

Multipurpose bioplastic from soy residues: a pilot plant in Finland

A biopolymer plant is being built in Uusikaupunki, Finland, in which bioplastic production from the soy residues derived from main stream food and feed production processes will be piloted on an industrial scale.



Brightplus supports leading global manufacturers and brands in achieving sustainability goals. Shown here are, from left: Brightplus technology director, Jarkko Leivo with a handful of granulated biomaterial derived from soy molasses; Rauna-Leena Kuvaja, innovations director holding 3D-printing filaments; and Maiju Hietala, sustainability director, with injection moulded bioplastic components.

Four companies have collaborated to develop the first process in the world to produce compostable bioplastic from the side streams of food and feed production. Finnfoam, Brightplus, VTT Technical Research Centre of Finland and Nordic Soya have been collaborating to explore the possibilities of using soy molasses – a waste product from the soy-based food and animal feed processing industries – as a raw material of the future. The research project, partly funded by Business Finland, has taken four years.

“The process developed as an outcome of this cooperation project is the first in the world to produce an ecological lactic acid polymer from the side streams of soy production. This way we can offer a sustainable alternative to sugar- and corn-based polylactic acid, i.e. PLA,” says Henri Nieminen, CEO of Finnfoam.

PLA is a thermoplastic, an organic open-chain polyester that has long been derived from renewable resources such as corn starch, tapioca roots or sugarcane. It is manufactured from either lactic acid or lactide monomer building blocks, which are

polymerised to form PLA bioplastic.

Soy molasses is unsuitable for food production and has previously had to be disposed of by incineration, which involves costs and negative environmental impacts. Producing biomaterials from this ‘waste’ stream not only improves the value chain of the food production cycle, it also reduces carbon emissions, contributing towards a much more circular economy.

Nordic Soya Oy uses soy grown in Europe in its Uusikaupunki plant. Soy molasses left over from its processing has been used as the raw material in the research.

The Finnish innovation combines synthetic biology, chemistry and material technology in a completely new way. “The project is an excellent example of what expertise in industrial biotechnology can achieve and a triumph in converting a challenging industrial residue into a higher value product using microbes. This endeavour required significant efforts in technology at various stages of the process. In particular, it makes use of VTT’s expertise in synthetic biology, the modification of microbes and optimisation of bioprocesses,” says Tiina

Nakari-Setälä, Vice President, Strategy and Business Intelligence at VTT.

An ecological alternative to plastic

In the future, this Finnish concept for the development and production of a bio-based sustainable raw material can be extended to many other emerging markets where soybeans are processed for food and feed production. Bioplastic produced from the residues of soy processing has huge potential as a scalable export product in the circular economy. Globally, residues from soy production could produce around 22-million tonnes of bioplastic per year.

Also known for its medical applications, bioplastic is ideal for the manufacture of various compostable packagings, and it has applications for 3D-printing consumables such as filaments, which opens up the use of soy-based bioplastics for a host of modern environmentally friendly products.

Finnfoam intends to use the new bioplastic in the production of thermal insulation for buildings. Its ecological quality is enhanced by the fact that thermal insulation also serves as a carbon sink, thus helping

to reduce the carbon footprint of buildings.

New plant operating by the end of 2023

For the purpose of piloting new biomaterial innovations, the companies are launching a pilot plant project in Uusikaupunki in connection with Nordic Soya Oy, the largest soy protein concentrate processing plant in EU. The pilot plant will be built during 2021 and 2022 and a full-scale plant will be operating by the end of 2023. “When completed, the pilot plant will significantly support Finland’s sustainable development ecosystem and the creation of future jobs,” says Nakari-Setälä of VTT.

At the beginning of 2021, Finnfoam Oy was divided into two companies, of which FF-Future will focus on future solutions. The pilot plant project is FF-Future’s first major investment. “Finland has huge potential to become a pioneer in biomaterials, but this requires resources for testing the scalability of the production process. We want to build concrete resources for the national ecosystem in the industry, and are looking for partners who are interested in building

the production of Finnish biomaterials and commercialising it for the global markets,” says Henri Nieminen.

Looking for pioneer-minded partners

Brightplus Oy, responsible for coordinating the project together with its partners, produces new green chemistry innovations that can be tested at the pilot plant. “It is a major technological step forward that waste residues which are unusable in food production can now be responsibly used to produce high-value bio-based products,” says Jarkko Leivo, Technology Director of Brightplus Oy. “Depending on the application, we can modify the properties of the biomaterial, such as its transparency and thermoformability, or improve its chemical resistance and reusability. We are now looking for pioneer-minded partners interested in this great technology – people with whom we can develop more innovative applications for this biopolymer.”

Henri Nieminen, the initiator of the project, expresses his gratitude to Brightplus and VTT for the technical success of the

project, having developed a functional concept from thousands of alternatives examined, as well as Business Finland, whose financial support has been a prerequisite for the success of the project. □



Soy molasses, which is unsuitable for food production, will be used as an alternative feedstock to sugar and corn in the manufacture of polylactic acid, (PLA). Photo: Nordic Soya.



The new pilot plant in Uusikaupunki will be situated on the right hand side of the current Nordic Soya refinery plant. Photo: Nordic Soya

Finnfoam, Brightplus, VTT Technical Research Centre and Nordic Soya

Finnfoam is a family-owned company founded in 1982 for the production of thermal insulation materials. The company is a leading Baltic producer of ground frost, base, wall and roof insulation, thermal insulation materials for use in building and construction, which include Finnfoam (XPS), FF-EPS and FF-PIR insulation boards. Finnfoam Oy is strongly committed to the circular economy and to generating more sustainable solutions for thermal insulation. www.finnfoam.com

Brightplus is a pioneering Finnish bio-sourced materials company that develops reusable, recyclable and biodegradable side-stream material solutions with its visionary chemistry. The company’s versatile offering ranges from coating and barrier solutions to plastic replacement materials.

Brightplus supports leading global manu-

facturers and major brands in packaging, consumer goods and agriculture striving to achieve sustainability goals. Its multitalented team works closely with customers to co-create innovations that seamlessly merge with existing processing methods and requirements, while incorporating side-stream solutions to reduce the circularity gap and meet EU Green Deal 2030 targets. www.brightplus.com

VTT is a visionary research, development and innovation partner that strives to achieve sustainable growth by tackling the biggest global challenges of our time and turning them into growth opportunities. The research centre goes beyond the obvious to help society and companies to grow through technological innovations. With almost 80 years of experience of top-level research and science-based results, VTT is at the

sweet spot where innovation and business come together. www.vttresearch.com/fi

The Nordic Soya production facility is the largest full scale, multi-stage soy processing plant in the European Union. The annual soybean processing capacity is 240 000 tonnes. Main products include soybean meal, soy protein concentrate (SPC) and soy oil, while side-stream products include soy molasses, lecithin and soy hulls.

Nordic Soya is a certified Europe Soya, Pro Terra and FoodChainID non-GMO refining facility, holding membership of the Round Table on Responsible Soy Associations. The company’s goal is to be Europe’s leading producer of further refined, high quality soy raw materials for the food and feed industries.

www.nordicsoya.com