-of-the-art designs and products, so we do not feel it necessary to reinvent the wheel. Instead, we are looking to partner with such producers, for example, set up an assembly plant here in Uganda, which could radically reduce the cost compared to importing a finished cookstove, Jaime Byaruhanga revealed.

However, as Byaruhanga elaborated, finding a suitable cookstove is only part of the puzzle, and several other challenges need to be addressed to achieve universal access in high-density and peri-urban areas in which the various clean cookstove initiatives wish to operate, replacing charcoal and open fire stoves with modern cooking solutions such as pellet cookstoves.

– Technology adoption, in other words, a suitable and affordable cookstove, is just one aspect; another is the packaging and distribution of the pellets, and associated cash flow, and finally, scale. Bioburn is just a drop in the ocean; we need other pellet producers and suppliers to gain critical mass, and there is room for everyone, said Jaime Byaruhanga.

Depending on their means, a conventional charcoal-consuming household typically buys fuel regularly, sometimes daily, and thus is not likely to afford, carry, or store a 15 kg – 25 kg sack of pellets. Instead, investment is required for pellet dispensing and/or micro-packaging infrastructure for 1 kg, 3 kg, 5 kg, and 10 kg systems.

– Typically, a shop owner would provide shelf-space on a payment after-sales basis, which translates into 30 to 60 days of credit, Byaruhanga said.

Aside from the capital outlay and associated risk, one can just imagine the paperwork in keeping track of a day's pellet production two months ahead. Clearly, a lot of thought needs to be put into the business model.

– We are still researching how best to approach the household cookstove market, ensuring that we address all the fundamental last-mile issues with an affordable and technically suitable cookstove design that is economically viable, and with a socially- and culturally appropriate business model for Uganda, said Jaime Byaruhanga.

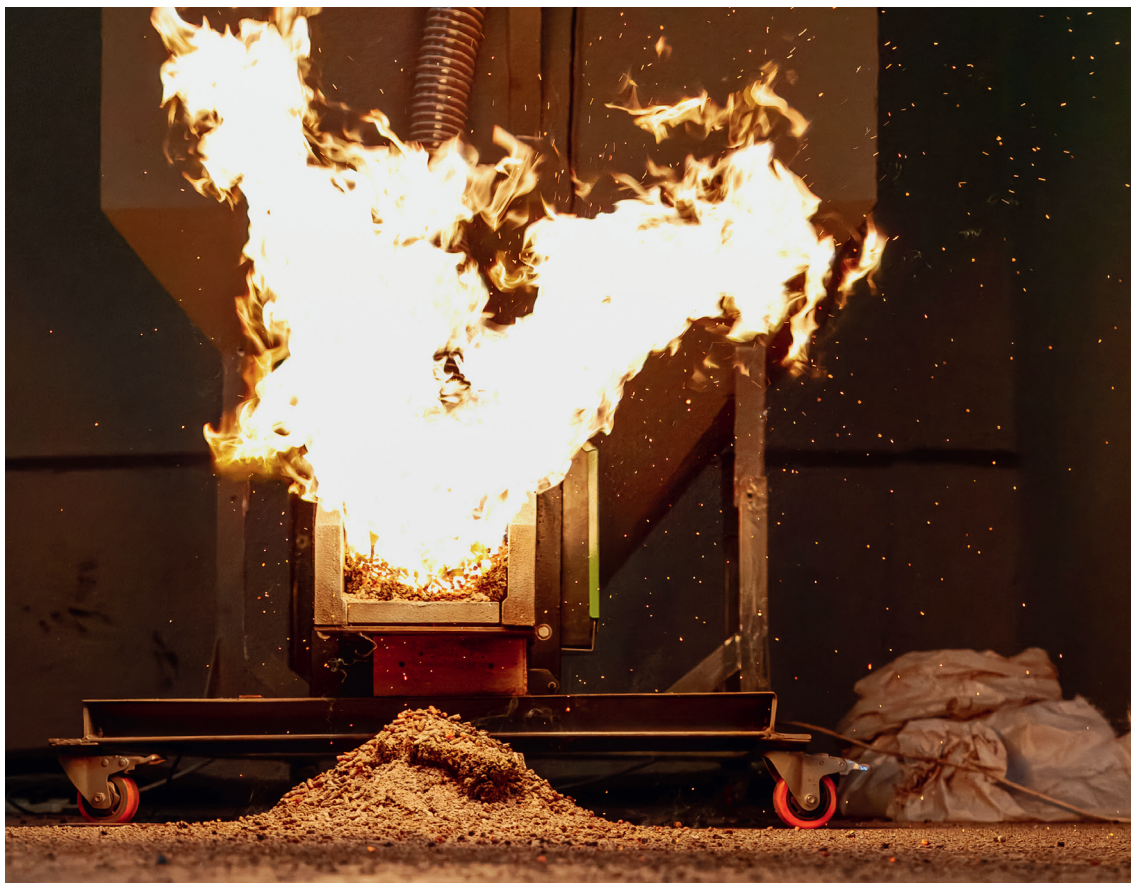
VAT waiver

In a bid to make pellets more affordable, one perhaps surprising recent outcome is a 100 percent waiver on value-added tax (VAT) on pellets. It came into effect on July 1, 2025, and is a big deal. A consumption tax, VAT is currently charged at 18 percent on all supplies made by taxable persons, and VAT plays a significant role in Uganda's revenue generation and economic structure.

– We are extremely grateful to have been heard by the Ministry of Energy and the Ministry of Finance. This is a tremendous boost to our fledgling industry, and a driver for market uptake, noted Jaime Byaruhanga.

Transforming biomass residues

Being in equatorial Africa, Uganda has a climate very conducive to biomass growth, and fertile soils on which farmers can grow a wide variety of crops, making two or even three harvests per hectare and year. In the >>



(Left) Demonstration of an idustrial pellet burner. (Top right) A sack of Bioburn biomass pellets. (Lower right) The feedstock blend en route to the grinder.

>> greater Kampala area, there are several rice mills, grain processors, and coffee co-ops, along with innumerable small local sawmillers.

Each of the latter processes perhaps a handful of eucalyptus or pine sawlogs per day to produce boards, poles, and firewood for local construction, furniture, and cooking markets, whereas the sawdust is collected in bags and sold to the pellet plant.

– We use what we have access to, sourcing from within a 120 km radius of the pellet plant. Otherwise, it becomes too expensive, said Jaime Byaruhanga, illustrating the point with cocoa pods, a desirable feedstock they have stopped using on account of the transport distance and associated costs.

Instead, the mid-term plan is to set up a second pellet plant much closer to this feedstock source, and a site for that purpose at an undisclosed location has been secured.

Seasonality mitigation strategy

Byaruhanga also disclosed that the Bioburn energy pellet is, in fact, a proprietary blend of various residues.

– Having a pellet recipe is part of our seasonality mitigation strategy. We need to be able to produce and deliver a consistent pellet quality yearround. Supplies and availability of the different raw materials, on the other hand, can vary during the year, he explained.

Bioburn has taken it one step further by grouping certain feedstock types on account of their properties and characteristics. These are to some degree interchangeable with one another without compromising the overall pellet quality. The company is actively exploring other feedstock materials and is keen to collaborate with others, citing pine cones as an example.

According to the National Forest Authority (NFA), three main pine species – Pinus *caribaea*, P. *oocarpa*, and P. *patula*, respectively – are commercially planted in Uganda with a rotation of 20 to 35 years. To mitigate the fire hazard during the dry season, Bioburn coordinates collection crews in villages close to the plantations to gather the fallen cones from the forest floor.

– There needs to be a local organization in the village that we can partner with, that can organize such a collection crew, Jaime Byaruhanga clarified, adding that the company is also engaged in a project looking at the possibility of using papyrus and typha as feedstock.

Compact and tidy operation

Of Chinese origin, the pellet plant itself is a compact and tidy piece of kit. Tucked into a warehouse, the plant comprises a feedstock receiving and mixing station, two grinders, a drum dryer, a twin pelletizer unit, a cooler-sieve, and a bagging unit. In an adjoining warehouse is the feedstock and bagged pellets store. Some of the feedstock, especially from smaller suppliers, arrives in sacks.

The feedstock receiving and mixing station comprises two bins and lines that feed two grinders before entering the direct-fired co-current rotary drum dryer, where the hot air and combustion flue gases enter the feed end of the drum. With the exception of sawdust, which is typically raw, wet off the saw so to speak, most of the feedstock is already inherently quite dry, typically under 20 percent moisture content.

The drum dryer is fired using the collected dust from production, and the blend of hot air and combustion flue gases acts as the drying medium while internal flights cause the material to cascade through the stream of hot gases as it rotates. The slight downward angle toward the discharge end also helps to move the material to the end of the drum. The temperature inside the dryer is regulated using ambient air, while the exhaust gases and water vapour are passed through a bag filter before exhausting.

On exiting the dryer, the material is conveyed into a feed bin that serves two ring-die pelletizers. A single discharge conveyor carries the fresh pellets to a single counter-flow sieve cooler. From here, the pellets are directed to a bagging station, a big-bag station, or bulk storage in an adjoining building.

