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AL041:
Microbiological Methods for Examination of Water & Wastewater

Training Objectives:

By the end of the training, participants 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
- ✓ Use JNOPTIC Capture 2.2 software

Training Designed for:

This course is intended for all Laboratory staff, Chemist, Laboratory Technicians, Environmental Specialist, Wastewater Treatment Plant Operators, Treatment Plant Engineers and anyone involved in microbiological analysis.

Training Program:

DAY ONE:

- ❖ Introduction to Microscopy
- ❖ Parts of A Microscope
  - The Lens
  - The Focus
  - The Resolving Power
- ❖ Basic 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 TWO:

- ❖ 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 of Stramenopiles
  - Protozoa
  - Fungi and Plants
- Amoebae
- Ciliates
- Common Wastewater Organisms
  - Ciliates

- Rotifers
- Wastewater Rotifers

❖ Rotifer Identification
❖ Nematodes & Roundworms
❖ Using a Counting Chamber
- Hemocytometer

❖ Other Metazoa
❖ Water bears and Water Fleas
❖ Helminth Ova

DAY THREE:

❖ Wastewater Microbiology Applications
❖ The Activated Sludge Process
❖ Detailed Walk Through on Local Wastewater Treatment Plant
❖ Organotrophs
- Aerobic or Anaerobic
- Includes All Animals And Fungi
- Many Bacteria And Protists
- Organotrophs' Energy Extraction

❖ Wastewater Microbiology Applications Nitrifying Bacteria Are:
- Chemoautotrophs
- Nitrosomonas
- Nitrosococcus
- Nitrobacter
- Nitrococcus And Their Significance in Wastewater Treatment

❖ Wastewater Microbiology Applications
- Nitrification and Denitrification

❖ Population Dynamics
❖ Lab Work & Techniques to Be Used

DAY FOUR:

❖ Detailed Practices
❖ Flavobacterium
❖ Microbiological Floc Formation
❖ Types of Problems:
- Pin-floc
- 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

DAY FIVE:

- Lab Visit/Practical Session
- Software & Applications
- What Comprises A Healthy Wastewater Treatment Plant Sludge- The Microbes and Their Content and Numbers
- Relating Microbes Numbers and Their Type to The Performance of a Wastewater Treatment Plant
- Bacterial Requirements and Identification of Bacteria Common in Water Treatment Plants
- Bacterial Control Methods for Water Treatment Plants and Other Facilities
- Helminth Ova, Control in Sludges
- The Art of Microscopic Photography
- Counting Chamber Use
- How to Perform Microscopic Particle Size Analysis, Materials Required, And Techniques
- Significance of Size and Number Analysis
- Olympus Jnoptic Capture 2.2 Software and How to Use It for Wastewater Applications
- Lab Work
- Course Conclusion
- POST-ASSESSMENT and EVALUATION

Training Requirements:

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

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:

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