TECHNOLOGICAL EDUCATION INSTITUTE OF CENTRAL MACEDONIA
SCHOOL OF TECHNOLOGICAL APPLICATIONS
DEPARTMENT OF MECHANICAL ENGINEERING

Graduate Studies Program: "Renewable Energy Systems: Design, Development and Optimization"

Academic Year 2014 - 15

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Subject:

Design of a UASB application for biogas recovery from industrial wastewater

Introduction & Motivation:

Exploitation of wastewater streams for biogas recovery via anaerobic treatment is nowadays widely accepted as a well-proved technology and extensively used. One of the main factors leading to the success of anaerobic treatment is the introduction of high-rate reactors in which biomass retention and liquid retention are uncoupled. High-rate anaerobic reactors that can retain biomass have a high treatment capacity and, therefore, low site area requirement. Several processes have been developed to operate anaerobic digestion reactors, each of them having several advantages. One of the most common is the UASB process that has successfully been used to treat a variety of wastewaters, exhibiting positive features, such as high organic loading rates (OLRs), short hydraulic retention time (HRT) and a low energy demand.

Implementation & Means:

- Fundamentals and applications of anaerobic digestion for high organic strength wastewater treatment
- Review of UASB reactor implementations for different types of wastewater in industry
- Basic UASB reactor features and operational aspects
- Co-operation with a local small-to-medium size industry (preferably from the food sector, e.g. dairy, distillery, meat etc.) for the conceptual design of a UASB reactor treating the wastewater streams produced with a view to energy production via biogas recovery
- Basic design an operational analysis of the proposed scheme
- Cost analysis and sustainability of the UASB reactor implementation

References:

[1] Lim, S.J., Kim, T.-H. (2014) Applicability and trends of anaerobic granular sludge treatment processes. Biomass and Bioenergy 60, pp. 189-202

[2] Rajagopal, R., Saady, N.M.C., Torrijos, M., Thanikal, J.V., Hung, Y.-T. (2013) Sustainable agro-food industrial wastewater treatment using high rate anaerobic process Water 5 (1), pp. 292-311

[3] Latif, M.A., Ghufran, R., Wahid, Z.A., Ahmad, A. (2011) Integrated application of upflow anaerobic sludge blanket reactor for the treatment of wastewaters. Water Research 45 (16), pp. 4683-4699

Requirements: *Basic background of biomass exploitation for biogas production*.