Characteristics of biogas production in dry single-phase anaerobic digestion tractor for combined treatment of sewage sludge with Food Waste

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The purposes of the present research are to suggest a stable and efficient treatment method for food waste in the anaerobic digester and to find good operating conditions for producing good-quality biogas by additionally injecting FeCl2, sewage sludge and carbon sources inside the dry single-phase anaerobic digester. As a result of operating the anaerobic digester of food waste by using a reactor with the effective capacity of 10L, the biogas of 80~90 N·L/kg in case of putting 1 kg of food waste into conditions of RN1 A and RN2 B was produced (RN; reactor number), and the biogas of 120~130 N·L/kg was generated in conditions of RN2 A. As the biogas of 130~140 N·L/kg was generated in conditions of RN2 B, the higher biogas generation ratio appeared in conditions of adding sewage sludge and carbon sources than the anaerobic digester using food waste. Also, the methane generation ratio in case of RN1 A, RN1 B, RN2 A and RN2 B respectively appeared around 50%, 60%, 65% and 75%. So, when adding the sewage sludge like RN2 A was mixed and putted into than input of food waste, the higher methane production can be expected, and the more higher methane production can be expected by putting carbon sources in case of RN2 B. It was appeared that as the concentration of H2S was maintained in less than 300 ppm at a reactor excluding conditions of RN1 A that FeCl2 was not put into, it inhibited toxic effects of anaerobic digestion of H2S. As a result, the better the anaerobic digestion efficiency gets, the biogas generation, methane concentration increased. Accordingly, it was determined that if the sewage sludge and carbon sources were added in rather than single treatment of only food waste, it will bring better stabilization of the digester and increase high-concentration biogas generation amount.

Keyword: anaerobic digestion, food waste, sewage sludge, carbon sources, biogas