Biorefinery combining HTL and FT to convert wet and solid organic, industrial wastes into 2nd generation biofuels with highest efficiency

NEWSLETTER

Heat to Fuel

September, 2018 - First Issue

INSIDE

WHY HEAT-TO-FUEL?

Transportation fuels corresponded in 2013 to 31.6% of the total energy consumption in Europe.

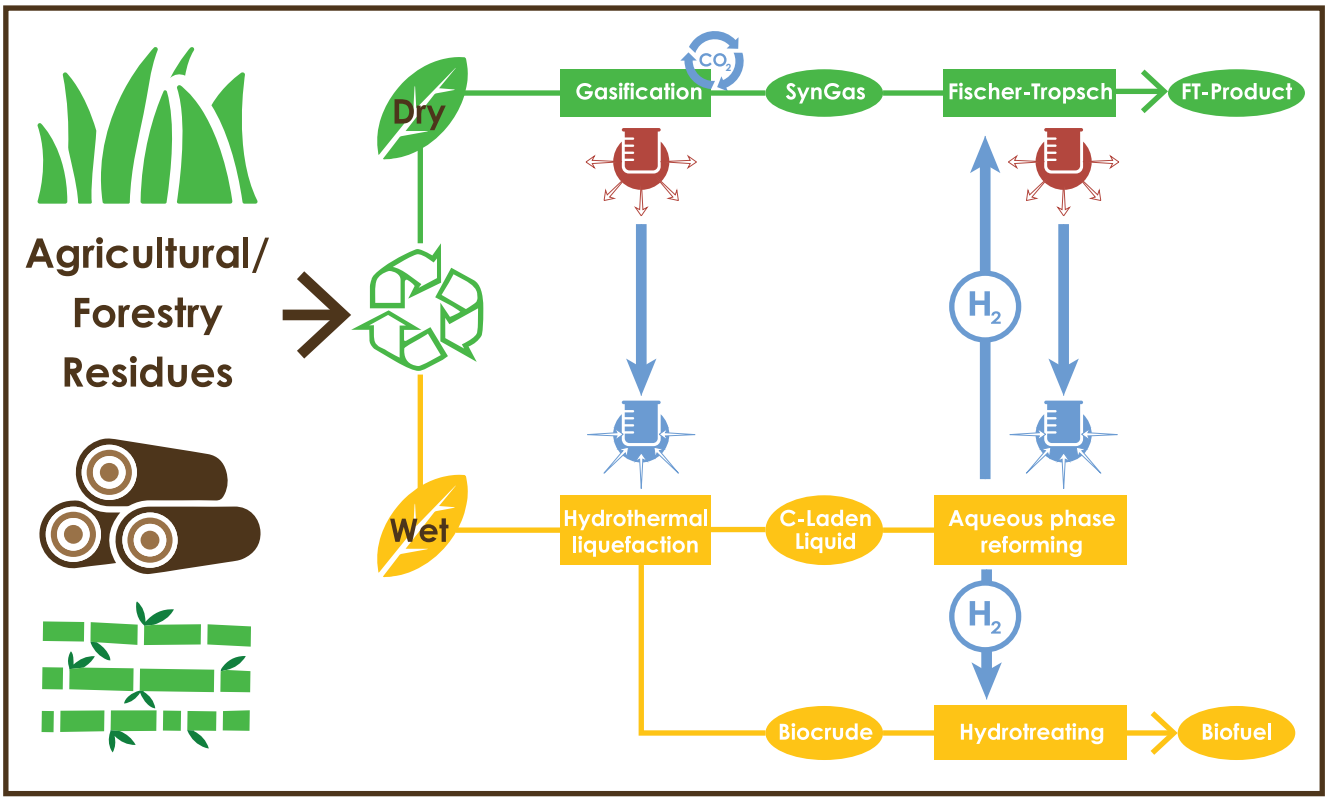
The source of this energy depends to a large extent on fossil fuels import, being diesel and kerosene the two major fuels for heavy trucks and air transportation.

