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Issue 2 Volume 18

March/April 2024

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£180/€245/$280 for
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ISSN 1754-2170

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Front cover image: ©Krivinis
Image from bigstockphoto.com

Biofuels International (ISSN No: 1754-2170, USPS No: 25611) is published six times a year by Woodcote Media Ltd, and distributed in the USA by Asendia USA, 701 Ashland Ave, Folcroft PA.

Periodicals postage paid at Philadelphia, PA and additional mailing offices.

POSTMASTER: send address changes to Woodcote Media Ltd 701 Ashland Ave, Folcroft PA 19032.

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The @EU Commission has established the Union Database for Biofuels (UDB) which opened for online registration by biofuel operators. https://biofuels-news.com/news/union-database-for-biofuels-set-up-by-commission/

Why the adoption of biofuels is crucial if the world is to meet its decarbonisation goals

The adoption of biofuels stands as a pivotal strategy in the global endeavour to achieve net-zero carbon emissions.

With the latest global warming figures showing that the average monthly temperatures exceeded the 1.5˚C level for every month last year, the warning signs are there for everyone to see.

The transport sector, which is one of the biggest polluters, needs to decarbonise fast and the adoption of biofuels is one of the most efficient ways this can be achieved.

As nations across the world intensify efforts to combat climate change, transitioning to renewable energy sources becomes imperative.

Biofuels offer a promising solution in this quest for sustainability.

So why should this source of 'green energy' be adopted? We at *Biofuels International* have long been championing this fuel for at least the last decade when its development was still in its infancy.

Firstly, as we all know, biofuels present a viable alternative to fossil fuels, which remain the primary drivers of carbon emissions.

This reduction plays a crucial role in mitigating climate change and curbing the catastrophic impacts of global warming.

Moreover, the production and utilisation of biofuels can foster economic development and job creation, particularly in rural areas, it has been argued.

This economic stimulation bolsters local economies and enhances livelihoods, contributing to sustainable development goals.

Additionally, biofuels possess inherent versatility, capable of powering a wide array of vehicles and machinery.

From cars and trucks to aircraft and ships, biofuels can serve as a direct replacement for conventional fuels, enabling seamless integration into existing transportation infrastructure. This versatility facilitates the transition towards renewable energy across diverse sectors, accelerating progress towards net-zero emissions.

In conclusion, the adoption of biofuels represents a critical component of the global strategy to achieve net-zero carbon emissions.

As nations strive to build a sustainable future, embracing biofuels is essential in realising the vision of a decarbonised world.

Some of these issues will be debated at our Biofuels Conference and Exhibition that will take place on June 18-19 in Brussels. New this year will be our Sustainable Aviation Fuels Summit. We look forward to meeting up with everyone again. In the meantime, you can keep reading about this and more in our news online at biofuels-news.com.

Paul Warner
Editor

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Chevron idles biodiesel facilities as prices fall

Chevron has idled two biodiesel production facilities in the US Midwest – blaming poor market conditions.

The oil producer bought biodiesel maker Renewable Energy Group two years' ago to expand its renewable fuels production to 100,000 barrels per day by 2030.

The deal brought it 10 biodiesel plants and one renewable diesel facility.

However, Chevron has now idled plants in Ralston, Iowa and Madison, Wisconsin, that combined can process 50 million gallons per year of biodiesel.

Prices have slumped in recently months as supplies have grown and the value of renewable credits recently fell to a three-year low.

The price of a blend of 20% biodiesel fell in February to $3.45 (€3.20) per gallon of petroleum equivalent, from the peak of $4.80 (€4.40) per gallon in October 2022.

President Joe Biden's administration last year increased the amount of biofuels that oil refiners must blend into the nation's fuel mix over the next three years, but the plan includes lower mandates for corn-based ethanol than it had initially proposed which sent credit prices lower.

Producers of renewable diesel generate more renewable credits due to their lower carbon intensity score than biodiesel.

Velocys secures €37 million in growth capital

Velocys has begun a new chapter following the completion of a new deal on 18 January.

As part of the transaction, a new consortium of growth investors including Carbon Direct Capital, Lightrock, GenZero and Kibo Investments have infused Velocys with $40 million (€37 million) of growth capital.

The funds will be used to accelerate the delivery of Velocys' proprietary technology to customer projects while further building its technology leadership and scaling its production.

Velocys has also invested to scale its reactor facility in Plain City, Ohio.

Algae biofuel pioneer HutanBio secures £2.25m funding

HutanBio, a biotech company founded by scientists from Cambridge University, has secured investment from the Clean Growth Fund to accelerate the commercial use of its HBx biofuel oil.

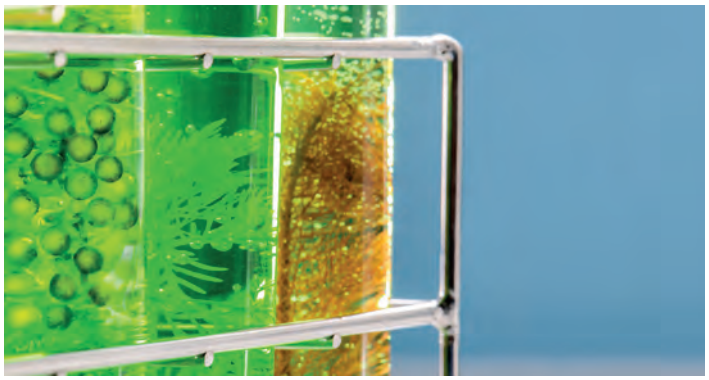
Clean Growth Fund has invested £2.25 million (€2.6 million) to accelerate the company's commercialisation processes.

HutanBio, which is based in Cambridge in the UK and in Malaysia, is aiming to secure a significant share of the maritime fuels market over the next decade – mandated by the International Maritime Organisation to reduce CO_2 emissions by at least 40% by 2030.

Designed from the outset as a ready-made drop-in replacement fuel for the global shipping industry, HBx will support these mandates.

HutanBio's HBx biofuel is a sustainable and scalable high-energy density, low carbon, sulphur-free fuel solution that uses CO_2 greenhouse gas as a feedstock for algae that is grown in special bioreactor farms.

These farms, designed and engineered by HutanBio and controlled by Artificial Intelligence to optimise yields, will be built on unproductive and non-agricultural semi-arid and arid land in countries where there are high levels of sunlight.



Drawing on its extensive global cultivation trials and research work undertaken in Malaysia, HutanBio will provide the algae cultures and expert guidance to set up these farms around the world.

These facilities will increase a country's energy security, provide a major economic stimulus and enhance the local environment.

The company is investigating the possibility of setting up its first biofarms in Morocco and Australia.

Amelia to power Schiphol flights with Neste SAF

Neste and Amelia, a French regional airline, have closed an agreement for the supply of blended Neste MY Sustainable Aviation Fuel™.

Amelia has been using the sustainable aviation fuel (SAF) for all its flights departing from Schiphol since New Year's Day.

This collaboration contributes to Amelia's strategy to reduce the greenhouse gas emissions of its operations, enabling the airline to use nearly 5% SAF as part of its total yearly fuel consumption.

This is already considerably more than the 2% SAF usage mandated from 2025 onwards as part of the European Union's ReFuelEU Aviation regulation.

The regular service connecting Amsterdam to Strasbourg, a route that Amelia has been operating since 2022, will be the first route to exclusively benefit from SAF.

"We are delighted about this new partnership with Neste. Their solution is a perfect fit with our Embraer and Airbus fleet, which can already fly on up to 50% SAF. We are looking forward to further expanding our use of sustainable fuels and carry on our path to lower carbon emissions," said Alain Regourd, president of Amelia by Regourd Aviation.

"Decarbonising aviation is more important than ever, and we are proud to support Amelia in reducing its environmental footprint. Using Neste My Sustainable Aviation Fuel for all flights departing from Amsterdam enables Amelia to substantially reduce greenhouse gas emissions of its aircraft operations. We look forward to continuing to work together," said Alexander Kueper, leading renewable aviation business at Neste.

"The use of sustainable aviation fuel is a major pillar of Amelia's decarbonisation strategy, complementing the company's other development axes. Its use before the upcoming regulation embodies Amelia's willingness and commitment to accelerate towards a more sustainable regional aviation," said Adrien Chabot, head of innovation and sustainability at Amelia.

Praj's SAF demonstration plant opens

Praj's sustainable aviation fuel (SAF) demonstration facility at its R&D Centre in Pune, India, was opened on January 20.

Praj has developed a proprietary technology to process agricultural feedstocks for the production of SAF that can be blended with aviation turbine fuel (ATF).

During the inauguration ceremony, Shri Hardeep Singh Puri, the Minister of Petroleum and Natural Gas and Housing and Urban Affairs, said: "This facility demonstrating indigenously developed technology for production of SAF is a testament to India's rising prowess in the global bioeconomy.

"The utilisation of captive agri-resources for the production of biofuels such as SAF is aligned with the government's goals towards Atma Nirbhar Bharat and it will go a long way in helping India achieve its energy self-reliance by 2047."

Dr Pramod Chaudhari, executive chairman, Praj Industries, said: "The inauguration of the SAF demonstration facility is yet another milestone in Praj's pursuit of energy transition through the use of the bioeconomy.

"Recently, we collaborated with IOCL and AirAsia India to successfully fly India's first commercial passenger flight with 1% SAF produced at our bench scale set up that was blended with ATF.

"We truly believe in India's potential to be a hub for supplying SAF to the global aviation industry and we stand committed to helping build SAF production capacities."

Around 3% of all GHG emissions worldwide are currently attributable to aviation. Unless controlled, these emissions could increase to as much as 22% of global greenhouse gas emissions.

The International Civil Aviation Organization (ICAO) has pledged to achieve net-zero emissions from the aviation sector by 2050.

