Decentralized Energy Production System by Anaerobic Digestion Using Organic Waste and Exhaust Heat

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Following the 2011 Tohoku earthquake, various obstacles to the activities of life were encountered when the electrical power supply was disrupted. One particular crisis arose when the function of waste treatment system stopped. We studied the construction of a decentralized energy production system by anaerobic digestion using organic waste and exhaust heat. The purpose of this project is to ensure energy supply at the time of a disaster. Biogas energy is produced via methane fermentation from organic waste using anaerobes. Electrical power is produced from generators powered using biogas. The goal of our study is to ensure energy production and resource recycling within a local area.

Large amount of fishery waste from marine product processing industry was discharged. Fishery waste was attractive material for anaerobic digestion because of its high organic matter content. However, it is a protein-rich substrate, and its degradation products, ammonia, inhibit activity of anaerobic microbes. In this study, to decrease ammonia inhibition on anaerobic microbes, the effect of oyster shell on methane gas production from anaerobic digestion of fishery waste was investigated. In addition, the energy balance for running the system was calculated. The results showed that oyster shell was enhancing methane production from anaerobic digestion of fishery waste . Various methanogen and anaerobic bacteria had attached on the oyster shell. The reasons why the gas production was enhancing by adding oyster shell was considered that oyster shell contributed as a microbial carrier in the system. Energy balance for running the system will be plus by using exhaust heat from factories and the electrical generator to warm anaerobic digestion tank.