



# BIO-BASED

## WORLD QUARTERLY

“...WHEN I SPEAK TO PEOPLE ABROAD ABOUT WHAT WE ARE DOING AND WHAT WE OFFER, THEY LOOK AT IRELAND AND SAY, YES, YOU ARE PERFECT FOR THIS.”

# THE INSIDE STORY ON IRELAND'S BURGEONING BIO-BASED ECONOMY.

PROJECT FOCUS: HOW THE DIGITALISATION OF BIO PRODUCTS IS BOOSTING MARKET CONNECTION

GROWING THE IRISH FOREST BIO-ECONOMY WITH COILLTE

BIOMETHANE ON IRELAND'S NATIONAL GAS GRID FOR THE FIRST TIME - A FIRST FOR IRELAND'S BIO-ECONOMY

HOW THE BUTANEXT PROJECT IS HELPING REALISE THE DREAM OF COST-COMPETITIVE BIOBUTANOL

AND MUCH, MUCH MORE...

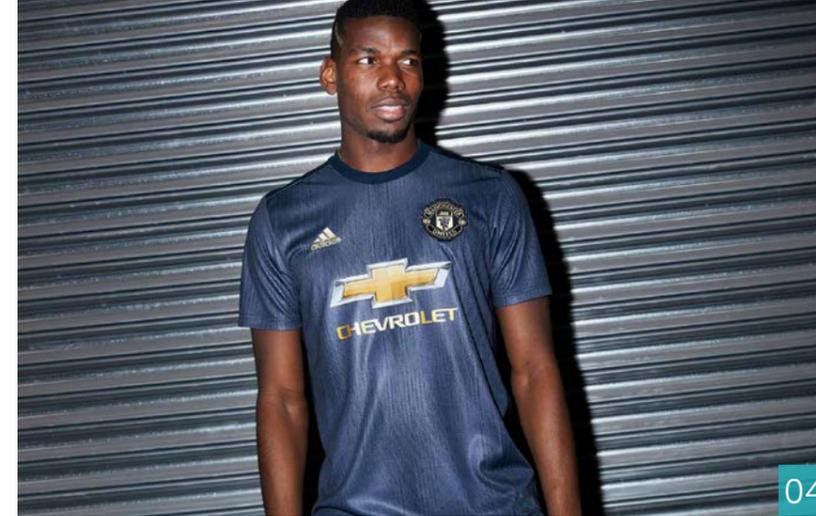


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### CONTACT US:



**EDITOR:**  
**Luke Upton**  
Luke@BioBasedWorldNews.com  
@Bio\_BasedWorld



**MANAGING DIRECTOR:**  
**Alex Williamson**  
Alex@BioBasedWorldNews.com  
@BioBasedMan



**MARKETING MANAGER:**  
**Stephen Scott**  
Stephen@BioBasedWorldNews.com



**CONTENT MANAGER**  
**Dave Songer**  
Dave@BioBasedWorldNews.com



**GLOBAL SALES DIRECTOR:**  
**Matt Anderson**  
Matt@BioBasedWorldNews.com

**Web:**  
[www.biobasedworldnews.com](http://www.biobasedworldnews.com)

**LinkedIn:**  
[www.linkedin.com/groups/8429881](http://www.linkedin.com/groups/8429881)

**Facebook:**  
[www.facebook.com/biobasedworldnews](http://www.facebook.com/biobasedworldnews)

**Instagram:**  
[www.instagram.com/biobasedworld/](http://www.instagram.com/biobasedworld/)

Bio-Based World News  
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57a Hatton Garden  
London EC1N 8JG

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# Considered Amsterdam?



## Port of Amsterdam

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Yes, that's us, down there. Yes, you know us as a prime tourist destination and a business service hub. But did you know that in the port of Amsterdam we have one of Europe's largest biorefinery clusters? The port also has reliable infrastructure, logistics providers and terminals, utilities, feedstock and markets literally at spitting distance. Schiphol Airport is, as you know, just around the corner. We reserved space for your business to grow: Biopark Amsterdam. So consider Amsterdam, you are more than welcome to join us! Discover our success stories on [portofamsterdam.com](http://portofamsterdam.com)



"THE GOVERNMENT WANTS IRELAND TO BE A GLOBAL LEADER FOR THE BIO-ECONOMY. WE WILL ACHIEVE THIS BY HARNESSING IRELAND'S NATURAL RESOURCES AND COMPETITIVE ADVANTAGE. WE ALSO NEED TO MOVE BEYOND SIMPLY FOCUSING ON COMPLIANCE TO INTEGRATING SUSTAINABLE ECONOMIC DEVELOPMENT INTO OUR ECONOMIC MODEL AS WE TRANSITION TO A LOW CARBON ECONOMY."

# WELCOME

Welcome to the tenth issue of the Bio-Based World Quarterly, your dedicated guide to the latest news and essential business developments for bio-based chemicals, products and fuels and the brands that purchase, use and sell them.

What would be your equation for building a bio-based economy?

You'd need feedstock, ideally nearby, and in large quantities. Added to this would be a strong streak of tech driven entrepreneurship. Some elite universities. An economy that feature a mix of start-ups and multinationals. Access to finance both local and international. And a government that doesn't need convincing as to the many advantages that bio-based business can deliver.

This sound about right?

Well, for this issue, we've put a particular focus on a country that ticks all these boxes – the Republic of Ireland. With its proud agricultural heritage it has been delivering bio-based products for millennia. But now it's using this farming culture as the foundation of a burgeoning bio-based economy.

The quote on the left is from Leo Varadkar the Taoiseach (Prime Minister) of the Republic of Ireland, and was attached to the first National Policy Statement on the Bioeconomy which was published on March 12th. Project Ireland 2040, the Government's €116 billion development plan, which is underpinned by a 20 year framework, highlights the potential of the bio-economy in promoting the more efficient use of renewable resources while supporting economic development and employment particularly in rural Ireland.

It was this announcement, the steady stream of stories emanating from the country, and the regularity of Irish voices leading the discussion in Brussels and further afield, led to a special focus in this issue. Thanks to University College Dublin, Coillte, tcbb RESOURCE, NUI Galway and Glanbia for their time and energy in supporting this special issue. If your country or region would like to be the subject of a similar focus, then let me know!

In addition to our Irish focus, we have all our usual features and insights and thanks also to Port of Amsterdam, Trifilon and Specialchem for their support.

Thanks for reading, and please let me know if you'd like to contribute to our future issues – we are always looking for fresh voices and new stories!

*Luke Upton*

**Luke Upton**

Editor & Co-Founder, Bio-Based World News  
[Luke@BioBasedWorldNews.com](mailto:Luke@BioBasedWorldNews.com)

## Verdezyne becomes latest victim of liquidation, as investors withdraw funding.

Confirmed in May, Verdezyne, the synthetic biology company that was founded in 2008 and was working on the production of renewable chemicals, using their own highly-proprietary platform, has gone into bankruptcy. First reported by BiofuelsDigest, with Green Chemicals Blog later speaking with a senior employee from Verdezyne, who said the Californian company closed its operations on May 15th due to its primary investor, Sime Darby, having withdrawn its funding. Verdezyne's other investors included BP Ventures, DSM Venturing B.V., OVP Venture Partners and Monitor Ventures. The closure of the company came ahead of the imminent opening of its first commercial facility, which would have been an impressive achievement for an industry where one of the main challenges lies in producing bio-based materials on an industrial scale.



