

Biogas Potential of Deinking Sludge from Wastepaper Recycling Industry: Influence of Dewatering Degree and High Calcium Carbonate Content

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Abstract : To improve on the sustainable resource management in the wastepaper recycling industry, studies into the valorization of wastes generated by the industry are necessary. The industry produces different residues, among which is the deinking sludge (DS). The DS is generated from the deinking process and constitutes a major fraction of the residues generated by the European pulp and paper industry. The traditional treatment of DS by incineration is capital intensive due to energy requirement for dewatering and the need for complementary fuel source due to DS low calorific value. This could be replaced by a biotechnological approach. This study, therefore, investigated the biogas potential of different DS streams (different dewatering degrees) and the influence of the high calcium carbonate content of DS on its biogas potential. Dewatered DS (solid fraction) sample from filter press and the filtrate (liquid fraction) were collected from a partner wastepaper recycling company in Germany. The solid fraction and the liquid fraction were mixed in proportion to realize DS with different water content (55-91% fresh mass). Spiked samples of DS using deionized water, cellulose and calcium carbonate were prepared to simulate DS with varying calcium carbonate content (0- 40% dry matter). Seeding sludge was collected from an existing biogas plant treating sewage sludge in Germany. Biogas potential was studied using a 1-liter batch test system under the mesophilic condition and ran for 21 days. Specific biogas potential in the range 133- 230 NL/kg-organic dry matter was observed for DS samples investigated. It was found out that an increase in the liquid fraction leads to an increase in the specific biogas potential and a reduction in the absolute biogas potential (NL-biogas/ fresh mass). By comparing the absolute biogas potential curve and the specific biogas potential curve, an optimal dewatering degree corresponding to a water content of about 70% fresh mass was identified. This degree of dewatering is a compromise when factors such as biogas yield, reactor size, energy required for dewatering and operation cost are considered. No inhibitory influence was observed in the biogas potential of DS due to the reported high calcium carbonate content of DS. This study confirms that DS is a potential bioresource for biogas production. Further optimization such as nitrogen supplementation due to DS high C/N ratio can increase biogas yield.

Keywords : biogas, calcium carbonate, deinking sludge, dewatering, water content

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