Course Overview

This course equips participants with the skills needed to tackle nutrient management issues, exploring the biological, chemical, and advanced processes for effective removal of phosphorus and nitrogen. Delving into regulatory requirements, retrofitting strategies, resource recovery technologies, and pollutant trading practices, it provides practical insights through design exercises and a site visit to a state-of-the-art nutrient recovery facility to improve system performance and meet environmental goals.

Learning Outcomes

- Master biological and chemical processes for phosphorus and nitrogen removal in wastewater systems.
- Understand and apply advanced nutrient recovery technologies and adaptive management strategies.
- Develop retrofitting techniques to optimize treatment plant performance and comply with regulatory requirements.

Who Should Attend?

- Wastewater engineers, operators, and managers responsible for nutrient removal and system optimization.
- Consulting engineers and regulatory staff working on nutrient management and compliance.
- Federal agencies and military base personnel overseeing water treatment facilities and operations.

Course Outline

Overview of Nutrients and Nutrient Removal

- Why are nutrients an issue?
- Nitrogen and phosphorus cycles
- Challenges for today's treatment plant

Nutrient Regulations and Discharge Permits

- Current status and trends

Fundamentals and Principles of Nutrient Removal

- Raw wastewater characteristics

- Nitrification, denitrification, anammox
- Biological and chemical phosphorus removal
- Sludge settling characteristics, biological selectors

Processes and Technologies for Nutrient Removal

- Nitrogen and phosphorus removal processes
- Conventional nitrification
- Wuhrmann, Ludzak-Edinger processes
- Bardenpho processes, 4-stage, 5-stage
- Variations to conventional processes
- A/O, A2/O, Johannesburg processes

Application of BNR Process Models

- Impacts of temperature, alkalinity, carbon
- Impacts of SRT, RAS, mixed liquor recycle rates
- Wet weather treatment performance

Advanced BNR Processes

- IFAS/MBBR
- Biomag
- Nereda

Retrofitting Plants for Nutrient Removal Technology

- Converting conventional plants to BNR
- Impacts on bioreactor volume, equipment, and controls

Sidestream Treatment Technologies

- Phosphorus removal – chemical and struvite precipitation
- Nitrogen removal – Sharon, Anammox, Anitamox, Demon processes

Nutrient Resource Recovery and Harvesting

- Technologies and developments
- Benefits, costs, efficiencies
- The food-water-energy nexus
- Struvite recovery
- Ostara, Airprex, other technologies

Nutrient Trading and Adaptive Management Practices

- Control of non-point sources
- Arrangements between POTWs and landowners