



Flexible Production of Synthetic Natural Gas and Biochar via Gasification of Biomass and Waste

Issue 3 / January 2023

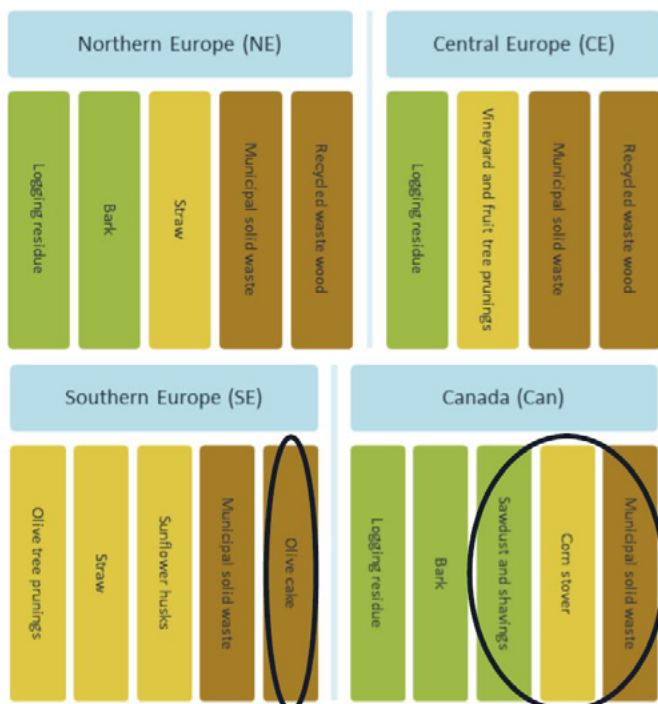
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1. Project Progress Update: December 2022

The consortium met online for the 4th general assembly on 14-15 December 2022 to share updates on each of the work packages, herein a short summary of the project's current status.

WP2: Low-cost harvesting/collection, pre-processing and handling strategies currently being defined for the selected feedstocks or feedstock mixtures; co-handling of agro and forest biomasses evaluated as a means of reducing costs.



Figures 1-2.: spatial feedstock availability

WP3: Manufacturing of the oxygen transport membrane (OTM) module almost finished – integration with VTT's gasification pilot (UCG-PDU) expected in March 2023.

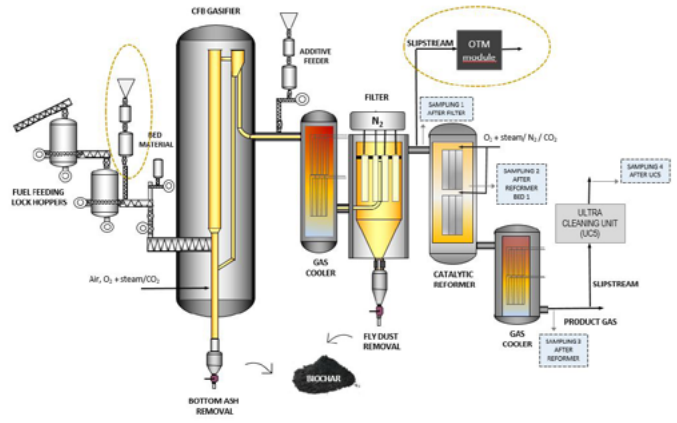


Figure 3.: Pressurised Fluidized-Bed Gasification Pilot Plant

WP4: Three pilot-scale gasification test campaigns performed so far where two alternative gasifier designs (BCFB/CFB) assessed for their suitability in biochar co-production; a standard CFB gasifier selected for FlexSNG (capable of co-producing biochar with adequate quality

and with a less complex reactor design than the BCFB); supporting CFD modelling work ongoing and semi-empirical gasification process model developed and implemented as part of the overall process model.

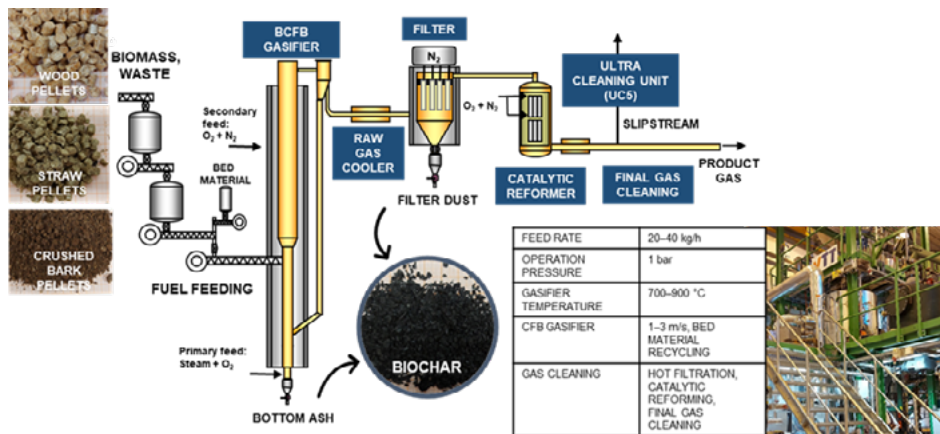


Figure 4: Bubbling Circulating Fluidised-Bed (BCFB) gasifier at VTT's Piloting Centre Bioruukki, Finland.

WP6: Biochar samples derived from bark, straw and wood feedstocks analysed (bottom and fly ash) – no big obstacles identified for end use in applications like combustion or soil amendment; assessment of utilization options for biomethane ongoing.

WP7&WP8: Preliminary definition of case studies for the different target regions done; process model set up in Aspen Plus®; ongoing discussion on the calculation approach to be used in TEA. Olive tree prunings (OTP) in Crete to be analysed in one of the case studies.

