



Abstract

An Austrian SME developed a high efficiency biomass power plant based on gasification technology. The main objective is the generation of electricity. Heat energy can be produced according to specific needs. The plant operates economically even on small scale and produces dust-free emission. The company looks for collaboration (license, technical agreement) with general contractors, municipalities and investors who are interested in applying the technology to achieve economic proof of concept.

Description

A review of development activities in universities and companies towards a solution of gasification problems in biomass power plants shows a lot of research has been done in the last years.

Most of these state-of-the-art solutions have their focus on the gas cleaning system.

The related tar problem is mainly tackled in two ways. First, removal the tar of the gas stream and second, crack the tar thermally in the gas cleaning system. Both options result in decreased heating values for the full gasification system, because the energy included in the tar is wasted.

Biomass represents one of the most promising sources for sustainable energy supply in the future. In the gasification process the solid fuel is not burned completely but transformed into a combustion gas. This gas will then be converted easily and efficiently into electric power and heat.

The motivation of the invention was to transform the tar into fuel gas within the gasification process itself. In contrast to other state-of-the-art processes the new approach offers improvements by solving four main problems of the state-of-the-art gasification technology:

- The pressure drop over the fixed bed by a higher

biomass input.

- The range of the biomass feed and size.
- The slagging problem – feed biomass with a low melting point.
- The tar contamination of the gas flow after the gasification process.

The main advantage in comparison to the combustion process is the higher electric efficiency of the system, even at smaller scale (350-1500 kW_{electrical}). It is designed to use the gas directly in a combustion engine to produce electricity.

Another big advantage is the low dust emission and cost reduction because of the small gas flows, compared to the combustion with the equal electrical output.

The main product of the gasification process is electric power. This focus is especially important during the warmer season, when it is hard to find consumer for “waste” heat from conventional biomass power plants. According to needs heat energy can also be produced where beneficial.

In short, up to now the state-of-the-art systems do not generate enough high quality gas without an expensive gas cleaning system.

The new technology eliminates all the disadvantages, but offers all advantages of the fixed bed down draft gasifiers for example clean gas, high gas quality and a low amount of tar in the producer gas without an expensive gas cleaning system. The successful technical operation of the gasification technology has already been approved on a 200kW_{gas} pilot plant.

Technically the main processes in the system are:

- 1 Pyrolysis (state of the art technology)
- 2 Partial oxidation (new technology – separated full stream unit)
- 3 Reduction (new technology – floating bed reduction)



reactor, FBRR)

Every process step is done in a separated device and therefore easy to handle.

The outgassing of the biomass (pyrolysis step) are partial burned in the oxidation unit and result in high temperatures that crack the tar. The energy in form of heat is used in the next step (reduction reactor).

In the reduction reactor, the char will be reduced to clean gas. The reactor is filled with the solid fraction (stabilised fixed bed). The gas stream flows in the reduction reactor from the bottom to the top through the char bed. This is one reason for the minimal pressure drop through the fixed bed. Therefore it is possible to feed biomass with a big size range.

In conventional fixed bed gasification systems, devices are needed to stabilise the char bed in the reduction reactor. These devices can lead to operational failures especially with the usage of biomass feed with a low melting point. In the worst case the operation has to be stopped because the pressure in the system dangerously increases. Costly and time-consuming cleaning is necessary before the restart of the system.

In the proposed technology the char bed is stable without any additional devices hence the problematic shut down of the process can be avoided.

The big advantage of the new invention is the clever combination of the three process steps into a singular flow of gas and solids. Eventually all this leads to increased economical benefits.

Innovations and advantages of the offer

- Economical and effective work in small operation plants is feasible
- Separated full stream unit
- Singular flow of gas and solids
- No grate or similar working tools in the reactor

- Unique selling point: Dust-free emissions and High efficiency for electricity production, even on small size plants
- Attractive electricity production costs
- Economical operation the full year possible with focus on the electric power production
- A manifold feedstock could be used, for example woodchips, straw, etc.
- Produce a clean gas without an expensive cleaning step, a low amount of tar
- Minimalism of feed logistic necessary because decentralize plant place

Current and Potential Domain of Application

Communities: where it is possible to build a decentralised power plant to supply some buildings with electricity and heat.

Wood industries: The “waste” material can be used as feedstock to generate energy (for the industry).

Farms and rural cooperatives: Excess products can be utilized to produce energy with the gasification technology.

For further information (including IPR status) please contact:

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