LDI Training

Course Outline

Production Safety Systems

Incorporating

The new 2017 8th Edition of API RP 14C, the new API RP 17V 1st Edition, API RP 14J, API RP 500/505, API RP 520/521/2000, IEC 61508-2 and IEC 61508-3

By Dr. Maurice Stewart, PE, CSP
"Worldwide Petroleum Training"

This intense 5-day course presents a systematization of proven practices for providing a safety system for onshore and offshore production facilities. Proper application of these practices, along with good design, hazards analysis, maintenance and operation of the entire production facility, should provide an operationally safe facility.

Course Objectives

- Present provisions for designing, installing and testing both safety and non-marine emergency support systems (ESSs) on both onshore and offshore production facilities.
- Discuss the basic concepts of a facility safety system and outline production methods and requirements of the system.
- Provide guidance how safety analysis methods can be used to determine safety requirements to protect common process components from the surface wellhead and/or topside boarding valve and for subsea systems including all process components from the wellhead (and surface controlled subsurface safety valve (SCSSV)) to upstream of the boarding shutdown valve. (Note: The shutdown valve is within the scope of API RP 17V for gas injection, water injection, gas lift systems and chemical injections).
- Understand the importance of **"Safety Concept**," **"Safety Reviews**," and "EB-HAZOPs."
- Provide a method to document and verify process safety system functions, i.e., safety analysis function evaluation (SAFE chart).
- Provide design guidance for ancillary systems such as pneumatic supply systems and liquid containment systems.
- Provide a uniform method of identifying and symbolizing safety devices.
- Provide procedures for testing common safety devices with recommendations for test data and acceptable test tolerances.
- Understand the **Principles of Safe Facility Design and Operation**, specifically, how to **Contain Hydrocarbons, Prevent Ignition, Prevent Fire Escalation** and **Provide Personnel Protection and Escape,**
- Understand the Principles of **Plant Layout Partitioning** and how to partition a plant into **Fire Zones, Restricted Areas and Impacted Areas** thereby **minimizing** the **Risk to Radiation, Explosion, Noise and Toxicity.**

- How to determine **Electrical Hazardous (Classified) Locations** and determine what Electrical Equipment should be installed in these locations,
- Understand the purpose of Surface Safety Systems, specifically, the **Emergency Shut-down System, Emergency Depressurization System, Fire and Gas Detection Systems and High Integrity Protection Systems,**
- **Understand the Objectives, Types, Location and Placement of Fire and Gas Detection Systems,**
- Understand the Objectives, Types and Performance of **Active and Passive Fire Protection Systems,**
- Understand the Function, Types, Selection and layout of **Vent, Flare and Relief Systems** so as to **minimize** the effects of **Radiation, Flammable Gas Dispersion and Toxic Gas Dispersion**,
- Understand the **function and design considerations** of **Liquid Drainage Systems**
- How to determine piping **"spec breaks"**
- How to **evaluate workplace** and **operating/maintenance procedures** for **"hidden" hazards**
- How to effectively design facilities and work areas to **reduce human errors** and improve performance

COURSE OUTLINE

Principles of Safe Facility Design • Contain Hydrocarbons • Design and Quality Control, • Surface Safety Systems	• Equipment Operation and Maintenance • Special Precautions • Control of Normal Releases
Prevent Ignition • Effects of Gas Gravity and Wind Speed • Overpressure from Gas Combustion Considerations • Flare and Vent Systems	• Drain Systems • Separation of Fuel and Ignition Sources • Adequate ventilation • Combustible Gas Detectors
Prevent Fire Escalation • Catastrophic Events occur as a result of Escalation • Fire Detection Systems	• Hydrocarbon Inventory Reduction • Passive Fire Protection • Active Fire Protection
Provide for Personnel Protection and Escape • Personnel Escape Routes • Fire-fighting and Emergency Equipment	• Alarm and Communication Systems
Installation Layout • Fire Zones • Restricted Areas • Impacted Areas • Hazard/Failure Scenario Categories	• Normal Operation, Credible Event, Major Failure, Catastrophic Failure • Principles of Plant Layout Partitioning • Radiation, Toxicity, Explosion, Noise
Electrical Installations in Hazardous (Classified) Areas • Definitions (API 500, API 505, API 14F, API 14FZ) • Hazardous (Classified) Locations	• Flammability Limits • Classification Procedure and Examples • Electrical Equipment Used in Classified Areas
Safety Systems • Purpose • ESD • Emergency Depressurization	• F&G Detection Systems • High Integrity Protection System • Emergency Support Systems
Safety Analysis Concepts • Why Safety Analysis? • What are the Main Components of a Safety System?	• Conducting a Safety Analysis o API RP 14C o API RP 17V • SAFE Chart Arrangement (format)

