

2<sup>nd</sup> Euro Global Summit and Expo on

# BIOMASS AND BIOENERGY

October 12-13, 2017 London, UK

## Performance evaluation of a custom built waste heat recovery unit attached to a gasification plant

Nwabunwanne Nwokolo, Sampson Mamphweli and Golden Makaka  
University of Fort Hare, South Africa

Johansson biomass gasification system is a standalone power generation system as it utilizes the syngas produced from the downdraft gasifier in an internal combustion gas engine for power generation. The syngas exiting the gasifier and entering the cyclone dissipates heat on the body of the cyclone due to the high temperature at which it exit. In addition this same syngas undergoes some cooling process at the gas scrubber before reaching the gas engine. As the gas engine drives the synchronous generator for power generation, some of the un-combusted gases exit through the exhaust pipe at high temperatures. All these add-up as waste heat within the gasification system, hence there is a significant opportunity for waste heat recovery in Johansson biomass gasification system. Therefore the aim of this study is to design and construct a waste heat recovery unit (WHRU) so as to harness the heat dissipated on the body of the cyclone for water heating. The design of the WHRU was made using an inventor based on the specifications of the cyclone dust collector. The WHRU was constructed using H R sheet commercial quality of dimensions 3 x 2,500 x 1,225 mm and angle equal commercial quality of dimension 30 x 30 x 2.5 mm. The performance evaluation of the WHRU was conducted at difference conditions and discussed. Result showed that the temperature of water in the WHRU could be raised from 20°C to 78°C without water withdrawal. Furthermore a maximum outlet water temperature of 65°C was recorded with water withdrawal at a rate of 1litre/min or 0.02 kg/sec. More also the standing loss realized at this maximum temperature was approximately 2.11 kW/h. A maximum temperature of about 130°C was recorded at the engine exhaust pipe which represents a significant opportunity for heat recovery with a thermoelectric generator.

### Biography

Nwabunwanne Nwokolo research interests focus on biomass gasification and renewable energy in the institute Fort Hare Institute of Technology.

NNwokolo@ufh.ac.za

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