## IKEA and Neste confirm large-scale production of renewable, bio-based polypropylene plastic.

Initiated first in 2016, the collaboration between IKEA and Neste, to utilize renewable residue and waste raw materials, such as used cooking oil, as well as sustainably-produced vegetable oils in the production of plastic products is confirmed as reaching commercial pilot stage in Autumn of this year. It will be the first large-scale production of renewable, bio-based polypropylene plastic globally. IKEA have issued a number of commitments to reducing their impact on people and the planet while still growing the business. A part of this is the use of more renewable and recycled materials and exploration of new materials for IKEA products and a change all of the plastic used in IKEA products to plastic based on recycled and/or renewable materials by 2030.

## Finland shines a light on algae biofuel, as ExxonMobil also develops method.

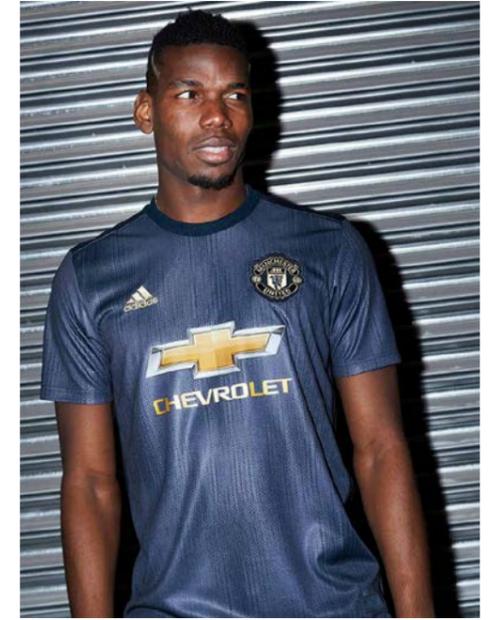
“The research provides important information on how to avoid ‘wasting’ solar-driven energy in biomass production and how to apply this energy directly for the production of useful bio-products.”

The search for a viable plant-based biofuel that could power the next generation of vehicles could have gathered some speed after a group of researchers from a Finland university announced it had developed an efficient method of producing biofuel derived from algae. The University of Turku in the country's south east discovered, via the study of photosynthesis of the organism, a sustainable technique of harnessing solar power into the chemical energy of bio-hydrogen – allowing the transformed algae to work as a microbial cell factory.

## Your shirt is rubbish! Man Utd launch new kit made from recycled plastic waste.

“We all need to change the way we think and act towards our oceans.”

Whilst their rivals from across the city are celebrating a record points Premier League triumph, Manchester United have at least taken a lead in sustainability. Their third kit for the 2018/19 season has been unveiled, and as well as being a rather fetching navy blue (a tribute to a 1968 European Cup win), it is also made from upcycled plastic waste intercepted from shorelines, beaches and coastal communities. The kit is made by German sportswear giants adidas, with the plastic from Parley Ocean Plastic in partnership with Parley for the Oceans. As well as creating awareness of the issue of plastic in our oceans, adidas and Parley also create footwear and clothing from the same waste.



## Going against the grain: AB InBev adopt circular economy thinking to create new by-products.

“These plant-based circular economy nutrients are much more sustainable than traditional sources like animals...”

Brewing beer can be a very wasteful process, with thousands of tons of grain residues dumped once they have been used. But now a different approach is being taken by AB InBev who are giving these spent grains a second life and making beer by-products suitable for consumption. The sustainable technology was developed in AB InBev's Global Innovation and Technology Center (GITeC) in Leuven, Belgium. The possible applications are huge and could be used all over the world.

## Do consumers notice on-pack sustainable messaging? No, says new report.

“It might be important to your brand to include these logos, but you don't need prime packaging real estate – awareness and education are more important to get through to consumers.”

Consumers may say that sustainability influences their purchases but most don't notice sustainability branding on packaging, according to a new study. The research examined whether or not shoppers' behaviours are influenced by a visual sustainability rating system placed on the front of packaging. . Ninety-two percent of the study participants did not notice sustainability logos on the packages despite 53 percent of participants saying that a simple rating system would impact their purchase and over 40 percent claiming sustainability influences their buying decisions.



# EXPERT VIEW: INVEST-ABILITY OF THE BIO-ECONOMY

ROB VAN DER MEIJ, INVESTMENT MANAGER CSCF, CAPRICORN VENTURE PARTNERS

**A**t Capricorn Venture Partners (CVP) we believe the bio-economy is turning into a world economy. The momentum is definitely picking up with a variety of companies going into commercial stages after a long development road, as well as a lot of new initiatives these past few years. Consumer acceptance and demand play a big role. Compared to 10 years ago, when we made our first investments in bio-based companies, we see distinct differences:

- **Drivers.** While 10 years ago the promise to turn a fossil economy into a bio-economy on a like-for-like basis was a main driver for innovation and investment. Today we see that product performance, sustainability and customer awareness are driving the demand for new products. It is not enough just to be 'green', products require a distinct advantage over its chemical alternative, while at the same time sustainability over the life of a product is also required.
- **Enablers.** 'Start-ups, scale-up, accelerators and hubs' are the buzz-words of today. Historically they tended to focus more on IT sectors but we have also seen a steady rise in the number of bio-based economy clusters in operation. Biobased Delta, Biovale and bio NRW are just a few of the many 'connectors' creating the enabling environment for startups, scale ups and established companies to meet, interact and grow.
- **Pilot facilities.** There's no doubt that the Capex needed for pilot plants was one of the constraints in the past for bio-based company developments. However, today we see that many private and (semi-)governmental institutions have made the investments and multi-purpose pilot facilities are available, saving both money and time for developments.
- **Sense of reality.** Costs, complexity and timelines were initially heavily underestimated. This has lowered credibility of the sector as a whole for investors and off-take partners (B2B consumers). Several of the success stories have helped today to demonstrate that it is possible to build a real business, and many more are on the verge of larger scale breakthroughs to the real economy. This is helping to create credible investment cases today. Funding for demonstration-stage facilities remains difficult. We see the EU stepping up with new finance instruments but many are still equity based. Debt-based structures are less of a barrier to the early stage investors and are easier to structure. Government-supported or partially guaranteed 'green' loans can unlock the participation of banks. We now see a lot of banks with 'sustainability' initiatives, but we also see limited potential for banks to participate

directly in projects that still face technology and/or early stage business risks. Smart debts structured instruments can be an enormous help at this stage because they keep a fair reward in play for the early stage investment risk.

Early stage investors have stepped in a big way regarding synthetic biology with high profile investments coming as a result. We observe that those investors are also diverging from the historic build-own-operate model to service and CMO-based models as a way to preserve capital efficiency. At CVP we remain careful in this area, and we observe the early warning signs of a hyped investment sector such as rapidly increasing (early stage) valuations and very high revenue expectations. We keep a very close eye on this sector but remain selective in our target screening.

Nutrients for human and animal food are a big attention area. The challenge of providing healthy and sustainable nutrition to the world is a very big one that drives a lot of innovations across the value chain. While operational farming technologies are out of our scope, we see good investment opportunities for bio-stimulants, fertilisers and pesticides. Also, the use of industrial bio-tech is developing rapidly and has proved extremely suitable for specialised and largescale ingredient manufacturing. Industrial bio-tech seems to be at the verge of larger market penetration, supported by the use of synthetic biology to accelerate and reduce the costs of the development cycle. Fermentation remains challenging as a manufacturing technology for low-priced molecules but is getting very good traction for higher value products. At the same time, we see very promising developments in improved fermentation technology, process optimisation, and intensified separations technology, which are necessary to improve the economics of the process.

