

# Earning Doctorate for Research in Biogas Upgrading

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Population and demand for energy from fuel continue to increase while energy resources still depend on depleting fossil fuels.

Biogas is a renewable energy which is potential to be used as motor vehicles fuel. But to become vehicle fuel, biogas has to contain CH<sub>4</sub> a minimum of 95% whereas each 1 Nm<sup>3</sup> of biogas only contains CH<sub>4</sub> 65%. So, a technology process is required to purify the biogas in order to produce CH<sub>4</sub> above 95%.

Chemical engineering doctoral student of Universitas Gadjah Mada, Agung Sugiharto, has done a dynamic study on the upgrading process of biogas from anaerobic digester production. Through this study, he earned optimum condition of the process in terms of system dynamics, namely absorber operation pressure at a minimum of 8 atm, maximum operation temperature at 28°. In his opinion, the rate of dissolving water is the parameter that is regulated to maintain the pure quality of absorber product based on the required standards.

He said biogas-water mix would form non-ideal electrolytes so the best thermodynamic model is those that are in line with pressures under 10 atm. "Biogas upgrading process with dissolving water has to have pressures at 6-10 atm," said Agung Sugiharto in his doctoral promotion at Faculty of Engineering UGM on Monday (29/1).



He used the model of biogas absorption process with pressured dissolving water by using feed biogas at a temperature of 40?. And the pressure is increased up to 10 atm and fed to the lower part of column, while dissolving water is fed to the upper part of column.

The water flowing from absorber have balance with highest partial pressure of CO<sub>2</sub> and lowest partial pressure of CH<sub>4</sub> so the water contains CO<sub>2</sub> at the most and CH<sub>4</sub> at the least. But to minimise CH<sub>4</sub> that is released due to absorption in water in the absorption column, the water released from the column is fed to the separator column whilst the pressure is reduced down to 2.5 - 3.5 atm. In the separator, some of CO<sub>2</sub> absorbed in the water will be released along with CH<sub>4</sub>. "This flow can be recycled to the absorber column and mixed with fresh feed of biogas," he said.

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