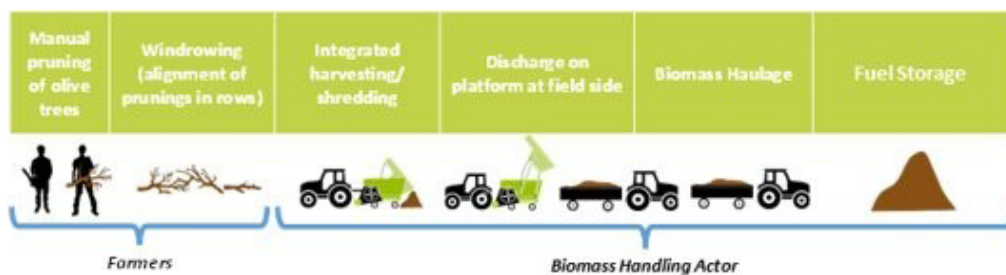


Figure 5: OTP harvesting+haulage value chain

WP9: The first industrial workshop organised in November 2022; promotional videos published; newsletters and newflash items shared on the website and social media channels;

the half-day event that was planned to be held by month 18 in occasion of the European Biomass Conference and Exhibition (EUBCE) postponed to year 2023 due to COVID.

2. Development of a Bubbling Circulating Fluidized-Bed Reactor

(Published: Chemical Eng. Transactions, Vol 92, 2022 [https://DOI: 10.3303/CET2292065](https://doi.org/10.3303/CET2292065))

The Bubbling Circulating Fluidized-Bed (BCFB) gasifier described in this paper is based on a combination of the two fluidized-bed reactor types: a bubbling and a circulating fluidized-bed.

The BCFB gasifier was originally developed in the early 2000s and designed for air-blown gasification of waste-derived feedstocks that have very high volatile matter content resulting in high tar concentration in the raw product gas.

In an ongoing EU project FlexSNG, the BCFB gasification technology is now adapted for the co-production of biochar and synthesis quality gas, using steam and oxygen as fluidizing gases.

In this paper, the pilot-scale development of the BCFB gasifier in air-blown operation with wood residues and a waste-derived feedstock is firstly presented.

Then, the use of this gasifier design for the co-production of biochar and synthesis gas is described and the results from preliminary process simulations are presented.

Estimated process performances are shown for two operation modes. In the maximized synthesis gas mode, the gasifier is operated at 900 °C resulting in a similar performance to a conventional CFB gasifier. In co-production operation mode, the bottom section of the BCFB gasifier acts as the carbonization zone producing good-quality biochar, which is recovered from the bottom of the gasifier.

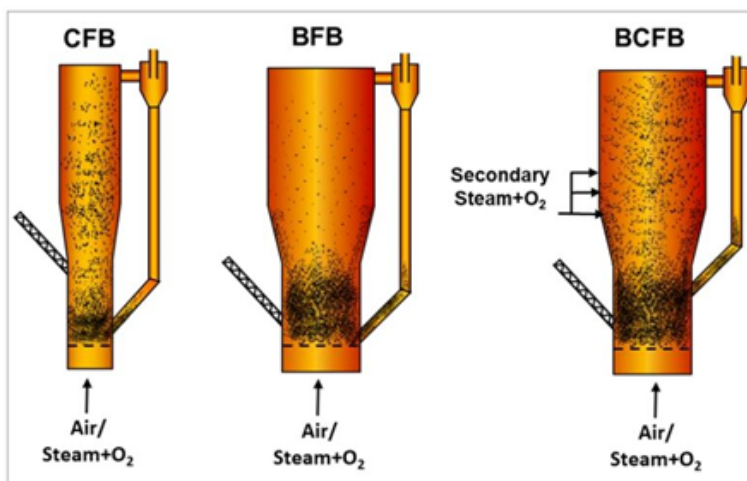


Figure 6. Basic fluidized-bed gasifier types and modified version used in the tests of this paper


3. First Topical Workshop: Turning low cost bio-feedstocks into valuable products

On the 3rd November 2022 FlexSNG H2020 Project held its first topical workshop at EIFER, Karlsruhe, Germany.

This hybrid event was joined by nearly 200 guests, in person and online from all around Europe and the world, proving to be a great success globally!

During this one day event we heard from leading experts about gasification, biochar and its market potential, as well as supply chain optimization, EU green energy policies, and how industrial scale gasification is progressing.

The event was rounded off with an introduction to industrial symbiosis and its critical role in the economic viability of biofuel processes, a summary of the projects case studies, and a group discussion about the “winning conditions” for the FlexSNG Process.

 The event can be rewatched here:
<https://youtu.be/luwB1v8YF4s>

 The presentation slides can be downloaded here:
www.shorturl.at/xJOY6



Figure 7. FlexSNG First Topical Workshop Turning low cost bio-feedstocks into valuable products


4. FlexSNG Project Video

FlexSNG produced an animated video to promote the project and its overall objectives. The finished video is 2.09 minutes long and gives an overview of the FlexSNG project; its objectives, the

technical aspect, the project consortium, and duration. As of 10th November 2022, the video has been viewed over 500 times on the projects LinkedIn page.



Figure 8. Scene from the projects animated video

 The full video can be viewed here:
<https://youtu.be/ZdSmkX3yhOs>

5. Scene from the FlexSNG Test Campaign Video

This video captures one of the pilot-scale gasification test campaigns conducted at VTT's Pilot Centre Bioruukki, in which process conditions in the gasifier are

optimized for co-production of biochar and synthesis gas from woody residues.



Figure 9. Scene from the FlexSNG Test Campaign Video

 The full video can be viewed here:
https://youtu.be/O_1wg5RNP9c



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