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DISINTEGRATION AS A KEY-STEP IN PRE-TREATMENT OF SURPLUS ACTIVATED SLUDGE

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This study has been carried out to investigate the effect of microwave, alkalization and freezing on surplus activated sludge disintegration (release of organic/inorganic substances into the supernatant) and mesophilic fermentation. After applying pre-treatments, chemical oxygen demand increased by 7 - 35 times, disintegration degree was 35 - 47%, proteins by 5 - 25, carbohydrates by 2 - 3, phosphates 7 - 22 and ammonium by 3 - 16 times. Disintegration by microwave, alkalization and freezing has a positive effect on the rate of sludge anaerobic digestion. Biogas production increased by: 62; 49 and 58%, for microwave radiation, alkalization and freezing, respectively. The conducted research shows that the application of disintegration as a pre-treatment of surplus activated sludge is an effective method, allowing for practical using sewage sludge.

Keywords: microwave radiation, alkalization, freezing, surplus activated sludge.

Introduction

The combination of anaerobic sludge digestion with disintegration are promising technical methods of enhancing the stabilization process. It can be noted that using different methods of cell disruption can significantly influence on the degree of disintegration and the digestion parameters. The anaerobic digestion of organic material basically follows; hydrolysis, acidogenesis, acetogenesis and methanogenesis. The hydrolysis step degrades both insoluble organic material and high molecular weight compounds such as lipids, polysaccharides, proteins and nucleic acids, into soluble organic substances (e.g. amino acids and fatty acids). The components formed during hydrolysis are further split during acidogenesis, the second step. The hydrolysis is the limiting step of the fermentation process. This process is accelerated by the increase of dissolved components.

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