Our Capricorn Sustainable Chemistry Fund is very well positioned to capture opportunities in the bio-based investment space. We currently have a fund size of €50 million but expect to have increased this considerably before the end of 2018. Our current investments, ViroVet and DMC BIO, have taken significant development steps since we provided funding and we expect we will close a third investment later this summer. Our flow of deals is constant and it continues to increase on an almost daily basis. To handle this properly we have expanded our team and filled it with new talent, so we are excited and ready to roll! ■

**Rob van der Meij,**  
Investment Manager CSCF,  
[Capricorn Venture Partners](http://Capricorn Venture Partners)  
[rob@capricorn.be](mailto:rob@capricorn.be)

## WHO ARE THE WINNERS OF THE 2018 BIO-BASED WORLD NEWS AWARDS?

**A**mong the many highlights of [World Bio Markets](http://World Bio Markets) in March in Amsterdam (under the ownership of Bio-Based World News for the first time) were the awarding of our 2018 Bio-Based World News Awards. After a two month process, our panel of independent industry expert judges carefully deliberated and decided our shortlist and winners. We received a varied range of submissions from around the world, with entries including gaining fuel from the fatbergs floating in our sewers, bio-based baby toys, some amazing uses of lignin and many more. But there could only be one winner for each category, so who are our 2018 winners?

### BIO-BASED PRODUCT OF THE YEAR 2018

**Winner:** [Stora Enso](http://Stora Enso) - Lignin repurposed for fossil-based materials  
**Runner Up:** [Clean Plus, Inc \(CPI\)](http://Clean Plus, Inc (CPI)) - Drip Trap Granules  
**Highly Commended:** [The Chemours Company](http://The Chemours Company) - Plant-based, water-repellent fabric...Teflon re-imagined.

Markus Mannström, Executive Vice President of the Stora Enso Biomaterials division, says, "We are delighted that Lineo™ has been recognised as an innovative, important bio-based product. Made from lignin, an abundant product and one of the main building blocks of a tree, Lineo™ is a step on the way to replacing petro-based products with renewable solutions. As we say at Stora Enso, "everything made from fossil-based materials today, can be made from a tree tomorrow" and it is wonderful that this is being recognised by key industry representatives."

### BIO-BASED CHEMICAL OF THE YEAR 2018

**Winner:** [Advonex](http://Advonex) - Hydrocarbon ingredients  
**Runner Up:** [Beta Process Bioenergy](http://Beta Process Bioenergy) - Biomass processing, using complete sugar beets

**Highly Commended:** [Vertoro](http://Vertoro) - Crude lignin oil  
Chad Joshi, of Advonex, "Advonex would like to thank Bio-Based World News for awarding Advonex with "Bio-Based Chemical Innovation of the Year 2018. Our electrochemical synthesis technology is a unique approach to making renewable chemicals that heretofore could only be derived from petroleum. With this recognition and thank to the excellent conference hosted by Bio-Based World News, Advonex is poised to launch its products into the European and global markets."

### BEST USE OF ALTERNATIVE FEEDSTOCKS 2018

**Winner:** [Enerkem](http://Enerkem) - Non-recyclable waste converted into fuels and chemicals  
**Runner Up:** [Argent Energy](http://Argent Energy) - Fatbergs to biodiesel  
**Highly Commended:** [Ynsect](http://Ynsect) - Insect meal as an alternative feedstock  
Anton de Vries, Corporate Director at Enerkem said on receiving the award: "We are very pleased and proud to be the Award Winner of Best Use of Alternative Feedstocks. We have come a very long

way from Waste-to-Chemicals technology development to commercial deployment stage today. It is now ready to make a substantial contribution to eliminate a global waste issue and at the same time making a substantial contribution to GHG savings"

### BIO-BASED INDUSTRY STORY OF THE YEAR 2018 - AS VOTED FOR BY THE BIO-BASED WORLD NEWS COMMUNITY.

**Winner:** [Clariant](http://Clariant) and [Enviral](http://Enviral) sign first license agreement on the sunliquid technology for a new full-scale commercial cellulosic ethanol plant.

### VAN'T HOFF INSTITUTE FOR MOLECULAR SCIENCES POSTER OF THE YEAR

**Winner:** Dr Sangho Chung, [University of Amsterdam](http://University of Amsterdam).

"It is an honour to receive the poster award at 13th World Bio Markets Conference. Thank you very much for your inspiring comments and sharing your knowledge. As a young scientist, it was an invaluable experience to meet people from various companies/institutes all over the world"

**Panel of judges:** Marcel van Berkel (CEO VanBerkel Consultancy), Bridgett Luther (Co-Founder, The Disruptive Factory, founder Cradle to Cradle Products Innovation Institute), Duncan MacLeod, (Former CEO, Iogen), Melanie Williams (Director, Melanie Williams Consulting), Jeff Passmore (Founder and CEO at Passmore Group Inca), Adam Lusby (Founder, CE Optimal) and Lawrence Sullivan (Adjunct Professor, the Citadel) for their time and energy in making these awards happen. ■



Photo credit: Ryan Swenich

# PROJECT FOCUS: HOW THE DIGITALISATION OF BIO PRODUCTS IS BOOSTING MARKET CONNECTION

"FIVE OR TEN YEARS AGO, CHEMICAL COMPANIES WERE TRADITIONALLY INITIATING THE FIRST CONTACT WITH THE POTENTIAL CUSTOMERS BUT NOW THAT'S REALLY BEEN FLIPPED ON ITS HEAD AND THAT FIRST CONTACT IS INITIATED BY THE ENGINEERS. AND IT IS A DIGITAL CONTACT, NOT A PERSONAL ONE."



"That was the reason for starting [SpecialChem](#); we wanted to harness the digital tech that was emerging at that time to make marketing and innovation in the chemicals and materials industry not only easier but faster, more effective, less expensive and measurable. At the forefront of these marketing and innovation needs, you will find bio-based products. These are still the dynamics of our company today."

That move taken by Cabarry back in 2000, "when no one was really anticipating digitalisation of their company's marketing or sales or even their innovation" has recently accelerated with a digitalisation wave hitting all sectors of the economy, the industrial sector at large and now bio-based chemicals.

The most transformational aspect is that customers themselves are digital. "All the engineers, formulators, material engineers spend a lot of time online to look for the solutions they need. During the exploration phase of their projects, they will select 3 to 4 suppliers, for example using specialized platforms like SpecialChem, and then initiate the contact. They are taking control" says Cabarry.

"Five or ten years ago, chemical companies were traditionally initiating the first contact with the potential customers but now that's really been flipped on its head and that first contact is initiated by the engineers. And it is a digital contact, not a personal one. Because of that change, companies need to adapt. It goes much deeper than just buying CRM software and having a nice website. It has to be more transformational in terms of redefining their market interaction processes."

Unsurprisingly, Cabarry says that usurping fossil-based products remains the original challenge for bio-based products but it's that very challenge that also potentially offers the key. "It is making their life more difficult, but also forces them to be more innovative in bringing the right products to market. The number one source of innovation is hunger. The bar for them is higher."

The acceleration of digitalisation can offer big benefits to those companies in the bioeconomy, especially regarding innovation, Cabarry explains. One of the keys for the success of bio-based technologies is to rapidly find the right co-development partners, i.e. the ones ready to pay a premium versus traditional alternatives or to co-invest in the development of their application. "It's great for innovators because implementing digital methodologies

like crowdsourcing or open innovation on the relevant online communities can help them find the right partners more rapidly and more systematically. It can also work for large companies releasing new products because it breaks down the barriers of time and distance even for them."

That strong community aspect that the [@SpecialChem](#) founder speaks of isn't just good for business, it also mirrors the way that people work in the bioeconomy today. "No one invents alone now – the days of lonely inventors creating something in a lab with no contact with potential customers until the product is fully ready are over. Today it's about collaboration between the supplier of the material holding the tech, and the industrialists who will be able to use it and jointly develop the applications of it."

