CONCEPT

Sewage Treatment Plant Operation: Activated Sludge, Nutrient Removal and Sludge Handling

22 November – 3 December 2026
Riyadh - KAFD district five-star



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Ref: 809_20151 **Date:** 22 November – 3 December 2026 **Location:** Riyadh - KAFD district five-star **Fees:** 35100 SAR

Introduction:

Sewage treatment plant operation goes wrong in familiar ways: screens blind in storms, mixed liquor ages past target, filaments bulk the final tanks and digesters sour, pushing the discharge outside its reuse or outfall targets. This Core Concept course gives STP shift crews, operations engineers, lab analysts and maintenance planners a working routine for inlet works, mixed liquor inventory, nitrogen and phosphorus reduction, settling tanks, disinfection and biosolids, backed by bench and microscope evidence. Week two adds biosolids, fault-finding, SCADA and maintenance scheduling. Participants build an STP Setpoint and O&M Programme for a case sewage works.

Course Objectives:

- Calculate influent BOD and nitrogen loads, population equivalent and storm peaks and benchmark the final discharge against outfall and irrigation reuse targets
- Set food-to-microorganism ratio, sludge age, dissolved oxygen and return and wasting rates so nitrifiers stay established in the mixed liquor
- Operate anoxic, anaerobic and oxic zones, final settling tanks, sand or cloth filters and chlorine or UV disinfection to meet nitrogen, phosphorus and pathogen limits
- Carry out settleometer, BOD5, COD, nutrient and microscope tests and translate the readings into daily setpoint changes
- Diagnose bulking, foaming, rising blankets, nitrification loss and sour digesters and run thickeners, digesters, dewatering machines and odour scrubbers safely
- Build an STP Setpoint and O&M Programme covering operating targets, a maintenance calendar, blower energy targets and KPIs

Target Audience:

- Shift operators who run screens, grit channels, oxidation basins, settling tanks and biosolids units
- Operations engineers responsible for nitrification, nutrient limits and final discharge quality
- Lab analysts who sample, run bench tests and examine mixed liquor under the microscope
- Maintenance technicians and planners who look after pumps, blowers, mixers, scrapers and belt presses
- Shift supervisors who coordinate rosters, reporting and safe entry into wet wells and digesters

Course Outline:

Day 1: Municipal Sewage Characteristics, Works Layout and Discharge Targets

- Domestic Sewage Composition: BOD, COD, TSS, TKN, Ammonia and Total Phosphorus
- Diurnal and Storm Flow Profiles With Peaking Factors
- Generic Outfall and Irrigation Reuse Quality Targets With Groundwater Recharge Criteria
- STP Flow Diagram From Inlet Works to Biosolids Outlet
- Population Equivalent and Per-Capita Load Worksheet

Day 2: Inlet Works, Primary Settling and Mixed Liquor Microbiology

- Coarse and Fine Screen Operation With Screenings Washer-Compactor
- Vortex and Aerated Grit Channels: Grit Classifier and Washer
- Fat, Oil and Grease Traps, Scum Skimming and Septage Tanker Reception
- Primary Settling Tank Surface Overflow Rate and Desludging Cycle
- Floc Formation, Heterotrophs and Autotrophic Nitrifiers

Day 3: Mixed Liquor Management and Nitrogen and Phosphorus Reduction

- Food-to-Microorganism Calculation From Influent BOD and MLVSS Inventory
- Sludge Age Targeting and Daily Wasting Volume Worksheet
- Return Pumping Rate Setting From Settleometer and Blanket Depth
- Anoxic Zone Denitrification, Internal Nitrate Recycle and Alkalinity Recovery
- Enhanced Biological Phosphorus Uptake With Anaerobic Selector and Ferric or Alum Dosing Backup

Day 4: Bench Testing, Microscopy and Reactor Configurations

- Thirty-Minute Settleometer, SVI and Blanket Profiling With a Core Sampler
- Bench Routine: BOD5, COD, Ammonium, Nitrate and Orthophosphate Methods With QC Charts
- Microscope Examination: Protozoa, Rotifers and Filament Identification Key
- Sequencing Batch Reactor Cycle Programming: Fill, React, Settle, Decant and Idle
- Membrane Bioreactor Flux and Transmembrane Pressure Checks With MBBR Carrier Fill Inspection

