

**Course Content****Title:** Refinery Troubleshooting**Potential PDH:** 16**Code:** BTT054**Description:**

Since day-to-day operation problem solving and optimizing are critical to the profitability of plant operations, troubleshooting is a prime responsibility of refinery and plant engineers. The importance of troubleshooting has grown as plants push to operate at tighter economic margins. Lost profits due to unsolved unit problems can never be recovered. Consistently maintaining smooth operation, maximum capacity, and acceptable product quality are important goals that can be difficult to achieve. Thus, this program has been developed to provide an in-depth yet practical review of the art and science of plant troubleshooting.

The program's content is both comprehensive and wide-ranging. The sessions begin with a discussion of the fundamentals, including process objectives, equipment behavior, interaction of the process and equipment, and troubleshooting techniques. A case study approach covers major equipment found in refineries and petrochemical plants, specifically pumps, heat exchangers, fired heaters, vacuum systems, piping and hydraulics, compressors, distillation towers, and auxiliary equipment. All case studies are developed from actual field case histories. This approach demonstrates the complexity of actual plant operations and how to simplify and identify solvable problems. Once the fundamentals are established the session moves into the topics of troubleshooting techniques,

**Outline:**

## INTRODUCTION

- Objectives and Approach
- Importance of Troubleshooting
- Case Studies

## TROUBLESHOOTING CONCEPTS AND TECHNIQUES

- Typical Problems
- Integration of Process and Equipment
- Troubleshooting Techniques
- Troubleshooting Tools

## DISTILLATION

- Flooding and Its Detection
- Pressure Surveys
- Saltation
- Entrapment
- Damaged Equipment
- Entrainment and Product Quality

## HEAT EXCHANGERS

- Preheat and Crude Fouling
- Leaks
- Hot Vapor Bypass and Sealing
- Vapor Blanketing
- Heat Integration and Startup
- Heat Flux Limits

**Course Content**

- Thermosyphon Reboilers
- HYDRAULICS**
- Gravity Flow and Open-Channel Flow
  - Unstable Systems
  - Compressible Flow: Transfer Lines
  - Nozzles
  - Pressure Balance Systems
- PUMPS**
- Suction Conditions-NPSH and Suction Specific Speed
  - Multiple Pumps in Parallel
  - Low Head Applications
  - Fan Law Limits
- FIRE HEATERS**
- Pass Balancing
  - Average Versus Peak Heat Flux and Coking
  - Heat Integration and Air Preheat
  - Environmental Control
- VACUUM SYSTEMS**
- Ejector Systems
  - Suction Constraints
  - Excessive Load
  - Precondenser Performance
  - Plugged Exchangers
  - Damaged Equipment
  - Liquid-Ring Low-Pressure Operation
- CENTRIFUGAL COMPRESSORS**
- Suction Conditions
  - Surge Control
- RECIPROCATING COMPRESSORS**
- Interstage Pressures
  - Capacity Restrictions
- CONTROL**
- Instability
  - Impossible Constraints
  - Unsound Control Schemes
  - Instrument Installation Problems
  - Advanced Control Problems
- OTHER EQUIPMENT**
- Coalescers
  - Dryers
  - Salt Dryers
  - Drums
  - Gas Turbines
- ADVANCED TECHNIQUES**
- Gamma Scans: Uses and Limitations
  - Neutron Backscatter
  - Thermal Scanning

**Instructor:**

Andrew W. Sloley is a Principal Engineer for CH2M Hill, Bellingham, Washington. He has over 30 years of experience in the hydrocarbon processing industry. At CH2M Hill he is primarily responsible for technical design and review and acts as team leader for process design for refinery crude units, delayed cokers, alkylation, and refinery recovery units including gas plants and FCC product recovery. His other responsibilities include proposal preparation, technical support and system troubleshooting. Andrew has authored or co-authored over 250 publications on petrochemical and refinery operations in the areas of equipment design and troubleshooting. He is currently a contributing editor on equipment and plant design for Chemical Processing magazine. He has a B.S. degree in Chemical Engineering from the University of Tulsa and is a licensed professional engineer in Texas.