

## Sustainable Jet Fuel from Flexible Waste Biomass

The GreenFlexJET consortium is delighted to introduce its second newsletter edition

This newsletter reports the latest news and developments of the GreenFlexJET project.

GreenFlexJET is a project part funded by the European Commission through the Horizon 2020 research initiative.

The innovative GreenFlexJET project is diversifying the feedstock for sustainable aviation fuel (SAF) beyond vegetable oils and fats to biocrude oil produced from a wide range of organic waste. This is also one of the first technologies to use green hydrogen from the processed waste feedstock for the downstream refining process thereby maximising greenhouse gas savings and further contributing towards the Paris Agreement GHG reduction goals.

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#### 1. Open access and peer-reviewed article

An article entitled “A step change towards sustainable aviation fuel from sewage sludge” illustrating the project activities has recently appeared in the Journal of Analytical and Applied Pyrolysis (JAAP) that is devoted to the publication of papers dealing with innovative applications of pyrolysis processes, the characterization of products related to pyrolysis reactions, and investigations of reaction mechanism. The utilisation of SAF in the aviation industry has been recognised by the International Air Transport Association (IATA) as the most promising way to reduce air emissions and dependence on fossil jet fuels. Accordingly, IATA aims to add 30% SAF as a fuel blend in conventional jet fuel by 2030.

GreenFlexJET will use wood and digestate as feedstock, however the publication adds value by highlighting the importance of validating a variety of alternative and problematic biomass waste feedstocks for SAF production. Sewage sludge, an abundant and problematic organic waste, was successfully converted into



Credits: Journal of Analytical and Applied Pyrolysis (JAAP) website.

sustainable jet fuel range hydrocarbons (C8-C16). Sewage sludge was pre-conditioned and processed through a Thermo-Catalytic Reforming (TCR) system (2 Kg/h) at 450 °C pyrolysis and 700 °C post-reforming temperature to produce a biocrude oil. The bio-crude oil was subsequently conditioned and upgraded via consecutive two-step hydroprocessing,

comprising hydrodeoxygenation and hydrocracking as two separate unit operations.

Sewage sludge derived jet fuel range fraction met the majority of the jet fuel specifications for calorific value, viscosity, density, and freeze point under the ASTM D7566 standard. Some parameters such as smoke, flash point and total acid number slightly fell out of specifications. The process also produced green naphtha and diesel as by-products. In addition, the process was further tested for catalyst reusability and regeneration potential that showed promising results for future research.

This article is open access and available online since 12 March 2022.

[Read it](#)

A full list of GreenFlexJET articles and other resources (project website, webpage Resources):

[Resources](#)

The utilisation of SAF in the aviation industry has been recognised by IATA as the most promising way to reduce air emissions and dependence on fossil jet fuels.

## 2. Project deliverables

Six public reports have been produced so far in the project framework. The full list of deliverables can be retrieved in the [Resources](#) page of the GreenFlexJET website, as well as on the [CORDIS](#) Results section.

### [D2.3 – Design of flue gas infrastructure from defined syngas treatment requirements](#)

This report describes the flue gas emission sources of the GreenFlexJET plant (NO<sub>x</sub>, SO<sub>x</sub>, heavy metals and particulate matter) and illustrates how these emissions are kept below the threshold values from EU legislation.

### [D6.1 – State of the art LCA model for SABR-TCR application selected](#)

The state of the art of LCA approaches applied to biorefinery systems, to the main products and co-products related to the SABR-TCR technology, with

an overview on current use of the organic feedstocks addressed by the project and on LCA approaches applied to the study of these applications.

### [D8.4 – Catalogue of Regulatory Issues](#)

Which fulfilments are expected for a GreenFlexJET installation? Which permitting routes are required as for authorisations and permits? The catalogue addresses the EU environmental regulation concerning GreenFlexJET technology and installations, by collects and share specific knowledge on principles, key provisions and permitting routes.

### [D9.2 – Branding Materials](#)

The project Visual Identity and its set of branding materials to maximize impact and engage with the general public.

Project communication and dissemination material, including the project logo, are addressed.

### [D9.3 – Website and social media feeds online](#)

GreenFlexJET media presence and engagement is ensured by its website and social channels, the most powerful online platforms to communicate and disseminate activities and results.

### [D9.10 – Open Research Data Pilot](#)

GreenFlexJET is part of the H2020 Open Research Data Pilot, aimed at supporting data sharing generated and collected by the project for access and reuse by the scientific community worldwide. This report describes the GreenFlexJET data management plan.

## 3. Cooperation with GLAMOUR project

The objective of the GLAMOUR project is the design, scale-up and validation of an integrated process that converts the waste bio-based feedstock such as crude glycerol into aviation and marine diesel fuels. The focus of the project will be a combination of high pressure, auto-thermal reforming/gasification using chemical looping to produce syngas and the integration of Fischer-Tropsch compact reactor integrated with 3D printed structured catalyst.

