

Optimal management of substrates in anaerobic co-digestion : an ant colony algorithm approach

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Abstract

Sewage sludge (SWS) is inevitably produced in urban wastewater treatment plants (WWTPs). The treatment of SWS on site at small WWTPs is not economical; therefore, the SWS is typically transported to an alternative SWS treatment center. There is increased interest in the use of anaerobic digestion (AnD) with co-digestion as an SWS treatment alternative. Although the availability of different co-substrates has been ignored in most of the previous studies, it is an essential issue for the optimization of AnD co-digestion. In a pioneering approach, this paper applies an Ant-Colony-Optimization (ACO) algorithm that maximizes the generation of biogas through AnD co-digestion in order to optimize the discharge of organic waste from different waste sources in real-time. An empirical application is developed based on a virtual case study that involves organic waste from urban WWTPs and agrifood activities. The results illustrate the dominate role of toxicity levels in selecting contributions to the AnD input. The methodology and case study proposed in this paper demonstrate the usefulness of the ACO approach in supporting a decision process that contributes to improving the sustainability of organic waste and SWS management..

Keywords

Co-digestion, Satellite plants, Anaerobic digestion, Biogas optimization, Ant-colony-optimization.