- IDEALFUEL -

Lignin as a feedstock for renewable marine fuels

GRANT AGREEMENT No. 883753

HORIZON 2020 PROGRAMME - TOPIC LC-SC3-RES-23-2019
"Development of next generation biofuel and alternative renewable fuel technologies for aviation and shipping"

Deliverable Report

D2.4 – Report on the optimization of the VERTORO Biomass-to-CLO (CLO Process #2) process in 300L reactor

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Publishable summary

The EU H2020 project IDEALFUEL aims to develop an efficient and low-cost chemical pathway to convert lignocellulosic biomass into a Biogenic Heavy Fuel Oil (Bio-HFO) - with ultra-low sulfur levels - that can be used as drop-in fuel in the existing maritime fleet. While technical lignins are cheap and available in large quantities, their characteristics are not suitable for the development of high-performance marine fuels. Among others, these lignins suffer from low solubilities, large molecular weight, high sulfur content and are generally non-uniform in their chemical nature. One strategy consists in solvent fractionation of technical lignins and/or woody biomass to extract a high-quality fraction, which can be more suitable for fuels applications. A second strategy consists in the production of high-quality lignin from biomass with alternative bio-refining process. Within IDEALFUEL, the partners selected lignin/biomass solvolysis and Aldehyde-Assisted Fractionation (AAF) as the most relevant technologies for the production of high-performance lignin for fuel applications.

Mild acid solvolysis of woody biomass to an intermediate crude lignin oil (CLO) prior to the bio-HFO production, is one of the process solutions within IDEALFUEL project coordinated by WP2; and this process developed by Vertoro under the IP patent application number WO2021064047 (A1). We continued the scale-up activities in the 300 L Hastelloy batch reactor; operational in a multipurpose pilot plant in Brightlands. The optimum lab recipe that was developed and reported (*Catalysts 2021, 11, 750*), has been adjusted to a detailed pilot recipe with the all the technical details that are required for the successful implementation of the pilot campaign. 4 production pilot runs were executed and 2 downstream processing pilot recipes were implemented in order to produce methanolic CLO at kg scale. We worked towards the understanding, optimization and control of critical fuel properties and target fuel specifications for the methanolic CLOs according to preliminary compliance with ISO8217 marine fuel specifications of both the CLO and bio-HFO from woody biomass.

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Project partners:

#	Partner short name	Partner Full Name
1	TUE	Technische Universiteit Eindhoven
2	VERT	Vertoro BV
3	T4F	Tec4Fuels
4	BLOOM	Bloom Biorenewables Ltd
5	UNR	Uniresearch B.V.
6	WinGD	Winterthur Gas & Diesel AG
7		(Formerly SeaNRG, is now GOODFUELS #12)
8	TKMS	Thyssenkrupp Marine Systems GMBH
9	OWI	OWI – Science for Fuels gGmbH
10	CSIC	Agencia Estatal Consejo Superior De Investigaciones Cientificas
11	VARO	Varo Energy Netherlands BV
12	GOOD	GoodFuels B.V.

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