

PERSPECTIVES ON THE EVOLUTION OF GASIFICATION: FROM CHP TO INTEGRATED POLY-GENERATIVE TECHNOLOGY

Marco Baratieri

Abstract

During the last years, there has been an increased interest and attention on small-scale biomass gasifier in Central and Northern Europe. As an example, since 2011 approximately 50 small-scale biomass gasification plants have been authorized and operating in South Tyrol region (Italy) and the number of installations and authorization acts seems to be strongly correlated with the available financial incentives. In this framework, research activities have been carried out with the main aims being the onsite monitoring of the systems and the valorization strategies of gasification chars to enhance polygenerative capabilities of this technology.

Measurements were performed in most all the available operating technologies for the characterization and the assessment to the mass and the energy flows. The producer gases along with the gasification by-products (namely, char and tar) were sampled and both chemically and physically characterized. The overall CHP efficiency of the gasifiers ranged between 53.5 % and 78.5 %, with most technology surpassing 68 %. Subsequently, char was analyzed in terms of chemical and physical characteristics, toxicity, heavy metals content and surface area.

Potential uses of char have been explored, focusing in particular on the utilization of char for energy production or as raw material for filtering medium, as it is or after its activation, and as catalyst support for Fischer-Tropsch synthesis.

Other opportunities of improvement for gasification are represented by the increase of the fuel flexibility in order to lower the cost of the feedstock, the design of more suitable automation systems and a more sustainable tar management.

As a whole, polygeneration and integration of biomass gasification in a biorefinery perspective can be proposed in the view of generating biofuels starting from synthesis gas, e.g. biomethane, also considering power-to-gas as an option for the use of excess electricity produced from renewable sources.