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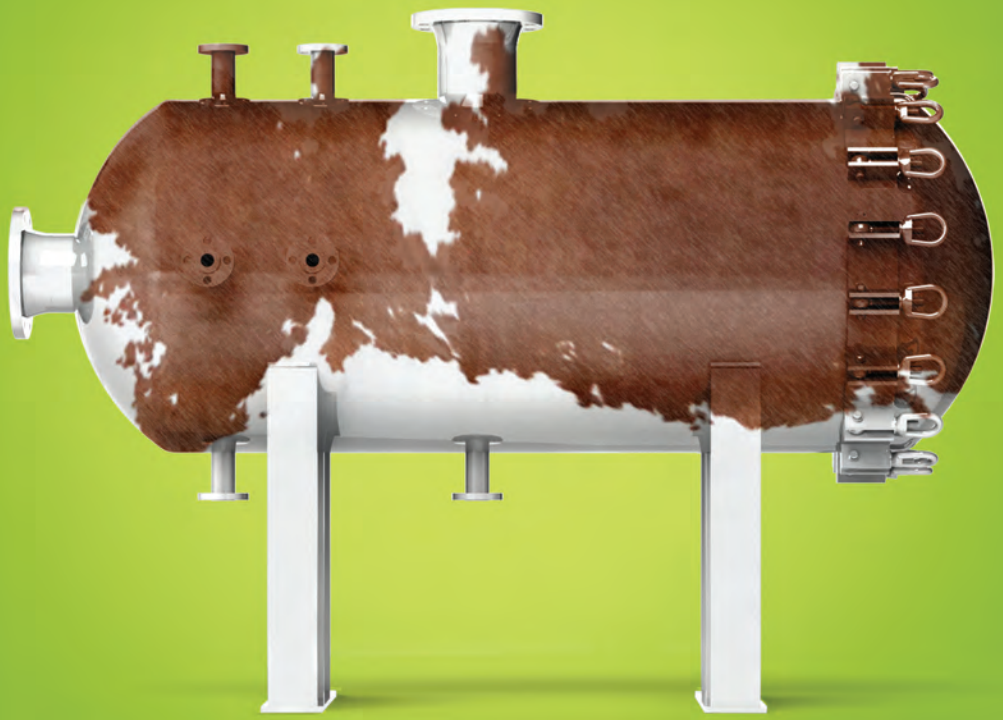

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Plant update: Europe

Cepsa and Bio-Oils

Location: Huela, Spain
Alternative fuel: Sustainable aviation fuel and renewable diesel
Development: Cepsa and the subsidiary of Apical are beginning construction of the largest second-generation biofuels plant in southern Europe. This facility, which will flexibly produce 500,000 tonnes of SAF and (hydrogenated vegetable oil or HVO annually will allow the joint venture formed by both companies to double its current production capacity. The new 2G biofuels plant will form the second largest renewable fuel complex in Europe with a total production capacity of 1 million tons per annum.

Greenergy

Location: Amsterdam, Holland
Alternative fuel: Biodiesel
Development: Greenergy has announced the successful commissioning of expansion works at two of their biodiesel plants in the UK and in Amsterdam. The works included upgrading the pre-treatment process capability, allowing for a wider range of waste oils as feedstocks to be processed into lower carbon biodiesel that will be used in transport fuels to reduce emissions.

Alfanar

Location: Teessside, UK
Alternative fuel: Sustainable aviation fuel
Development: Alfanar has awarded Air Liquide an engineering package to support the development of its Lighthouse Green Fuels project. The project is one of the first underway in the UK aiming to convert biogenic and non-biogenic solid wastes and residues into sustainable aviation fuel. The plant is expected to enter commercial operation in 2028 and to fuel the equivalent of more than 25,000 short-haul or 2,500 long-haul flights a year.

Renovare Fuels

Location: Craigmore, Northern Ireland
Alternative fuel: Sustainable aviation fuel
Development: Renovare Fuels said the first of its kind UK and EU operation will create up to two million litres of sustainable aviation fuel from gases trapped in the waste. The company said it would be able to supply UK-based fuel distributors and multinational petrochemical and airline companies.

Arcadia eFuels

Location: Vordingborg, Denmark
Development: New plant
Alternative fuel: SAF
Construction: Arcadia eFuels (Arcadia), a leading developer of eFuels, Sasol, a global chemicals and energy company, and Topsoe, a global leader in carbon emission reduction technologies, have signed a single license agreement for Arcadia's Vordingborg eFuels plant. Once operational, the plant will deliver eFuels for the Danish and European aviation markets to help meet the European Union mandate of 1.2% RFNBO (Renewable Fuels of non-Biological Origin) or eFuels in 2030.

Galp

Location: Lisbon, Portugal
Development: New facility
Alternative fuel: Biodiesel and SAF
Construction: Portugal's environment regulator has approved a project by Galp to produce biodiesel and SAF using cooking oil at its Sines refinery. Galp aims to build a hydrogenated vegetable oil (HVO) plant, with an initial investment of €269 million at its refinery south of Lisbon, where it plans to install its first 100-megawatt (MW) green hydrogen unit. The plant will have a maximum production capacity of 262,700 tonnes per year of biodiesel and 193,000 annual tonnes of biojet and other products.

CropEnergies

Location: Elseraue, Germany
Development: New plant
Alternative fuel: Bioethanol
Development: CropEnergies is set to build a plant for the production of renewable ethyl acetate from sustainable ethanol. The plant will be built in the Zeitz Chemical and Industrial Park, Elsteraue, Germany. The supervisory board has given the green light to the investment into what will be the first production plant in the new biobased chemicals business. The total investment for the new production facility will be between €120 and €130 million and the ground-breaking is to take place this year and the commissioning is scheduled for the summer of 2025.

Repsol

Location: Cartegena, Spain
Development: Plant investment
Alternative fuel: Second generation advanced biofuel
Construction: The European Investment Bank (EIB) is providing a €120 million loan to Repsol to support the construction and operation of its facility in Cartagena, Spain. The plant will produce second generation and advanced biofuels from different types of waste primarily from the agri-food industry, such as used cooking oils. The plant will process 300,000 tonnes per annum (tpa) of lipidic residues for the production of up to 250,000 tpa of second generation or/and advanced biofuels for the transport sector.

bp

Location: Castellón, Spain
Development: New development
Alternative fuel: Sustainable aviation fuel
Construction: bp has launched a green hydrogen cluster plan at its Castellón refinery in Valencia, Spain. Its transformation – including green hydrogen, biofuels and renewable energy – could see bp invest a total of up to €2 billion in Castellon by 2030. Its production of biofuels is expected to increase three-fold, to 650,000 tonnes a year by 2030. Green hydrogen will also be used as a feedstock in biofuel production, specifically for sustainable aviation fuel production.

biofuels plant update

Apical

Location: Huelva, Spain
Development: New biofuels plant
Alternative fuel: SAF
Construction: Apical has established a joint venture with Cepsa to produce second generation (2G) biofuels by constructing the largest plant in southern Europe. This will be done through its renewable energy subsidiary Bio-Oils located in Huelva, Spain. The joint venture will entail an investment of up to €1 billion, one of the largest private investments in the history of the southern Spanish region of Andalusia.

Fulcrum BioEnergy

Location: Ellesmere Port, UK
Development: New plant
Alternative fuel: SAF
Construction: Jet2 plans a major investment into a new sustainable aviation fuel (SAF) production plant to be constructed in the north-west of England – one of the first such deals in UK aviation. The agreement will see Jet2 invest an equity stake in the plant and it is expected to receive more than 200 million litres of SAF over a 15-year period – which will be one of the longest SAF supply agreements currently. Production of SAF is expected to commence at the plant in 2027, and, when at full capacity, 600,000 tonnes of non-recyclable household waste, which will otherwise have been destined for incineration or landfill, will be converted into around 100 million litres of SAF annually.

IAG

Location: Teesside, UK
Development: New facility
Alternative fuel: Sustainable aviation fuel
Construction: IAG's investment will progress the development of NOVAONE, NPTs first waste-to-fuel commercial-scale production facility, and the UK's first of its kind. The facility is expected to produce biofuels by 2025. Nova is one of several companies in the UK preparing to contribute towards the country's domestic SAF production. The UK's SAF mandate requires at least 10% jet fuel to be made from sustainable feedstocks by 2030. This represents 1.2 million tonnes of fuel (1.5 billion litres).

VARO Energy

Location: Rotterdam, The Netherlands
Alternative fuel: SAF facility
Development: The company will invest $600 million (€560 million) with the aim of helping its airline customers to decarbonise. The facility will have a total feedstock capacity of 350 kt per annum, with a SAF production capacity of 245 kt pa alongside a mixture of bio-naphtha and bio-propane. Production is expected to commence by the fourth quarter of 2026.

Galp

Location: Sines, Portugal
Alternative fuel: Biodiesel and SAF
Development: Portuguese oil company Galp has teamed up with Japan's Mitsui to invest €400 million in an industrial-scale plant to produce biodiesel and sustainable aviation fuel (SAF) from waste at its Sines refinery. The companies will create a joint venture for the project, which will be 75% controlled by Galp. Galp also said it had made a final decision to invest €250 million on its own in a 100 mega-watt (MW) electrolyser unit to produce green hydrogen to power the refinery. It said that both plants will start operating in 2025.

ORLEN

Location: Kętrzyn, Poland
Alternative fuel: Biofuels
Development: The plant is set to process 500,000 tonnes of rapeseed annually, yielding a production output of 200,000 of oil to manufacture low-carbon biofuels. In 2022, Poland's rapeseed crop yielded a total of 3.6 million tonnes. The facility's construction is planned to start in the first half of this year, with completion expected by mid-2026.

Lighthouse Green Fuels

Location: Stockton-on-Tees, UK
Alternative fuel: Sustainable aviation fuel
Development: LGF will convert non-recyclable waste and waste biomass into advanced sustainable aviation fuel at its Billingham site in Stockton-on-Tees. This SAF will then be blended with conventional jet fuel and distributed to UK airports to reduce greenhouse gas emissions in the aviation industry. As the largest and most advanced green-fuel facility in Europe, LGF will convert over 1 million tonnes of non-recyclable waste and waste biomass annually to over 165 million litres of SAF for use on domestic and international flights.

EDL

Location: Böhlen-Lippendorf in Germany
Alternative fuel: Sustainable aviation fuel
Development: Johnson Matthey's Fischer Tropsch (FT) CANS™ technology has been selected for EDL's HyKero plant. The HyKero plant is planned to produce 50,000 metric tonnes of sustainable aviation fuel per year when fully operational, including eSAF from a power-to-liquids route, and it will be the first plant of its kind at commercial scale in Germany.

