



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

Graduate Studies Program:
Academic Year 2014 - 15

**"Renewable Energy Systems: Design,
Development and Optimization"**

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Subject:

Anaerobic digestion of sewage sludge for biogas production

Introduction & Motivation:

Anaerobic Digestion (AD) is a biochemical process during which complex organic matter is decomposed in the absence of oxygen, by various types of anaerobic microorganisms. On the other hand, sewage sludge is the main by-product generated in any wastewater treatment plant (WWTP) for municipal or industrial wastewater. The generated volume of the sludge is predicted to increase continuously in the next decade because more WWTPs will be put into operation with upgraded effluent quality requirements. AD has been widely used as a main process for the treatment of biosolids, for its ability to reduce the amount of sludge solids, further transform organic matter into biogas and limit possible odour problem associated with residual putrescible matter. The capability to recover energy from waste biomass provides AD a more promising prospective.

Implementation & Means:

- Fundamentals and applications of anaerobic digestion for treatment of biosolids
- Sewage sludge types, production volume, composition, treatment, disposal and exploitation possibilities
- Review of AD implementations for sewage sludge treatment
- Basic AD reactor features and operational aspects
- Co-operation with a local municipal wastewater treatment plant for the conceptual design of a AD reactor treating the excess sludge stream with a view to energy production via biogas recovery
- Basic design and operational analysis of the proposed scheme
- Cost analysis and sustainability of the AD reactor implementation

References:

- [1] Liao, X., Li, H., Cheng, Y., (...), Li, C., Yang, Y. (2014) Process performance of high-solids batch anaerobic digestion of sewage sludge. Environmental Technology , Article in Press
- [2] Duan, N., Dong, B., Wu, B., Dai, X. (2012) High-solid anaerobic digestion of sewage sludge under mesophilic conditions: Feasibility study. Bioresource Technology 104, pp. 150-156
- [3] Athanasoulia, E., Melidis, P., Aivasidis, A. (2012) Optimization of biogas production from waste activated sludge through serial digestion Renewable Energy 47, pp. 147-151

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