

Progress in biomass gasification

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Biomass is considered the renewable energy source with the highest potential to contribute to the energy needs of modern society for both the developed and developing economies world-wide. Energy from biomass based on short rotation forestry and other energy crops can contribute significantly towards the objectives of the Kyoto Agreement in reducing the green house gases emissions and to the problems related to climate change.

Biomass fuels and residues can be converted to energy via thermochemical and biological processes. Biomass gasification has attracted the highest interest amongst the thermochemical conversion technologies as it offers higher efficiencies in relation to combustion while flash pyrolysis is still in the development stage.

Gasification is an energy process producing a gas that can substitute fossil fuels in high efficiency power generation, heat and/or CHP applications, and can be used for the production of liquid fuels and chemicals via synthesis gas. Gasification technology consists of several unit operations, the most critical of which is gas cleaning and conditioning for utilisation in power production engines. Numerous types of gasifiers have been developed and tested and many industrial applications can use the technology. Significant progress has been achieved over the last five years and some applications are on the threshold of becoming commercial. However, for most of the applications the efficient and economic removal of tar still presents the main technical barrier to be overcome.

However, although gasification technologies have recently been successfully demonstrated at large scale and several demonstration projects are under implementation, they are still relative expensive in comparison to fossil based energy and, therefore, face economic and other non-technical barriers when trying to penetrate the energy markets. Their penetration into the energy markets can only be achieved at present via economic development through biomass systems integration. Thus the innovation in practically all demonstration projects under implementation lies not only on the technical aspects of the various processes but also in the integration of the gasification technologies in existing or newly developed systems where it can be demonstrated that the overall system offers better prospects for economic development.

The overview starts with the present status of the various gasification technologies and after a brief introduction to their market prospects the most important projects are briefly presented and discussed based on their market segments. Developments in the various fields are also discussed as well as the R&D needs for an accelerated penetration of gasification technologies in the energy market. The paper concludes with recommendations for future R&D needs and demonstration requirements while attempting to present a strategy for the commercialisation of gasification technologies.