Orlen

Location: Olsztyn, Poland
Alternative fuel: Biodiesel
Development: The plant, when completed in 2026, is expected to process 500,000 tonnes a year of rapseed sourced from Polish agricultural producers. This will allow it to produce 200,000 tonnes of oil for the manufacture of low-carbon biofuels. The plant is expected to cost €179 million with work expected to begin shortly.

*This list is based on information made available to *Biofuels International* at the time of printing. If you would like to update the list with any additional plant information for future issues, please email paul@woodcotemedia.com

Commercial progress in Europe despite policy shortcomings

Long-term strategy for biofuels

by Colin Ley

Biofuel producers and investors in Europe undoubtedly face a challenging future, although maybe one with a little more hope than has been true of the past decade of high promise and low achievement.

For all the ambitious words and targets attached to European biofuels in the recent past, the damning conclusion reached by the European Court of Auditors (ECA) at the end of last year is that most member states missed their 2020 goals, and that the EU's biofuels' policy lacks long-term perspective.

Looking for hope in the face of such a verdict may appear ultra-optimistic, but recovery and progress invariably starts with a clear, even blunt, diagnosis of what has gone wrong, and the ECA's 61-page analysis was certainly that.

After listing the shortcomings of the EU's approach to the fostering of biofuels as a green energy solution, the report concluded with three key recommendations:

1. Prepare a long-term strategic approach.
2. Improve guidance on advanced biofuels categorisation and assess the capping of feedstock.
3. Improve data and transparency.

The need for urgency in dealing with these issues was also highlighted, a requirement which has long been a challenge for the EU structure, but one which the ECA clearly views as being non-negotiable.

Even if producers and investors accept that a case exists for hope concerning the future development of European biofuels, the task of getting there is not going to be easy, especially not in the short term.

Weaker than expected

On the back of 'subdued growth' last year, for example, the EU economy has started 2024 on a weaker footing than expected, according to the European Commission's Winter Interim Forecast.

As a result, EU growth this year is set to be 0.9%, rather than the 1.3% projection contained in the Commission's previous Autumn Forecast.

Looking beyond the immediate period, however, EU economic activity is expected to accelerate gradually as

the year progresses.

Such expectation is based on inflation continuing to fall, alongside a degree of real wage growth and a resilient labour market combining to support a 'rebound in consumption'.

In addition, the forecast suggested that investment is set to benefit from a gradual easing of credit conditions this year while trade with foreign partners is expected to normalise, after a weak performance last year.

Rising above the gloom

Whatever the economic climate may look like, however, there are always projects and investments with a capacity to rise above the general gloom.

The global drive to develop sustainable aviation fuel (SAF) is clearly one of those, as displayed by the recently announced European partnership agreement between Airbus and TotalEnergies and the construction of Cepsa and Bio-Oils' €1.2 billion biofuels plant in southern Europe. Beginning with TotalEnergies, their new partnership with Airbus commits them to supply more than half the SAF requirements in Europe.

There is also a joint commitment to back a research and innovation programme, geared to create 100% sustainable fuels, with a special focus on the needs of both present and future aircraft technology.

Although the two companies were not exactly strangers before their latest announcement, TotalEnergies having first supplied SAF to Airbus for its Toulouse-based aircraft in 2016, this will still be seen as a major step forward.

The Cepsa and Bio-Oils' project, meanwhile, which is set to begin production in 2026, is scheduled to have a 1 million tonne 2G capacity, geared to convert farm waste and/or used cooking oils to 'help address the decarbonisation of land, sea, and air transport'.

Despite the eight-year prologue to the TotalEnergies/Airbus agreement and the big money commitment of the Cepsa and Bio-Oils venture, the overall state of SAF production in Europe is still best described as being at a relatively early stage.

Not as early as it was, of course, but still well short of the sector's potential. According to the EU Aviation Safety Agency (EASA), approximately 2.3 million tonnes of SAF will be required to accommodate a 5% SAF blending rate if such a rule was applied by the EU to all flights departing from EU airports by 2030. Currently, in quite marked contrast, EASA's assessment is that the EU's SAF production capacity is around 0.24 million tonnes, namely just 10% of the amount of SAF required to meet a 5% blending mandate, a mere six years into the future.

"The doubling of SAF production in 2023 was encouraging as is the tripling of production expected in 2024"

European elections in the summer could have a bearing on future renewable energy legislation

The International Air Transport Association (IATA) issued a similar message in late December last year, commenting that while SAF production reached over 600 million litres in 2023, double the fuel's output in 2022, the future challenge remains immense.

"The doubling of SAF production in 2023 was encouraging as is the tripling of production expected in 2024," said IATA's director general, Willie Walsh.

"However, even with that impressive growth, SAF as a portion of all renewable fuel production will only grow from 3% this year to 6% in 2024.

"Aviation needs between 25% and 30% of renewable fuel production capacity for SAF. At those levels, aviation will be on the trajectory needed to reach net-zero carbon emissions by 2050.

"Until such levels are reached, we will continue to miss huge opportunities to advance aviation's decarbonisation."

Walsh also urged governments to 'make a difference' by prioritising policies to incentivise the scaling-up of SAF production and diversifying feedstocks with those available locally.

IATA believes policy action is required to address the fact that hydrotreatment (HEFA) production technology will dominate the next generation of SAF facilities, according to projections for plants that are expected to be added to the industry over the next five years.

With HEFA relying on inedible animal fats (tallow), used cooking oil and industrial grease as feedstock, the association is lobbying for the identification of 'more potential feedstocks' to boost diversification and regional options. Existing SAF producers in Europe may well be capable of hitting the sector's 2030 requirements, of course, driven by rising demand and a political

SAF supplies to European airports are still small, said IATA's Willie Walsh

climate in which keeping the Paris Agreement's 1.5C global warming target under control remains central.

At the same time, the regulatory landscape within the EU continues to be subject to pressure from those who wish to see ever more restrictive measures applied to which SAF raw materials they consider are acceptable and which are not.

Strong local support

Biofuels International sought a view on all this from Alvaro Macarro, director of sustainable aviation at Cepsa. Did he agree, for example, with IATA's assessments and with the Association's comments on the need for governments to 'make a difference'?

"Cepsa's current 2030 annual SAF target is 800,000 tonnes capacity, an amount that would amply cover demand in Spain from the EU mandate requiring 6% of SAF by 2030," he said.

"As part of that production target, our new plant in Huelva will have the capacity to flexibly produce an annual 500,000 tonnes of SAF, plus renewable diesel from agricultural waste and used cooking oil."

On the government point, he added: "Top institutional representatives on a local, regional and national level were present at our groundbreaking (Huelva) ceremony to support the initiative."

Turning to the feedstock question he said it is 'crucial' that the EU and individual member state governments facilitate the use of the maximum amount of different feedstocks approved under Annex IX of the European Directive on Renewable Energy (RED).

Looking beyond 2030, however, he suggested that synthetic fuels will be needed to satisfy the EU mandate for 70% SAF usage in 2050.

"To make this possible, we must accelerate local, national and EU support for the roll-out of the green hydrogen industry," he said. "Cepsa has an ambitious plan to develop 2GW of green hydrogen as well as the largest green ammonia and green methanol plants in Europe this decade, but incentives and regulatory support are instrumental to accelerating these projects."

Regulatory tsunami

Further accusations of EU policy confusion, this time concerning the European Green Deal, have been highlighted in an open letter to EC president, Ursula Von der Leyen, and Alexander De Croo, Belgium's Prime Minister and current Council president.

Issued in late February by Copa-Cogeca, the European farmers and farm co-operative organisation, the letter describes the Green Deal as a 'regulatory tsunami', with too many rushed consultations, top-down targets lacking assessment, and proposals pushed through without feasibility studies.

As key providers of many energy-based raw materials, alongside their day job of producing food, Europe's farmers are pressing for better recognition of their multi-tasking activities.

"The increasing number of legitimate farming protests in recent weeks and months highlights the pressing necessity for the EU to shift the focus back to rural areas, agriculture and forestry within its policies," stated Copa-Cogeca, adding that in the upcoming months, it will be necessary to assess the Green Deal's impact on the agricultural sector and learn from it.

There was also a warning that the clock was counting down to the next 'pivotal elections' for the European Parliament which are only a few months away.

A sharp reminder, therefore, that those responsible for the shortcomings of the EU's biofuels' policy could easily be moved aside later this year, enabling others with greater vision to take over.

The Cepsa and Bio-Oils' project, meanwhile, is set to begin production in 2026

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www.biofuels-news.com/conference

ePURE's director general David Carpintero, who will be speaking on the second day of the Biofuels International Conference and Expo to be held in Brussels on June 18-19, shares his thoughts on the challenges the industry faces

Setting the agenda

ePURE's director general David Carpintero

Can you outline what you will be addressing at the conference?

Regulatory challenges remain, even after the sustainability of crop-based biofuels has been confirmed by the revised Renewable Energy Directive. At the Biofuels International Conference & Expo in June, we'll explore these challenges, including a look at the potential future for Renewable Energy Directive-compliant renewable ethanol as a carbon neutral fuel, the need to promote the development and mainstreaming of higher ethanol blends and ensuring a continued role for biorefineries achieving EU goals for energy independence, food security and strategic autonomy.

How important are bioethanol plants in helping to reach decarbonisation goals?

European ethanol biorefineries are an important driver of decarbonisation in transport and should have a more important role to play in achieving carbon-neutrality. ePURE members' ethanol already reduces GHG emissions by more than 78% compared to fossil petrol, and there has been continuous improvement in ethanol's GHG intensity savings over the past decade, partly thanks to growing implementation of CCU, CCS and CHP technologies and increasing circularity. Many European biorefineries have the potential to reach carbon neutrality after 2030 and to be carbon negative after 2040.

Is the EU doing enough to combat climate change?

The EU's ambitions to be a world leader in the fight against climate change are admirable, but daunting – which makes it all the more vital for policymakers to take a pragmatic approach that uses every available sustainable emissions-reduction technology. This is especially evident in the latest EU figures on renewable energy compiled by Eurostat, which show that the bloc is still heavily dependent on fossil fuel in transport once the influence of artificial multipliers is removed – more than 92% in 2022, compared to just 7% renewables. It's clear that more needs to be done to promote real renewables in transport.