Thus, decarbonised production of diesel and kerosene as alternative to fossil fuels becomes relevant for reducing carbon emissions in these two means of transport.

Heat-to-Fuel (HtF) will spearhead EU's research in grasping the opportunity to provide efficient technologies and processes generating decarbonised fuels for the transportation sector.

www.heattofuel.eu

THE HEAT TO FUEL PROCESS



Fischer-tropsch (FT) and aqueous phase reforming (APR) are promising technologies for the efficient production of 2nd generation fuels. But similarly to the situation of many other biofuel technologies, their economic border conditions don't allow their implementation. The radical innovation of combining an APR with a FT reactor is the basis to overcome this barrier.

As shown in the HtF process scheme, the organic waste feedstock is separated into two streams, the "dry" and the "wet" route. Several questions concerning the process specification have been answered by fundamental research performed during the first year of the project. The results show that the HtF process is in the position to handle any organic waste feedstock, there are just some minor limitations within gasification, mainly concerning the physicochemistry of feedstock's ash. For this reason several feedstocks are tested in three different scales at the moment in Poland, Spain and France. The solution for this issue will be the key to unlocking the main potential of HtF biorefinery.

On the other hand, wet organic wastes (i.e., from hydrothermal liquefaction or other streams) can be conveniently treated with APR to produce renewable H_2.

There are a lot of synergies between these two conversion platforms. In general, thermal conversion of organic waste feedstock often demand large quantities of hydrogen, so production of H_2 from C-laden waste water is of large benefit. Another positive effect of the combination APR-HTL is that the waste water of HTL is treated within the process itself, so no additional waste streams are generated.

Besides the mass integration, a perfect heat integration is under development at the moment. As shown in the scheme the dry route is exothermic, whereas HTL and APR lack this enthalpy. Thus convertion of both dry and wet organic wastes can be integrated with mutual advantages. Using the synergies between these technologies maximizes the total process efficiency. Thus, Heat-to-Fuel aims will be met thanks to the diversification of feedstocks available for production of biofuels, reducing the supply costs and upgrading the conversion efficiencies.

INTERVIEW WITH GET

Güssing Energy Technologies (GET)

As regular member of the ACR (Austrian Cooperative Research, 60 MM. EUR turnover, 800 employees) GET is a fully independent, non-profit research institute.
GET provides new solutions in the traditional disciplines: chemical, mechanical and architectural engineering by introducing experience and methods from computer sciences, innovation management, social and human societies as well as marketing, dissemination and business development.
GET's main aim is to transfer knowledge from fundamental research into usable products.

For this reason GET operates two business units: R&D and service. Main R&D focus areas are anaerobic digestion and biomethane, digitization, thermal conversion, syngas applications, sorption processes, 4th generation district heating and cooling, and circular economy. Main services are process optimization, energy efficiencies, audits, design and engineering. This generates practical know-how, which is used to extend the service area by latest R&D results. Vice versa this experience is useful to increase the technology readiness level of processes and products in order to build demonstration units.

GET Headquarters

Richard ZWEILER
(President)
Project Coordinator in Heat-to-Fuel

Role of GET in the project:

Financial and technical project manager, Lead partner, technical advisor to scientific HtF-partners

Expectations from HtF:

As non-profit research institute we are interested to extend the state-of-the-art and to publish our results as open access in order to serve our international scientific partners. For this reason we are rather active in dissemination events, participating at different biofuel workshops and working groups and are intensively networking with similar H2020 projects.
Additionally we would like to exploit the targeted project results as much as possible. At the moment we are investigating the matters of a prospective HtF-patent for instance. My personal goal is that the HtF Consortium establishes and demonstrates a novel concept, which is in the position to process any kind of naturally occurring biogenic residues.
Another target is the optimization of the process in order to reduce the production costs of biofuels. As long as there are no subsidies for biofuels existing, but subsidies for fossil fuels are still in place we'll hardly implement our technology on a competitive basis. However, if we optimize the already sound HtF-concept we'll be one of the first, who will implement our technology as soon as border conditions have changed.

