

WASTEWATER TREATMENT

INTRODUCTION

The use of water for municipal and industrial purpose is increasing considerably with a resultant increase not only in the volume of wastewater, but also in the concentration of pollutants it contains. This concern has been heightened in recent years due to the more stringent legislative requirements for effluent quality. Biological treatment of effluent is usually the most economical method for reducing wastewater toxicity and organic content. This course provides the fundamentals of biotechnological processes in wastewater treatment. It will educate operators working in wastewater treatment plants the principles of biological treatment processes. Emphasis will be given to the design and operation of biological treatment plants.

COURSE OBJECTIVES

To provide the participants with a fundamental understanding of the operation and design of biological wastewater treatment processes. The course integrates science and engineering principles that are related to design and operation of a biological treatment facility.

On completion of the course, the participants should

- Have knowledge of the impurities in wastewater, their concentrations and importance in the treatment.
- Understand the principles and technology of biological treatment processes and able to select the appropriate one.
- Have a knowledge about processes for sludge handling and treatment.

COURSE METHODOLOGY

The course will be given over 5 days. English will be the language of instructions. In the course presentation, a mix of lecturing, classroom discussions and problem solving will be used.

PRESENTER

Dr. Ibrahim M. Abu-Reesh

Dr. Abu-Reesh obtained his M.Sc. and D.Sc. degree in Chemical Engineering from Washington University, St. Louis, Missouri, USA. In addition to this he holds a B.Sc. in Petroleum Refining Engineering from Suez Canal University, Egypt. Currently he is Professor at Chemical Engineering Department, The University of Jordan (joined the department Jan 1990). Dr. Abu-Reesh's area of research is biochemical engineering and environmental biotechnology. He published more than 50 papers in reputed international chemical engineering journals. Dr. Abu-Reesh worked as operation engineer in Petroleum Refinery Co. of Jordan. He also worked for three years at Chemical Engineering Department, King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia. He has conducted a number of short courses for chemical and food industries in Jordan and Saudi Arabia such as: Biological wastewater treatment. Bioseparation, Anaerobic wastewater treatment, Chemical Engineering principles for non-chemical Engineers, Membrane separation technology.

PROGRAM

DAY ONE

- Characterization of wastewater
 - Physical characteristics
 - Chemical characteristics
 - Biological characteristics
- Wastewater analysis
- Pre-and primary treatment processes
- Secondary treatment processes
- Advanced treatment processes

DAY TWO

- Biological concepts
 - Batch cell growth, Microbial activity, Biodegradation
- Aeration and agitation
 - Oxygen requirement in biological processes.
 - Oxygen transfer
- Suspended versus attached-growth treatment processes.
- Aerobic treatment processes
 - Activated sludge
 - Trickling filters
 - Rotating biological contactors
 - Sequencing batch reactor
 - Constructed wetlands
 - Aerated lagoons

DAY THREE

- Anaerobic treatment processes
 - Microbiology, chemistry of anaerobic processes
 - Anaerobic reactor systems (sludge digestion, UASB, ...)
 - Nitrification and denitrification
- Design problems
 - Activated sludge

Trickling filter

Sequencing batch reactor

- Membrane bioreactor (MBR)
- Selection of biological treatment process

DAY FOUR

- Case study (1) : Wastewater treatment in petroleum and petrochemical industries.
 - Composition of wastewater
 - Treatment processes
 - Microbial blend used to enhance biodegradation
- Case study (2) : Wastewater treatment in food industries.
 - Composition of wastewater
 - Treatment processes
- Biological gas treatment
 - Overview of the process
 - Biofiltration
 - Biological methods
- Phosphorous and nitrogen removal

DAY FIVE

- Sludge handling and disposal
 - Introduction
 - Sludge generation and production
 - Sludge characterization, thickening, stabilization, conditioning, dewatering
 - Sludge reuse and disposal
 - Regulations for reuse and disposal of sludge
 - Health problems associated with sludge