For more information:
Visit: epure.org

Delegates listening to a presentation at last year's event

"European ethanol biorefineries are an important driver of decarbonisation in transport and should have a more important role to play in achieving carbon neutrality"

The director general has been a regular contributor at the conference over the past few years

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Fueling a greener future with Pongamia trees

Sustainable biofuel

In a world increasingly focused on the pressing challenges of climate change and the imperative to transition away from fossil fuels, a new era of sustainable, renewable energy sources has been unfolding.

Amid this transition, the quest for sustainable and scalable biofuel feedstocks has also intensified. Understanding this gap, Terviva recognised the power of the Pongamia tree, a subtropical tree native to countries like India and Australia, for its immense potential as a sustainable new feedstock for producing advanced biofuels.

The tree is a carbon-sequestering, perennial crop that is suited for a climate changing world, with its ability to grow and revitalise poor quality and underutilised land while also offering sustainable food and fuel.

This potential is being harnessed and led by agriculture innovation company Terviva, which is advancing commercial opportunities to produce the products at scale.

Understanding Pongamia

Pongamia, a climate-resilient, hardy tree, stands at the forefront of a potential revolution in biofuel production, containing attributes that make it future-ready to thrive in a world with a changing climate.

The trees produce beans that harbour a remarkable capability – enabling scaled production of advanced biofuel, a promising alternative with the potential to reduce carbon emissions drastically, relative to fossil fuels.

Dubbed a 'super tree', Pongamia thrives where other crops struggle, rejuvenating exhausted lands, curbing erosion and sequestering carbon.

Belonging to the legume family, the tree has nitrogen-fixing capabilities – it improves soil health and water quality while lessening the need for inputs such as synthetic fertilisers.

Drawing on over a decade of research and innovation, Terviva has developed elite proprietary cultivars (non-GMO) and implemented regenerative agricultural practices, working with local farmers and communities to grow and harvest the tree.

The beans harvested from them contain oil, which Terviva sells to product partners who process the crude into advanced fuels such as renewable diesel, sustainable aviation fuel (SAF) and biodiesel.

It is a transformation narrative — from a humble bean to advanced biofuel which helps to revitalise land and communities around the world.

Terviva's planting projects and wild-harvest Pongamia supply chain do not just produce oil for renewable fuels – they are a catalyst for change, creating jobs and offering sustainable livelihoods to farmers and smallholders globally.

The bean represents an opportunity for wide-scale change — a sustainable, equitable feedstock for renewable fuels that uplifts local communities and the environment.

The effect

Terviva has implemented an equitable and transparent supply chain by collaborating with local farmers and communities to cultivate and harvest the tree.

They convert their sustainably sourced Pongamia beans into crude oil, a low carbon second-generation feedstock positioned as a highly promising alternative for renewable fuels which can serve as a drop-in replacement for traditional fossil fuel.

Crude Pongamia oil is positioned in high regard, as it ranks on par with the environmental friendliness of used cooking oil (UCO) concerning greenhouse gas (GHG) and indirect land-use change (ILUC) impact.

With over a decade of innovation, the company has created elite proprietary Pongamia cultivars that yield high amounts of beans rich in oil and protein.

As these trees mature, they require little to no inputs such as fertiliser and pesticides, low water usage, showcase heightened disease resistance

The tree is suited to subtropical conditions

and exhibit enhanced yield ensuring a steady and efficient feedstock supply.

Once mature, Terviva's proprietary cultivars in an orchard model can yield up to 3-4 metric tonnes of beans per acre (depending on the region) with a remarkable oil content of up to 35-40%.

The company's wild harvest operations meet rigorous standards and have achieved ISCC Plus and ISCC EU certifications, which means that from the wild harvest supply chain to crushing production, they fully comply with RED II and global sustainability criteria, guaranteeing the highest environmental and quality standards are consistently upheld.

In their commitment to regenerative agriculture as a solution to climate change, Terviva partners closely with farmers by helping them to plant trees, restore land and generate new sources of income for smallholder communities.

The trees produce beans that have the capability of producing biofuel

"The beans harvested from them contain oil, which Terviva sells to product partners who process the crude oil into advanced fuels such as renewable diesel, sustainable aviation fuel (SAF) and biodiesel"

Why Pongamia to generate biofuel?

Beyond showcasing a significantly reduced carbon footprint in comparison to traditional fossil fuels, Pongamia-based renewable fuel holds the potential to significantly curb greenhouse gas emissions, aligning with global targets to reduce carbon output.

The perennial crop stands out for its remarkable capability to capture and store carbon for over 30 years.

Terviva, through its regenerative agricultural practices, harnesses the inherent qualities of the tree to not only sequester carbon, but also to rejuvenate land and enhance biodiversity.

Additionally, its extensive root system serves as a staunch defender of soil integrity and water conservation.

In areas facing soil erosion and degradation, these trees act as natural barriers, improving soil health and water quality.

These capabilities make the firm's operations a formidable ally in sustaining ecological balance.

Uplifting communities

In terms of economic impact, Pongamia-based renewable fuel extends far beyond the land and production facilities, profoundly influencing local communities:

Rural development and job creation: Pongamia commercialisation offers an opportunity to improve economic opportunities for rural communities, particularly benefiting smallholders and collectors of wild-harvesting Pongamia in India. Terviva has engaged over 300 female community leaders, or TKS (Terviva Karanja Sakhis), in India to supervise wild harvesting and bean collection, helping to contribute to sustainable livelihoods, and training and education to collectors, making a broader social impact.

Its community and equitable harvest procurement initiatives in India directly impact over 40,000 lives and will continue to impact more.

By utilising the tree for biofuel production, these initiatives pave the way for job creation in rural areas, contributing to economic growth and aiding in poverty alleviation.

Price coupled with impact at scale: Through Terviva's vertically integrated operation, the company is building a system for impact and scale.

Its capability to scale up the oil supply chain stems from its distinctive approach of unlocking the full potential of the bean.

In contrast to other groups that may focus solely on oil extraction, Terviva's strategy involves capitalising on the entire bean, underscoring the economic feasibility of utilising both Pongamia oil and the meal.

The innovative valourisation of the meal opens avenues for diverse applications, including feed and flour, thereby enriching the economic landscape. By prioritising the holistic valourisation of Pongamia, the company is working on meeting the demand for crude oil as a fuel feedstock, where offering a product at a competitive market price is core to that strategy to make sure Pongamia-based renewable fuels can be attainable.

Income diversification for farmers: Growing the elite proprietary trees creates an opportunity for diversified income streams for local farmers.

In addition to their traditional crops, the inclusion of the trees in their agricultural portfolio offers farmers a reliable revenue source as Terviva buys back the beans they have grown and transforms them into a diversified portfolio of products, all at a higher price than traditional uses for the products.

The commercialisation of Pongamia holds immense promise in the biofuel sphere. Its regenerative nature, plentiful oil content and positive environmental impact make it a compelling choice for a world transitioning towards cleaner energy sources.

The economic benefits, including rural development and increased renewable fuel production, further underlines its potential as a change-maker in the energy landscape.

As countries move forward in the quest for sustainable energy, renewable fuel from the seeds is a shining example of the innovation and dedication needed to transform energy systems.

The efforts of companies are pushing the boundaries of what is possible, offering a glimpse of a greener, more sustainable future for the biofuel industry that combines community upliftment with environmental impact.

With continued research, investment, and collaboration, Pongamia biofuel can become a significant player in transitioning towards a cleaner, more sustainable energy future.

For more information:
Visit: terviva.com

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A recent London conference highlighted how new legislation was helping the sector thrive despite geopolitical and economic concerns

Driving growth in biofuels sector

Delegates mingle before the start of the conference

With energy transition mandates demanding continual change within industry, gaining clarity on today's energy markets and the future fuels markets is key.

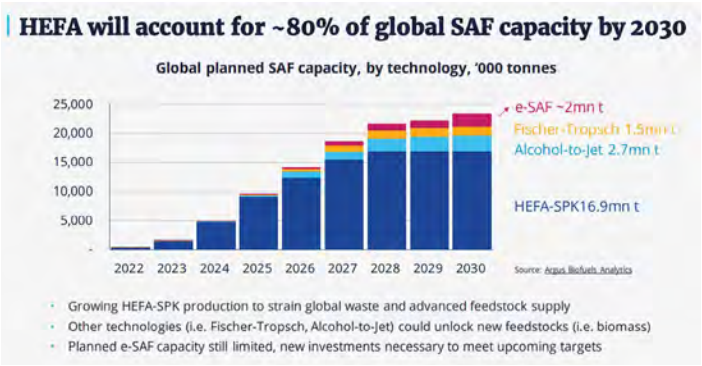
This shift towards cleaner and more sustainable energy sources is not merely a trend, but a fundamental restructuring of the energy sector, driven by a combination of environmental concerns, technological advancements and policy imperatives.

This set the tone and mood for the annual *Future Fuels Forum* organised by Argus Media.

Around 400 delegates packed into the main auditorium at the London Hilton Hotel in London to listen to a range of topics from crude oil and conventional fuels to alternatives including biofuels, ammonia and hydrogen.

Full agenda

The full-day event also provided an opportunity for people to network with their peers and to keep up-to-date with the latest market trends.



"We all need to find ways to ditch hydrocarbons, or instead just find ways to ditch the carbon element when producing oil and gas," declared Euan Craik, president of Argus oil markets.

Today's energy markets are characterised by a mix of traditional fossil fuels, such as oil, coal and natural gas, alongside a growing presence of renewable energy sources like biofuels, solar, wind and hydroelectric power, delegates were told.

This diversity reflected both the legacy infrastructure of the energy industry and the increasing adoption of alternative energy technologies.

Understanding the dynamics

Adrian Binks, Argus chairman and CEO, opened the event

The development of SAF technology was high on the agenda at the conference

of these markets requires a multifaceted approach, visitors were informed.

It involves analysing supply and demand trends, assessing geopolitical factors that influence energy prices and availability, and staying abreast of regulatory developments that shape the operating environment for energy producers and consumers alike.

Moreover, it necessitates a keen awareness of technological innovations driving efficiencies in energy production, storage and distribution.

David Fyfe, Argus's chief economist, addressed some of these issues by saying that energy prices have fallen off from their peak in 2022.

They were still about 40% above pre-Covid levels, he added.

He continued: "Concerns about the availability of supply is keeping prices high despite weakening demand. Added to this, the issues in the Red Sea area are hitting container freight prices.

