



LAB1601

Microbiological Methods for Examination of Water & Wastewater

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- ✓ Examine wastewater for biological characteristics, identify various organisms, perform particle size and number counts, and advise the operators of a wastewater treatment plant on the implications of the microbiological information developed
- ✓ Understand how the changes in microbiological populations in a wastewater treatment plant can affect the plant performance and what to do to bring it back into the proper operation
- ✓ Participants will also be able to use JNOPTIC Capture 2.2 software

Who Should Attend?

This course is designed for Laboratory staff, Chemist, Laboratory technicians, Environmental Specialist, Wastewater Treatment Plant Operators, Treatment plant engineers and anyone involved in microbiological analysis.

Course Outline:

Day 1:

- Introduction to Microscopy
- Basic Microscopy
- Introduction to Microscopy
- Different types of Microscopy
- Bright Field Microscopy
- Cross-Polarized Light Microscopy
- Dark Field vs. Bright Field
- Variants on Dark Field Microscopy
- Examples of Rheinberg Darkfield Microscopy
- Kohler Illumination Microscopy
- EPI Illumination
- Phase Contrast Microscopy Theory and Practice

Day 2:

- Basics Taxonomy
- Order of Biology
- Kingdom-Phylum- Class –Order –Family –Genus -Species
- Types of Microorganisms
 - Bacteria
 - Protozoa

- (including *Guardia* and *Cryptosporidium*)
- Metazoa
 - (Multicellular organisms)
- Viruses
- Important Terms
- Parasites and Pathogens
 - worms and fungi
- Soil Microbes and Heterotrophs:
 - Bacteria
 - protozoans
 - nematodes
 - Obligate aerobes
 - Anaerobes
 - facultative organisms
- Bacteria Characteristics and Identification of types
- Size & Shapes
 - Sheathed
 - Stalked
 - Budding
 - Filamentous
 - Cyanobacteria
- Parts of the Cell and Identification
- Introduction to Dye Staining
- Gram Positive vs Gram Negative
- Dye staining techniques
- Gram Negative Bacteria Flowchart
- Components of a bacterial cell
- Extracellular proteins
- Flagella and Pili Motile bacteria
- Inclusions and vacuoles
- Endospores
- Autotrophs Heterotrophs
- Photoautotrophs
- Chemolithotrophs
- Aerobic and Anaerobic Bacteria;
 - Psychrophilic
 - Mesophilic and Thermophilic Bacteria Typical Growth Patterns
 - Time and concentration for growth

- Protozoa
 - Identification stramenopiles
 - protozoa, fungi and plants
- Amoebae
 - Ciliates
 - Common Wastewater Ciliates
 - Rotifers
 - Wastewater Rotifers
- Rotifer Identification
- Nematodes & Roundworms
- Using a Counting Chamber Hemocytometer
- Other Metazoa Water bears and Water Fleas
- Helminth Ova
 - Some associated diseases

Day 3:

- Wastewater Microbiology Applications
- The Activated Sludge Process
- Detailed Walk through on local Wastewater Treatment Plant
 - Organotrophs
 - aerobic or anaerobic
 - includes all animals and fungi
 - and many bacteria and protists
- Organotrophs' energy extraction
- Wastewater Microbiology Applications **Nitrifying bacteria**
 - chemoautotrophs
 - chemolithotrophs:
 - *Nitrosomonas*
 - *Nitrosococcus*
 - *Nitrobacter*
 - *Nitrococcus and their significance*
- Wastewater Microbiology Applications
- Nitrification and denitrification
- Population Dynamics

Day 4:

- Detailed Practices
- FLAVOBACTERIUM
- MICROBIOLOGICAL FLOC FORMATION

- Types of problems:
 - Pinfloc
 - Filamentous Floc & Bulking
 - Rising Floc
 - Foaming
- Factor affecting floc formation:
 - Clarifier Underflow/Sludge Wasting
- Filamentous Organism and Wastewater Treatment
 - Tests and Procedures on Mixed Liquor in an AS System
 - Measuring Total Floc Length
- Identification of filaments & Jenkins guide
- *Nocardia spp. Type 1701*
- Type 021N
- Type 0041
- *Thiothrix spp.*
- *Sphaerotilus natans*
- Type 0092
- *Haliscomenobacter hydrossis*
- Type 0675
- Factors affecting growth of Filamentous Organisms:
 - MCRT
 - DO Concentration
 - Toxics (including chlorine)
 - pH
 - Sulfide
- Filament Control methods
 - Selective Toxicity
 - Chlorination control
 - Hydrogen Peroxide
 - Ozone
 - nutrient additions vs. deficiencies
 - compounds to add
 - Foam and Scum Controls
- Identification of Filamentous Bacteria
- A Simple Approach
- What's Needed A listing of supplies
 - Separation by Staining
 - Graham and Neisser
 - Typical Observations Filament Shape

- Filament Size
- Cell shape
- Cell size
- Cell Septa
- Indentations
- Sheath
- Branching and other properties
- Beggiatoa
- More on bulking and foaming and how to identify various organisms
- Nocardia
- Good Practice
 - Keep a process chart of treatment system parameters
 - Measure the parameters consistently and routinely
 - Measure the parameters when the system is running properly
 - Exercises and Class Problems

Day 5:

- Software & Applications:
 - Helminth Ova,
 - significance, & control:
 - The art of microscopic photography,
 - Counting Chamber use;
- Software use
- Lab Work

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International Centre For Training & Development

Course Fees:

To be advised as per course location. This rate includes participant's manual, and-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request".

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session