

### Operation performance and optimization of 3MW<sub>th</sub> circulating fluidized bed gasification system

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In this study, a 3 MW<sub>th</sub> circulating fluidized bed was newly developed for biomass gasification. The fluidized bed was mainly composed of circulating and bubbling fluidized reactors integrating in-situ tar removal step in the system. For cleaning of the tar and acid gas in the product gas, the sequential gas cleaning process comprised of a ceramic filter, rapid quencher and wet scrubber was adopted. Optimal operating conditions of the integrated system were investigated for various parameters. The slipstream of cleaned product gas composed mainly of carbon monoxide, hydrogen, carbon dioxide, and methane, was used in a gas engine to generate power. As a result, product gas with a lower heating value of more than 5 MJ/Nm<sup>3</sup> and a cold gas efficiency of more than 53% was obtained under air-blown conditions. In addition, the performance of the syngas power generation engine was tested with the slipstream of the product gas. A power output of about 50 kWe and the overall power efficiency of about 22% was obtained.