Utilities Water Systems Operation: Efficient Management and Optimization

Course general description:

Water is a critical utility in industrial operations, playing a vital role in processes such as cooling, heating, steam generation, and wastewater treatment. Efficient operation of water systems ensures process reliability, cost savings, and environmental compliance. This course, "Utilities Water Systems Operation: Efficient Management and Optimization," provides participants with a comprehensive understanding of water systems, including raw water treatment, cooling water circuits, boiler feedwater preparation, and wastewater management. Through lectures, case studies, and hands-on exercises, participants will learn how to operate, maintain, and optimize water systems for maximum efficiency, reliability, and sustainability.

Audience:

This course is designed for:

1. Utility operators and technicians responsible for water systems.
2. Process engineers and supervisors overseeing water utilities.
3. Maintenance personnel involved in water system upkeep.
4. Energy managers and sustainability professionals focusing on water efficiency.
5. HSE professionals overseeing safety and environmental compliance in water operations.

Course objectives:

By end of the course participants will:

1. Understand the principles and importance of water systems in industrial utilities.
2. Operate and monitor key components of water systems, such as pumps, filters, heat exchangers, and treatment units.
3. Optimize water usage and treatment processes to improve efficiency and reduce costs.
4. Troubleshoot common issues in water systems and implement corrective actions.
5. Apply process safety management (PSM) principles to mitigate risks associated with water systems.
6. Conduct routine maintenance and inspections to ensure system reliability.
7. Evaluate the economic and environmental impacts of water system performance.

Course duration:

5 days

Course location:

Cairo-Dubai-Istanbul

Course contents:

Day 1: Fundamentals of Water Systems

- Overview of water systems in industrial utilities: Raw water, cooling water, boiler feedwater, and wastewater.
- Importance of water quality and its impact on equipment performance.
- Basics of water chemistry: Hardness, alkalinity, pH, dissolved solids, and corrosion mechanisms.
- Key parameters: Turbidity, conductivity, and total dissolved solids (TDS).
- Pretest: Assessing baseline knowledge of water systems and their operations.
- Case study: Analyzing the impact of poor water quality on cooling tower performance.
- Tutorial: Solving basic calculations for water flow rates and chemical dosing.

Day 2: Raw Water Treatment and Preparation

- Raw water sources and pretreatment: Sedimentation, filtration, and coagulation.

- Removal of impurities: Suspended solids, organic matter, and microorganisms.
- Advanced treatment methods: Reverse osmosis, ion exchange, and deaeration.
- Preparation of boiler feedwater: Softening, demineralization, and degassing.
- Case study: Investigating a membrane fouling issue in a reverse osmosis system.
- Group exercise: Designing a raw water treatment system for a hypothetical plant.
- Quiz: Testing understanding of raw water treatment processes.

Day 3: Cooling Water Systems and Optimization

- Cooling water circuits: Open recirculating vs. closed-loop systems.
- Key challenges: Scaling, corrosion, biofouling, and water loss.
- Chemical treatment programs: Corrosion inhibitors, scale preventers, and biocides.
- Monitoring and control systems: Sensors, automation, and real-time data analytics.
- Case study: Implementing a water conservation program in a cooling tower system.
- Hands-on tutorial: Using software tools to simulate cooling water performance.
- Discussion: Sharing best practices for optimizing cooling water systems.

Day 4: Wastewater Treatment and Reuse

- Wastewater treatment processes: Primary, secondary, and tertiary treatment.
- Biological treatment methods: Activated sludge, anaerobic digestion, and biofilters.
- Water reuse and recycling: Zero liquid discharge (ZLD) and graywater systems.
- Environmental regulations and compliance: Effluent standards and discharge permits.
- Case study: Diagnosing and resolving a biological treatment failure in a wastewater plant.
- Tutorial: Developing a water reuse strategy for an industrial facility.
- Quiz: Reinforcing learning on wastewater treatment and reuse.

Day 5: Economic and Environmental Impacts, Final Assessment

- Economic analysis: Capital expenditure (CAPEX), operational expenditure (OPEX), and cost savings.
- Environmental considerations: Water scarcity, carbon footprint, and sustainability.
- Post-test: Comprehensive exam covering all topics discussed during the course.

Methodology:

- 50% lectures & concepts
- 10% Videos
- 15% Case studies
- 15% Exercises
- 10% Discussions

Course code: (TPRS059)