

Project at glance

OBJECTIVE

FLEDGED project aims to develop a highly intensified and flexible process for DME production from biomass.

WHY DME

DME is recognized as one of the most promising future biofuels, due to the easy adaptability of car engines and reduced life-cycle environmental impact.

OUTCOME

The outcome of the FLEDGED project will be a highly competitive concept for both small-medium scale plants serving regional markets and for large scale plants.

Where to find us

www.fledged.eu

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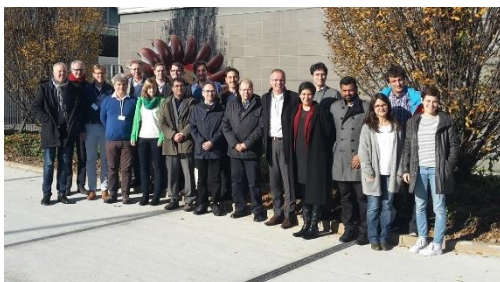
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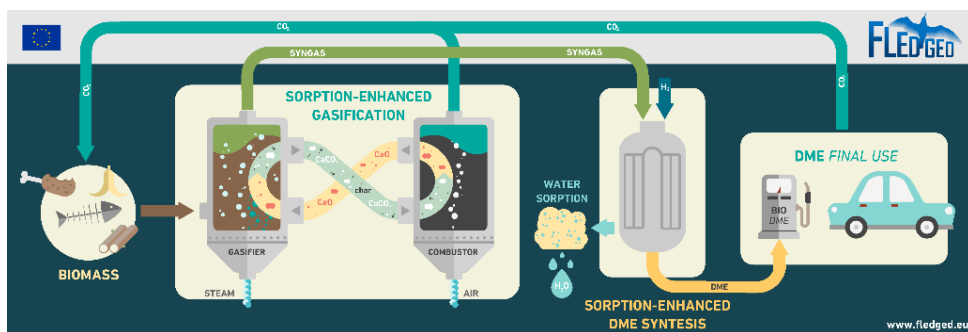
PROJECT NEWS

FLEDGED project started



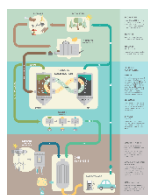
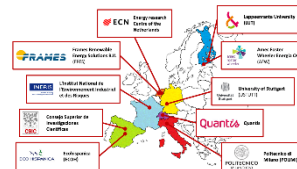
FLEDGED Project kick-off meeting has been held in Milan on November, 29th 2016. The project combines an innovative [sorption-enhanced gasifier \(SEG\)](#) with a [sorption-enhanced DME synthesis process](#), aiming at improved and efficient production of DME as a fuel for automotive.

In this four year project, different second generation biomass types, sorbents and catalysts will be tested in laboratory and at pilot scale in the facilities of the consortium. Modelling activities will support scale-up and process integration studies aiming at high-efficiency process. Life-cycle, risk and economic analyses will be also performed.



Partners involved in the consortium are leading institutes in their respective fields and cover all the key units of the biofuels production chain. FLEDGED consortium combines 10 legal entities from 6 EU countries:

- Politecnico di Milano (Italy)
- Energy Research Centre of the Netherlands (ECN, Netherlands)
- Spanish National Research Council (CSIC, Spain)
- University of Stuttgart (Germany)
- Lappeenranta University of Technology (LUT, Finland)
- QUANTIS (Switzerland)
- INERIS (France)
- Amec Foster Wheeler Energia Oy (AFW, Finland)
- Ecohispanica (Spain)
- Frames Renewable Energy Solutions (FRES, Netherlands)



A more detailed descriptive [infographic](#) about the project is available on the project website www.fledged.eu, as well as [free downloadable material](#) on project concept and results, presentations and publications. [Twitter](#) and [Facebook](#) profiles keep you updated on the project.

Input biomass and CO₂ sorbent characterized at CSIC-ICB

In the first phase of the project, different analytical techniques were used to characterize the raw materials (biomass and CO₂ sorbents) to be used in the gasification process. Regarding the sorbents, both natural limestone and dolomite are tested in TGA to determine their CO₂ carrying capacity. Possible issues with attrition phenomena will be assessed during the next experimental campaign.

The composition and the physical properties of wood pellets, pine wood, straw, grape seeds and biomass from municipal solid waste (MSW) treatment are measured. [Read more here.](#)



Steam sorbents for the SEDMES process tested at ECN



At ECN, several steam sorbents have been screened in the so-called "Spider" facility. This high-throughput rig allows assessing the performance of mixtures of commercial catalyst and sorbents under SEDMES conditions. Based on a literature review, a list of water sorbents candidates has been drafted.

Some materials exhibit a promising behavior with respect to the adsorbent targets for SEDMES, with water slip levels, cyclic sorbent capacity and regeneration temperatures compatible with the process.

Experimental setup of BFB gasifier built at CSIC-ICB



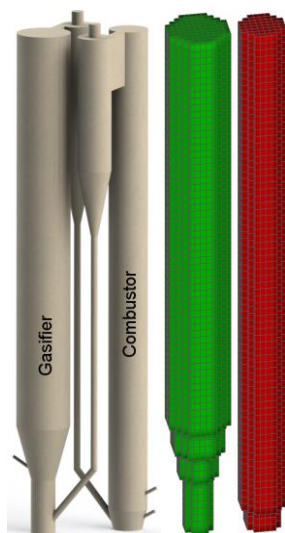
The construction of the sorbent and with different operating experimental facility at CSIC-ICB in parameters.

