

# Co-generation System Combined with Tar-Free High Temperature Gasification of Biomass

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## **Abstract:**

Gasification technology is paid attention as one of upgrading techniques for effective utilization of waste biomass. Produced gas can be used not only for the chemical materials, but also the fuels for gas engines, gas turbines and fuel cells that can generate electric power with high efficiency in a small scale. Various kinds of gasification technologies of biomass have been investigated and developed in recent years. The gasification processes, using moving bed, circulated fluidized bed and rotary kiln, with steam, oxygen or air condition have been developed. Most of these gasification processes were performed at lower temperatures than 1000 to 1200 K. However, serious tar emission causes the operational troubles in those temperature ranges. To control tar generation, catalyst application or reforming of yield gas was employed in many processes, but cheap and high efficient catalyst have not been developed yet nor they are sufficiently effective. On the other hand, the present author studied a high temperature entrained-bed gasification process, which was able to directly decompose tar compositions in a high temperature zone. It was clarified that tar generation was controlled in the high temperature gasification process. To archive the high temperature and high gasification performance, oxygen was usually used in the gasification process, but the oxygen separation process, which consume significantly energy, was necessary. To avoid oxygen separation process, air was employed as gasifying agent for the gasification process instead of oxygen, and high temperature gasification experiment was conducted. Gasification model of wood biomass was developed based on the experimental results to determine the scale up effect.

In the present workshop, the gasification technology performed by the present author is introduced briefly as well as an innovative co-generation system combined with the gasification is proposed to recover waste low temperature heat in a view point of advancement of the total efficiency in the energy conversion processes.

## **Keywords:**

Gasification, Biomass, Entrained bed, Cogeneration, Heat pump, Tar emission free