Success Stories of Advanced Biofuels for Transport

FIRST IN THE WORLD BIOREFINERY PRODUCING WOOD-BASED RENEWABLE DIESEL – UPM BIOFUELS

Year of plant start-up:	2015
Location:	Lappeenranta, Finland
Technology:	Process developed by UPM, based on hydrotreatment
Plant capacity:	130 kt of renewable diesel and naphtha
Operational experience achieved:	Commercial production started in January 2015, name plate capacity (100 kt) exceeded in 2017
Total Capital Expenditure:	EUR 179 million without public subsidies
Principle feedstocks:	Crude tall oil (CTO)
Feedstock Capacity:	N/A, major part of CTO from UPM´s own pulp mills
Products/markets:	Renewable diesel as main product for transport sector, renewable naphtha for transport and as feedstock for petrochemical industry (e.g. bioplastics), renewable pitch and turpentine for chemical industry
Technology Readiness Level (TRL):	TRL 9 – actual system proven in operational environment

DESCRIPTION

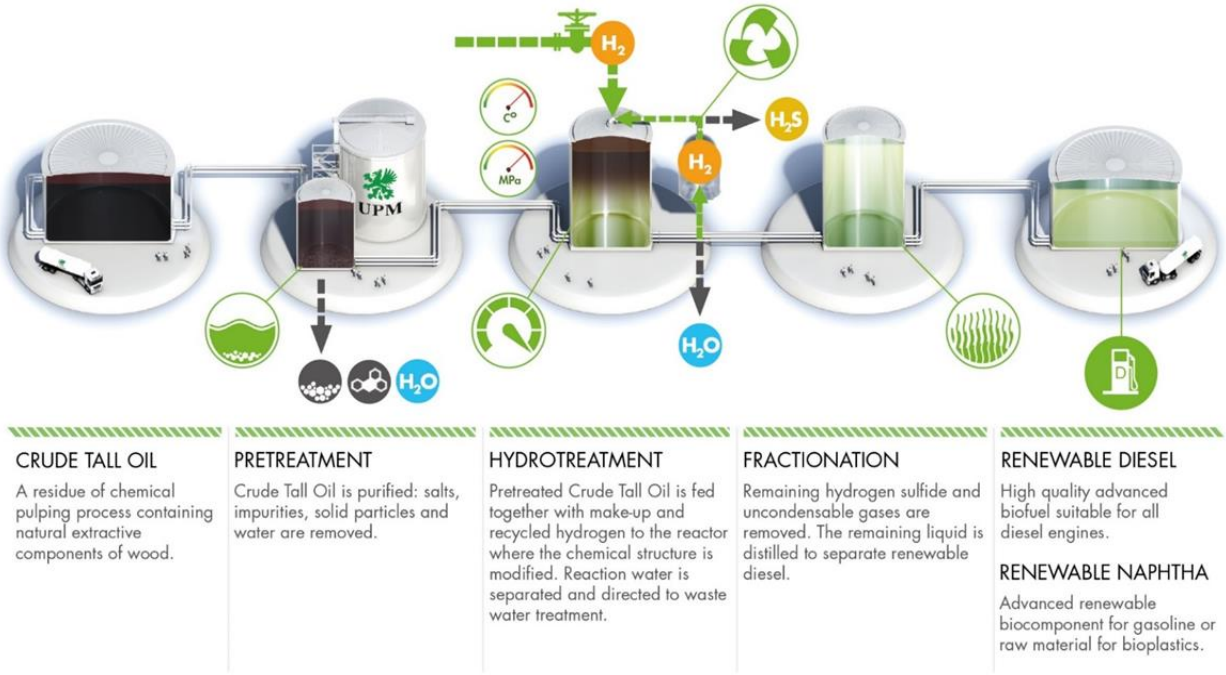
UPM Biofuels has developed an innovative production process from crude tall oil (CTO), a natural wood extract and a residue of pulp making process, to biofuel for transportation. The product, UPM BioVerno, is unique wood-based renewable diesel resembling fossil diesel, suitable for current distribution systems and all diesel engines without modification. The greenhouse gas emissions are reduced significantly, over 80%. In addition, tailpipe emissions, such as NOx and particles, are reduced significantly.

Converting CTO to biofuel is an innovative way to use an own process residue without changing the main process, pulp production. The key success factor is certified sustainability: feedstock is wood-based, non-food origin with no increase in harvesting or land use, and the greenhouse gas emission reduction is significant. Distributors value the high stability of this high quality, oxygen-free hydrocarbon fuel as it functions as direct replacement for fossil diesel. There is no blending limitation like in first generation biodiesels.

As a result, UPM produces a cost-competitive high quality transport fuel that truly decreases emissions.

The biorefinery started in commercial scale in January 2015, reached break-even at the end of 2015, and improved profitability further in 2016. During 2017, production efficiency has increased significantly, and energy consumption reduced by 25%. UPM Biofuels was rewarded as the Bioenergy Industry Leader at the 2017 Platts Global Energy Awards.

Currently, UPM Biofuels is evaluating growth opportunities for a possible second biorefinery in Mussalo, Kotka, in south-eastern Finland with a planned capacity of 500,000 tons.



UPM Lappeenranta Biorefinery production process

UPM Lappeenranta Biorefinery produces 120 million litres of wood-based advanced biofuels annually.

Stakeholders involved:	The Biorefinery has been developed mainly by UPM in collaboration with numerous technology providers, industrial partners, fuel distributors and research institutions. In addition, UPM has engaged with local, national and EU policy makers on issues related to advanced biofuels markets.
Financing Support:	UPM invested EUR 179 million to build the biorefinery without subsidies.
Contribution to Sustainable Development Goals:	UPM Lappeenranta Biorefinery enables significant reduction in transport emissions, provides a safe and environmentally sound option for consumers for the logistics needs, improves the climate and air. UPM Biorefinery is also an excellent example of innovation in the forest industry, as it uses a residue of pulp production, does not increase harvesting of forest but provides an environmentally friendly option for transport. As the Biorefinery is located in South-Eastern Finland, it also boosts regional economy and provides jobs and well-being in the small city of Lappeenranta. Yearly greenhouse gas emissions savings achieved by production of UPM BioVerno equals to removing 120.000 cars from roads. In addition, tailpipe emissions, such as NOx and particles, are reduced significantly. In 2015, UPM Biofuels was chosen as an example case for goal number 13 for Climate Change by the United Nations (UN) Global Compact.
Contribution to GHG emission reduction in transports:	The greenhouse gas emissions are reduced significantly, over 80% compared to fossil diesel. UPM BioVerno low-ILUC advanced biofuels are categorised as the most sustainable advanced biofuel that have a mandatory blending mandate.
Employment:	The biorefinery benefits the local economy by offering work for 250 people directly and indirectly, reducing oil imports, increasing domestic area raw material, technology, equipment and labor.
Replicability and scale-up potential:	UPM Lappeenranta Biorefinery has reached its original goals. Currently, UPM Biofuels is evaluating growth opportunities for a possible second biorefinery in Mussalo, Kotka, in South-Eastern Finland. The UPM Kotka Biorefinery would produce approximately 500,000 tonnes of advanced biofuels made from sustainable raw materials for use in the road transport, marine and aviation sectors. The biorefinery's products could also be used for replacing fossil raw materials in the chemical industry.
Success factors:	The key success factor of the novel drop-in fuel is sustainability: feedstock is non-food origin with no direct or indirect land use change, and the greenhouse gas emission reduction is significant. UPM Biofuels welcomes the RED2 agreement as it creates an obligatory advanced biofuel blending mandate in all EU Member States and provides long term security and enables the further roll-out of advanced biofuels in the EU. UPM Lappeenranta Biorefinery has shown that investments in advanced biofuels industry are viable and showcases the power of innovation.
Constraints:	EU and national policies on biofuels will play an important role in the final assessment of

new investments. UPM calls for ambitious implementation of RED2 in order for Member States to achieve their Paris agreement goals.

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The story of UPM BioVerno -video:
https://www.youtube.com/watch?v=0gd-miAoII0&feature=youtu.be
Links to other UPM Biofuels videos:
http://www.upmbiofuels.com/whats-new/videos/Pages/default.aspx

UPM Biofuels WHITEPAPER:
http://www.upmbiofuels.com/whats-new/other-publications/Documents/Publications/upm-biofuels-argus-conference-2017-advanced-biofuels-provide-solution-to-reduce-transport-emissions.pdf

Articles in Biofuels International Magazine – Latest one is "From sewing spools to renewable diesel" in March/April 2018 issue, pages 22-23:
http://www.upmbiofuels.com/whats-new/other-publications/Pages/Default.aspx

The ART Fuels Forum brings together 100 experts and leaders representing the alternative transportation fuels Industry to facilitate discussions, elaborate common positions on policy issues and identify market penetration opportunities and barriers for these fuels. The Forum is established and financed by the European Commission under the project name "Support for alternative and renewable liquid and gaseous fuels forum (policy and market issues)".
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