But how does one choose the right organisation to partner with? Well, that still remains an area that has been constant over the last 18 years, explains Cabarry, and not everyone gets it right. "Typically you have a start-up with a new biopolymer, for example, and they know they can't develop it alone – so to develop the application and the tech they tend to rush and want to form partnerships with large companies." Clearly, those big companies represent a big potential market for them, admits

Cabarry, but those same companies aren't agile or fast. "They're definitely not going to push to develop the innovation as fast and furious as a start-up company would."

Cabarry advises to look towards the smaller to medium-sized firms, or the "hungry seconds" as he calls them. "You'll have a better interaction in the market with them as they often need your innovation and they're ready to invest resources quickly. They will also share their knowledge more readily than the big companies, which are often that way because the big companies want to own the innovation for themselves." And again, the use of digital and agile methodologies can help companies to find those "hungry seconds" faster, and in the end even accelerate the whole product development process itself.

As for the future of the bioeconomy, Cabarry predicts that production costs will be driven down as bio-based products are more widely adopted, a change that is in the hands of the big suppliers, he says. "What could change the game is if retailers or big brands decide to change the game themselves. They could, for example, foster the adoption of bio-based products, create labels or certifications to force an entire industry to make a move. I think that big companies will increasingly use this argument to gain market share." ■

For developers and suppliers of bio-based chemicals, one of the main obstacles standing between success and failure is finding the right co-development partners. Helping that process, the omnipresence of technology connects people across the globe and makes that connection easier in one sense, due to the fact there is an active audience. But it also throws up a big challenge: with a seemingly infinite number of possibilities, where does one start?

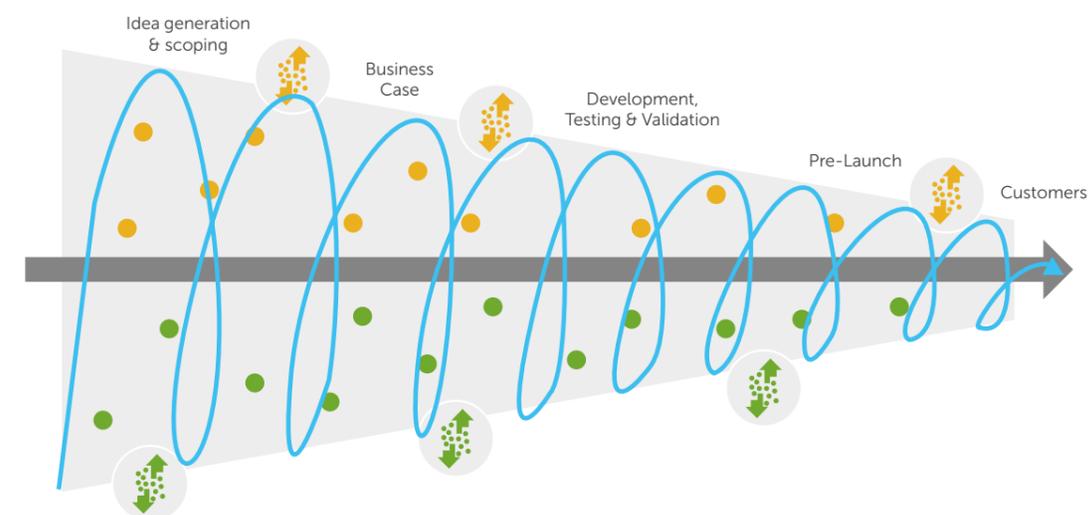
One company has been addressing this very issue since its inception 18 years ago. [SpecialChem](#) helps formulators and suppliers navigate the choppy digital waters with their online platforms dedicated to the chemical industry – from plastics, elastomers and polymer additives to coatings, adhesives and cosmetics ingredients. Explaining how it does this the founder and CEO of SpecialChem, Christophe Cabarry, spoke to Bio-Based World News about the company's modus operandi, the impact of digitalisation on the bioeconomy, and why it's "frustrating being a marketer in the chemical industry".

That source of frustration relates to joining the dots between the huge numbers of applications and bio-based products that are available in the bioeconomy today. "It's no mean feat to protect and maintain margins that exist in very long value chains with so many decision makers, and it makes marketing difficult and very complex," Cabarry says.

## The Agile and Digital Stage-Gate

**TECHNOLOGIES**  
Digital connections to the technology holders to get feasibility, techno & partners

**MARKETS**  
Digital interactions to the market to get needs, validation, partners





## HEADLINER: PROFESSOR ORLA FEELY, VICE-PRESIDENT FOR RESEARCH, INNOVATION AND IMPACT AT UNIVERSITY COLLEGE DUBLIN.

**W**alking through the expansive University College Dublin (UCD) campus with its shiny glass covered buildings, impressive lush lawns and laptop-hugging students hurrying between lectures, it is momentarily surprising to turn a corner and come face to face with an 18th century villa.

This is Merville House, once a gentleman's residence, then a riding school, and now host to NovaUCD, the university's centre for new ventures and entrepreneurs, and a key driver of the fast-growing Irish bio-economy. The journey from discovery in a university lab, to those first steps into commercialisation through to growth, scale and profitability is one that most businesses in the bio-economy aim to achieve, but far fewer experience.

[NovaUCD](#) offers state-of-the-art facilities for the high-tech and knowledge-intensive start-ups that help to power the bio-economy and connections with a community of entrepreneurs and investors both at home and abroad.

The buzz found within the facility is indicative of the growing positivity around the bio-economy in the Republic of Ireland. In order to learn more Luke Upton recently sat down with **Professor Orla Feely**, Vice-President for Research, Innovation and Impact at UCD to talk about linking academia to entrepreneurship, why Ireland is a perfect fit for the bio-economy and much more.

**Luke Upton (LU):** Thanks for the time today. With the first National Policy Statement, the development of the National Bioeconomy Campus at Lisheen as well as a growing number of start-ups, we are seeing a real focus in Ireland on developing its bio-economy. What's driving this change?

**Professor Orla Feely (OF):** Quite simply, it's an obvious opportunity for Ireland to take. With our strong tradition of forestry, marine and in particular agri-food - which employs around 170,000 people in a sector worth €26 billion - we are perfectly placed to become a global leader.

For rural areas, the bio-economy offers an opportunity for a more diversified agricultural economy, helping create new businesses, new products and new jobs. To give just one example, we are seeing agricultural waste, which previously has been a costly problem for farmers to dispose of, being turned into products and new revenue streams. Many of the high-tech outputs of academic research are most visible in urban areas, but the bio-economy represents an important link between academia and rural areas.

Beyond these economic benefits, a growing bio-economy can also help Ireland address the challenges that every country faces - climate change, food and energy security and sustainability. The bio-economy can help us find new ways to make the things we need and help achieve the United Nations Sustainable Development Goals (SDGs) to which the country is fully committed.

**LU:** So, where does UCD fit into supporting the bio-economy growth?

**OF:** We are not just Ireland's largest university, but also the most globally engaged. The whole university is committed to excellence in research and innovation, with the bio-economy a major aspect of this. NovaUCD is a major example with around 30 exciting companies currently clients and with 160+companies incubated since 2003.

Another is the Science Foundation Ireland (SFI)-funded Beacon Research Centre, which focuses on bio-based resources, creating clusters for partnerships and delivering expertise and training, and of which UCD is the lead institution.

