**carbon dioxide recovery system using low temperature liquefaction process from Biogas upgrading plant**

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Biogas produced by anaerobic digestion of waste sludge is generally composed of CH4 (Methane) of 50 ~ 70% and CO2 (Carbon dioxide) of 40 ~ 50%. Biogas should be upgraded to Biomethane for high efficient energy usage such as grid injection, vehicle fuel. In case of biogas upgrading, the major component of exhaust gas released from biogas upgrading plant to air is CO2 which is known as a primary GHG (Green House Gas). Most of biogas or biomethane system emit CO2 to atmosphere without any treatment because of renewable carbon. Our study is to reduce this CO2 recovery for negative CO2 reduction. A CO2 recovery technology from discharge gas in biogas upgrading plant could play a key role for GHG reduction and industrial utilization. Among various CO2 recovery technologies, low temperature liquefaction technology is regarded as an alternative to baseline technology such as chemical absorption methodologies because of its potential advantages in high efficiency and compact recovery system point of view. In the present study, the low temperature liquefaction performance of CO2 recovery pilot plant was demonstrated to show a high purity CO2 recovery capability with presently available and mature process equipment under various operating conditions. The result indicated that the ratio of mixture gas between CO2 and CH4 is a crucial factor to determine liquefied CO2 recovery rate because of dew point temperature drop-down. Although further R&D is required, based on the results from this study, the present work provides useful guidelines for the optimum process design of CO2 recovery system to improve low temperature liquefaction performance with low capital cost in a next study of biogas upgrading system.

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