Green power

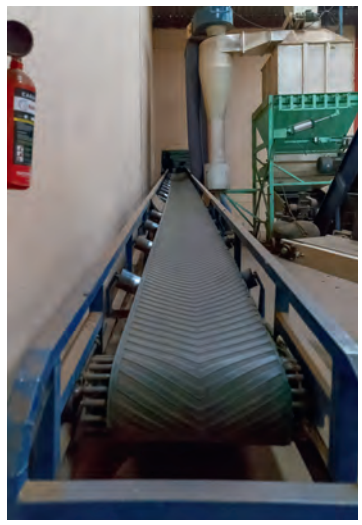
Mains electricity is used to power the plant. Being in an industrial zone, unscheduled blackouts are less of a problem than elsewhere.

And the carbon footprint? Uganda has just over 2 GW of installed power generation capacity, of which 95 percent is from renewable sources, primarily hydropower but also sugarcane bagasse cogeneration, and solar PV. That is a great starting point for a pellet plant.

Text & photos: Alan Sherrard
PS11/7511AS

A single hopper feeds a set of twin pelletizers.

The direct-fired co-current rotary drum dryer.

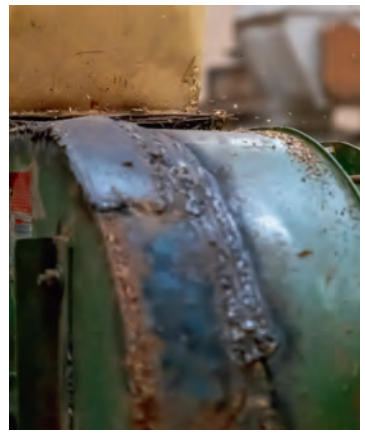


(Above left) The counter-flow sieve cooler. (Above right) The bagging station conveyor that brings the bagged pellets into an adjoining warehouse with the pellet cooler in the background.

Demonstration of an industrial pellet burner.

The feedstock receiving hopper and grinders.

The dried feedstock en route to the pelletizer feed hopper.



(Right) Feedstock, such as coffee husks, are typically supplied in sacks. (Far right) Signs of well used equipment.

HS TIMBER GROUP EXPANDS WOOD PROCESSING CAPACITIES

(Top) The Acon Timber facility in Argentina. (Above) A big-bag of HS Timber pellets.

Over the last twelve months, Austria's wood processing major HS Timber Group has embarked on an expansion and acquisition program that has seen the Group increase its production capacity significantly, and a presence on two continents.

IN JANUARY 2022, HS TIMBER BROKE GROUND on Acon Timber, a greenfield softwood sawmill and wood pellet plant in Argentina, marking the Group's first venture in Latin America. Start-up operations began in December 2023, with gradual ramping up, and in April 2024, HS Timber declared the plant officially commissioned.

Located in Virasoro, Province of Corrientes, the sawmill is designed to exclusively process sustainably managed plantation grown Loblolly Pine (Pinus *taeda*), and Slash Pine (P. *elliottii*), two principal species that collectively in the industry are traded as Southern Yellow Pine (SYP). Favoured by the climatic conditions with year-round growth, these pine species are grown in the region and harvested on a 20-year rotation cycle.

The Acon Timber sawmill is equipped with state-of-the-art equipment and technologies. In the current stage of expansion, it has an annual production capacity of 370,000 m³ of kiln-dried sawn wood. The heat required for drying is generated in two 20 MW biomass boilers using bark and locally sourced biomass.

The lumber products are mainly exported to North and Central America, the Middle East, and Asia. Connected to the sawmill is a secondary sorting system with a quality scanner and planing system. The sawmill by-products – woodchips, sawdust, and planer shavings – are further processed into wood pellets. The current annual pellet production capacity is 132,000 tonnes, EN*plus*-certified and exported to Europe.

Latvian acquisitions

Back in Europe, HS Timber Group announced two significant sawmill acquisitions in Latvia earlier this year. In January 2025, it acquired Vika Wood SIA from Swedish sawmill group Bergs Timber AB. Located in Talsi, Vika Wood is a softwood sawmill with an annual production capacity of up to 300,000 m³ of kiln-dried sawn timber. While Vika Wood has no pellet production of its own, it plays a crucial role in the regional value chain, supplying residues to other pellet producers.

Also in late January 2025, HS Timber Group reached an agreement to acquire a second softwood sawmill, this time Kurkess SIA. Located near Ventspils, Kurkess has an annual production capacity of 250,000 m³ of kiln-dried sawn timber. It also operates a pellet plant in the Port of Ventspils via its subsidiary Kurzemes Granulas, which is included in the deal. Kurzemes Granulas currently produces around 70,000 tonnes of pellets per annum, both EN*plus* A1 and industrial grade pellets.

Text: Alan Sherrard
Photos: HS Timber
PS11/7519/AS

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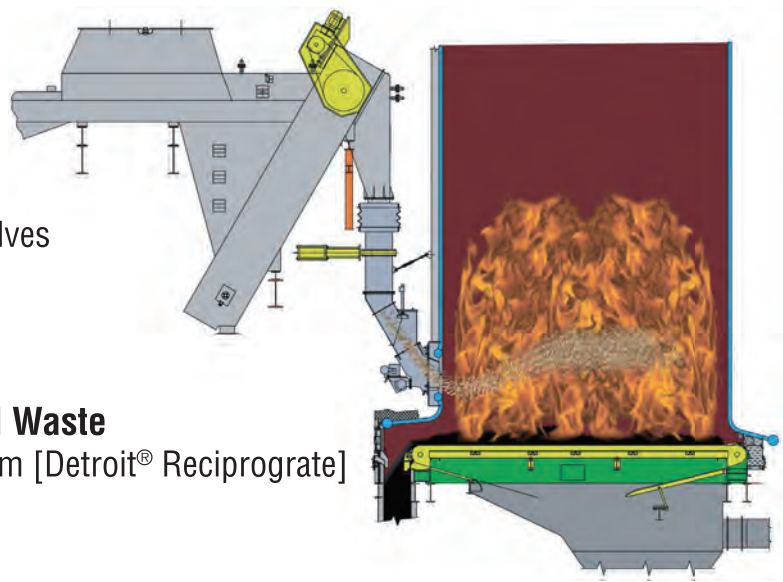

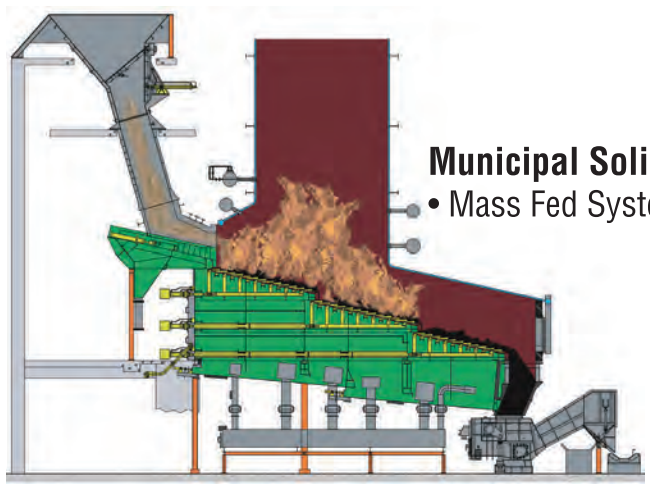

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OPTIMIZING PELLET PLANT PERFORMANCE THROUGH REAL-TIME MOISTURE CONTROL

Whether in the form of woodchips, pellets, or agricultural residue, biomass fuels serve as a flexible, renewable, and carbon-neutral energy source. However, this versatility comes with challenges, particularly concerning moisture content, as MoistTech Corporation highlights.

With rugged design, one time calibration, and drift-free operation, the IR3000 excels in high dust, high vibration environments typical of pellet plants. They can be integrated at multiple points in production to deliver a holistic view of moisture trends (photo MoistTech).

MOISTURE, OFTEN TREATED AS A BYPRODUCT of the process, is in fact a critical performance variable. Biomass moisture levels influence combustion efficiency, emissions, equipment performance, fuel costs, and the quality of downstream products such as wood pellets. Yet for many pellet producers and biomass power plants, moisture is still managed reactively through lab sampling, visual inspection, or outdated sensor technology, which not only introduces costly delays but also fails to capture the rapid moisture variability typical of biomass feedstocks.

Hidden costs of moisture mismanagement

Improper moisture levels in biomass feedstocks can undermine operational efficiency. In pellet manufacturing, excess moisture compromises densification, leading to weak, crumbly pellets that underperform in both combustion and storage. Conversely, biomass feedstock that is too dry can be brittle, abrasive, and difficult to process. In pellet mills, variations of just 1 percent in moisture content can throw off amperage loads on main drives, forcing frequent recalibration and increasing equipment wear. When moisture varies by more than 3-5 percent, producing a consistent, durable pellet becomes nearly impossible.

Additionally, fine biomass particles with low moisture content are more prone to combustion and dust explosions. On the other end of the spectrum, sticky, wet biomass can cause clogs in conveyors and silos, risking unplanned downtime. The cumulative effect of these inefficiencies is significant: reduced yield, elevated maintenance, higher emissions, and increased capital spend.