I should also mention my colleague [Professor Kevin O'Connor](#), Director of the Beacon Research Centre, who is playing a major role in shaping the future of the bio-economy, not just in Ireland but also across Europe in his role as chairman of the Science Advisory Board for the Bio-Based Industries Joint Undertaking (BBI JU). In addition to his academic and policy work, he's also an entrepreneur, and has his own business, [Bioplastech](#), which was founded as a UCD spin-out company. This mix of experience and perspective, makes him a great leader.

**LU:** Thanks, with lots of bio-based innovations beginning at university, one of Irish projects making headlines recently is AgriChemWhey after securing €22 million in EU funding. What's UCD's connection with the project?

**OF:** We are very proud to be part of the consortium behind this project, which will explore the development of a new state-of-the-art bio-refinery. Based in Lisheen in Co. Tipperary, it had its foundation in UCD's research and innovation partnership with Glanbia Ireland. Together with Trinity College Dublin, we helped find a sustainable solution for disposing of by-products which represent a major challenge for the dairy industry and turn them from a problem into an opportunity. The process converts them into cost-competitive, sustainable lactic acid which can be used to make bio-based products including biodegradable plastics, bio-based fertiliser and other minerals. There's a fantastic consortium behind this, and one that really shows the value of partnerships in building major projects.

**LU:** We will certainly be covering AgriChemWhey as it develops. Are there any projects or products in Ireland that you would like our readers to be aware of?

**OF:** I think the SFI Beacon Research Centre is going to be a very exciting development for the country and is going to help make a big difference to scientific, technological and social challenges in the country.

Another project, I'd like to highlight is another that unites agriculture and ICT - [Consus](#). This is a five year collaboration between UCD and Origin Enterprises that delivers a 'data-driven' approach to agriculture, with the aim of sustainably improving crop yields. Again, it's another link between academia and business in Dublin and rural parts of the country, and one that has huge potential for economic and job growth.

**LU:** Thanks, and just to finish if we were having this discussion again in ten years' time, how would you like to see the role of the bio-economy in Ireland?

**OF:** We want to see real change. From the economic benefits, to the growth it can deliver in rural areas, job creation, helping alleviate the problems of climate change and fulfil the UN SDG

agenda, it is too big an opportunity not to take. Whilst a small country, we have a global outlook, and when I speak to people abroad about what we are doing and what we offer, they look at Ireland and say, yes, you are perfect for this. It's an exciting time, and I'm looking forward to seeing a lot more developments and projects in our bio-economy.

**LU:** Great, well thanks for the time today, we'll certainly keep our readers up to date with the work that UCD are doing in this sector and those projects you've mentioned.

The energy and confidence that Ireland has in growing its bio-economy is clear when speaking to Professor Feely. The blend of a strong agricultural base, academic institutions such as UCD infused with not just expertise but also a strong entrepreneurial spirit, supported by a government (and legislators with rural constituencies) who are beginning to see the many positives of a strong bio-economy, create a powerful proposition. Merville House, which once would have been surrounded by fields, but has now been renovated, restored and extended, and renamed NovaUCD, to support hi-tech innovation is on reflection, the perfect setting for one of the major hubs driving forward the Irish bio-economy. ■

For more information visit: [www.ucd.ie/researchandinnovation](http://www.ucd.ie/researchandinnovation)

Professor Feely can be found tweeting at [@OrlaFeely](#)



"WE WANT TO SEE REAL CHANGE. FROM THE ECONOMIC BENEFITS, TO THE GROWTH IT CAN DELIVER IN RURAL AREAS, JOB CREATION, HELPING ALLEVIATE THE PROBLEMS OF CLIMATE CHANGE AND FULFIL THE UN SDGS AGENDA, IT IS TOO BIG AN OPPORTUNITY NOT TO TAKE."

# GROWING THE IRISH FOREST BIO-ECONOMY



**Fergal Leamy**  
CEO  
COILLTE



**C**oillte is a commercial company managing over 440,000 hectares across Ireland and operating a forestry business, a land solutions business and two manufacturing plants producing timber panels for the construction sector. As producers of a renewable biological resource and value added bio-based products, Coillte is already well established in the traditional forest bio-economy. However we see this as just the beginning, and as part our strategy to 2030, we are actively exploring new and innovative bio-based products as a new bio-economy emerges in response to the pressing need for de-carbonisation of production and energy systems.

Forests serve multiple and interrelated social, economic and environmental functions. Besides providing jobs, income and raw materials to traditional timber industry, forests continuously sequester carbon as they grow and accumulate biomass. Products made from forest biomass store carbon and can provide a substitute for high embedded carbon products such as plastic, concrete and steel.

Forests purify water supplies and regulate water flow, mitigating flood risk. Forestry is generally a low intervention land use and contributes to soil stability and fertility. Finally the life cycle of forests is long and, between planting and final harvesting, forests provide an important habitat for wildlife and a place to recreate and experience nature.

In providing a sustainable feedstock for the new bio-economy, the multiple uses of forests must be considered and carefully balanced and this is a core competence of Coillte. All our forests are sustainably managed and all harvested biomass is independently certified to FSC™ and PEFC™ standards.

The structural characteristics of forest biomass are unique and extraordinary and recent innovations in engineered timber are taking the world's oldest construction material and radically expanding its range of use. Pioneered in Austria in the 1990s, cross-laminated timber technology has now matured and moved from niche to a mainstream alternative to structural steel or reinforced concrete.

The Tall Wood Residence at the University of British Columbia in Vancouver is an 18 storey (53m) wood structure built on a concrete podium. Completed in 2017 and now home to 400 university students, the building was designed by Canadian architects Action Ostry with the Austrian practice Architekten Hermann Kaufmann acting as tall wood advisors. Closer to home at 14 storey (49m) building has been completed in Bergen, Norway and a cluster of 10 storey (33m) buildings have been built

in London. These low-carbon buildings can be built fast and are well suited to constrained city centre sites.

Bio-based products are not limited to bio-based version of existing products. Novel products which exploit the structural quality of forest biomass, but have entirely new and innovative functionalities, are also being developed. Swedish clothing company Allvar manufactures premium products from textiles produced from forest material. The Swedish forest origin is a key marketing feature of Allvar's products. New high-tech, low-impact packaging materials derived from forest biomass are now in use and a wide range of plastic substitutes are under development.

At a non-structural level, biorefinery technology provides an opportunity to create new value-added products from forest biomass and in particular from forest residues. Biorefineries can potentially produce high value products such as liquid bio-fuels, bio-resins and a variety of other bio-based materials and could provide feedstocks for further processing in the biotechnology sector. The future development of integrated and diversified biorefineries holds the potential to create synergies and economies of scale between agriculture, forestry and fisheries and would have particular advantage for an island nation with a strong agricultural base such as Ireland.

The bio-economy will need creative new business models for partnering the production of renewable natural resources with engineering and conversion technologies. Ireland has a relatively low population density, fertile soils, abundant freshwater resources and a mild year-round climate, creating excellent conditions for biomass growth generally and arguably some of the best conditions in the world for growing trees. Coupling this with Ireland's strengths in life sciences and data technologies creates the potential for a world leading bio-economy.

The age structure of Irish forests is such that the total output is set to double in the next ten years. This coupled with developments in engineering and conversion technologies and a strong policy drive to reduce use of fossil derived materials and fuels creates a great opportunity for a thriving Irish bio-economy. The new bio-economy requires a shift in our thinking away from traditional sectorial conceptions and definitions and a move towards new collaborations between resource production and processing and conversion. Success has the prize of a range of innovative, resource efficient, dynamic and competitive industries responding to the key challenges of our times. ■

For information contact Ciarán Fallon, Head of External Relations

[Ciaran.Fallon@coillte.ie](mailto:Ciaran.Fallon@coillte.ie)

“THE NEW BIO-ECONOMY REQUIRES A SHIFT IN OUR THINKING AWAY FROM TRADITIONAL SECTORIAL CONCEPTIONS AND DEFINITIONS AND A MOVE TOWARDS NEW COLLABORATIONS BETWEEN RESOURCE PRODUCTION AND PROCESSING AND CONVERSION.”