Zaragoza finished in June and is ready for the first experimental campaign. Tests at different gasifier temperatures, sorbent quantity and activity, steam and oxygen feeding

In the bubbling fluidized bed, the two steps of the sorption-enhanced gasification process will be tested will validate the models and provide inputs for the design of the dual bed system.

with different types of biomass and

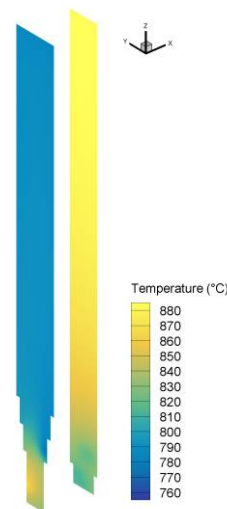
Modeling activities of the indirect gasification process at LUT are ongoing...



Accurate models are needed to support development and scale-up of new processes, such as sorption enhanced gasification (SEG). At LUT, the development of a modelling tool for comprehensive simulation of interconnected CFB reactors for indirect gasification is ongoing. In particular, a three-dimensional semi-empirical model is available, which can be applied to air/oxygen-fired combustion, gasification and calcium looping.

The results will be validated on experimental data and used for scale-up.

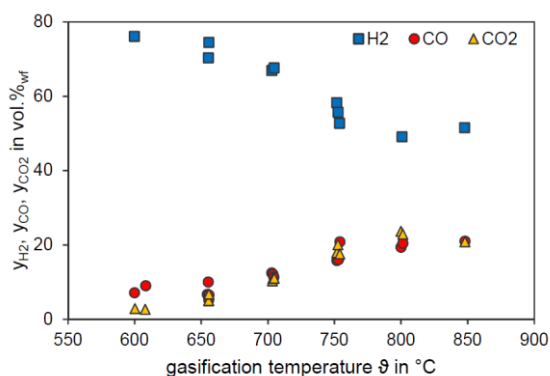
More details on the initial work performed by LUT can be found in the presentation held at the CFB 12 conference, available [here](#).



... and a preliminary experimental campaign started at USTUTT

Preliminary test on sorption enhanced gasification were performed in the laboratory-scale 20 kW_{th} dual fluidized bed facility at USTUTT, working with wood pellets and limestone.

Influence of temperature on syngas composition is evidenced, with syngas carbon content increasing with temperature due to the effect of the CaO-CaCO₃-CO₂ system equilibrium.

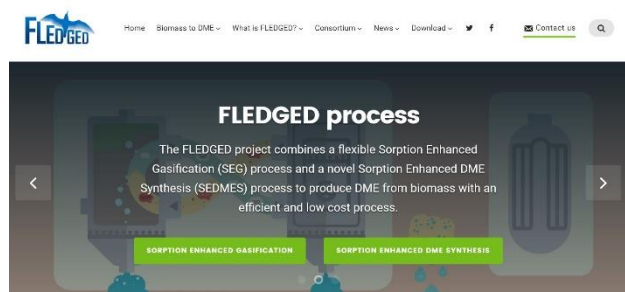


Optimal conditions for downstream DME production are reached at a gasifier temperature of about 715 °C.

Conditions favoring reduced methane content are also explored in a semi-batch experimental setup at different temperatures.

Details on USTUTT experimental campaign can be found in the presentation held at the CFB 12 conference, available [here](#).

FLEDGED website is online...



[FLEDGED website](#) is online, with description of the process concept, of the project structure and of the consortium.

Publications and informative material are available and will be updated during the project.

A project presentation and a poster are freely available [here](#), while an infographic can be downloaded [here](#).

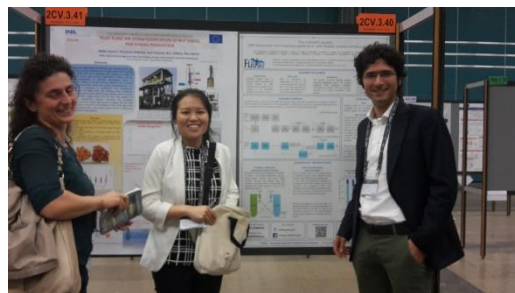
... and Twitter and Facebook profiles will keep the general public aware of project advancement.

FLEDGED Project has been presented at conferences and events

Project coordinator Matteo Romano (POLIMI) presented the FLEDGED project at *EUBCE 2017 (European Biomass Conference & Exhibition)*.

Guy Marlair (INERIS) presented a work titled "Promoting safety in innovative and sustainable biomass value chains" at *International Symposium on Green Chemistry 2017*. Key issues that needs to be considered towards proactive material hazard characterization or process safety in the sector of biomass have been evidenced, with reference to FLEDGED and other ongoing projects.

Jurriaan Boon (ECN) presented at *5th International Conference on Tailor-Made Fuels from Biomass*. A novel sorption enhanced dimethyl ether synthesis (SEDMES) process is presented using a solid adsorbent for in-situ water removal. The abstract is available on the website ([here](#)).



Two contributions about FLEDGED process have been presented at the *12th International Conference on Fluidized Bed Technology*. Selina Hafner (USTUTT) presented a work on the production of tailored syngas for DME synthesis by sorption enhanced gasification, while Kari Myöhänen (LUT) presented a work about the 3D-modelling of the governing phenomena inside indirect gasifiers. Presentations are available in the website [download section](#).