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Green fuels from biogenic residues

Flexible production of valuable energy sources from various residues, with maximum efficiency thanks to dfb gasification technology

The Paris Agreement on Climate Change, signed in late 2015, aims to significantly reduce CO_2 emissions and, in the long term, to fully replace fossil fuels with renewable energy. The following steps are essential for implementing the Paris Agreement and for achieving the UN climate goals:

-50% reduction of fossile CO_2 emissions every 10 years,

+100% increase of CO_2-free energy supply every 5 years

(Rockström J. in: Science, Nr. 6331, 2017)

Therefore, the rapid development of energy sources with a high energy density from regenerative, biogenic residues or waste is absolutely essential. Then the demand may be satisfied that cannot be met as a matter of principle or not fast enough by electricity from the sun, wind and water. A particular challenge for plant operators are the volatile prices in the energy sector, which imply considerable fluctuations both in the cost of input materials and in the prices realizable for the energy sources produced.

Green fuels from biogenic residues –
already today for sustainable transport of tomorrow

Objectives

The aim of the research group “Future Energy Technology” at TU Wien is to develop efficient technologies of thermal gasification for the production of synthetic fuels and to implement them together with plant operators.

Prof. Hermann Hofbauer and his group have been developing their know-how for three decades and have already been implementing it in several large-scale plants for many years – in particular for the gasification of wood-like raw materials. Now the previous experience was to be bundled and result in a technology that allows for a very flexible production of a wide range of green fuels from a variety of biogenic residues.

Solution

A sustainable energy supply requires a mix of energy sources that must be able to adapt to the prevailing market conditions. Therefore, a solution was required that would allow to separate the processes running in the conventional production of synthetic fuels so as to adapt and optimize each of them separately to the existing raw materials and the products to be produced.

For this purpose, a new technology has been developed that divides combustion and gasification – which are usually entangled and run both at the same time – to two spatially separated reactors. That way, raw materials may be converted into a high-quality synthetic gas in a highly efficient thermal process. The bed material that circulates between the two reactors ensures optimal reaction processes and the desired heat input to the gasification process. In addition to the common and frequently required energy sources of electricity and

heat, the generation of high-quality fuels is also possible, such as hydrogen, synthetic natural gas, up to green forms of diesel, kerosene and gasoline.

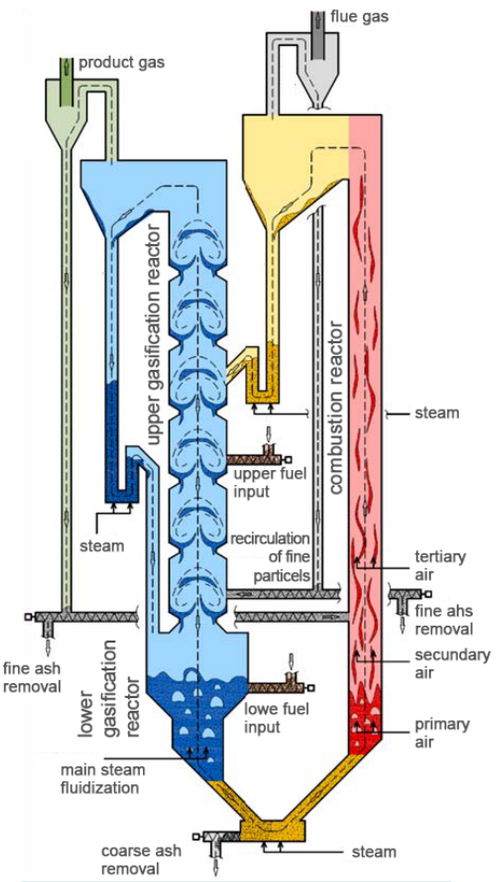
Results

With the dual fluid bed gasification, or in short dfb gasification, developed at TU Wien all products of a petroleum-based refinery may also be produced from biomass. When considering the calorific value and energy content of the input products, system efficiencies of 50 to 80 percent may be achieved!

Thus, the dfb gasification is able to contribute significantly to the safe and flexible supply of green energy and to the solution of the CO2 problem.

The dfb gasification may be used to process a variety of biogenic residues, such as forest residues, bark, agricultural residues and fractional household waste or sewage sludge, as well as homogeneous industrial and commercial waste.

The achievements at TU Wien ranged from modeling and simulations, to a cold model for testing and optimizing the control of the dfb gasification, to the construction and operation of a dedicated 100 kW (thermal) pilot plant. These results and tools as well as an own test laboratory for a wide variety of fuels are now available to interested companies.



Scheme of dfb-technology

Your benefit

- dfb gasification allows for the conversion of a variety of protected by several patents biogenic and industrial residues and wastes to fuels as well as electricity and/or heat
- flexible fuel production with system efficiencies of up to 80 %
- experiences from operating a 100 kW pilot plant (thermal)
- specific modeling and simulation tools available for scale-up
- new dfb technology is based on experiences from the successful realization in six commercial industrial plants with 8 to 32 MW in Austria, Germany, Sweden, Thailand, Japan
- protected by several patents
- research group “Future Energy Technology” as a cooperation partner with 30 years of experience in thermo-chemical transformation of biogenic fuels, residues and wastes into various energy sources and forms
- know-how and equipment available at TU Wien for: planning and validating specific plant concepts, conducting laboratory tests, building and operating pilot plants, operating and optimizing industrial plants

Target groups

- utilities and energy suppliers
- plant engineering companies
- flexproducers in the agriculture, food, and forest industry
- flexwaste and residual materials recyclers
- local research and development partners (including academic institutions) of current and potential plant operators

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