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## FEATURE

### PROJECT FOCUS: CONVERTING DAIRY BY-PRODUCTS INTO HIGH VALUE BIO- BASED CHEMICALS IN TIPPERARY.

DAVE SONGER, BIO-BASED WORLD NEWS.

**A**mong the many positives of bio-based chemicals and feedstock production is that they often use materials that would otherwise be put to waste, fulfilling a vital aspect of the circular economy. In order to make this process as sustainable as possible, it's necessary to make use of resources that are close by. Being forced to ship materials over large distances certainly adds cost and – crucially from a bio-perspective – it can also massively reduce the sustainability of an entire project.

Producers that can access plentiful feedstocks with the minimum of fuss can have the best of both worlds – exactly the position that Ireland finds itself in. The country is in the midst of a bio-based revolution and one company is doing particularly well, calling on the island's strong dairy sector to produce high value bio-based chemicals made from the by-product of whey protein. [AgriChemWhey](#) is a consortium comprising 11 partners from 5 member states (manufacturers, technical specialists, councils and educational institutions) that will work together to valorise excess by-products from the dairy industry to value added products such as lactic acid, polylactic acid, minerals for human nutrition and bio-based fertilisers. Providing the backing to make this project a success is the [Bio-Based Industries Joint Undertaking](#) (BBI JU), the €3.7bn public-private EU partnership that aims to lower Europe's dependency on fossil-based products by increasing investment in the development of a sustainable bio-based industry sector in Europe, and the European Commission.

To learn more about this fascinating project that works in tandem with Ireland's thriving agricultural sector, Bill Morrissey, procurement manager with one of the companies at the head of AgriChemWhey, Glanbia Ireland, spoke to Bio-Based World News about the BBI JU (@BBI2020) partnership.

"We see lots of potential for this sector and our project is just the start of it," says Morrissey. "It started out as a supply chain contract to dispose of one of the major side streams of whey processing - whey permeate and delactosed permeate. Through our research, we have found a sustainable solution for disposing of these by-products, which can add value by creating a circular bio-economy centred on the dairy industry."

The end product primarily produced by AgriChemWhey is lactic acid, the major market for which is the manufacture of the biodegradable plastic polylactic acid (PLA). But what makes this

lactic acid so special, maintains Bill Morrissey who has been with Glanbia Ireland since 2007, is that it's manufacture has no impact on food production. "What we'll be producing is actually from second-generation feedstock, it isn't from primary foods, which all other lactic acids are. We're also a multi-product bio-refinery, producing probiotics from the same facility to make this project work from an economic point of view."

Explaining its success, Morrissey makes it plain that without the help of the BBI JU, which is providing €22m (£19.5m) of support, the project would be in a very different place. "The reality is this project wouldn't have taken place had it not been for the BBI JU. What they have done has de-risked the whole thing. It's not just about the money – which is huge – they also allow us to bring in partners with new technologies to offer, creating a whole eco system for this to take place." That consortia approach, says Morrissey, is key to the project's success because with such new and evolving technologies, there is a real need "to have all the support you can get". "By disseminating, other partners allow you to add value to their by-products and that's vital to the whole thing – particularly when the margins we're dealing with are tight."

The AgriChemWhey project, which started in January 2018, will be based at Lisheen, County Tipperary. This bio-economy innovation and piloting facility has been something of a game changer, putting the bio production facilities that keep AgriChemWhey going on its doorstep.

"That was one of the major challenges we had when we started – we had no pilot lab facilities so we couldn't prove internally to our stakeholders that this works at 1,000-litre level, as we were always at a 100-litre level. We had to go to Europe to use facilities there, which delayed the AgriChemWhey project by about two years. We don't have that problem now," he says. "Now we have such high levels of expertise in Ireland it'll be a huge enabler for the entire bio-economy. That, combined with the unparalleled support from the BBI JU, puts Ireland in a great place."

As for the future, Morrissey concludes by providing a snapshot of what 2018 and beyond has in store. "Well, after having submitted planning permission we'll have a team of 15 on site in Lisheen, and from there we'll be going into basic engineering followed by detailed engineering. After that we'll hope to turn soil in 12 months' time for a €60m multi-product bio-refinery." ■

For more on the AgriChemWhey project visit:  
[www.bbi-europe.eu/projects/agrichemwhey](http://www.bbi-europe.eu/projects/agrichemwhey)

"WHAT WE'LL BE PRODUCING IS ACTUALLY FROM SECOND-GENERATION FEEDSTOCK, IT ISN'T FROM PRIMARY FOODS, WHICH ALL OTHER LACTIC ACIDS ARE. WE'RE ALSO A MULTI-PRODUCT BIO-REFINERY, PRODUCING PROBIOTICS FROM THE SAME FACILITY TO MAKE THIS PROJECT WORK FROM AN ECONOMIC POINT OF VIEW"



# BIOMETHANE ON IRELAND'S NATIONAL GAS GRID FOR FIRST TIME – A FIRST FOR IRELAND'S BIO-ECONOMY

In 2018, Gas Networks Ireland will introduce renewable gas onto the Irish gas network for the first time. Renewable gas, also known as biogas or greengas, will be introduced into the Irish market as a means of further reducing emissions.

As natural gas and biomethane are interchangeable, renewable gas can be used in the same way and in the same appliances as natural gas. Customers, business and domestic, would never be aware that the gas they are using is a renewable alternative. From a financial perspective, this means that commercial customers can adopt the new renewable fuel without any investment.

Renewable gas is generated principally through anaerobic digestion. Not only is this gas renewable, it will also be sourced in Ireland. By using agricultural residues and by-products to make renewable gas, there is an opportunity to significantly reduce emissions from Ireland's important farming sector. This will deliver a double saving –by reducing Ireland's emissions, we come a step closer to addressing our environmental policy commitments, while also developing new revenue sources for Irish agriculture, our original bio-economy.

Gas Networks Ireland is part of the Ervia commercial semi-state company that owns and operates the national gas grid in Ireland and together with project partner, NUI Galway, it is leading the European Union co-funded Causeway project. Causeway, funded under the EU's Connecting Europe Facility (CEF), will deliver a clean energy project for Ireland's transport sector, and in doing so, provide a template for the rest of Europe. Causeway's infrastructural roll-out is carried out by Gas Networks Ireland, with NUI Galway's Ryan Institute leading the dissemination element of the €25 million project. Causeway's work will facilitate new green energy developments across Europe. Its impacts will be studied by Gas Networks Ireland and disseminated by a Ryan Institute team at NUI Galway.

Causeway project lead, Gas Networks Ireland, believes that at least 20% of all gas used in Ireland can be renewable by 2030, with this figure growing rapidly thereafter. This would make a significant impact on reducing Ireland's greenhouse gas emissions and will ensure that Ireland remains a country in which environmentally-sound manufacturing is possible.

Causeway will see the development of a natural gas transport re-fuelling network in Ireland. The project will support an overall nationwide roll-out of 70 compressed natural gas filling stations. Combined with Causeway's introduction of renewable gas into the natural gas network for the first time, the roll-out of the public network of natural gas filling stations will see these stations become a pathway or "causeway" to renewable gas in transport –an opportunity to significantly de-carbonise transport in Ireland. The work which is undertaken in Ireland will be monitored and documented to capture the key lessons learnt from the deployment of CNG and renewable gas. This research will then be fed back to gas operators all over Europe and will assist in the development of similar projects across the continent.

