Oil and Gas Process Troubleshooting and Problem Solving

Course general description:

This course provides the participants with the means to properly operate and support the facilities of process operations in a way based on the good acquaintance with the modern technologies applied in this field. Trouble-shooting & forecasting break downs are inclusive.

Audience:

This course is intended for professionals working in risk management, process safety, operations, and safety leadership roles, including:

- Petroleum refining engineers ,
- Chemist who interest in oil and gas industry
- Mechanical engineers.
- Operators in oil and gas industry (refining, gas processing, oil treatment , oil production
- Operators in petrochemicals and fertilizers refining, gas processing, oil treatment , oil production
- Supervisors in oil and gas industry refining, gas processing, oil treatment , oil production
- Supervisors oil and gas industry refining, gas processing, oil treatment , oil production

Course objectives:

To enhance the delegate knowledge, skills, and abilities necessary to give him some practical exposures to help maintain the facilities of process operations in good operational conditions and cope with the emergency cases of breakdown

By the end of this course, participants will be able to:

- Monitor instrumentation and the operation of equipment.
- To detect potential and actual problems and take corrective action to prevent the interruption of system operations.
- To analyze operational trends and take corrective actions.
- To use standard operating procedures to start/stop production equipment
- Define troubleshooting.
- Identify the steps of troubleshooting.
- Understand the process of elimination

Course duration:

5 days

Course location:

Dubai

Course contents:

Day-1:

1. **Characterizing Hydrocarbon**
   - Single-Component Systems
   - Two-Component Systems
   - Three-Component Systems
   - Multicomponent Systems

- Classification of Reservoirs and Reservoir Fluids
- Phase Rule
- PVT Properties of Crude Oils
- Crude Oil Gravity
- Specific Gravity of the Solution Gas
- Crude Oil Density
- Crude Oil API
- Effect of pressure on API
- Effect of temperature on API
- Effect of GOR on API
- Bubble-Point Pressure
- Oil Formation Volume Factor
- Crude Oil Viscosity

2. **Basic process Concepts**
   - Basic Concepts to remember
   - Introduction to Base Oil Refining
   - Flow diagrams
   - Piping and Instrumentation Diagrams (P&IDs)
   - Process equipment
   - Introduction to mass and energy balances
3. **Introduction to Plant troubleshooting**
   - Definition of troubleshooting.
   - Steps of troubleshooting.
   - Identify the problem.
   - Determine the cause of the problem.
   - Correct the problem.
   - Return the process to service.
   - Sources of information.

Day-2:

4. **Process Plant And Machinery Specific Issues**
   - Process Plant and Machinery Commissioning
   - Instrumentation and Control Systems
   - Preparing and Isolating Process Plant
5. **Centrifugal pumps Operating**
   - Operating characteristics
   - Priming, cavitation
   - NPSH, NPSH margin
   - Power requirement for pumping
   - Pump performance curves
   - Head – capacity curve [H – Q]
   - Power – capacity curve [P – Q]
   - Efficiency – capacity curve [η – Q]
   - Specific speeds
   - Operating point of centrifugal pump
6. **Compressor working principles, types, operational aspects**

- Classification, Types of compressors
- Operational principles and constructional features
- Compressor operation
- Performance characteristics curves
- Minimum and maximum flow, constraints
- Surge, significance and control
- Compressor selection and specification, criteria for drive rating selection
- Performance testing
- Standards and acceptance criteria for performance testing

Day-3:

7. **Fluid Flow**
   - Pressure and Head
   - Bernoulli's Theorem
   - Flow of Liquids
   - Reynolds number, pressure drop in pipes
   - Compressible flow
   - Introduction to Thermodynamics
   - Principle of process relief devices and process design of relief systems
   - Two-phase and Multi-phase Flow
8. **Basic Boilers and Facility Auxiliaries**
   - Steam Boilers
   - Boiler Systems
   - Steam System Fittings
   - Steam System Accessories
   - Feedwater Systems
   - Water Treatment
   - Combustion Equipment
   - Fuels and Combustion
   - Combustion and Boiler Controls
   - Draft Systems
   - Instrumentation and Control Systems
   - Steam Boiler Operation
9. **Heat exchangers troubleshooting**
   - Thermal conductivity
   - Conduction and convection
   - Insulation
   - Heat transfer coefficients
   - Heat exchangers, type and sizing
   - Heat exchangers troubleshooting

Day-4:

10. **Fluid measurement and instrumentation:**
    - Liquid and gas metering using positive displacement meters
    - Orifices
    - Sonic meters
    - Mass measurement meters

- Three phase flow measurement
- New metering devices

11. **Troubleshooting Of Process Control**

- Introduction
- Open loop system
- Closed loop system
- Fundamentals of process control
- On - off controller
- Description of key points in the operation of control systems like: DCS, PLC, UPS, SCADA, etc .
- Process Control Troubleshooting
- Fail safe

12. **Pipe line valves**

- Introduction to valves
- Various types of valves
- Gate
- Expanding gate
- Plug
- Ball
- Check
- Valve Maintenance

13. **Operational Safety**

- Roles and Responsibilities
- Routine Operations
- Operating within Process and Equipment Limits
- Written Procedures
- Communication
- Communication during Shift Changes
- Special Safety Considerations of Batch Processes
- Standby Operations
- Emergency Operations
- Management of Change
- Safety Protective Systems
- Safety Shutdown Systems
- Pressure Relief Equipment
- Training
- Incident Investigation
- Recognizing and Reporting Incidents
- Investigation Results and Followup
- Human Factors
- Human-process Interfaces
- Behavioral Issues
- Audits, Inspections, Compliance Reviews
- Accident Investigation
- Accident Reporting & Recordkeeping

- Working safely in confined spaces
- Hazardous (classified) locations
- Risk management process

Day-5:

14. **Hydrogen Sulfide and Propane**
    - Intro to OSHA. OSHA & API regulations specific to H2S
    - Chemical and Physical Properties
    - Occupational Exposure Limits
    - Health Hazards
    - Respiratory Protective Equipment
    - Detection of gas
    - Initial Response Strategy
15. **Start- Up Troubleshooting**
    - Technical Issues, Solutions, Implementing Changes, Introduction
    - to troubleshooting procedures and techniques, Troubleshooting
    - during start-up, Technical Issues and solutions,
    - Problem Analysis, Practical Use of Tools and Techniques, Developing
    - Troubleshooting and Problem Solving skills, Implementing
    - Changes, Start- up and process simulation (Hands-
    - On Demonstration) Shutdown and Decommissioning, Case
    - studies discussions
16. **Shutdown and Decommissioning**
    - Normal Shutdown, Decommissioning and demolition, Case

Methodology:

- 50% lectures & concepts
- 10% Videos
- 10% Case studies
- 10% Exercises
- 10% Discussions
- 10% Software (if applicable or examples)

Course code: (TPRS046)