According to MoistTech, moisture monitoring must occur at multiple points in the process, with the most critical stages including:

- **Incoming feedstock:** Moisture content at the point of entry affects not only drying efficiency but also pricing and combustion value. Undetected high moisture biomass can lead to overpaying for material with less usable energy.
- **Before and after drying:** Real-time moisture feedback allows operators to dynamically adjust dryer temperatures and retention times. This minimizes fuel usage and helps prevent overdrying, which can create dust, fines, and unnecessary mechanical strain.
- **Pre-pelletization:** Precision is paramount at this final stage. Even a small deviation in moisture can dramatically alter pellet sheen, density, and durability. Properly calibrated in-line sensors ensure consistent output quality and reduce off-spec batches.

The ability to maintain moisture within optimal thresholds, typically 6–10 percent for wood pellet production, can transform the economics of a facility. Operators gain tighter control over energy use, product quality, and equipment longevity.

Legacy methods are slow, inconsistent, and reactive

Despite the high stakes, many pellet plant operations still rely on periodic lab testing or operator intuition to assess moisture content. These methods are slow, inconsistent, and inherently reactive. Visual inspections, still surprisingly common in some facilities, are subjective and prone to human error. Manual sampling and lab testing, while more reliable, introduce significant time delays. By the time an out-of-spec moisture level is detected in the lab, large quantities of material may already be processed, stored, or shipped, leading to preventable waste or product rejection.

Some facilities use technologies such as radio frequency (RF), oven weight loss, or contact probes. While these offer incremental improvements over manual methods, they remain vulnerable to variability in biomass materials. For example, RF and probe systems often struggle to deliver consistent results when particle size, bulk density, or material color shifts. These are factors that fluctuate widely in woodchips, agricultural residues, or mixed biomass feedstocks. These technologies also tend to require frequent recalibration or maintenance, reducing uptime and operator confidence in the data they provide.

Traditional measurement approaches also fall short when it comes to scalability. Batch testing cannot deliver 100 percent product inspection or offer actionable, in-line feedback. Operators are left to extrapolate based on incomplete data, making it harder to fine-tune drying cycles, control combustion conditions, or ensure consistency in final pellet quality.

NIR enables non-contact and continuous monitoring

In contrast, near-infrared (NIR) moisture sensors, such as the MoistTech purpose-built IR3000 series, overcome these limitations through non-contact, continuous scanning. NIR technology measures moisture continuously, is unaffected by material heterogeneity or conveyance method, and NIR analysis eliminates the need for collecting and drying samples, while also avoiding chemical exposure and labor-intensive processing.

By enabling real-time measurement directly on conveyors, silos, or pellet presses, moisture becomes one of the most controllable, high-impact variables in a pellet facility. These sensors allow pellet producers to detect moisture variability instantly and adjust on the fly. Instead of estimating trends, pellet manufacturers can now see exactly what's happening inside their processes, moment to moment. The result is faster decision-making, reduced waste, lower energy use, and more predictable product performance.

When connected to plant control systems, they enable closed-loop automation that responds instantly to moisture deviations, optimizing performance without manual intervention. This level of insight not only prevents spoilage and inefficiencies but also helps pellet plants cut drying costs, reduce fire hazards, minimize emissions, and increase product consistency.

PS11/7521/AS

PELLET CONSUMER BECOMES PELLET PRODUCER

In 2023, Arctic Paper decided to invest SEK 285 million (≈ EUR 25.75 million) in BIO-25, a green energy project at its paper mill in Grycksbo, Sweden. This includes drying of sawdust for combustion in a combined heat and power (CHP) unit and for pellet production. A Mantex Biomass Analyzer to measure the moisture content of incoming sawdust is the latest tech addition.

The wet-material handling and storage systems for the BIO-25 project are being supplied by BMH Technology. Supplied by Hekotek, the pellet plant and two silos for intermediate storage of sawdust are nearing completion.

– The BMH Technology-Hekotek setup is a strong combination that guarantees the success of the BIO-25 Project, commented Markus Westman, Project Manager at Arctic Paper Grycksbo.

Hekotek's scope of supply includes a belt-dryer with 17 tonnes per hour capacity, which will utilize low-temperature surplus heat from the mill's paper machines, two CPM Twin-Track pellet presses with a total of 10 tonnes per hour capacity, as well as automatic pellets-storage and outloading systems. A new reception unit, a so-called "dump pocket", for deliveries of sawdust, as well as a truck scale to weigh the deliveries, are also included. Arctic Paper has also invested in a Mantex Biomass Analyzer to measure the moisture content of incoming sawdust. Weight and moisture content are important parameters for pricing the raw material.

– Almost two tonnes of green biomass are needed to produce one tonne of pellets. Companies that pay suppliers by the tonne would usually gain by switching to paying on energy value calculated by the moisture content, commented Gustav Melin, CEO at Mantex, here with a Mantex Biomass Analyzer.

– With the Mantex Biomass Analyzer, we will have a simple and quick handling of the moisture measurement. The drivers who come with the deliveries can take the sample themselves upon delivery, and we will get the moisture value immediately, avoiding the 24-hour waiting time that the oven method alternative entails. It will be part of the unloading, said Markus Westman.

The BIO-25 project is progressing according to plan, with the first pellets expected by the end of 2025. The investment is expected to provide annual energy cost savings of SEK 50 million (≈ EUR 4.5 million).

Text: Alan Sherrard, Photo: Mantex
PS11/7522/AS

INAUGURATION HELD OF CARBONITY – CANADA'S FIRST INDUSTRIAL-SCALE BIOCHAR PLANT

In Canada, Airex Energy Inc., an innovative leader in the development of world-class decarbonization solutions, Groupe Rémabec, a cornerstone of Québec's forest industry committed to responsible transformation and decarbonization, and SUEZ, a global leader in circular solutions for water and waste, have inaugurated "Carbonity", the country's first industrial-scale biochar plant.

Officiating at the inauguration of the Carbonity biochar plant in Port Cartier, Québec, on May 22, were Patrick Girard (left), General Manager, Carbonity; Michel Gagnon, CEO of Airex Energy and Chair of Carbonity's Board; Alain Thibault, Mayor of Port-Cartier; Kateri Champagne Jourdain, Minister of Employment, Minister Responsible for the Côte-Nord region, and Member for Duplessis; Réjean Paré, President and Chief Operating Officer, Groupe Rémabec; and Yves Rannou, Interim Co-CEO, SUEZ, and Head of Recycling.

Located in Port-Cartier, northern Québec, it is the country's first industrial-scale biochar plant.Born from a partnership between the three companies, the plant in Port-Cartier has an annual production capacity of 10,000 tonnes of biochar, which is expected to triple by 2026, making it the largest facility of its kind in North America—and one of the most significant globally.

– The inauguration of Carbonity marks a pivotal step toward a new, more sustainable forestry model rooted in today's economic and environmental realities and serving the ecological and industrial transition of tomorrow. Taking part in this Canadian first is a tremendous source of pride, said Patrick Girard, General Manager, Carbonity.

Utilize forestry residues

Once fully ramped up, it will create 75 direct and indirect jobs in the region and produce carbon-rich biochar from approximately 58,000 tonnes of forestry residues annually, sourced from Groupe Rémabec's operations.

– Today, we continue an extraordinary journey that is shaping the future of forestry and asserting Quebec's leadership in bioproduct development. Alongside Airex Energy and SUEZ, we are building a new economy, future-focused and environmentally committed. At Port-Cartier, we're betting on innovation and boldness to convert our forest residues into sustainable economic value. This project breathes new life into a long-neglected industrial site, giving it a promising future. Thanks to strong partnerships, cutting-edge technology, and a clear vision, we are positioning ourselves as a global player while diversifying our products and markets for a better future, said Réjean Paré, President and Chief Operating Officer, Groupe Rémabec.

A decarbonization tool for multiple industries

Produced through biomass pyrolysis —a carbonizing process at high temperatures without oxygen, biochar is recognized by the UN Intergovernmental Panel on Climate Change (IPCC) as one of the most effective technologies to combat climate change due to its long-term carbon sequestration capacity. In addition, its many benefits enhance agricultural resilience, drive sustainable innovation in construction and urban development, and support the decarbonization of heavy industries.

– With Carbonity, Port-Cartier becomes a leader in sustainable innovation. By transforming our forest residues into biochar, we are smartly harnessing local resources while creating lasting jobs. This is a flagship project that proves environmental protection and economic development can go hand in hand. It's a great source of pride to see our community become a model of responsible development, said Alain Thibault, Mayor of Port-Cartier.

Soil ammendment and farming

When used as a soil amendment, biochar enhances nutrient and water retention, aeration, drainage, and microbial activity. Cities are increasingly using biochar to process organic waste and combat flooding. Its absorbent qualities make it ideal for creating "sponge parks."

It also supports the remediation of contaminated soils. It regenerates soil, increases fertilizer efficiency, improves crop yields, and aids water drainage—key advantages for the agriculture sector.

It can also be added to livestock feed to promote animal health and reduce methane emissions. When integrated into concrete, cement, or asphalt, biochar enhances material performance while significantly lowering their carbon footprint, addressing a major challenge in sustainable construction and urban development.

– I'm thrilled to see the Carbonity project come to life. The new automated plant will generate significant economic and social benefits in Côte-Nord, including the creation of highly specialized jobs. It also strengthens the region's forestry sector, which plays a key role in our economy, said Kateri Champagne Jourdain, Minister of Employment, Minister Responsible for the Côte-Nord region, and Member for Duplessis.