Earlier this year Mr Denis O'Sullivan, now Managing Director of Gas Networks Ireland, explained the importance of the Causeway project to Ireland: "Transport accounts for over one third of all energy used in Ireland. The development of a natural gas transport network will significantly de-carbonise Ireland's commercial fleet. CNG, and the soon to be introduced renewable gas, will play a major role in making transport in Ireland cleaner. Gas Networks Ireland is

determined to play an important role in facilitating the development of this new, cleaner transport network. It is particularly important that the advances we are making through this project, and through the work of NUI Galway, will play a role in changing the transport landscape throughout Europe."

Ervia CEO, Mr Mike Quinn, has set out that Ervia and Gas Networks Ireland have developed a long-term vision to outline how they could play their part in decarbonising Ireland and in particular the electricity, heating and transport sectors. This vision is to utilise natural gas as a "bridging fuel" out to 2030 and then decarbonised gas as a "destination fuel" out to and beyond 2050.

Mr Quinn has also set out that over the next five years, Ervia plans to construct six renewable gas injection facilities with a total combined annual capacity of 1,450GWh. That is enough energy to heat 145,000 homes with a 100% carbon neutral fuel. By 2030 Ervia is targeting that 20% of total gas demand will be met by renewable gas - a figure supported by a recent Sustainable Energy Authority of Ireland costs and benefits report on biogas and biomethane in Ireland.

These are exciting times for the emerging bioeconomy in Ireland and Causeway marks a significant "first" as it will see commercial deployment of a bio-based product, renewable biomethane, on the Irish national gas grid, for the first time. ■

Article written by Pádraic Ó hUiginn, Research Fellow and Project Manager for Causeway at NUI Galway's Ryan Institute

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# HOW THE BUTANEXT PROJECT IS HELPING REALISE THE DREAM OF COST-COMPETITIVE BIOBUTANOL



Writing, reading and discussing the bio-economy, it is sometimes easy to forget that innovations in this sector aren't all from the 21st century. As early as 1826 ethanol (a chemical compound with multiple uses, including as a clean-burning fuel source) was used to power an engine, a generation later, Louis Pasteur first observed butanol (an alcohol produced from petrochemical or biological sources) as a product of fermentation. Fast forward to 1916 and ABE fermentation is first used to produce acetone, butanol, and ethanol from carbohydrates such as starch and glucose. This was developed during World War I, as acetone was used to produce cordite, a substance essential for the British war industry. These military demands led to mass production of ABE and during this period we also saw the development of biobutanol, with it being produced from plant based rather than from fossil-based sources.

Biobutanol is an exciting alternative to first generation biofuels such as biodiesel and bioethanol. Its similarity to petrol means that with effective pumping systems it could be easily implemented immediately within the existing infrastructure. Its density ensures that a litre of biobutanol will get your car almost as far as a litre of regular petrol would but with up to 85% less greenhouse gas emissions. As well as its potential as a transport fuel, biobutanol is also a building block chemical used extensively in the paints, coatings, adhesives and inks markets.

However, despite the many benefits, opportunities and properties that ABE fermentation can offer due to the costs of production, inefficiencies in the process and the stubbornly low cost and organisational advantages of fossil-based equivalents, biobutanol has not gained a significant presence in the market.

Until now that is. **The ButaNexT ('Next Generation Bio-butanol') project** aims to overcome these technical and economic constraints to the use of bio-butanol both as a commodity

chemical and advanced biofuel. The project began in 2015, with a consortium that brought together the leading experts in Europe to further optimise the value chain for biobutanol. Together they have developed and demonstrated, at pilot scale, a more cost-competitive, efficient and environmentally friendly process to convert sustainable renewable feedstocks into biobutanol. Their work has been validated by a full environmental, resource, techno-economic and social impact assessment of the entire chain.

UK based **Green Biologics** are the project co-ordinator and experts in fermentation (microorganism and technology development) and butanol commercialization.

Speaking at the **Innovation in the bioeconomy Conference in Brussels on April 12th**, at which the results of ButaNexT project were presented, Project coordinator **Tim Davies** from Green Biologics gave us some insights into the next stages of biobutanol development; "ButaNexT partners made significant advances in the bio-butanol production process, addressing every aspect of its value chain. We have shown that bio-butanol would be a valuable addition to the renewable fuel options for Europe with environmental benefits. Some challenges do remain and in particular production economics still need to improve. However, Green Biologics do have a commercial bio-butanol plant operating in the USA, so the prospects for a European manufacturing centre using renewable feedstocks remains a feasible prospect."

The project had a multi-layered innovation process:

**FLEXIBLE BIOMASS CONVERSION:** Tecnicas Reunidas, together with CENER, have developed a new two-step pre-treatment process which is able to convert different lignocellulosic biomass and wastes in such a way that provides higher yields in subsequent stages. Crucially, the new milling unit

significantly reduces the biomass particle size - to less than half a millimetre. This allows for milder conditions in the subsequent thermochemical treatment, and an improved conversion rate during the hydrolysis stage. It is expected that both capital and operating costs can be reduced - the unit reduces the energy consumption up to 25% compared to the conventional technologies studied.

**TAILOR MADE ENZYME COCKTAILS:** MetGen designed and developed tailor-made enzyme solutions for non-food lignocellulosic feedstocks. The optimised cocktails increased total sugar yield by 70% to 90% compared to the initial offerings, in only half of the hydrolysis time.

**HIGH PRODUCTIVITY FERMENTATION PROCESS:** Green Biologics has developed an improved clostridial strain specifically for use with lignocellulosic feedstocks. The fermentation was coupled with membrane technology developed by the Flemish Institute for Technological Research (VITO) to achieve in situ product recovery (ISPR). This hybrid fermentation concept not only alleviates product inhibition but also leads to partial product purification and enrichment, thus improving water balances and reducing energy consumption in further downstream processing.

**INTEGRATION AND UPSCALING:** The innovations were combined at a pilot plant, installed at the Second Generation Biofuels Centre operated by CENER - Spain's National Renewable Energy Centre - in Navarra, Spain.

**Dr. Holly Smith**, Head of Fermentation, Green Biologics tells us more about the improvements they have made to the fermentation process; "We have developed strains with increased tolerance to butanol and shown that when these strains were grown in the

presence of higher solvent concentrations they maintained a 25% higher rate of sugar usage than the original strain. We also developed strains with increased tolerance to feedstock inhibitors and shown that these strains have up to 40% higher rate of solvent production. We have shown that it is possible to use second generation feedstocks with these microbes."

Within the project, researchers at the University of Castilla-La Mancha (UCLM) also investigated different fuel blends incorporating biobutanol. They found that, in general, biobutanol as a blend component does not reduce engine efficiency and is beneficial for reducing particulate emissions. Bu10D (10% biobutanol, 90% diesel) and Bu10B10D (10% biobutanol, 10% biodiesel and 80% diesel) were identified as the most promising blends to substitute 100% diesel fuel.

Most of the innovations and developments achieved in the ButaNexT project will also have a broader impact than for biobutanol being used as a fuel alone. They can also be used for transforming lignocellulosic biomass into other biofuels and biobased chemicals.

The ButaNexT project is a fantastic example of how the bio-economy can bring together international expertise to overcome its challenges. For generations the potential of bio-butanol has not been able to be fully realised but now this consortium has shown the path to how an advanced biofuel business can be built from sustainable feedstock. I think we'll be covering bio-butanol on our pages a lot more in the coming years!

