

## **Co-gasification of palm kernel shell and polystyrene plastic: Effect of different operating conditions**

### **Abstract**

Palm kernel shell (PKS) biomass has great potential for power generation via gasification as it contains high energy content. However, abundant it may be, the source of PKS is scattered throughout the country, thus the consistency of feedstock supply may be hard to maintain. Co-gasifying with another source, such as plastics, can be seen as one of a solution to mitigate the supply chain problem. Polystyrene (PS) plastics have potential as a plastic feedstock because of its high domestic and industrial usage. As PS is also hard to recycle, using PS as a co feedstock for gasification is a way for PS waste management. However, the study on the performance of air co-gasification of PKS and PS has not been done before. It is essential to investigate the performance before it is utilized in the real world. In this work, the performance co-gasification of PKS and PS with different operating conditions was investigated. The gasification experiment was done in an electrically heated downdraft gasifier with a diameter of 8 cm. The reaction temperature was varied from 700 to 900 °C, with the equivalence ratio varied from 0.07 to 0.27. The PS weight percentage of the total feedstock was varied from 0 to 30 wt%. It was found that the vol% of CO and H<sub>2</sub> on the producer gas increased with temperature while reducing the vol% of CO<sub>2</sub> and CH<sub>4</sub>. HHV and the amount of gas produced were also increasing with increasing temperature. Increasing ER reduced the HHV of the gas but increased the amount of gas produced. Adding more PS to the feedstock blend increased the percentage of the produced gas at 900 °C, however, at the lower temperature of 800 °C, the percentage of gas produced decreased with increasing PS wt%. © 2019 Energy Institute

### **Keywords**

Co-gasification; Gasification; Palm kernel shell; Polystyrene