An innovative facility

The Carbonity plant is powered by proprietary technologies developed by Airex Energy. Its proprietary and patented "DryFX" and "CarbonFX" technologies are at the heart of the plant's innovative process. The biochar production also yields surplus energy in the form of steam or pyrolytic oil, which can be used as fuel.

– The inauguration of Carbonity is a true industrial milestone for Québec. Airex Energy's technology, including our patented CarbonFX and DryFX solutions, is central to this success, and it makes us very proud. Our primary mission is to contribute to the decarbonization of our economy. This investment represents Airex Energy's first step toward scaling global biochar production, a product that will help many businesses here and abroad achieve net zero, said Michel Gagnon, CEO of Airex Energy and Chair of Carbonity's Board.

Global expansion plans

SUEZ brings key expertise in organic waste recovery, the production of amendments and cont. p. 26

IBTC MOBILIZES TO SECURE IMO REGULATIONS FOR BIOCARBON

In response to recent international regulatory developments, the International Biomass Torrefaction and Carbonisation Council (IBTC) has established a dedicated Working Group to address the impending challenges surrounding the maritime transportation of pyrogenic biocarbon.

The IBTC Working Group is tasked with navigating the complexities of maritime logistics and regulatory compliance in light of a significant amendment to the International Maritime Solid Bulk Cargoes (IMSBC) Code.

The Working Group focuses on production standards, transportation regulations, and is spearheading the effort to create a new IMSBC codification for Biocarbon within the framework of the International Maritime Organization (IMO).

In a critical regulatory shift, the IMO has issued an amendment to the IMSBC Code, classifying carbon of animal or vegetable origin as dangerous goods. Coming into force on January 1, 2026, this amendment, IBTC says, poses a "direct threat" to the growth trajectory of pyrogenic biocarbon as an emergent commodity class.

Under Amendment 42-24 to the IMDG Code, key changes include the removal of SP925 and SP223 from column 6 of the Dangerous Goods List for CARBON, animal or vegetable origin UN 1361, and the addition of the new SP978. This new special provision imposes stringent requirements, including disqualification from the UN N.4 self-heating exemption, mandatory weathering periods for unpackaged cargo, headroom requirements in CTUs, a 1.5m maximum stowage height, and a temperature cap at the time of packing.

For CARBON, ACTIVATED UN 1362, SP925, and SP223 are similarly replaced by SP979, which stipulates conditions under which steam- or chemically activated carbon may be exempt from most Code provisions.

According to IBTC, the reason for this IMO decision lies in shipments that actually have nothing to do with biocarbon for energy or industrial use, but mainly result from accidents involving shisha charcoal, which was itself often incorrectly declared. Nonetheless, regardless of the cause, the entire industry is affected, at least those products that will fall under the foreseen ISO 17222TS rather than ISO 17225-8.

Recognizing the urgency, the IBTC launched the "IMO Working Group" in December 2024 and assembled a dedicated Taskforce to work in direct collaboration with relevant authorities. The primary objective is to develop a new UN code for biocarbon that allows for the continued legal, safe, and economically viable transportation of the material at scale.

At present, the Taskforce is investigating several critical questions to initiate a constructive and targeted process with regulatory bodies:

- Which specific products fall under the amendment's scope?
- Is there adequate differentiation within the IMO regarding these product classes? Were the distinctions overlooked, or does the amendment selectively impact only certain categories?
- What interim measures can mitigate the amendment's effects, and what longer-term reversals may be achievable?
- What strategic steps are required to ensure bulk shipping remains cost-efficient, legal, and safe?
- Which classifications, certifications, or codifications need to be developed, submitted, or implemented?

The IBTC formally invites all companies and institutions active across the Circular Biocarbon value chain to join this initiative, pointing out that stakeholder participation is "essential to co-create a sustainable and regulation-compliant future for biocarbon logistics."

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cont. from p. 25

biofertilizers, and the development of circular solutions to help clients reduce their carbon footprint.

This project marks the first step in Airex Energy and SUEZ's ambitious roadmap to build a global annual production capacity of 350,000 tonnes of biochar by 2035 to meet the decarbonization challenges of industrial operations.

– We are delighted to contribute to this pioneering biochar production project in Canada. Identified by the IPCC as a negative-emissions solution, biochar is effective in fighting climate change and aligns with SUEZ's waste recovery activities. We believe biochar will play a key role in the ecological transition of industry. That's why we aim, alongside Airex Energy, to produce 350,000 tonnes of biochar annually by 2035, providing our customers committed to carbon neutrality with innovative solutions to reduce their residual emissions, said Yves Rannou, Interim Co-CEO, SUEZ, and Head of Recycling & Recovery.

Public and carbon market funding

This project in Port-Cartier was made possible thanks to the vision and financial support of the governments of Québec and Canada.

– Carbonity is helping accelerate decarbonization in key sectors across Québec. Our government is proud to have invested more than CA$16 million in this project, which leverages innovative technology and contributes to building a prosperous, sustainable economy, said Christine Fréchette, Minister of Economy, Innovation and Energy, and Minister responsible for Regional Economic Development.

At full capacity, the plant in Port-Cartier will sequester 75,000 tonnes of carbon dioxide equivalent (CO_2eq) per annum. This output will generate certified and guaranteed carbon credits, marketed on the voluntary carbon market (VCM) by First Climate.

– The federal government is proud to have contributed to this flagship project supporting the establishment of a new subsidiary in Canada. Biochar is a key solution for carbon sequestration, with additional benefits for agriculture, the development of resilient cities, and the support of a diversified forestry industry, said Mélanie Joly, Minister of Industry and Minister of Canada Economic Development for Québec Regions.

In 2024, Microsoft selected Carbonity to purchase 36,000 carbon credits over the first three years of operations.

– The official launch of Carbonity is an important step in international climate protection through technical carbon removal solutions, demonstrating that biochar technology can scale. We are thrilled by the strong interest our clients have shown in Carbonity, supporting the continued development of carbon removal technology, said Olaf Bachert, CEO of First Climate.

Text: Alan Sherrard
Photo: Airex Energy
PS11/7512/AS

EUROPE'S LARGEST BIOCOAL PRODUCTION UNIT STARTS OPERATIONS

In Finland, Joensuu Biocoal, the biocoal production facility developed by Taaleri Bioindustry, has begun production, and the first deliveries to customers have been made. The production capacity is 60,000 tonnes of torrefied biomass, also known as biocoal, and is the largest-of-its-kind single biocoal production unit in Europe.

Biocoal can replace fossil raw materials and support hard-to-decarbonise industries by substituting for coal in the steel and cement industries. It can also be utilised for soil improvement .

TAALERI GROUP IS A NORDIC INVESTMENT and asset manager that focuses on businesses with industrial-scale opportunities within the bioindustry and renewable energy sectors. Taaleri Bioindustry is one of the first private equity owner-operators in the Finnish bioindustry market, and offers a concept in which clients using biocoal do not need to make significant investments in new equipment. Instead, biocoal is a drop-in product, meaning it can almost directly replace coal in industrial processes.

Integrated heat recovery

The production facility is located in Joensuu, Finland, next to the Savon Voima combined heat and power (CHP) plant. The surplus energy generated during biocoal production is utilised for district heating.

Construction of the facility began in 2023, and the plant was completed at the end of 2024. During 2025, the facility produced test batches and ramped up operations.

– This is a significant step on our biocoal journey. Taaleri is among the first in the world to have developed and scaled an industrial-scale biocoal production facility, said Iiro Tiilikainen, Project Director at Taaleri Bioindustry.

Taaleri is currently exploring opportunities for new biocoal investments in Canada.

