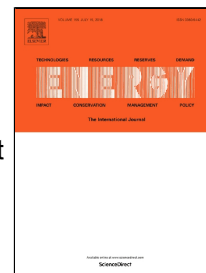


# Accepted Manuscript

Enhancement of biogas production from sewage sludge in a wastewater treatment plant: evaluation of pretreatment techniques and co-digestion under mesophilic and thermophilic conditions



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1 **Enhancement of biogas production from sewage sludge in a wastewater treatment**  
2 **plant: evaluation of pretreatment techniques and co-digestion under mesophilic**  
3 **and thermophilic conditions**

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9 **Abstract:**

10 Boosting biomethane production makes it possible to offset the required energy in a  
11 wastewater treatment plant. In this research, using batch biomethane potential assays,  
12 various techniques including pretreatment, co-digestion, and digestion temperature rise  
13 were evaluated to increase the methane productivity of municipal sewage sludge (SS).  
14 Between thermal and sonication pretreatment methods, thermal pretreatment was shown  
15 to be more efficient and there was no need to pretreat SS for more than 0.5h.  
16 Thermophilic digestion of SS led to 160.8% rise in the methane productivity, compared  
17 to mesophilic digestion. The most suitable co-substrate for co-digestion with SS was  
18 food waste (FW). FW and SS had little negative synergistic effect, however higher FW  
19 concentration caused to higher specific methane yield. Thermal pretreatment was not  
20 effective on FW. To evaluate the techniques, a combined cooling, heat and power plant  
21 was suggested. The energy recovery balance was positive for all the techniques, but co-  
22 digestion was not successful to reduce the levelized cost of energy (LCOE). Unlike co-

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**Abbreviations:** AD: Anaerobic Digestion; An.Bd: Anaerobic Biodegradability; CM: Cow Manure; EC: Electrocoagulation; FW: Food Waste; FWSL: Food Waste Slush; HEx: Heat Exchanger; HRT: Hydraulic Retention Time; IBR: Initial Biodegradation Rate; ISR: Inoculum to Substrate Ratio; LFL: Landfill Leachate; LCOE: Levelized Cost of Energy; OBMPR: Overall Biomethane Production Rate; OLR: Organic Loading Rate; SBMY: Specific Biomethane Yield; SD: Standard Deviation; SS: Sewage Sludge

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