INTERVIEW WITH CEA

Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA)

The French Atomic Energy and Alternative Energy Commission (CEA) is a public research agency involved in four main areas: nuclear and renewable energies, defense and security, technological research for industry and fundamental research. Relying on acknowledged expert capabilities, the CEA takes part in setting up collaborative projects with a large number of academic and industrial partners.

The LITEN (Laboratory for Innovation in new Energy Technologies and Nanomaterials) is one of Europe's largest research institutes entirely dedicated to new energy technology. As an institute of the CEA, for more than a decade LITEN has been conducting advanced technological research to respond to climate change and support a circular economy that will protect environment for future generations. LITEN covers the entire energy value chain, from materials synthesis to scaling up processes for industrial rollout, positioning the institute to bring its partners a crucial competitive advantage on their markets. With fourteen technology platforms, a portfolio of more than 1,500 active patents, and the know-how of a thousand research scientists, technicians, and support staff, LITEN is a powerful R&D resource capable of overcoming complex technological challenges and developing tomorrow's products, components, and industrial processes.

www.liten.cea.fr

Genevieve GEFFRAYE
Scientific researcher and project leader

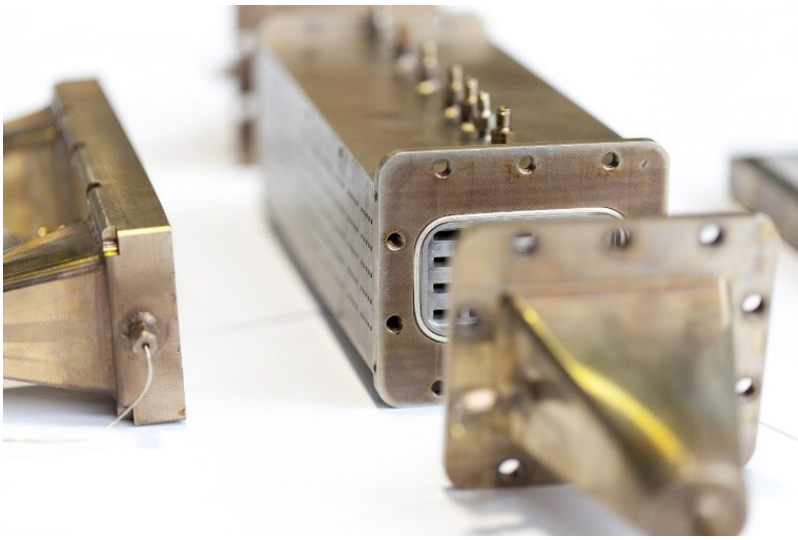
Working at CEA since 1991. She is currently in charge of modelling, design and test of structured catalytic exchanger-reactor dedicated to carbon oxide hydrogenation at CEA-LITEN. She has been involved in numerous international projects as expert in fluid mechanics and heat transfer, in the field of energy.
She is WP4 leader in HtF.

Role of CEA in the project:

The CEA will contribute on the design, modelling and the manufacturing of the Fischer tropsch (FT) structured reactor; assess the FT reactor; design both reactors, APR and FT, and will participate to the tests at Güssing. CEA will also investigate new solutions for facing the agglomeration issue in fluidized bed, related to the use of different types of problematic feedstock. CEA will be involved in the study of gasification kinetics of the biomass.

Expectations from HtF:

The Heat-to-Fuel project will allow the strengthening of competencies on the heat exchanger reactor for the FT reaction. CEA will improve its know-how in the gasification of different organic waste feedstock and on the risk of agglomeration due to the presence of inorganic element in fluidized bed reactor.



