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Refinery Utility Troubleshooting

OEM: Koenig Original • Duration: 5 Days (40 hrs)

COURSE MODULES & TOPICS

Module 1: Refinery Utility Systems Overview

- Role and importance of utility systems in refinery operations
- Relationship between process units and supporting utilities
- Major refinery utility systems: steam, water, air, nitrogen, fuel gas, power
- Utility consumption patterns, peak demand and operating loads
- Utility system interdependencies and impact of failures
- Centralized vs decentralized utility generation and distribution

Module 2: Utility System Diagrams and Performance Indicators

- Interpretation of utility PFDs, P&IDs and balance diagrams
- Development of block diagrams and consumption matrices
- Identification of critical equipment and operational bottlenecks
- Introduction to utility performance indicators and operating logs
- Utility balance calculations and system interaction maps

Module 3: Systematic Troubleshooting Methodologies

- Fundamentals of troubleshooting in continuous process industries
- Symptoms, failure modes, root causes and consequences
- Common utility system problems and process disturbances
- Transient vs persistent failures and cascading utility failures
- Importance of operational history and equipment condition

Module 4: Structured Troubleshooting Tools and Techniques

- Root Cause Analysis (RCA), 5 Whys and Fishbone diagrams
- Fault Tree Analysis (FTA) and Failure Mode and Effects Analysis (FMEA)
- Interpretation of process trends and alarm histories
- Development of troubleshooting flowcharts and diagnosis matrices
- Problem prioritization based on safety and production impact

Module 5: Boiler and Steam Generation Troubleshooting

- Steam generation systems and refinery applications
- Boilers, economizers, superheaters, deaerators and feedwater pumps
- Steam characteristics: pressure, quality, enthalpy
- Common boiler problems: combustion, pressure, leakage, scaling
- Steam distribution issues: pressure drops, heat losses, water hammer

Module 6: Boiler Performance Assessment and Troubleshooting

- Boiler performance using steam generation rates and efficiency calculations
- Combustion and flue gas analysis
- Steam pressure and temperature monitoring
- Boiler water chemistry testing and operating log review
- Troubleshooting with steam balance and pressure-drop analysis

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Module 7: Steam Trap and Condensate Recovery Troubleshooting

- Principles of steam condensation and condensate recovery
- Types and operation of steam traps
- Common steam trap failures and condensate contamination
- Deaerator operation and dissolved oxygen removal
- Impact of condensate system problems on efficiency and corrosion

Module 8: Steam Trap Inspection and Condensate System Analysis

- Steam trap inspection: ultrasonic, infrared, temperature measurement
- Steam trap surveys and failure classification
- Condensate recovery calculations and contamination testing
- Deaerator performance evaluation and temperature monitoring
- Development of maintenance programmes and troubleshooting matrices

Module 9: Cooling Water and Cooling Tower Troubleshooting

- Cooling water system configurations: once-through, recirculating, closed-loop
- Cooling towers, pumps, headers and heat exchangers
- Cooling tower performance parameters: range, approach, cycles of concentration
- Common problems: inadequate cooling, scaling, corrosion, fouling
- Impact on heat exchangers and process unit performance

Module 10: Cooling Water System Performance and Troubleshooting

- Cooling tower performance calculations and heat balance analysis
- Monitoring temperatures, flow rates and pressure drops
- Water chemistry testing and scaling tendency assessment
- Corrosion monitoring and microbiological analysis
- Troubleshooting distribution and pump performance problems

Module 11: Water Treatment and Demineralization Troubleshooting

- Refinery water treatment requirements and water quality importance
- Raw water treatment, clarification, filtration and softening
- Reverse osmosis, ion exchange and demineralization processes
- Boiler feedwater quality and chemical conditioning
- Common water treatment problems: fouling, scaling, contamination

Module 12: Water Quality Analysis and Treatment System Assessment

- Water quality analysis: conductivity, pH, turbidity, hardness, silica
- Reverse osmosis performance and membrane cleaning
- Ion exchange resin performance and regeneration monitoring
- Water balance calculations and chemical dosing optimization
- Use of operating logs and performance monitoring dashboards