

Anaerobic Wastewater Treatment

Introduction

Anaerobic digestion is the fermentation process in which organic material is degraded and biogas (mainly composed of methane and carbon dioxide) is produced. Anaerobic digestion processes occur in many places where organic material is available and the redox potential is low (neither oxygen nor nitrate or nitrite is present). This is typically the case in stomachs of ruminants, in marshes, sediments of lakes and ditches, municipal landfills, or even municipal sewers.

Anaerobic treatment itself is very effective in removing biodegradable organic compounds, leaving mineralized compounds like NH_4^+ , PO_4^{3-} , S^{2-} in the solution. It can be conducted in technically plain systems, and the process can be applied at any scale and at almost any place. Moreover, useful energy in the form of biogas is produced instead of high-grade energy consumed. Accepting that anaerobic digestion in fact merely removes organic pollutants, there are virtually few serious drawbacks left. Furthermore, the amount of excess sludge produced is small and well stabilized, and it even has a market value when the so called granular anaerobic sludge is produced in the bioreactor.

This chapter is comprised of 8 video lectures recorded by **Prof. Jules van Lier**, from Delft University of Technology and UNESCO-IHE Institute for Water Education in Delft, The Netherlands, in collaboration with **Dr. Nidal Mahmoud**, from Birzait University in Palestine, and **Dr. Grietje Zeeman**, from Wageningen University in The Netherlands. It presents an overview on the main characteristics, features and advantages of anaerobic treatment technology. The processes that take place during the anaerobic digestion are described focusing on the strong interaction among them. Special attention is given to the development of anaerobic wastewater treatment systems on the basis of their main features, configurations and operating conditions. Basic considerations and parameters for the design and operation of anaerobic wastewater treatment systems are also provided.

Time Framework of the course:

Aims of the Course

- To present an overview of the main characteristics, features and advantages of anaerobic wastewater technologies.
- To describe the different processes involved in anaerobic digestion and their interactions among them.
- To provide an overview of the development of the most commonly applied anaerobic wastewater treatment systems, their main features, configurations, and operating conditions.
- To provide basic considerations and describe the relevant parameters for the design and operation of anaerobic wastewater treatment systems.

Learning Objectives

Upon the completion of this chapter, the participant will be able to:

- Apply the knowledge on biological treatment processes and engineering on the design and critical assessment of anaerobic wastewater treatment systems and configurations for the removal of organic matter (as COD) as a function of environmental, operating and wastewater conditions and characteristics.

Videos

1. <http://unesco.presentations2go.eu/p2gplayer/Player.aspx?id=eAjVhy>
2. <http://unesco.presentations2go.eu/p2gplayer/Player.aspx?id=efx6Qe>
3. <http://unesco.presentations2go.eu/p2gplayer/Player.aspx?id=dHyfyI>
4. <http://unesco.presentations2go.eu/p2gplayer/Player.aspx?id=c6h17a>
5. <http://unesco.presentations2go.eu/p2gplayer/Player.aspx?id=cOI5S8>
6. <http://unesco.presentations2go.eu/p2gplayer/Player.aspx?id=emhy7g>
7. <http://unesco.presentations2go.eu/p2gplayer/Player.aspx?id=cbdYQi>
8. <http://unesco.presentations2go.eu/p2gplayer/Player.aspx?id=neP5A>