Novel torrefaction reactor

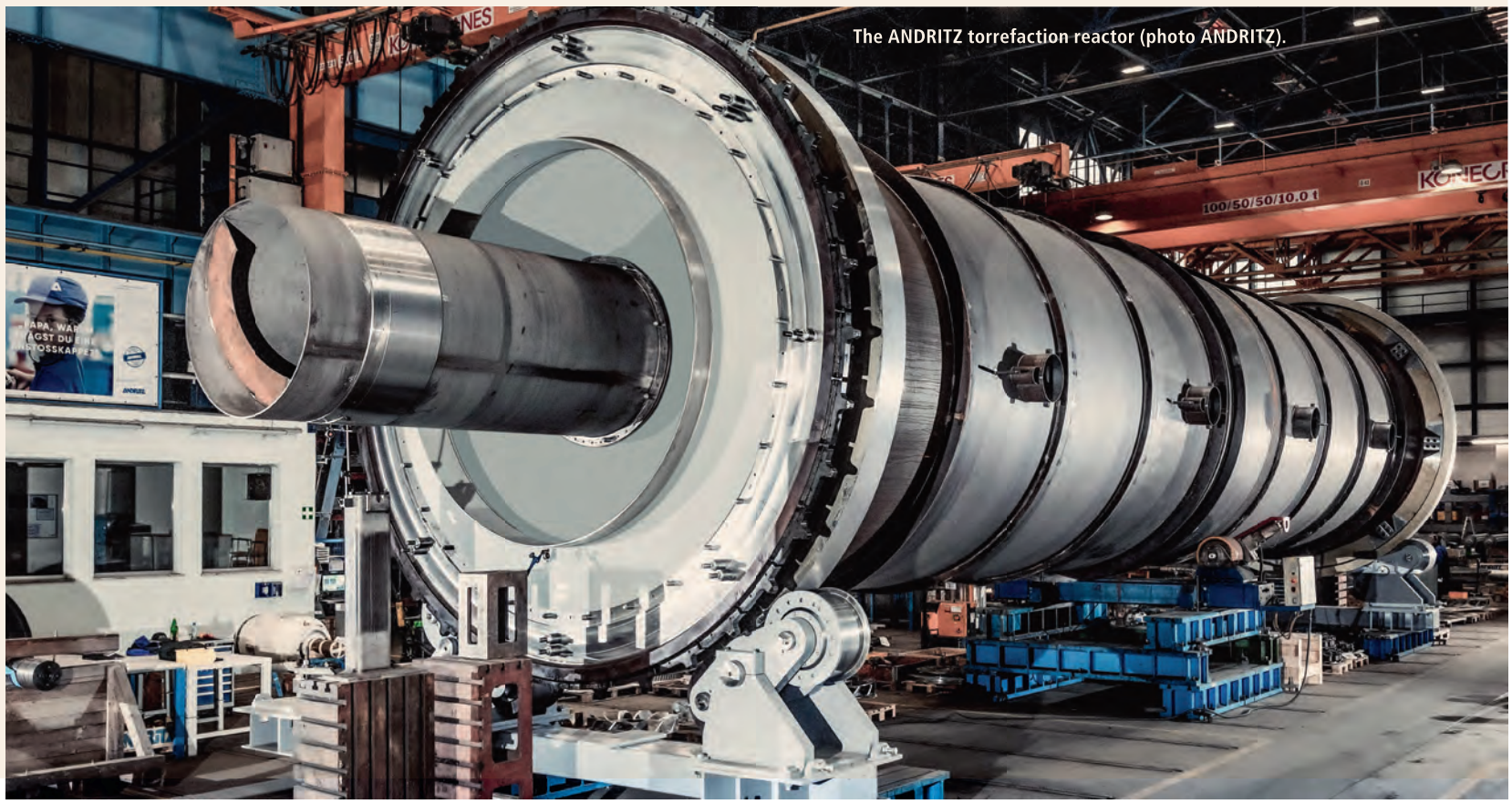
The heart of the plant is an innovative torrefaction reactor, manufactured by global technology major Andritz AG in Graz, Austria, under license from NextFuel. In addition to the reactor, ANDRITZ supplied the Metris addIQ system for control of the torrefaction process.

ANDRITZ is in fact no stranger to torrefaction having developed two demonstration projects, in Austria and Denmark respectively, back in 2011-2013.

– We are very proud to contribute to one of the largest torrefaction plants in Europe. This milestone underscores ANDRITZ's commitment to innovation and sustainability by providing renewable energy solutions that support a greener future, said Stefan Peter, Global Product Group Manager at ANDRITZ.

Iiro Tiilikainen (left) and Laura Luukkonen at the Joensuu Biocoal production facility in Finland.

Text: Alan Sherrard
Photos: Taaleri
PS11/7514/AS



The ANDRITZ torrefaction reactor (photo ANDRITZ).

VALMET AND WILHELMINA TO COMMERCIALIZE TG2 PELLET PLANT TECH

The Netherlands-headed holding and investment company Maatschappij Wilhelmina N.V. (Wilhelmina), and Finland-headed forest industry and energy technology major Valmet Oyj have announced a strategic collaboration to commercialize the "TG2" pellet technology on a global scale.

The partnership has been formalized through a Strategic Collaboration Agreement aimed at commercializing steam-treated pellet production processes utilizing high-potassium feedstocks, such as agricultural residues.

Wilhelmina, via its project development subsidiary TG2 GmbH, currently operates a demonstration facility in in Kuantan, Malaysia. TG2 plans to commence construction of its first 15-tonnes-per-hour commercial plant in Malaysia during 2025, with ambitions to scale globally and achieve a target of over 1 million tonnes of annual production by 2031.

– A significant milestone was achieved by Wilhelmina in January 2025, when 300 tonnes of TG2 pellets were tested and approved by a major client in Japan. The testing included one month of uncovered outdoor storage in a coal yard before the pellets were blended at 10 percent and 20 percent with coal and fed into a pulverized coal boiler. The test utilized existing coal-handling infrastructure, confirming TG2 pellets as a true drop-in replacement for coal, explained David Hiel, Co-founder and CCO of TG2.

Integrating proprietary processes

The collaboration integrates TG2's proprietary process with Valmet's BioTrac steam explosion technology, advancing sustainable energy solutions and promoting efficient utilization of problematic agricultural residues for steam-treated pellet production.

In particular, through joint efforts, a novel and unique application was developed when processing high-potassium agricultural residues such as empty fruit bunches (EFBs) with the BioTrac system, which forms the basis of this strategic partnership. This innovative technology is a key component in the TG2 steam-treated pellet plants, highlighting a strong dedication to both technological progress and environmental responsibility.

– This partnership enables Valmet to bring proven technology to a rapidly growing market segment with immense potential. By combining TG2's innovative process with our BioTrac system, we aim to set a new standard for high-quality, steam-treated pellet production from challenging feedstocks. This truly mutual cooperation opens up global opportunities for both Valmet and Wilhelmina, ended Per Norlin, Sales Manager, Biomass Conversion at Valmet.

PS11/7515/AS

Celebrating the first shipment of stream-treated black pellets (photo TG2).

An artist's rendering of Valmet's advanced Steam Explosion system. Known as BioTrac, it is the result of a decade-long development journey from pilot studies to full commercial implementation (image Valmet).

Pellets Special Suppliers Directory 2025

The 11th edition of the Pellets Special Suppliers Directory gives overview of a large group of suppliers representing different industrial sectors. This listing, with 172 companies in alphabetical order, includes companies providing complete solutions for pellet plants, companies offering specific components such as solid fuel preparation, size reduction and densification units, drying, condensing, storage and handling solutions. Included also are suppliers of spark detection and fire prevention systems while insurance and finance are excluded. While comprehensive, the list is not exhaustive nor does it represent a recommdation or an endorsement.

Technologies, equipment and services are grouped into three catagories – A, B and C respectively depending on where in the pelleting process and/or typical pellet plant they are usually found and how critical/specific they are to the process. Naturally a company can be found in one, two or all three categories. Companies that offer turnkey supply, EPC or EPCM services are by default in all three categories.

GROUP A – consists of core technologies, machinery and equipment for raw/green feedstock receiving and pre-treatment found in the log- and/or woodchip yard upstream of the dryer. This includes equipment such as log handling, debarkers, chippers, flakers, wet grinders, stack reclaimers, truck dumps, destringers, bale breakers and allied equipment.

GROUP B – consists of core technologies, machinery and equipment needed to convert a green woodchip or feedstock particle into a finshed pellet such as dryers (belt- and/or drum), dry grinders, hammer mills, pellet presses, conditioners, mixers, coolers, dies, rollers, sieves, bagging machinery incl. palletisers.

GROUP C – consists of ancillary technologies, machinery, equipment and services found throughout the plant or project such as conveyors, pumps, scales and measurement equipment, silos and storage solutions, cyclones, bag filters, ship loaders/unloaders, bulk delivery systems, spark and fire detection and extinguishing systems, binders and additives, lubricants, plastic foil and other consumables, project consultancy, plant automation and certification systems.

Company	Category	Website
ACO Automation Components	**C**	**www.acoweb.de**
Advanced Cyclone Systems, S.A.	C	www.acsystems.pt
Aimo Kortteen Konepaja Oy	A, B, C	www.murskabiopacker.fi
Airex Energy	B	www.airex-energy.com
AJP	A	www.acierjp.com
Amandus Kahl GmbH & Co.KG	**A, B, C**	**www.akahl.com**
Andritz Feed & Biofuel	A, B, C	www.andritz.com
Arjes GmbH	A, C	www.arjes.de
Asket	A	www.asket.pl
Astec Industries	A, B, C	www.astecindustries.com
B. Maier Zerkleinerungstechnik GmbH	A, B, C	www.maier-dieffenbacher.de
Bandit Industries, Inc	A	www.banditchippers.com
Bathan Aktiengesellschaft	**C**	**www.bathan.ch/en/**

Company	Category	Website
Bechem	**C**	**www.bechem.de/de_en**
Bioenergy Machinery Sdn Bhd.	A, B, C	www.greenbioenergy.net
Biomass Engineering & Equipment	A, C	www.beande.net
Blackwood	B	www.blackwood-technology.com
Bliss Industries LLC	B	https://onecpm.com/brand/bliss
BMH Technology Oy	A, C	www.bmh.fi
Briklis Spol. s r.o.	B	www.briklis.cz
Brikol	A, B, C	www.brikol.pl
Bruks Siwertell Group AB	A, C	www.bruks-siwertell.com
Brunette Machinery Co.	A	www.brunettemc.com
BS Bollareto Implants	A, B, C	www.bsbollaretoimpianti.it
BS & B Safety Systems (UK) Ltd	C	www.bsbipd.com
Buskirk Engineering	B	https://buskirkeng.com/

