

## ABSTRACT

This work discusses the experimental testing of palm kernel shells in multi-stage air gasification. The gasification of palm kernel shells was operated under atmospheric pressure, using air as the gasifying agent. The research focused on the effect of multi-air-stage supply and equivalence ratio (ER) on heating value of producer gas, gas composition, and tar content. The configuration was regarded as first stage, second stage and third stage air supply to enrich the producer gas. With increasing ER from 0.25 to 0.30 presented the good results of gas compositions. The results showed that CO (15.31 vol.%) and H<sub>2</sub> (10.33 vol%) gas concentrations had the highest values in this range of ER. The gas composition of gasification attained a good condition with higher heating value and lower heating value were 3.90 MJ/m<sup>3</sup> and 3.6 MJ/m<sup>3</sup>, respectively. The result of tar content in producer gas was lowest at ER of 0.3 as low as to 2.01 g/Nm<sup>3</sup>. In terms of gasification efficiency, the cold and hot gas efficiencies were employed in which they were 45% and 58%, respectively.

**Keyword:** Multi-stage downdraft air gasification, Tar, Palm kernel shell.