EVALUATION OF WASTEWATER PRIMARY SIEVED SOLIDS AS A GASIFICATION FEEDSTOCK

K. Tsamoutsoglou[1], A. Manali[1], P. Gikas[1,*]

[1]School of Chemical and Environmental Engineering, Technical University of Crete, Chania, Greece

*(*pgikas@tuc.gr)*

ABSTRACT

Microsieving by rotating belt filters (RBFs) is a novel process for the removal of suspended solids of raw wastewater via a sieving process, upfront of the aeration tank. RBFs selectively remove larger suspended particles from wastewater, which improve the downstream treatment processes due to the reduced BOD_5 and COD into the aeration tank. RBFs not only separating solids from wastewater, but also thickening the solids on the belt by gravity, and dewatering solids with an integrated screw press. The biosolids produced by the RBFs are commonly known as Primary Sieved Solids (PSS) with solids contents over 30%. Because of the high solids content of PSS, it is possible to use them as a feedstock in thermal processes for the exploitation of their energy content. This study examines the effectiveness of microsieving in treating municipal wastewater and analyses the energy potential of PSS when used as feedstock in a downdraft gasification system. An integrated mircosieving-drying-gasification plant has been installed at the Wastewater Treatment Plant (WWTP) of Rethymno, Crete, Greece. The pilot plant has a maximum wastewater treatment capacity of 5,000 m^3/d. The RBF is the first stage of the integrated pilot plant for biosolids management, followed by a dryer and a gasification-cogeneration system to produce electric and thermal energy to meet the energy requirements of the entire pilot plant. The thermal energy is used for PSS drying, while the electric energy is used for the operation of the pilot plant. From the preliminary results, around 8 kg/h of PSS (on dry basis) are produced. The PSS are characterized by high organic and energy content (total solids 36 ± 2 %, volatile solids 89,6 ± 0,7 % of total solids and calorific value of 21,5 ± 1,4 MJ/kg, respectively). Based on the initial mass and energy balance calculations, minor modifications to the pilot plant will yield a positive impact to the energy self-sufficiency of the pilot unit. Due to "economy of scale," systems with greater capacities have an energy advantage over smaller ones, as they consume less energy per unit of inlet mass, as indicated by the balances.

KEYWORDS: microsieving, gasification, wastewater, energy production.

ACKNOWLEDGMENTS: This study is supported by the Green Fund and the LIFE project (EC): “New concept for energy self-sustainable wastewater treatment process and biosolids management (LIFE B2E4sustainable-WWTP)”, LIFE16 ENV/GR/000298.