

A method for in-situ thermal-alkaline sludge treatment to enhance anaerobic solids degradation and biogas generation

Overview

Anaerobic digestion of sludge is often hampered by the large size of the organic particulates and microbial cell walls. In order to improve the kinetics of hydrolysis, various pre-treatment methods to disintegrate the sludge and microbial cell structure have been developed. Alkaline treatment has several advantages, i.e. simple devices, easy to operate and high efficiency. However, higher dosage of alkaline would result in higher solids reduction and higher pH of treated sludge. The common practice is to use acid to neutralize the alkalinity and reduce the pH before feeding the treated sludge into anaerobic system. This adds extra cost to sludge treatment. Heat treatment of sludge has also been shown to be effective as pre-treatment. However, the energy consumption is very high. This invention presents hydrolysis/acidogenic reactors, which are operated under alkaline conditions with better solid reduction performance and had consistently produced CH_4 while VFAs production was greatly improved.

Applications

- ➡ Sludge treatment
- ➡ Organic wastes treatment
- ➡ Anaerobic digestion

Key features

The proposed system has a hydrolysis/acidogenesis reactor which is different from the conventional acidogenesis reactor in a 2-phase anaerobic system. The system increases SS reduction and VFAs production via in-situ alkaline treatment, and so improve methane generation in the subsequent reactor. A relatively higher pH is applied in the first reactor. Temperature of this first-stage reactor is controlled from 35 to 60 °C with the preferred temperature at 50 to 60 °C. pH and temperature ranges of the first-stage reactor promote both chemical and biological destruction of SS.

Market opportunities

Global demand for sludge management is expected to increase as organic solid waste are diverted away from landfills. We expect operational expenditure to be significantly reduced if our Thermal-alkaline sludge treatment technology is applied for sludge management. Improved energy recovery resulting from the enhanced solids destruction will improve cost efficiency of investments in sludge management. Enhanced solids destruction rates allow for smaller reactor size, also reducing capital expenditures.

Advantages and benefits

- ➡ Chemical savings
- ➡ Energy savings
- ➡ Footprint reduction