"Therefore, that last mile of getting inflation to below 2% is going to take longer. The global economic growth level this year looks like being around 2.5%, lower than 3% at the moment.

"A barrel of oil is around $85 (€78) which is not too high to increase inflation and not too low to hamper oil and gas spend."

He concluded by saying that more refineries were closing in Europe and that companies were shifting production to other parts of the world.

High costs in Europe were forcing the hand of firms like TotalEnergies, Shell and ExxonMobil.

Some of these facilities were also being sold on and were being converted into biofuel production sites, delegates were told.

Josepine Ahlstrom, vice-president of business development at Argus, flew the flag for the biofuels sector by saying that its perception has changed in recent years.

"Big investments are going in particularly for sustainable aviation fuel (SAF) and for HVO"

She said: "It is not a marginal business now. The market is going to continue to grow, driven by ambitious targets.

"Its capacity is ramping up to meet the growing demand. Big investments are going in particularly for sustainable aviation fuel (SAF) and for HVO. By 2028, Europe will have doubled its capacity for HVO."

She added that hydrogen-based biofuels, like bio-naphtha and bio-propane, were growing, while 70% of all aviation fuel will need to be SAF by 2050. European mandates for marine biofuel will also see further growth in that sector, she added.

In conclusion, gaining clarity on today's energy markets and the future fuels markets is essential for industry stakeholders to navigate the complexities of the energy transition successfully.

By staying informed, adaptable, and proactive, businesses can position themselves to thrive in a rapidly evolving energy ecosystem while contributing to a more sustainable and resilient future, delegates were told. ●

For more details:
Visit: argusmedia.com

Axiom Global Oil and Gas spearheads sustainability in alternative fuels

Helping to shape the future of biofuels

In a world increasingly focused on sustainability and renewable energy sources, Axiom Global Oil and Gas Trading DMCC has emerged as one of the leaders in the biofuel industry.

With a commitment to environmental responsibility and innovation, Axiom has achieved significant milestones and is poised for further growth and influence in the market.

Introduction to Axiom Global Oil and Gas

Founded with a vision to revolutionise the energy sector, Axiom Global Oil and Gas Trading DMCC has quickly established itself as one of the frontrunners in sustainable fuel solutions.

Headquartered in Dubai, Axiom operates at the nexus of innovation, technology and environmental stewardship.

The company's dedication to reducing carbon emissions and promoting renewable energy sources is evident in its recent achievements and ongoing initiatives.

ISCC Plus Certification: Setting the standard for sustainability

The company achieved a significant milestone last November by obtaining the ISCC Plus certification.

This prestigious certification is a testament to Axiom's unwavering commitment to sustainable practices and adherence to stringent environmental standards in the biofuel sector.

The certification serves as a benchmark for sustainability, validating its efforts to promote eco-friendly fuel alternatives and minimise its carbon footprint.

Pioneering VLSFO B24 supply with second generation biodiesel

In January, the company further solidified its commitment to sustainability with the launch of its inaugural supply of Very Low Sulphur Fuel Oil (VLSFO) B24.

This initiative involved blending second generation biodiesel derived from used cooking oil, sourced from a local plant in the UAE.

The biodiesel procured by Axiom adheres to EN 14214 standards, guaranteeing its quality and reliability. Rigorous qualitative testing was conducted to verify the Fatty Acid Methyl Ester (FAME) content of the final blend, ensuring compliance with industry regulations and standards.

Innovating with blockchain and digital solutions

The company is at the forefront of innovation, leveraging cutting-edge technology to enhance sustainability and efficiency in biofuel operations.

Collaborating with Circularise, a provider of blockchain-based solutions, Axiom is revolutionising the sustainability declaration process for ISCC Plus certification.

By utilising the power of blockchain technology, the company aims to streamline sustainability declarations, making the auditing process more efficient and transparent. This initiative not only enhances the integrity of certified data, but also reinforces its commitment

to accountability and transparency in its operations.

Furthermore, Axiom is exploring the implementation of Electronic Bunker Delivery Notes (E-BDN) to digitise the bunkering process.

By digitising key operational processes, the firm seeks to enhance efficiency, reduce paperwork and minimise the environmental impact of its operations. Both the deployment of E-BDN and digital sustainability declarations are slated for implementation towards the end of the year, underscoring the company's commitment to innovation and technological advancement in the biofuel industry.

Outlook and challenges: Navigating regulatory landscapes

While regulatory developments such as the Carbon Intensity Indicator (CII) and the European Union Emissions Trading System (ETS) present promising opportunities for biofuels, significant challenges persist.

Despite the environmental benefits of biofuels, the bio-premium – the additional cost associated with biofuel production – currently outweighs that of traditional fossil fuels and EU ETS compliance.

This disparity poses financial hurdles for widespread adoption and market penetration of biofuels in the region.

Moreover, the near-term demand for biofuels in the region is largely driven by discretionary actors, such as environmentally conscious consumers and organisations.

While regulatory frameworks provide a supportive environment for biofuel adoption, market dynamics and consumer preferences play a crucial role in shaping demand patterns. Axiom recognises the importance of addressing these challenges through strategic partnerships, advocacy efforts and market development initiatives.

Expansion into the aviation industry: Commitment to sustainable aviation

The company's ambitions extend beyond traditional biofuel markets, with a strategic focus on the aviation industry.

Recognising the aviation sector's significant carbon footprint, Axiom is committed to providing sustainable aviation fuel solutions that reduce emissions and promote environmental stewardship.

As part of its expansion into the aviation industry, Axiom underwent the CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) audit, a crucial step towards obtaining certification.

Anticipated to receive certification shortly, Axiom is poised to become a trusted provider of sustainable aviation fuel, positioning the company as one of the leaders in the transition towards greener aviation practices.

By offering sustainable alternatives to conventional aviation fuels, Axiom aims to mitigate the environmental impact of air travel and contribute to global efforts to combat climate change.

Conclusion

In conclusion, Axiom Global Oil and Gas Trading DMCC stands as a beacon of sustainability and innovation in the biofuel industry.

From achieving ISCC Plus certification to pioneering the supply of VLSFO B24 and embracing cutting-edge digital solutions, it is driving positive change and setting new standards for environmental responsibility in the energy sector.

As the company navigates regulatory landscapes, addresses market challenges and expands into new frontiers such as the aviation industry, its commitment to sustainability remains unwavering.

With a steadfast dedication to innovation, integrity and environmental stewardship, Axiom is poised to shape the future of biofuels and contribute to a cleaner, greener planet for generations to come.

"As the company navigates regulatory landscapes, addresses market challenges and expands into new frontiers such as the aviation industry, its commitment to sustainability remains unwavering"

The company's headquarters is located in Dubai, UAE

For more information:
Visit: axiomglobaltrading.com

Gregor Schaub, associate division director for biodiesel at BDI-BioEnergy International, discusses future areas of application for waste oil-based feedstock and the necessity of selecting the suitable technology

Cargill's biodiesel plant

What fits the process

Traditionally vegetable oils of different quality and refined stages were used for first generation biodiesel and HVO (hydrotreated vegetable oil) production.

The business and its growth was supported by governmental measurements and subsidies.

These measurements were stopped in most cases as new incentives were created, increasingly for waste-based feedstock only called advanced feedstock.

These changes were logically part of the development of overall carbon reduction that came into focus.

Even though technologies to process advanced feedstock have been available for many years, the main focus has only recently shifted to waste-based feedstocks due to political decisions.

Political situation

The current political landscape and the expected future development has led to the conclusion that the industry has a greater interest in increasing the use of waste-based raw materials for biofuel production.

These incentives include the Renewable Energy Directive (RED III) in Europe and measures like the carbon intensity score in the US.

The RED III directive sets a common target for the share of renewable energy consumption of 42.5% by 2030 and encourages member states to further increase this share by 2.5% by the same year.

In summary, advanced feedstock types will be pushed further into the market by national politics or tax incentives.

When biodiesel producers shift to waste-based material as feedstock, the first choice is often used cooking oil (UCO).

The main reason is that UCO's feedstock parameters are close enough to that of vegetable oil.

The result is that there are no, or only minimal changes, to the processes involved.

To incorporate low-quality waste oils as feedstock, significant alterations to the current process are necessary, leading to increased investment requirements. In certain instances, a completely fresh process design will be essential, which could involve retrofit units such as additional washing steps or distillation, the establishment of a parallel production line, or the creation of an entirely new standalone production process.

Technology

Yet, for producers of renewable diesel and sustainable aviation fuel (SAF), progress in utilising waste-based feedstock is advancing at a slower pace due to the diverse array of impurities present in the feedstock, posing challenges for downstream processing.

Typically, processes involving hydration (such as HVO and SAF) necessitate higher feedstock purity requirements because the catalysts utilised in these processes are sensitive to common catalyst poisons

like phosphorus and metals.

Therefore, the typical input specification for HVO or SAF process plants are quite restrictive when compared with biodiesel production facilities.

Well-known technologies for HVO have limits in phosphors in the single digit ppm range as well as for metals group one and two.

In addition, existing facilities for co-processing might not fulfil corrosion protection necessities, which also strictly limits chlorides and acid values in the feedstock.

For biodiesel production, these parameters in waste-based feedstock are not that crucial because most of the production plants are equipped with a final purification step – a biodiesel distillation unit.

In this unit, the problematic impurities end up in the distillation bottom and not in the distilled product.

A general overview of the different kinds of feedstock are listed here.

Apart from UCO, the most common feedstock is animal fat or waste and residue streams from palm oil production.

Feedstock types, which are rarer on the market include trap greases from oil separation systems and acids oils from soap stock splitting processes from large-scale vegetable oil refining.

Generally, these types of feedstock can be categorised into different qualities, listed below from typically favourable to typically inferior.

Argent's biodiesel plant

Each feedstock is accompanied by its most crucial and characteristic parameter, which is discussed briefly, regardless of its intended use in biodiesel or SAF production.

Feedstock types

UCO is a common advanced feedstock for renewable fuel producers, as already discussed.

Relevant feedstock parameters include, for example, free fatty acids (FFA), water content and solid impurities.

The typical range of FFA in "classic" UCO spans from 0.5% to 5%. The water content varies between 0.2 to 2% and solids from 0.1 to 3%.