The consortium includes two universities, three large research centres and 5 industries (including SMEs) which will combine fundamental knowledge on gas-solid and catalytic reactions, material design and engineering process design, economics, environmental analysis, societal and policy making decision. In the long term, GLAMOUR could unlock low-cost feedstock with cost decrease of 65%, increase the production of biofuel to achieve the overall bio-jet fuel production to move 19% of the

EU passengers reducing the CO<sub>2</sub> emissions up to 27 Mt/year and generating a scalable business up to 11 bln/years.

GreenFlexJET and GLAMOUR have started a mutual collaboration, that is open also to other national and international projects working on sustainable aviation fuels, marine fuels, biofuel conversion, new and advanced technology for biomass and bio-waste conversion.

#### [Related-initiatives](#)

The specific objective is to conduct networking activities to establish links with the key actors of EU funded projects to further increase the impacts of the project. The projects collaboration is now focused on collaborating by supporting activities on social media channels and projects newsletters. Other activities already discussed should be related to the organization of joint activities, such as workshops and webinars.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 884197

#### 4. Presence at EUBCE 2022

For the third time over four years, the GreenFlexJET project will attend the **European Biomass Conference and Exhibition (EUBCE)** in May 2022. In this year's virtual edition, a visual presentation 5BV.6.2 illustrating the project's results and activities will be given in a session dedicated to Conversion Processes and Technologies for Renewable Fuels and Biofuels Production, on Wednesday 11 May.

#### [Read more](#)

A project workshop on Sustainable Aviation Fuels is being organized on the first day of the Conference, Monday 9 May. For more details about this workshop, keep informed at EUBCE 2022 website. The Scientific Programme of the EUBCE includes several other presentations and sessions dedicated to SAF and related topics.



EUBCE 2022  
30th European Biomass Conference & Exhibition  
9 – 12 May 2022, online  
[eubce.com](http://eubce.com)

Session code: 5BV.6, Conversion Processes and Technologies for Renewable Fuels and Biofuels Production  
**GreenFlexJET to Produce Advanced Sustainable Aviation Biofuel**  
(University of Birmingham)

#### 5. Clustering biofuel projects

GreenFlexJET activities were illustrated by project representatives during the 5th Horizon Biofuels workshop organized by CINEA on 14-15 of October 2021. Many other EU projects on bioenergy and biofuels were presented during this virtual meeting, by sharing project objectives, available results and planned actions. Among these, there were GLAMOUR, BIO4A and TO-SYN-FUEL.

[BIO4A](#) will scale up the industrial production and the market uptake of sustainable aviation fuel, made from residual lipids. The project will enable the large-scale pre-commercial production of ASTM-certified sustainable aviation fuel in the EU. Also, it will test the entire value chain and logistic at industrial scale and it will assess the environmental performance of the overall process.

[TO-SYN-FUEL](#) aims to demonstrate a sustainable process able to transform waste biomass such as dried sewage sludge into renewable liquid fuels and hydrogen. The TCR® is implemented in an integrated process with hydrodeoxygenation and pressure swing adsorption technologies to convert residual biomass into three main products: H<sub>2</sub>-rich synthesis gas, biochar and a liquid bio-oil that can be upgraded to advanced biofuel capable of being used directly in automotive internal combustion engines without modification, as they fulfil EN fuel standards.

This workshop was a very successful event that fostered synergies, and can help pushing the adoption of biofuels production technologies. In this context, European policy-near actions such as ETIP

Bioenergy were presented. It is an Innovation and Technology Platform (ETIP) based on the European Commission's Energy Union strategy, following the previous European Industrial Bioenergy Initiative (EIBI). ETIP Bioenergy aims to promote knowledge based research, technology development and

demonstration in the field of bioenergy, and its [website](#) provides scientifically sound and up to date information on renewable fuels and the bioenergy sector (review articles, list of ongoing advanced biofuel projects in Europe, fact sheets, etc.).

## New project video will be released soon!

The video will be available both on the project's [YouTube](#) channel and in the [Resources](#) section of the project website.

### About the Project

The consortium with 12 partner organisations has brought together some of the leading researchers, industrial technology providers and renewable energy experts from across Europe, in a collaborative, committed and dedicated research effort to deliver the overarching ambition. Partners include: University of Birmingham, Green Fuels Research Ltd, University of Sheffield, WRG Europe Ltd, Sterling Power (UK), HyGear Technology and Services BV, SkyNRG (The Netherlands), Fraunhofer UMSICHT (Germany), Alma Mater Studiorum – University of Bologna, ETA–Florence Renewable Energies, Sormec (Italy) and LEITAT (Spain).

The project has a total duration of 72 months from April 2018 to March 2024 and will be funded by the European Union under the Horizon 2020 programme.



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