Company	Category	Website
Bühler AG	B	www.buhlergroup.com
Büttner Energie- und Trocknungstechnik	B	www.buettner-energy-dryer.com
C.S.B. Waste Solution	A, B	www.csb-wastesolutions.be
Caravaggi S.r.l.	A	www.caravaggi.com
Caterpillar	A	www.cat.com
CBI Europe BV	A	www.cbi-eu.com
Cellwood Machinery AB	B	www.cellwood.se
CherkassyElevatorMash BRONTO	B, C	www.bronto.ua
Cogent Industrial Technologies Ltd.	A, B, C	www.cogentind.com
Costruzioni Nazzareno	A, B, C	www.nazzareno.it
CPM Europe B.V.	**B**	**www.OneCPM.com**
Crespel & Deiters GmbH &Co. KGC&D	C	www.crespel-deiters.com
Crowley Engineering	A, B, C	www.crowley.ie
Di Piu s.r.l	B	https://onecpm.com/brand/di-piu
Dome Technology	C	www.dometech.com
Doppstadt Calbe GmbH	A	www.doppstadt.com
Dorssers Inc	B	https://onecpm.com/brand/dorssers
Double Crane Machinery Manufacture	B	www.sdshuanghe.com
Dutch Milling Technology International B.V.	A, B, C	www.dmt-int.com
Ecostar srl	A	www.ecostar.eu.com
EDGE Innovation at Work	A	www.edgeinnovate.com
EUROmilling	C	www.euromilling.dk
Europe Forestry V.O.F	A	www.europeforestry.com
Fagus-GreCon Greten GmbH & Co. KG	C	www.fagus-grecon.com
Ferotec	**B**	**www.ferotec.eu**
Firefly AB	**C**	**www.firefly.se**
Fisker Skanderborg A/S	**B**	**www.fisker.as**
Five Continents Machinery Co. Ltd.	B, C	www.fcm-cn.com
Fredrik Mogensen AB	B	www.mogensen.se
Friedli AG Engineering und Anlagenbau	**A, B, C**	**www.friedliag.ch**
Gemco Energy Machinery	A, B, C	www.gemco-energy.com
General Dies s.r.l.	**B**	**www.generaldies.com**
Gongyi Xiaoyi Mingyang Machinery Plant	B	www.mingyangmachinery.com
Gerdes AG	B	www.gerdes-ag.de
Graf-Equipment GmbH	B, C	https://onecpm.com/product/direct-drive-pellet-mill
Hekotek AS	**A, B, C**	**www.hekotek.ee**
Henan Kingman M&E Complete Plant	B, C	www.kmecomp.com
Henan Richi Machiner Ltd	A, B	www.cn-pellet.com
Henan Strongwin Machinery Equipment	B	www.strongwin.cn

Company	Category	Website
HRV Equipamentos de Processo SA	**A, B, C**	**www.hrv.pt**
IMAL s.r.l.	**A, B, C**	**www.imalpal.com**
Inadco Moisture Measurement BV	C	www.inadco.nl
Inray Oy	C	www.inray.fi
IQR Systems AB	A	www.iqr.se
IS Save Energy AG	C	www.saveenergy.ch
J.P. Carlton Company	A	www.stumpcutters.com
Jacobs Corporation	B	https://onecpm.com/spare-parts
JCB	A	www.jcb.com
Jenz GmbH Maschinen- und Fahrzeugbau	A	www.jenz.de
Jiangsu Zhengchang Cereal Oil & Feed Machinery	A, B, C	www.zhengchang.com
Jinan jinxiang Machinery Co	B	www.jnextrude.com
Katres spol. sr. o.	B	www.katres.cz
Klüber Lubrication Nordic A/S	C	www.klueber.com
Komptech GmbH	A	www.komptech.com
Konecranes AB	A	www.konecranes.com
Laitex Oy	A, C	www.laitex.fi
La Meccanica srl di Reffo	**B**	**www.lameccanica.it**
Lasco Heuthecknik GmbH	A	www.lasco.at
Linder-Recyclingtech GmbH	A, B	www.lindner.com
Liyang Rongda Feed Equipment Co., Ltd	B	www.lyrdgj.com
Liyang Tongfu Feed Machinery Co., Ltd.	B	www.liyangtongfu.com
Liyang Yuda Machinery Co., Ltd	A, B, C	www.yd-js.com
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Minimax Fire Solutions International GmbH	C	www.minimax-mobile.com
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MoistTech Corp.	C	www.moisttech.com
Molinari srl	B	www.molinari-recycling.com
Mondi Coatings GmbH	C	www.mondigroup.com
Morbark, Inc.	A	www.morbark.com
Morillon SAS	A, C	www.morillonsystems.com
Mühlböck	**B**	**www.muehlboeck.com**
Münch-Edelstahl GmbH	**B**	**www.muench-gmbh.net**
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Nanjing Hengmu Machinery Equipment Co	B	www.hengmu-machine.com
Nawrocki Pelleting Technology LLC	A, B, C	www.granulatory.com
Neuero Industrietechnik für Förderanlagen	A	www.neuero.de
Newtec Bag Palletizing	**B**	**www.newtecbag.com**
O.M.A Impianti	B, C	www.omaimpianti.it/en/about/

Company	Category	Website
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Pawert - SPM AG	B	www.pawert-spm.ch
Pelleting Technology Netherlands B.V.	B	www.ptn.nl
Peterson Pacific Corp.	A	www.astecindustries.com/
Petkus Technologie GmbH	B	www.petkus.de
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Riela Karl-Heinz Knoop e.K.	A, B, C	www.riela.de
Rinke Engineering GmbH	A, B, C	www.rinke-engineering.de
Rosal S.A.	B	www.rosal-feedmills.com
Rotochopper, Inc	A	www.rotochopper.com
Rudnick & Enners GmbH	**A, B, C**	**www.rudnick-enners.de**
RUF Maschinenbau GmbH & Co KG	**B**	**www.briquetting.com**
S-E-G Svenska AB	C	www.s-e-g.se
S&F Siebmaschinen und Fördertechnik	**B, C**	**www.sf-gmbh.de**
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Salmatec	**B, C**	**www.salmatec.com**
Scheuch GmbH	**C**	**www.scheuch.com**
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Segem Macbo	A, B, C	www.segem.com
Simatek A/S	C	www.simatek.dk
SKAKO Vibration A/S	B	https://skako.com
Stela Laxhuber GmbH	B	www.stela.de
Stolz	A, B, C	www.stolz.fr

Company	Category	Website
Supersilo	C	www.supersilo.at
Swedish Exergy AB	B, C	www.swedishexergy.com
Swiss Combi - W.Kunz dryTec AG	B	www.swisscombi.ch
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Xuzhou Orient Industry Co. Ltd	B, C	orient-biofuel.goldsupplier.com/
Yemmak	B	www.yemmak.com
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This is easy to check if needed; all web pages are presented in the table and the links are clickable on the online e-magazine version.

CRUCIAL CONVERSATIONS ON SAFE WOOD PELLET STORAGE

The inherent risks associated with dust and dust accumulation are a regular topic of discussion and best practice sharing at pellet industry events. And for good reason, as the recent tragic Horizon Biofuels explosion in Nebraska was a stark reminder of. Another related area of concern, perhaps not as often discussed, is self-heating in pellet storage, an issue that, like dust, transcends the entire value chain – from pellet producer through to end-user.

THERE HAVE BEEN SEVERAL SELF-HEATING in pellet storage incidents in recent years that, thankfully, have "only" resulted in spectacular photos and significant material damage, although they could have resulted in serious injuries and fatalities. What has been learned from these incidents? How can these learnings be transposed into best practices to avoid and mitigate such incidents in the future, and what known unknowns need to be researched and addressed?

Well-attended workshop

Around 90 participants from across the pellet value chain – producers, shipping companies, port authorities, utilities, and fire departments – gathered at Ørsted's corporate HQ in Copenhagen, Denmark, for the Safe Wood Pellet Storage: Preventing, Detecting, and Managing Self-Heating Incidents workshop to discuss these and related issues. It was very timely, candid, and held in the spirit of sharing with a refreshing absence of corporate positioning and posturing.

Why Ørsted? Ørsted has had two large pellet storage fires – Studstrup in 2022, and Avedøre in 2023 – despite having what was at the time considered best practice detection and mitigation systems installed. A casual conversation on the topic between Dr William Strauss, CEO of FutureMetrics, and Søren Alsing, Director Bioenergy, Head of Fuel at Ørsted, resulted in the duo, together with the Wood Pellet Association of Canada (WPAC), and support from Firefly, taking the initiative to host and organize the one-day workshop.

The workshop was preceded by a visit to Ørsted's ongoing carbon capture installation at its Asnæs Power Station in Kalundborg, a topic for a coming issue. Auspicious too. The day after the workshop, Copenhagen hosted an informal meeting of EU energy ministers, which included a visit to Ørsted's Avedøre Power Station.

A value-chain issue

Ørsted is by no means alone, nor are these incidents isolated at one end of the value chain, which is why self-heating, along with dust, is a critical issue for all along the value chain.

For example, in 2016, a pellet ship-loader in the Port of Panama City, Florida, caught fire, damaging the equipment. In early 2017, a conveyor from a German Pellets storage silo in the

Port of Port Arthur, Texas, caught fire while ship-loading. Just a month later, a German Pellets storage silo in the Port of Port Arthur began to smoulder, before it caught fire several weeks later caught fire and ultimately collapsed.