Furthermore, a high polymerised triglycerides content is expected – up to 10% – from the deep frying process.

Since UCO can be a complex mix of vegetable oils and animal fats, typical contents like phosphorous can be up to 50 ppm. Metal content, sodium chloride and other cooking ingredients in UCO can be on the high side.

Animal fat has a range of between 5 to 45% FFA depending on the source and time of storage.

The longer the storage time the higher the degradation of the fat, which also increases the sulphur content drastically.

Additionally, a significant concern with animal fat is the presence of polymer-type plastics such as polyethylene. The polyethylene often comes from the ear tags of livestock. In addition, the phosphorus content can be very high, but in most cases this is not a critical factor as it comes from the bone meal, which can be separated by a washing step.

Residues and byproducts from the palm oil industry like palm oil mill effluent (POME) and palm fatty acid distillate (PFAD) are also listed as feedstock for fuel production.

Offering a range of typical feedstock parameters would not be feasible due to the significant fluctuations in the various parameters of POME.

Water content, metal, sulphur and other parameters can vary a lot depending on origin and storage conditions of the sourced material.

However, a typical parameter for POME is the FFA content – 50% and above. However, even with this parameter, unexpected qualities (FFA < 25%) have recently appeared on the market.

PFAD is usually a clean high FFA feedstock and has little fluctuation in the quality parameters, but it is likely to be priced higher when compared with POME.

Greases are known by various names and classifications, including yellow, brown, black, and trap grease.

For instance, yellow grease is often synonymous with UCO. Generally, these greases comprise a blend of other waste oils and fats, residues sourced from various

A range of biodiesel types

origins such as fat separation in wastewater systems.

Due to their diverse sources, they tend to have high levels of moisture, impurities, and insoluble substances (MIU), and the triglycerides within the fats and oils can undergo significant chemical degradation. These characteristics collectively render greases as low-quality feedstock, often lacking reliable availability in substantial quantities.

Acid oils are derived from soap stock, a byproduct of large-scale vegetable oil production, particularly from the degumming process.

To recover the oil residue from soap stock, a process known as soap stock splitting is employed, often involving the addition of sulfuric acid.

These acid oils are characterised by high levels of FFA reaching up to 90%, and phosphorus levels as high as 2000 ppm, concentrated from the vegetable oil refining process.

Despite the daunting parameters associated with even the high-quality waste oils mentioned earlier, numerous state-of-the-art technologies exist for converting such waste oils into valuable biofuel products.

Among these technologies are the BDI RepCAT process, which produces biodiesel, and the BDI Advanced PreTreatment, which prepares the feedstock for subsequent use in SAF production through co-processing or hydration.

Purification

As described above, the pre-requirements for feedstock used in SAF and HVO production are very strict.

A multistage purification process is necessary to prepare the waste oils for their use in this sector.

One example for such a purification process is BDI's Advanced PreTreatment unit.

This consists of multiple washing steps combined with a feedstock drying unit, adsorption and filtration processes.

The process reliably reduces selected parameters like MIU, sulphur, phosphorus, chlorides and metals.

The effort and associated cost of cleaning the feedstock increases in proportion to the level of impurities, which are typically more abundant in low-quality feedstock such as animal fat, greases, and acid oils.

This limitation narrows down the range of economically feasible feedstock qualities that can be cleaned up for SAF and HVO production.

Essentially, all types of feedstock listed above are suitable for the BDI RepCAT process.

From the producer's perspective, the preferred feedstock will be of lower quality, which implies a lower asking price for the feedstock and, thus, higher margins when selling biodiesel as a product.

The technology was specifically developed to process materials with a high proportion of free fatty acids (up to 99% FFA) and is insensitive to typical impurities.

The design of the RepCAT technology makes it a robust choice when producers aim for the lowest quality of feedstock, like acids oils.

"The current political landscape and the expected future development has led to the conclusion that the industry has a greater interest in increasing the use of waste-based raw materials for biofuel production"

A Tricanter Pretreatment plant

The main process steps of the RepCAT plant are a pre-purification step followed by a two-stage continuous trans-esterification process under higher temperature and pressure conditions.

As a final production step, the biodiesel and glycerin are distilled in an optimised distillation column.

The products are biodiesel according the required norm (ASTM or EN14214) and is an absolutely salt-free glycerin of distilled quality.

The bottom product of the distillation, which contains the heterogenic catalyst, is partly recycled to the upstream process.

This step gives the technology its name – RepCAT – repeatable catalyst.

Conclusion

As political pressure for advanced feedstock and biofuels overall is increasing, so does the general demand for bio-based feedstock.

This leads to the conclusion that in the near future all feedstock qualities – whether good or bad – will be a valuable addition to the global feedstock mix for renewable fuel production.

Due to the disproportionate demand for SAF and HVO, coupled with the increased effort required for thorough feedstock purification, higher-quality feedstock such as virgin vegetable oil, UCO, and others will be largely absorbed by this market.

Consequently, biodiesel producers will primarily have access to lower-quality feedstock types that are generally unsuitable for SAF/HVO production. This evolving landscape in the feedstock market places added pressure on biodiesel producers to adapt their processes, integrate new lines with appropriate technologies, and maintain profitability while striving to regain a competitive edge. ●

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BioSFerA reveals key results from a ground-breaking approach for advanced biofuel production

A success story

BioSFerA is a research and innovation project that aims to develop a cost-effective production method of sustainable aviation and maritime fuels by combining different technologies.

The project, funded by the European Union's Horizon 2020 (Grant Agreement number 8842089), started in 2020 and it will finish in March.

The main aim of the concept is to produce advanced biofuels by means of hydrotreatment of microbial lipids (triglycerides, TAG).

The partners include the Centre for Research and Technology Hellas (CERTH), Q8 Research, Technical Research Centre of Finland Ltd (VTT), Fundación CARTIF, Bio Base Europe Pilot Plant (BBEPP), Spanish National Research Council (CSIC), RINA Consulting, SUMITOMO SHI FW, National Technical University of Athens (NTUA), Environment Park and the FinCo Fuel Group.

While the hydrotreatment process is similar to conventional HVO production, the BioSFerA project proposes an innovative and low-carbon process based on feedstock conversion of biogenic residues and waste that is by gasified into syngas.

Following on from this, the syngas is converted by two industrial fermentation steps to microbial lipids as illustrated in Figure 1.

After four years from the start of the project, BioSFerA is now able to share the most significant results and conclusions of its advanced ways of producing drop-in liquid biofuels using high TRL and diversified technologies that specifically contribute to the process.

The project received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement number 884208

The results

The art of industrial fermentation, for instance, is determined by the ability to select the right micro-organisms and to develop the right shape to make the highest possible yield of required molecules from the feedstock under specific conditions.

The big advantage of industrial fermentation is that the conversion is executed by the micro-organisms at ambient temperature, what may result in lower energy demand compared to conventional, often thermic, processes.

In case of, for example, syngas-fermentation to acetate there is another big advantage – syngas for a Fischer Tropsch (FT) process must be ultrapure, where industrial fermentation can handle more impurities and contaminants.

It has a significant impact on the pretreatment cost of the feedstock.

Different lab scale fermentation trials have been performed alongside the project by determining exhaustively the role of some of the main parameters influencing the fermentation performance, such as media, pH, syngas composition, pressure and duration on the maximisation of acetate/acetic acid and lipids at the syngas and acetate fermentation, respectively.

A proof-of-concept for continuous fermentation with cell-recycle using anaerobic bacteria was established in a 10 litre gas fermentation bioreactor. This allowed for the production of a sterile acetic acid stream with concentration of around 30 g/l, and reaching productivities up to 0.42 g/l/h, which are acceptable yields.

As for the second fermentation for the production of TAGs from acetate, the use of a genetically modified version of the oleaginous yeast *Y. lipolytica* together with the optimisation of key process parameters (mainly pH, dissolved oxygen content and nitrogen feeding) in one litre and seven litre bioreactors resulted in high biomass production and lipid titer (21 g/l).

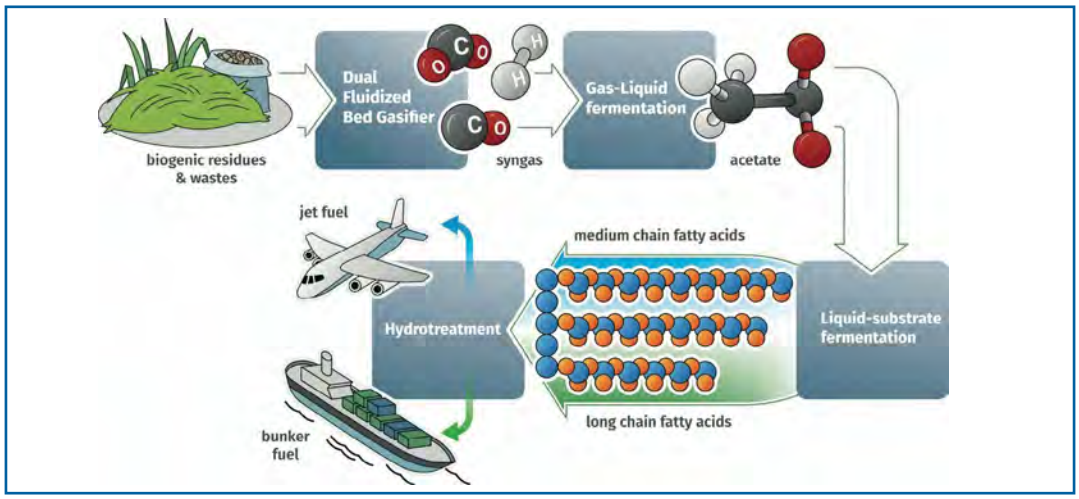
The profile of microbial TAGs produced was based on C16 and C18 fatty acids (30%:70%, respectively).

C16 and C18 fatty acids are commonly found in plant fats, where C16 is typically the formula for palm oil and C18 fatty acids are found in nuts.

This is a mix of lipids suitable for drop-in biofuel (HVO) production.

One of the project highlights was undoubtedly the successful pilot campaign in VTT's premises (Biorrukki site).

For the first time, a biomass fired gasification unit was successfully coupled with BBEPP's mobile unit and real biomass derived syngas was



BioSFerA technical scheme as referred to in Figure 1

converted into acetic acid (AA) via gas fermentation for almost 1.5 months in total.