Day 5: Case Study: Final Settling, Polishing and Disinfection at an Oxidation Ditch Works

- Final Settling Tank State Point Analysis and Solids Loading Check
- Sand and Cloth Disc Filtration for Irrigation Reuse
- Disinfection Options: Chlorine Contact Tank, UV Dose and Ozone
- Case Works Monthly Operating Log and Bench Result Review
- Week One Scorecard for the Case Oxidation Ditch

Day 6: Biosolids Thickening, Digestion, Dewatering and Odour Abatement

- Gravity Belt and Flotation Thickening With Polymer Jar Trials
- Mesophilic Digester Monitoring: Volatile Acids to Alkalinity Ratio, Temperature and Biogas Yield
- Belt Press, Screw Press and Decanter Centrifuge Cake Dryness and Capture Rate
- Biosolids Outlets: Drying Beds, Composting, Land Application and Landfill
- Odour Abatement: Biofilters, Chemical Scrubbers and Carbon Vessels

Day 7: Fault-Finding, Gas Hazards and Confined Space Entry

- Filamentous Bulking Diagnosis: Selectors, Oxygen Adjustment and RAS Chlorination
- Nocardioform Foam and Scum Suppression
- Rising Blankets From Denitrification and Nitrification Loss From Cold or Toxic Loads
- Hydrogen Sulphide Gas Detection and Confined Space Entry Permit for Wet Wells and Digesters
- Discharge Exceedance Root Cause Review and Upset Response Log

Day 8: Online Instruments, SCADA and Shift Coordination

- Online Analysers: Optical DO Probes, Ammonium and Nitrate Sensors, Suspended Solids and Blanket Meters
- SCADA Alarm Rationalisation, Trend Screens and Shift Handover Report
- Daily Operations Huddle Between Shift Crews, Lab and Maintenance
- Monthly Operations Report to Utility Management and Environmental Inspectors
- Standard Operating Procedure Drafting for Critical Setpoint Changes

Day 9: Maintenance Scheduling, Asset Criticality and Blower Energy Optimisation

- Asset Register and Criticality Ranking for Pumps, Blowers, Mixers and Scrapers
- Preventive Maintenance Routines and Weekly Work Order Scheduling in a CMMS
- Blower Energy Audit: kWh per Cubic Metre and Oxygen Setpoint Tuning
- Ammonia-Based Oxygen Setpoint Adjustment and Variable Speed Drive Retrofit Appraisal
- STP KPI Dashboard: Nutrient Reduction, Energy Intensity, Biosolids Yield and Maintenance Backlog

Day 10: Capstone: STP Setpoint and O&M Programme for a Case Sewage Works

- Case Works Briefing Pack: Flow, Load and Asset Condition File
- Setpoint Sheet Drafting for Oxidation Basins, Settling Tanks and Biosolids Units
- Annual O&M Calendar and Critical Spares List
- Fault-Finding Decision Tree and Emergency Bypass Response Card
- STP Setpoint and O&M Programme Presentation and Peer Review

Skills You Will Gain:

- Influent Load Assessment
- Sludge Age Management
- Nitrogen and Phosphorus Reduction
- Mixed Liquor Microscopy
- State Point Analysis
- Digester Monitoring
- Maintenance Work Scheduling
- Blower Energy Tuning

Why Attend This Course:

- Leave with an STP Setpoint and O&M Programme built on a case sewage works data set and reviewed by peers
- Spot bulking, foam and nitrification loss early from settleometer, microscope and online analyser readings
- Cut blower kWh and chemical spend by linking oxygen, polymer and coagulant doses to measured demand
- Compare practice with operators and engineers running conventional, SBR, MBR and oxidation ditch works in different countries

Conclusion:

Steady sewage works performance rests on a healthy mixed liquor, sound bench evidence and disciplined maintenance. Week one moves from raw sewage loads and inlet works, through sludge age, nitrogen and phosphorus reduction and microscopy, to final settling, polishing and disinfection in a case study. Week two adds biosolids thickening, digestion and dewatering, odour abatement, fault-finding and gas safety, SCADA and online instruments, maintenance scheduling and blower energy. The final day turns these routines into an STP Setpoint and O&M Programme for a case sewage works.