Also in 2017, Göteborg Energi had an explosion and fire in a pellet silo containing around 2,000 tonnes at its Rya energy plant in Gothenburg, Sweden. In 2018, UK pellet producer Balcas had a fire in a storage silo containing 14,000 tonnes of pellets at its Invergordon plant in Scotland. In Japan, Daigas Group had a long-drawn silo smoulder incident in 2022-2023 at its Sodegaura Biomass Power Plant, something that was first highlighted during the USIPA 2024 conference in Miami.

Experinces and learnings

Setting the scene for the workshop, Dr Strauss presented PacBio's two silo fire experiences at the pellet plant as detailed by colleague John Swaan. Both incidents were attributed to self-heating and subsequent smouldering, but were tackled in two different ways and had two very different outcomes, illustrating the gains in knowledge.

The first incident in 2002 was, assumed at the time, to be a normal fire within the silo; thus, aborting the silo – opening it up to clear it out – was initiated, resulting in the top of the silo being blown off. The aborted pellets exposed the smouldering clump of pyrolyzed material, providing the heat and oxygen to ignite the build-up of combustible pyrolysis gases such as methane (CH_4), in the headspace.

The second incident was in 2017, and this time the response was based on the recommendations of the "*Silo Fires*" research report by Henry Persson, researcher at the Swedish SP Technical Institute (now known as RISE – Research Institutes of Sweden). Nitrogen gas (N_2) was injected into the headspace according to specific volume and flow rates, thereby restricting oxygen (O_2), and this procedure was found to be the most effective way to stabilize the smouldering pyrolysis of the pellets before discharging the silo safely, minimizing danger to personnel and damage to the silos and surrounding facilities.

Following on these experiences, Jens Kai Holm, Chief Specialist at Ørsted, recounted details from Ørsted's two pellet storage fire instances – the Studstrup silo fire in September 2022, and the Avedøre storage fire almost a year later in October 2023. Compared to PacBio, both storage units were significantly larger.

With a capacity to hold 65,000 tonnes of pellets, the Studstrup pellet silo was built in 2015 and equipped with detection systems as per the best practice at the time. This included four smouldering fire detectors in the headspace of the silo, four infra-red (IR) cameras for surface temperature monitoring, six hanging thermocouple cables for bulk temperature monitoring, and a spark detection system in a transfer point beneath the silo. Fire mitigation features comprised a liquid nitrogen purging system, a fire foam system for surface fire-fighting, a primary gate, and two secondary, smaller gates for emergency extraction of the wood pellets.

Nonetheless, the silo fire was detected too late to be managed in a controlled way. Likewise, the deployed monitoring and detection systems at the Avedøre flat storage shed failed to detect the smouldering fire in time to allow a controlled response. Indeed, the fire was first realized when white smoke was seen from the rooftop.

The third example, presented by Dr Strauss, was the Daigas Group silo smoulder at Sodegaura Biomass Power Plant. Located on Tokyo Bay, the silo complex receives and discharges pellets for the 75 MW power station 4 km away. Designed to berth ocean-going vessels, the complex comprises a receiving and discharging station and four concrete silos that can hold 10,000 tonnes of pellets each.

Like in Studstrup, the silos were built with the best practice monitoring and detection systems in mind – the "*Silo Fires*" report. These included gas concentration, relative humidity, and 24 temperature monitoring points in each silo, a ventilation system for each silo, a nitrogen truck line to each silo, a pellet circulation option to move pellets from one silo to another, spark detection and extinguishing systems on conveyors, and a fire extinguishing system capable of spraying water on each silo, conveyor transfer area, and warehouse building.

Pellets had been stored in the silos for six months because of delays with the power plant commissioning. The temperature and gas concentrations in the silos had been continuously monitored, and continuous ventilation had been performed to reduce the carbon monoxide (CO) concentration. Suddenly, the CO concentration spiked on December 31, 2022, with white smoke – saturated water vapour with pyrolysis gases – visible from the top of one silo and a few days after, in a second silo. Nitrogen was deployed, but smouldering in the two silos was now a fact, taking until May 1, 2023, when the local fire chief officially declared the silo fire extinguished. Only then could pellet discharge from the two affected silos begin, which took until April 2024 to complete before clean-up operations, including tar- and smoulder debris removal, repair works, and installation of new safety measures could begin. The silos went back into operation in June 2025.

Microbial and oxidative reactions

Clear from these and other examples that silo fires require a different approach than conventional fires, and that Henry Persson's work and findings laid the foundation for safely mitigating a detected smouldering event in a cylindrical silo. For a flat floor storage shed, there are challenges with gas tightness.

However, of even greater pertinence, irrespective of storage type, is the ability to detect and monitor a potential self-heating incident in time to mitigate it long before it becomes a smoulder. The cases thus far had illustrated that detection systems had failed to provide enough time. Therefore, having a comprehensive understanding of what self-heating is and the mecha-

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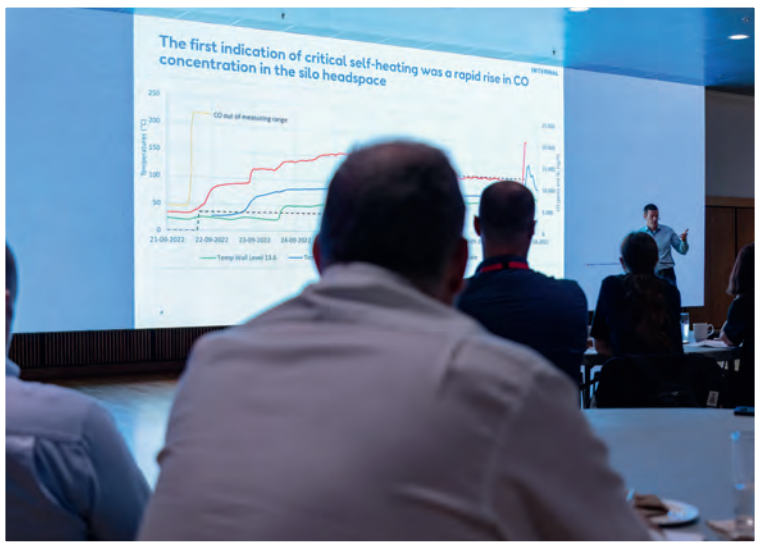
(Top left) A typical flat storage warehouse for pellets at a district heating plant. (Below left) Ørsted's Jens Kai Holm describing the first indications of the Studstrup self-heating indicident, a rapid rise of CO in the silo headspace. (Below right) Dr Fahimeh Yazdan Panah, WPAC explaining what self-heating is.



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nisms behind it provides key insights into what to monitor and why, but also how. With over a decade of biofuel densification, pre-treatment and storage, and handling research studies, Dr Fahimeh Yazdan Panah, recently appointed Associate Executive Director at WPAC, is just the right person to provide these insights.

– Self-heating is an exothermic process that starts small. It may begin with microbial or oxidative reactions that slowly generate heat. If the heat is unable to dissipate, and wood is a poor conductor of heat, the temperature rises further, eventually crossing into thermal runaway and combustion, Dr Panah explained.

As Dr Panah explained, self-heating is an internally driven process of heat build-up from biological, chemical, or reactions that, if unchecked, can lead to combustion. In fact, any material that can decompose or be oxidized by air can exothermically reach spontaneous combustion. Similar to coal, wood pellets self-heat when stored as a bulk, and the self-heating can increase the bulk temperature to the point of self-ignition, as evidenced by silo fires.

Intrinsic and operational factors

According to Dr Panah, there are a number of factors that drive self-heating, intrinsic and operational. Intrinsic factors in pellets include the type of feedstock, e.g., wood species, age (fresh, old), extractives content, particle size distribution, density, porosity, moisture content, and internal surface area. Operational factors include drying method, temperature, and residence time, storage temperature, humidity, residence time, and oxygen availability.

– Moisture is the single most critical intrinsic driver of self-heating. The secondary heat release from moisture rewetting, for example, water vapour condensing on the ceiling of a silo and dripping onto the surface pellets or running down the walls, can be 15–18 times greater than the initial oxidation heat, Dr Fahimeh Yazdan Panah stressed.

Fine particles dramatically increase the surface area available for oxygen contact, which accelerates oxidative reactions, increasing the rate of heat release.

– Monitoring species mix and feedstock history during production is as important as controlling moisture and temperature. Controlling fines during production, handling, and storage is essential to reducing the self-heating risk, Dr Fahimeh Yazdan Panah said.

New strategies to minimize, monitor, and mitigate self-heating

Both Ørsted and Daigas have since deployed updated and new strategies to minimize, monitor, and mitigate the risk of self-heating in pellet storage. For Ørsted, this begins with an assessment of the critical self-heating potential of a wood pellet shipment before it arrives in Denmark using an OxiPress test.

– This method assesses the oxidation stability of wood pellets by accelerating oxidation at elevated temperatures and under oxygen overpressure, explained Jens Kai Holm.

Ørsted has developed a provisional 1 to 4 ranking of reactivity based on the OxiPress results – 1 being very high risk, and 4 very low risk. This in turn decides if a specific risk assessment for that shipment needs to be carried out before storage, and if so, what measures might need to be taken.

– For example, pellets with high or very high reactivity might only go to a flat storage unit, be stored for no more than three months at a maximum pile height of 4 m, and with forced aeration if the bulk temperature exceeds 50 °C, Jens Kai Holm explained.

Changes have been made regarding monitoring temperature and off-gas concentrations such as carbon monoxide (CO), carbon dioxide (CO_2), and oxygen (O_2).