The syngas fermentation process involved the growth of *Moorella thermoacetica,* an acetogenic bacterium capable of producing AA alongside growing biomass.

The lab-scale development of the syngas fermentation process was utilised as a starting point to bring the technology to TRL5.

Two different biomass feedstock were used, bark and straw.

Different gas cleaning configuration schemes were tested. *M. thermoacetica* exhibited strong resilience towards syngas contaminants, being able to grow and produce AA regardless of the gas cleaning strategy.

Larger scale

The process settings which resulted from the lab-scale process optimisation experiments were verified and applied at a larger scale.

The liquid fermentation technology was successfully upscaled at TRL5 where *Yarrowia lipolytica* was employed for the TAGs production in a 15 m^3 fermenter, resulting in 116 kg TAG.

All the performed fermentation runs at pilot scale were successfully executed. No contamination and no major process issues occurred.

This showed the robustness of the process and the scale-up potential of the *Y. lipolytica* fermentation for TAG production.

CERTH, with the assistance of KPRT, carried out the hydrotreatment tests for the jet and marine diesel fuel production on both TRL3 and TRL5.

Different catalytic systems were studied and the optimum hydrotreatment operating conditions that led to high diesel and jet yields were selected for the TRL5.

As the large scale production is still ongoing (24 January, 2024) and the quality assessment has not finished, more than 120 litres of advanced biofuels with promising characteristics for use as drop-in in aviation and maritime have been produced.

Taking into account any available experimental/pilot data, but also implementing the necessary upscaling considerations, an appropriate process model for the commercial BioSFerA replication has been developed.

The configuration for the integrated commercial concept was elected with the aim of technical viability as well as the greatest possible performance/cost balance.

Full-scale (200 MWth) simulations were performed, the corresponding Process Flowsheet Diagram (PFD) was generated, an appropriate industrial layout was provided, and the overall process heat and mass balances were calculated.

The energetic fuel efficiency (fraction of the chemical energy in the initial feedstock that is transferred to the final fuels) of the plant was calculated at 35.6% whereas the carbon utilisation (fraction of carbon in initial feedstock that is converted to the final fuels) was estimated at 25.4%.

The performed benchmarking of the BioSFerA pathway with other established Biomass-to-Liquid (BtL) technologies such as FT and Alcohol-to-Jet (AtJ) in terms of performance revealed that the BioSFerA concept could be fully competitive.

The theoretically favourable position of BioSFerA lies in its ability to reach decent efficiency levels by avoiding the strict specification of FT that usually requires costly and energy-demanding equipment, or the several unit operations of the AtJ route that raises the total production costs.

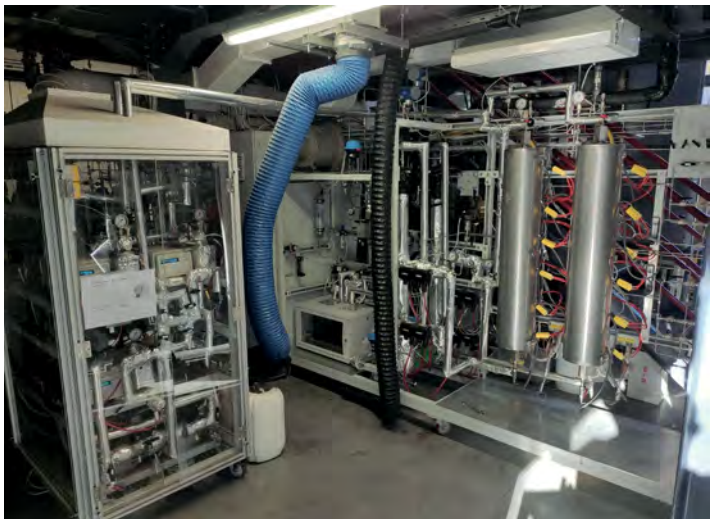
Value for money

The preliminary techno-economic evaluation of the concept implies sustainability and financial competitiveness compared to already certified BtL technologies that also target advanced feedstock (FT, AtJ).

Even though the capital costs for the suggested concept were expected to be even lower, the estimated baseline minimum selling prices of €1.83/l for jet fuel and €1.71/l for diesel (marine fuel) can be considered in the competitive price range for advanced biofuels.

Similar to other technologies that target advanced feedstock, capital investment and feedstock costs seem to be the main cost-drivers of the BioSFerA process as well.

Thus, favourable financial terms expressed in reduced



capital costs or potential involvement of cheap feedstock (for example, biogenic wastes) can lead to fuel production costs close to €1/l.

An additional business scenario was investigated, assuming the hydrotreatment of the purified TAGs (microbial oil) in an existing refinery.

The rationale was to avoid the investment cost of a part that can be entirely carried out in an ordinary refinery, thus exploiting the large existing refining infrastructure and experience. A microbial oil production of cost €1.32/l was calculated for that case.

The environmental assessment through LCA modelling revealed that the GHG emissions of a BioSFerA-type biorefinery are between 15.5-47.4 $gCO2_{eq}/MJ_{fuel}$ depending on the grid electricity carbon footprint of the country that it is located in and the required pre-treatment of the selected feedstock.

It was found that the GHG emission savings compared to conventional fossil production pathways can reach 86%, presenting a significant environmental improvement.

Last, but not least, the results also indicated that future electricity mixes, with higher renewable energy penetration, could play a significant role in the decrease of the overall GHG emissions related to the production of biofuels.

A health and safety evaluation risk assessment was also conducted to identify the main issues associated with the process and also the main mitigation actions to reduce the identified risks.

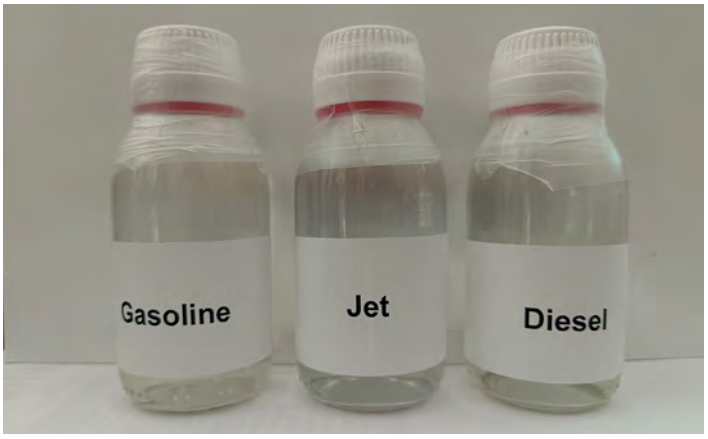
The BioSFerA project introduced, developed and tested at pilot scale an integrated thermochemical/biochemical route for aviation and maritime biofuel production.

The proof of concept throughout the BioSFerA value chain was also carried out.

The aim of the concept is the establishment of a competitive, new BtL technology based on mild operating temperatures, low pressures and generally reduced costs.

The beneficial environmental impact and the financial competitiveness of the concept were validated with appropriate LCA and techno-economic analyses, respectively.

An extended portfolio including verified process models, experimental/pilot results, identification of strong/weak aspects, and upscaling considerations was formed towards the potential scale-up of the technology.



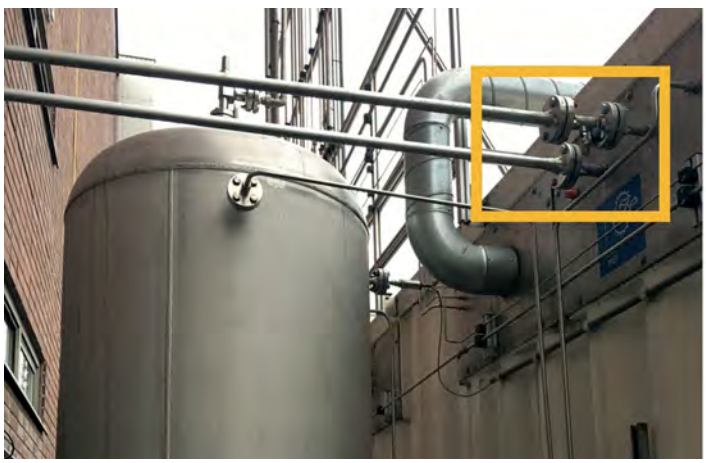
Samples of the produced fuels

The legacy of the project includes the following points:

- Six different types of biogenic feedstock (forest/bark residues, olive/vineyard pruning, wheat straw, sunflower husk) were successfully gasified, ensuring the feedstock flexibility of the concept.
- The operability of the biological synthesis was successfully tested under various real bio-syngas purities, further reducing the cost related to gas cleaning requirements.
- Further advances in strains optimisation can lead to higher acetic acid and TAGs productivities/concentrations and subsequently efficiency improvement of the double-stage fermentation process as well as reduced capital costs (smaller required number of bio-reactors). The biological synthesis optimisation in terms of performance and cost is a key identified aspect towards the scale-up of the technology.
- The hydrotreatment tests verified that the produced BioSFerA microbial oil is an appropriate feedstock for upgrade into drop-in advanced biofuels, compatible with the existing refining infrastructure. ●

For more information:
Visit: biosfera-project.eu

Transport and coupling of mobile gas fermentation unit with the biomass gasification pilot plant



IATA outlines the steps that need to be taken to ramp up SAF production

Overcoming hurdles to decarbonise aviation

The International Air Transport Association (IATA) has announced new estimates for sustainable aviation fuel (SAF) production.

In summary the headline figures include:

- SAF volumes reached over 600 million litres (0.5Mt) in 2023, double the 300 million litres (0.25 Mt) produced the year before.
- SAF accounted for 3% of all renewable fuels produced with 97% of renewable fuel production going to other sectors.
- SAF production is expected to triple to 1.875 billion litres (1.5 Mt) this year, accounting for 0.53% of aviation's fuel need and 6% of renewable fuel capacity. The small percentage of SAF output as a proportion of overall renewable fuel is primarily due to the new capacity that came online in 2023 being allocated to other renewable fuels.

Encouraging news

"The doubling of SAF production last year was encouraging as is the expected tripling of production expected in 2024," said Willie Walsh, IATA's director general.

"However, even with that impressive growth, SAF as a portion of all renewable fuel production will only grow to 6% in 2024.

