THE SINGLE-STAGE GASIFICATION OF MAGNETITE HEAVY SUSPENSION SEPARATED COAL SAMPLES FROM HUNGARIAN BROWN COAL

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ABSTRACT

On one hand, it cannot be denied that the electricity generation has been highly depended on fossil fuels, like coal and it will be at least until the half of this century. But on the other hand,the use of traditional technologies in coal power generation will lead to even higher emission levels. Clean coal technology (CCT) could be one of the solutions. Currently, gasification of coal is considered the centre of CCTs.

In this study, there were two coal samples from the magnetite heavy suspension separated process used in the single stage fixed bed gasification within the non-moving of material. Thesetwo samples were marked as A1 and A2 sample, with the specific densities of □1.8 g/cm^3 and

□1.6 g/cm^3, respectively and diameters from 1 to 20 mm. The main purpose of the experimentswas to consider the effects of temperature and steam flow rate during the coal gasification fromboth, the energetic and chemical utilisation point of views.

As the temperature increased, the char yields decreased, and the gas yields increased at all examined steam flow rate. At each gasification temperature, the higher steam flow rate resultedin the lower char yields and higher gas yields. With higher temperature and steam flow rate, theexperiments within A1 sample performed a better char yield and higher volume of produced syngas. In the case of A1 sample, the lowest char yield was 23.78 %wt at 900 °C gasification temperature and 10 g/min steam flow rate. While the ash content of A1 sample was 19.05 %wtin the proximate analysis. As the temperature increased from 700 to 900 °C, the total composition of H_2, CO_2, and CH_4 showed a decreasing trend in both samples. While CO concentration increased with the increasing gasification temperature. When steam flow rate increased from 5 to 10 g/min, the H_2 and CO_2 concentration increased in case of both samples. While that of CO and CH_4 showed a decreasing trend at all temperatures.

Regarding to the effect of samples in gasification performance, the A1 sample showed a betterpromising starting material for gasification than the A2 sample in term of carbon conversion and cold gas efficiency, especially at 900 °C of gasification temperature. In the case of A2 sample, the carbon conversion efficiency was 41.98 % at 5 g/min and 42.28 % at 10 g/min of steam flow rate. While that was 36.01 % and 50.12%, respectively, for A1 sample. The highestcold gas efficiency was at 61.97 % for A1 sample at 900 °C of and 10 g/min of steam flow rate.From the results of experiment, it can be concluded that the steam gasification is a promising solution for the better efficiency of low rank coal utilisation. In addition, the proper selection of operation parameters will help to increase the overall efficiency in both the energetic and chemical utilisation point of views.

Key words: Low rank coal, brown coal, clean coal technology, steam coal gasification. Acknowledgements: