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Development of portable ultra-small biomass gasification and power generation system

A portable and small-scale biomass gasification system has a potential for use in damaged areas by natural disasters (earthquake, flooding, Tsunami, etc.) or un-electrified rural areas in developing countries. However, the available feedstocks are usually high moisture content ones with different size, shape and properties. Therefore, some pretreatments are essential for efficient gasification of these feedstocks. In this study, woody biomass samples were first carbonized/ torrefied by a carbonizer without usage of electricity. Then the carbonized/ torrefied biomass were crushed and molded into briquette shape to be supplied into a fixed bed updraft gasifier. The syngas produced in the gasifier was first cleaned up by physical tar removal processes (the oil scrubbing, the centrifuge misty tar collection and the char bed adsorption) and was then supplied into a gas engine with 30 kW electrical output. In the presentation, some detail results on the carbonization/ torrefaction process, the briquetting process, the gasification process, the gas clean-up process and the gas engine operation will be presented. Then the mass balance and the energy balance of the total system will be analyzed to show the self-sustainability of this system.

Biography

Kunio Yoshikawa is a Professor of Tokyo Institute of Technology and an Associate Editor of Applied Energy. His Bachelor's, Master's and Doctor degrees were awarded from Tokyo Institute of Technology. His major fields are Energy Conversion, Waste Management and Environmental Engineering. He has been working in Tokyo Institute of Technology for more than 38 years as Research Associate, Associate Professor and as a Professor. He has published nearly 200 journal papers and received awards like AIAA Best Paper Award, ASME James Harry Potter Gold Medal, JSME Environmental Technology Achievement Award and Best Educator Award of Tokyo Institute of Technology.

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