"This allocation limits SAF supply and keeps prices high. Aviation needs between 25% and 30% of renewable fuel production capacity for SAF.

"At those levels aviation will be on the trajectory needed to reach net-zero carbon emissions by 2050.

"Until such levels are reached, we will continue missing huge opportunities to advance aviation's decarbonisation. It is government policy that will make the difference.

"Governments must prioritise policies to incentivise the scaling-up of SAF production and to diversify feedstocks with those available locally."

CAAF/3 outcome

The Third Conference on Aviation Alternative Fuels (CAAF/3) hosted by the International Civil Aviation Organisation (ICAO) agreed a global framework to promote SAF production in all geographies for fuels used in international aviation to be 5% less carbon intensive by 2030.

To reach this level, about 17.5 billion litres (14 Mt) of SAF needs to be produced.

"Governments want aviation to be net-zero by 2050. Having set an interim target in the CAAF process they now need to deliver policy measures that can achieve the needed exponential increase in SAF production," added Walsh.

Issues that were raised included:

- Demand is not the issue: Every drop of SAF produced has been bought and used. In fact, SAF added $756 million (€696 million) to a record high fuel bill in 2023. At least 43 airlines have already committed to use some 16.25 billion litres (13 Mt) of SAF in 2030, with more agreements being announced regularly.
- Unlocking supply to meet demand is the challenge that needs to be solved: Projections are for over 78 billion litres (63 Mt) of renewable fuels to be produced in 2029. Governments must set a policy framework that incentivises renewable fuel producers to allocate 25-30% of their output to SAF to meet the CAAF/3 ambition, existing regional and national policies as well as airline commitments.

Policy objectives

Effective production incentives for SAF should support the following objectives:

- Accelerating investments in SAF by traditional oil companies;
- Ensuring renewable fuel production incentives encourage sufficient SAF quantities;
- Focusing stakeholders on regional diversification of feedstock and SAF production;
- Identifying and prioritising high potential production projects for investment support;
- Delivering a global SAF accounting framework.

Unlocking diversification

Approximately 85% of SAF facilities coming on line over the next five years will use Hydrotreatment (HEFA) production technology, which relies on inedible animal fats (tallow), used cooking oil and industrial grease as feedstock. Limited quantities of these necessitate policies to:

- Diversify SAF production by increasing production through pathways already certified, in particular the Alcohol-to-Jet (AtJ) and Fischer-Tropsch (FT) which use bio/agricultural wastes and residue.
- Promote investments in, and the fast-tracking of certification for, new SAF production pathways currently in the developmental phase.
- Identify more potential feedstocks to leverage all SAF technologies to provide diversification and regional options, including those with side-benefits such as environmental restoration.

Passenger support

A recent IATA survey revealed significant public support for SAF. Some 86% of travellers agreed that governments should provide production incentives for airlines to be able to access SAF. In addition, 86% agreed that it should be a priority for oil companies to supply SAF to airlines. ●

For more information:
Visit: iata.org

SAF accounted for 3% of all renewable fuels produced

Bill Morphew, Global VP of Sales – Liquids Segment, CPM/Crown, takes a closer look at its global innovation centre

A proven biofuels asset

CPM introduced Crown's Global Innovation Centre in 2019 at their headquarters in Blaine, Minnesota, US, and more recently unveiled Crown's Liquids Pilot Plant as part of a continuing commitment to innovation.

The Global Innovation Centre has been instrumental in both client and internal innovations for process and equipment designs.

The products and processes have varied considerably, from traditional oilseeds to new-to-the-world oilseed crops, but the biggest areas of interest have been in plant-based proteins and pretreatment of feedstocks for biofuels.

Pilot plant

The pilot plant is a small-scale continuous production facility, built to mimic full-size equipment and processes in nearly every detail.

It operates 24 hours per day and includes a control room and laboratory like one might find at a processing plant.

Oilseeds and other raw materials are processed into final products and any intermediates or co-products relevant to the project.

In 2022, Crown's Liquids Pilot Plant was added to the Global Innovation Centre with capabilities to pretreat oils and fats to the specifications for RD and SAF feedstock.

This investment by CPM and Crown represents a significant commitment to the biofuels industry and creates the opportunity to bring in novel oilseeds and take them all the way to pretreated feedstocks for renewable fuels.

In addition, the company recently finished the installation, commissioning and first operations of a 31-metre-tall processing tower with capabilities for fat splitting, edible oil deodorisation and methyl ester and fatty acids distillation.

In an ironic twist, many biofuel producers have so far used the pilot plant more to explore co-products other than the resulting oil.

In many cases, these clients intend to produce vegetable oils for biofuels, but they also have to develop end markets for these co-products.

They are provided with product samples for that purpose. They may also need validation of the processes to justify investments in new processes and facilities.

In most cases, piloting begins with bench scale testing and analysis. These smaller volumes allow quicker responses and give an indication of the value of full pilot testing.

The results from testing a few litres in the laboratory also lead to better planning for a full pilot run.

The lab testing and analysis continues even after the pilot run begins.

In one interesting situation, a client proposed a standard approach to pretreatment, which seemed to make sense given the feedstock.

However, during the operation, the lab analysis did not match expectations created during bench scale testing.

Engineers quickly changed the sequence of the unit operations to try something unique. The results spoke for themselves as it was

able to achieve the final quality expectations through a modified process.

Recently, when a client was looking for mitigation of specific parameters in their feedstock, CPM's Crown was able to modify and install new equipment and then test the performance of those changes all before finalising the pilot run for that feedstock. As new issues arise in the marketplace, Crown is able to adapt and adjust.

The pilot plant

Feedstocks

SAF and renewable fuels producers are always concerned with feedstocks. Many of the most interesting feedstocks have limited availability and questionable quality.

Even when a certificate of analysis is provided, there is still risk that the delivered material will not match expectations because quality can vary quite a bit.

The company has seen these differences between the small volumes for bench testing and the larger quantities that arrive for pilot testing.

The pilot plant can be a great environment for learning about feedstock quality variations. For these situations and many others, it may make sense to run a pilot test for risk mitigation.

The Global Innovation Centre also provides an excellent opportunity to train people on the exact processes found in full-size pretreatment plants.

Control board operators, supervisors and even process engineers will find value in seeing this equipment firsthand, learning how feedstocks move through pretreatment, and how each step is controlled and monitored.

For more information:
Visit: crowniron.com/biofuel

Work being carried out at the plant

"This investment by CPM and Crown represents a significant commitment to the biofuels industry and creates the opportunity to bring in novel oilseeds and take them all the way to pretreated feedstocks for renewable fuels"

The founder and CEO of FatHopes Energy outlines his vision for the company and the industry

No such thing as 'fat hopes' for Vinesh Sinha

What was your first job?
I dropped out of school to start FatHopes Energy and the founding of this business is my first and only job thus far – so it can be said that I was born into this industry as it is the only thing I have ever done. We started back in 2007 when biofuels wasn't even a thing globally yet and, hence, why the company name. When I embarked into the used cooking oil industry I had more disbelievers than believers and many people told us 'fat hopes' this will never succeed.

What interested you about the biofuels industry?
I am very intrigued by fundamentals, it was obvious to me 15 years ago that converting a waste stream into an environmentally-friendly fuel was here to stay. It made economic, social and environmental logic especially in Asia where recycling used cooking oil (UCO) back for human consumption was rampant. Today, on the other hand, that practise is almost non-existent as we have created one of the most financially equitable models to rightfully repurpose UCO towards biofuels instead of any other unscrupulous uses.

What does a typical day consist of?
I am still very involved in the business, it is what I enjoy and I don't know what my day/life would be like without being totally immersed in the business.

I am predominantly tasked with expansion decisions and activities for the continued growth of the organisation, aligned with strategic partnerships regionally to take the company's footprint to the next level.


Vinesh Sinha

I also constantly work on business development, growing new trade channels and opening new markets and to engage with regulators to accept the sustainable products that we originate into their markets.

We worked closely with the EU back in 2014 for Asian-based feedstocks to be accepted and recently with the EPA to prove the sustainability attributes of our products for it to be accepted into the US.

Tell us a bit about FatHopes Energy?
FatHopes Energy is a pioneer in the area of origination, collection, aggregation and purification of various different waste and residue biofuels feedstocks like, but not limited to used cooking oil, palm oil mill effluent, animal tallow and others.

We identify reliable sources, establish the collection network across South East Asia and soon the rest of Asia. We consolidate industrial volumes of the product at the major ports we operate from, before they are processed to meet refiners' requirements and exported to all the European and American oil majors.

We have had the vision to clean up Asia from waste oil as far as possible and to use it to liberate the aviation sector and enable them to use sustainable aviation fuel at scale.

What type of leadership skills do you possess?
I think I understand multi-bottom line business models well, along with the ability to make the wider audience understand why it is important for us to push ahead with this approach.

I have always been the dreamer that liked to look out into the future and theorise what it would or could look like.

I have always been brutally honest – which sometime is not favoured as not everyone likes to have difficult conversations. I have no demarcation between work and family as I treat everyone like family, and knowing that I don't know everything has been quintessential to our continued pursuit.

What is your favourite book and film?
Favourite book: *The world is flat* by Thomas L Friedman
Favourite film: *Jobs* by Ashton Kutcher

How do you like to relax?
I do a significant amount of road cycling, but spending 'me' time has also been very important.

Where is the best place to go on holiday?
I am open to any destination. I usually prefer to go to places I have not been, but going back to places with good friends is also something I look forward to every year.

What piece of advice would you give to someone thinking about entering the biofuels industry?
The biofuels industry is not as simplistic as we initially think it ought to be, it's one of the few markets that have got many inter dependencies and they differ from country to country, for example, the feedstock originating from one country to the end product being consumed in another. Try it out, don't jump in blind – it is intricate, but extremely interesting if you like solving the most difficult problems in the world.

What do you think are some of the immediate challenges the sector faces in the years ahead?
I think the unification of global policies is key to decarbonising, especially the aviation sector. Airlines are multi-country operations and many operate across the planet so regulators, aggregators, producers and distributors need to be in sync globally to be able to meet the needs of airlines globally.

Furthermore, it is important to accept that aviation is a critical industry to decarbonise given its continued growth and the limited alternative options that are currently available, so unification is going to become critical.

For more information:
Visit: fathopesenergy.com

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