The **ButaNexT** consortium consists of **Green Biologics, CENER - National Renewable Energy Centre of Spain, C-Tech Innovation, E4tech, Greenovate! Europe, MetGen, Tecnicas Reunidas, Universidad De Castilla La Mancha, VITO - Flemish Institute for Technological Research** and **Zabala Innovation Consulting**. The project received funding from the European Union Horizon 2020 Research and Innovation Programme under grant agreement n° 640462.

## THE LAST WORD WITH... JEREMIAH DUTTON, HEAD OF SALES AT TRIFILON

There seems to be something about Sweden when it comes to bio-based developments. From their continent leading uptake in sustainable biofuels, to consumer products from IKEA and H&M through to truly innovative use of the nation's forests and some exciting digital start-ups in Stockholm, there's lots happening. Today, we are delighted to bring you an exclusive insight into the latest company making waves in Sweden, Trifilon who develop, produce and sell lightweight biocomposites. Our Editor Luke Upton, speaks to Jeremiah Dutton, Head of Sales at Trifilon whose own journey has taken him from Canada, via a stint working with Siemens on their wind power projects, about how the business has evolved, the 'Blue Planet effect', overcoming scale-up challenges, bio-based luggage and much more...

"WE ARE A SMALL COMPANY BASED IN SWEDEN THAT LIKE SO MANY OTHERS IN OUR INDUSTRY SPRUNG OUT OF A UNIVERSITY PROJECT. BEGINNING IN 2007, THE INITIAL FOCUS WAS ON THE MECHANICS AND ENGINEERING TO DEVELOP LIGHTWEIGHT HYBRID MATERIALS USING CARBON AND WOVEN NATURAL FIBERS."

**Luke Upton (LU):** Many thanks for the time today, perhaps we could start by you giving a little introduction to [Trifilon](#)?

**Jeremiah Dutton (JD):** No problem Luke. Well, we are a small company based in Sweden that like so many others in our industry sprung out of a university project. Beginning in 2007, the initial focus was on the mechanics and engineering to develop lightweight hybrid materials using carbon and woven natural fibers. It was only as the research and testing continued that we dropped the carbon fiber and focused just on combining natural fibres, mainly hemp, with plastics to create our biocomposites specifically designed for injection molding. We underwent a long incubation period but by 2015 we were a fully commercial operation. For us the bio-based aspect is important, but it is in the creation of advanced, lightweight materials that both save weight and improve performance that we truly see the creation of environmentally friendly products.

**LU:** Great, so where is the business at the moment?

**JD:** It's going very well as we've been growing steadily in recent years. We have three main products: Biolite, a natural fibre reinforced polypropylene which can be used as an injection molding material; Bioform, a natural fibre reinforced biocomposite that can be easily shaped into any form in conventional compression moulding equipment and Biophon a mix of sustainable hemp fibres and a starch-based binder, delivered in panels for acoustic applications.

But since Christmas and the showing of Blue Planet (the BBC documentary that graphically detailed the plastic crisis in our seas) we've had a huge upsurge in interest from consumer facing brands. They are telling us that their customers are now taking a keener interest in plastics and what goes into the products they make. We've had interest from all over the world which is fantastic. And just today I found out that our Biolite material was one of 12 cleantech solutions nominated for this year's [WWF Climate Solver awards](#). We're super thrilled for this!

**LU:** It's something we are hearing a lot from companies in the bio-economy, so great to hear you are also riding this wave. Could you give us an example of a consumer facing product you supply?

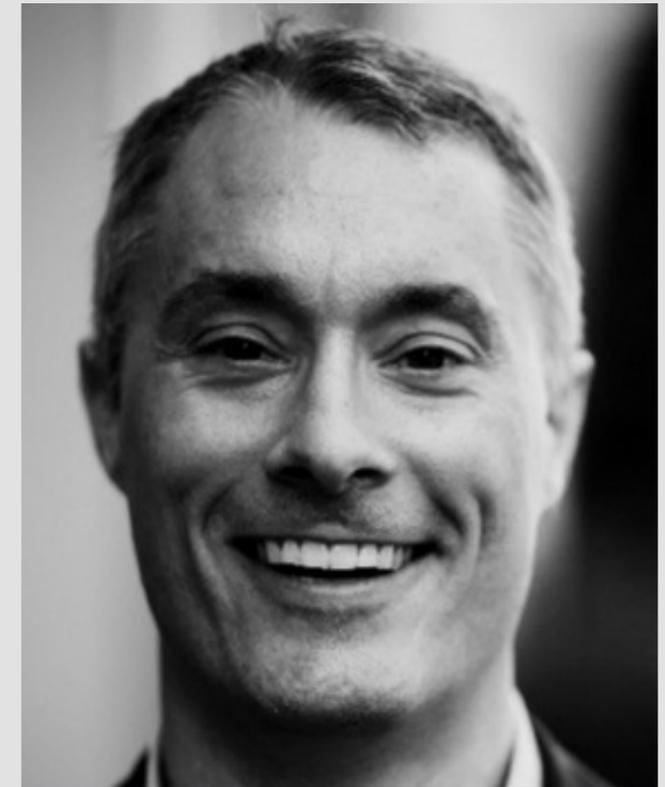
**JD:** Yes, in 2017 after some intensive material engineering, we signed a five year deal with [EPIC](#) for their [PhantomBIO](#) range of luggage which is made of Biolite. This composite is both lighter and stronger than traditionally reinforced polymers due to the hemp fiber's ability to reduce density while engaging the polymers on a molecular level. The feedback has been great, with their customers keen to show their 'environmental conscientiousness' through their buying decisions. Our previous contracts have been on industrial projects but this is our first big commercial one, so a very exciting step for the business.

**LU:** It sounds like a great journey so far. But what's been the biggest challenge?

**JD:** For us it was the step up from lab / start-up level to the pilot stage that was the biggest challenge. When we were in the lab we could produce maybe 1-2 kilos of BioLite an hour. At our pilot line in Nyköping, just south of Stockholm, we now produce about 100 kg per hour and this stage has its own new challenges – ISO certification, material traceability, etc. It's a completely different world! We're now actually planning on undergoing another big step up this summer to industrial scale, where we will be producing 500 kilos per hour, in our newly expanded facilities. We've learnt from the changes last time and so we're keeping our fingers crossed that it will be a far smoother process.

**LU:** Thanks, so for our community members who are reading this and are perhaps just beginning their bio-based journey, what advice would you give?

**JD:** If you have an idea, or a technology you must test the idea with paying customers. It has to be exposed to reality, even if this sometimes come with disappointing realizations and some truths you may not want to hear. It's essential to get this done early, at



"IF YOU HAVE AN IDEA, OR A TECHNOLOGY YOU MUST TEST THE IDEA WITH PAYING CUSTOMERS. IT HAS TO BE EXPOSED TO REALITY, EVEN IF THIS SOMETIMES COME WITH DISAPPOINTING REALIZATIONS AND SOME TRUTHS YOU MAY NOT WANT TO HEAR."

the start of the Valley of Death. It will equip you and the business model far better to succeed and enable you to make changes and ensure a focus from the very start.

**LU:** And finally as we ask all our Friday interviewees, what is your favourite bio-based or sustainable product and why?

**JD:** While I'm passionate about sustainable plastics, I really love wind power. I worked with it for a few years and it's such a great source of clean, sustainable energy that can be rolled out relatively fast. The tech involved is cool and I like seeing them dotted around the countryside. Hopefully one day we could even help make longer, lighter bio-based turbine blades. I'd even offer to host the first test turbine in my backyard!

**LU:** Many thanks for the time today Jeremiah, and we'll be sure to keep our readers up to date with your developments. ■

For more about Trifilon [click here](#)