Millistructured Heat Exchanger reactor (© Vincent GUILLY)

INTERVIEW WITH ICHPW

Instytut Chemicznej Przeróbki Węgla (ICHPW)

The Institute for Chemical Processing of Coal (ICHPW) is a research organisation which started in 1955 operating in the field of scientific research driven by industrial demand. The Institute provides scientific research that finds recipients and fulfils demand of companies operating in coke and power industries, thermal utilization of waste, carbochemical products, high-temperature ceramic materials as well as organizations from government and self-government administration. In all of the above mentioned areas ICHPW has a large spectrum of competence and a highly specialized staff.
During the last years the ICHPW has been involved in a number of research projects. Financing for those projects has been obtained mainly from structural funds and research programmes of the EU, scientific cooperation with countries outside of the EU (i.e. Norway, USA) as well as from national funding.

The Institute participates in many R&D and implementation projects, cooperating with more than 50 national and international scientific and R&D centres.

Strategic priority of the Institute is to gear its research field to the development of low- and zero-emission heat and electrical energy production technologies, including clean coal technologies, CO_2 capture and storage (CCS) and utilization (CCU) systems, as well as energy production from renewable resources. The performance of many analyses on actual and perspective routes of the development of power, heat, waste management and coke-making industries is the basis of current research topics and action lines of the Institute.

www.ichpw.pl

Ph.D. Sławomir STELMACH
Director of Centre for Technological Research

Role of ICHPW in the project:

First and foremost role of ICHPW in the Heat-to-Fuel project is our responsibility for coordination of actions conducted in WP3, entitled "organic waste conversion process", which rotates around four main tasks: preparation of organic waste feedstock, laboratory scale gasification studies, lab-scale batch HTL studies and development of APR process.

Expectations from HtF:

ICHPW scientific programme, research projects and developed infrastructure all closely correlate with topics related to the main goal of the HtF project. During the last decade our Institute has been the leading institution providing scientific research on CO_2 enhanced gasification of coal (with integrated technologies of CCS and CCU) which is mainly connected to development of so called clean-coal technologies for large scale power generation sector. As it has been mentioned above, fields of novel feedstock conversion technologies for clean and environmentally friendly power and chemical species generation are at the very centre of our Institute's interests. ICHPW expects the HtF project to be the kick-starter of a global revolution in the market of second generation, highly available, liquid fuels for transportation sector. We envisage the results of HtF as a pillar that will decrease our need for crude oil based fuels and will open us a route for safe and smooth transition from petrol engines as we know them today into new, more eco-friendly solutions of tomorrow.

CONSORTIUM

- Atmostat
- bioenergy 2020+ GMBH
- Beta renewables Spa
- Commissariat à l'Energie Atomique et aux Energies Alternatives
- Centro Ricerche FIAT
- Skupina Fabrika
- Instytut Chemicznej Przeróbki Węgla
- Institut de Recerca en Energia de Catalunya
- Johnson Matthey PLC
- Politecnico di Torino
- R2M Solution Spain
- Consorzio per la Ricerca e la Dimostrazione sulle Energie Rinnovabili
- Gussing Energy Technologies GMBH
- TU WIEN

Heat-to-Fuel is a Horizon 2020 EU-funded project carried out by 14 partners from across Europe that aims to deliver the next generation of biofuel production technologies supporting the decarbonisation of the transportation sector.

NOVEL TECHNOLOGIES + COMPLEMENTARY ACTIVITIES DESIGN MODELLING

TESTING | ANALYSIS INTEGRATED HEAT TO FUEL SYSTEM + DEVELOPMENT HARDWARE PROCESSES

REPRESENTATIVE OF NEXT GENERATIONS OF SUSTAINABLE BIOFUELS TECHNOLOGIES

At the end of the project, the technology will be market ready in around 7 years.
The know-how acquired will allow scalability at a demonstration level before commercialisation.

PROJECT FACTS

Title:
Biorefinery combining HTL and FT to convert wet and solid organic, industrial wastes into 2nd generation biofuels with highest efficiency

Acronym:
Heat-to-Fuel

Budget:
€ 5.896.987,50

Type of action:
Research and Innovation Action

Duration:
48 months

This project has received funding from European Union's Horizon 2020 research and innovation programme under grant agreement n° 764675