– Surface IR, gas monitoring, and aeration, or purging, are all indirect methods to varying degrees. The continuous monitoring of the bulk temperature of pellets is essential. At the rebuilt Studstrup silo, we now have 65 thermocouple cables installed and secured to the floor, since freely hanging cables tend to shift and provide less reliable data, said Jens Kai Holm, illustrating with a 3-D colour image showing the temperature variations over time.

Furthermore, the gas composition is monitored using a free-standing "Gas Cube" system with sampling through high-temperature-resistant tubes and filters, combined with a wide measuring range. A redundant gas analyzer in the silo penthouse provides detection of measurement errors and ensures continuous monitoring during calibration and maintenance of the primary analyzer.

– The gas monitoring system needs to be able monitor CO up to 100,000 ppm, CO_2 up to 30 percent and O_2 up to 25 percent by volume, allow an easy setup of warning/alarm thresholds, and support data trending using multiple sampling points for accuracy, said Jens Kai Holm, adding a word of caution with auto-calibration and sensor saturation, both of which can lead to false readings.

For temperature monitoring in flat storage, the challenge for Ørsted has been that conventional temperature sensor spears only reach 1-2 m in depth and IR-cameras only the surface, thus a deep-seated hotspot closer to the floor risks being detected too late, as likely what happened at Avedøre.

In an R&D project, Ørsted has developed a simple yet clever and cost-effective method to get temperature sensors 6 - 8 m into a pile using metal piping and an 18V cordless drill. If needed, then portable grain aeration fans can be deployed for "localized" cooling. These have an airflow capacity of approximately 1,500 m^3/h and have an estimated effective aeration coverage of 25 sq. m to a depth of 5 m, depending on pellet porosity. The estimated critical airflow

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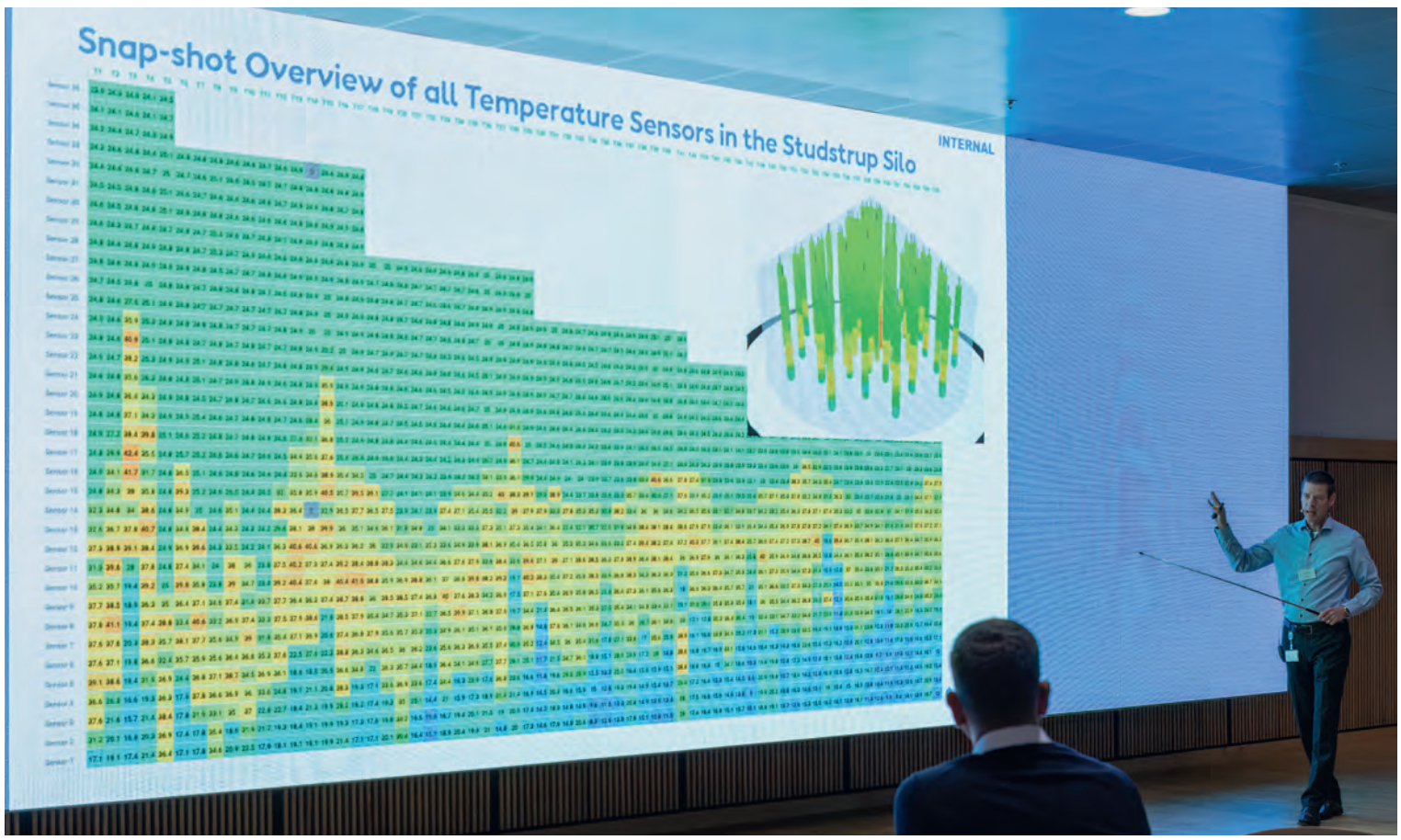
DR FAHIMEH YAZDAN PANAH, ASSOCIATE EXECUTIVE DIRECTOR AT WPAC



Ørsted's Jens Kai Holm explaining the temperature monitoring matrix now deployed at the Studstrup silo. A total of 65 thermocouple cables, each secured to the floor to prevent drift provide a 3-D view over time, identiifying potential hot-spots that can then be mitigated, for instance with a nitrogen purge.

rate is approximately 100 m³/h per sq. m.

For the Studstrup silo, the required aeration capacity would be at least 330,000 m³/h, which would require a total fan power demand in the MW range. Since nitrogen is still needed as a mitigation barrier for the silo, Ørsted decided to rely solely on nitrogen purging to suppress any low-temperature oxidation. In addition, the silo is subdivided into eight purging zones and can, at full deployment mode, inject around 12.5 tonnes per hour.

Another, perhaps surprising addition given the critical role of moisture in self-heating, is a water mist system for the headspace.

– Water mist has a cooling effect, and this is a sectionalized system to control headspace temperature, and not for extinguishing, Jens Kai Holm explained, adding the the total volume of water used is very small.

Likewise, in Japan, Daigas has installed continuous gas, temperature, and humidity monitoring, permanent onsite nitrogen generation capacity, improved the air tightness of the silos, deployed portable gas monitors, and self-contained breathing apparatus (SCBA), rearranged access to valves and other key equipment, as the smoulder incident created a high CO concentration environment around the silos. Both companies have also added a storage time factor into their respective storage management strategies, with pellets either circulated or used after a specified time.

Emptying a silo that has on ongoing self-heating activity or has just had one is also not straightforward, as both the Daigas, and Ørsted incidents showed. The potential presence of elevated levels of explosive gases and deadly carbon monoxide along with the risk of falling debris prevent conventionally operated wheeled loaders from driving in. Ørsted has now three remote-controlled, ATEX-approved wheel loaders shared across its sites as well as extra gates in the storage units for efficient emergency emptying with wheel loaders.

A forum for crucial conversations

While the workshop focused on large-scale storage facilities, it is also worth noting that smaller silos, and even household pellet storage units are not exempt from off-gasing and self-heating issues if not correctly handled. A recent study commissioned by the Swedish Pellet Association (PelletsFörbundet) on fires in pellet silos found that of 29 incidents since 1998, two were under 200 m³ in size of which one has been attribued to possible self-heating. These and other experiences and learnings shared by Daigas, Ørsted, and participants at the workshop have come at a significant cost to each respective organisation.

Although not explicitly discussed with a case during the workshop, the shipping of wood pellets is not free from self-heating and off-gassing incidents either. In the period 2002 to 2021, at least six incidents of fatal CO poisoning have been reported in Europe (the Netherlands, Denmark, and Sweden) as a result of entering cargo holds or rooms adjacent to holds carrying wood pellets.

Not least thanks to efforts by WPAC, the International Maritime Organization (IMO) updated its recommendations with Resolution A. 1050(27) in 2011, and mandated enclosed space entry and rescue drills every two months starting in 2015, as well as requiring ships to carry portable atmosphere testing instruments since 2016. In September 2024, the IMO's CCC adopted a comprehensive revision of the enclosed space entry guidelines and submitted it to the Maritime Safety Committee (MSC) in 2025 for final approval.

Despite this, repeat accidents still seem to occur, suggesting a failure to disseminate and use the knowledge available. Against this backdrop, the *Safe Wood Pellet Storage: Preventing, Detecting, and Managing Self-Heating Incidents* workshop was a good and timely starting point for these crucial conversations. The next step is to build on this momentum of candid experience and knowledge sharing to create an interdisciplinary best practice forum with everyone in the wood pellet value chain on board.

Text & photos: Alan Sherrard
PS11/7520/AS

Editor's note: the presentations from the workshop, and other safety resources are available on the WPAC website https://pellet.org/category/safety/?

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