• Safety Analysis Tables (SAT's) • Safety Analysis Checklists (SAC's) • Safety Analysis Function Evaluation (SAFE) Charts	• Reading the SAFE Chart: (SACed Devices with Alternate Protection) • Filling Out a SAFE Chart
Pressure Ratings and Determining Specification Breaks • Design Procedure	• ASME B16.5 and API 6A Pressure Ratings • Determination of Pressure Breaks
High Integrity Pressure Protection Systems (HIPPS) • Advantages/Disadvantages • Industry Standards	• HIPPS Requirements o Performance option in accordance with API 521 (risk based SIL 2/3) o Prescriptive solution describing ▪ Design ▪ Commissioning ▪ Documentation ▪ Operation ▪ Maintenance and Testing
Safety System and ESS Bypassing • All bypass classes thoroughly defined • Annunciation requirements for bypasses defined • Specific time delays are outlined and process for extending these time delays	• Automated By-passes are to be maximized to minimize human error • Emergency Support Systems (ESS) Bypassing
Onshore Gathering Station Safety System Design Considerations • Onshore Gathering Station Components • Developing a SAT	• Developing a SAC • Developing a SAFE
Fire and Gas detection Systems • **Gas Detection** • Objectives • Combustible/ toxic Gas Detectors • Location and Placement	• **Fire Detection** • Objectives • Heat • Smoke and Flame Detectors • Location and Placement
Active and Passive Fire Protection • **Active Fire Protection** ▪ Objectives ▪ Fixed Deluge Systems ▪ Sprinkler Systems ▪ Fire Water Systems ▪ Total Flooding Systems	• **Passive Fire Protection** ▪ Objectives ▪ Functional Requirements ▪ Performance Criteria ▪ Fire Rating for Partitions/Structures ▪ Fire Proofing and Fire Proof Material
Relief, Vent and Flare Systems • Functions • Understanding the requirements of Industry Codes and Standards ▪ ASME Pressure Vessel Code Section VIII, Division 1 & 2 ▪ API RP 520, Part 1 & 2; and 521 • Understanding Regulatory requirements • Determining worst case conditions	• Types and Selection • Determining relief loads • Piping layout considerations • Installation Considerations • Radiation • Flaring and venting Scenarios • Flammable Gas dispersion • Environmental considerations • Testing and calibration
Liquid Drainage Systems • Function of Drainage Systems	• Segregation • Closed/Open drains

Electrical Area Classification • Objectives • Applying NEC and IEC • Determining Class, Group and Division/Zone • Applying API RP 500 and RP 505	• Developing an Area Classification Drawing • Installing Electrical Equipment in Hazardous Locations • Applying API RP 14F
Putting it altogether • Surface Safety System Analysis • Electrical Area Classification	• Fire and Gas Detection Systems • Human Factors Considerations

Who Should Attend

This workshop is specifically targeted for Experienced Professionals and Senior Engineering Personnel who are involved in safety or production operations and who want to:

- Develop a better understanding of the **effectiveness** of **existing** Production Safety System initiatives at existing oil and gas facilities,
- Appreciate the main steps contemplated in the **Safe Design** of a plant or facility,
- Better understand the **scope and functioning** of the various **safety related equipment** installed onshore, offshore and subsea
- **Review or broaden their understanding** of how to conduct a safety analysis, Experience-Based HAZOP and how to install electrical equipment in hazardous (Classified) locations
- Other professionals who want to develop a better understanding of **how to conduct** a **Safety Analysis, EB-HAZOPs** and install **electrical equipment in hazardous (Classified) locations**

Course Materials

- Each participant will receive a comprehensive set of worksheets and checklists to aid them in conducting a safety analysis
- Each participant will receive a comprehensive set of lecture notes for after course reading and reference
- An extensive set of practical in-class "case study" exercises specially designed by Dr. Stewart that emphasizes the design and "trouble-shooting" pitfalls often encountered in the industry. The suitability and applicability of the case studies is recognized as one of the best in the industry.

About Dr. Maurice Stewart

Dr. Maurice Stewart, PE, CSP, a Registered Professional Engineer with over 40 years international consulting experience in project management; designing, selecting, specifying, installing, operating, plant optimizing, retrofitting and trouble-shooting oil, water and gas handling, conditioning and processing facilities; leading hazards analysis reviews and risk assessments.

He is **internationally respected for his teaching excellence and series of widely acclaimed textbooks** in the areas of designing, selecting, specifying, installing, operating and trouble-shooting: 1) oil and water handling facilities, 2) gas handling, conditioning and processing facilities, 3) facility piping and pipeline systems, 4) gas sweetening, 5) gas dehydration, 6) pumps, compressors and drivers, 7) instrumentation, process control and safety systems, 8) oil and gas measurement and metering systems and 9) conducting safety audits, hazards reviews and risk assessments. Dr. Stewart is one of the co-authors of the *SPE Petroleum Engineering Handbook***.** He has authored and co-authored over 90

technical papers and has contributed to numerous conferences as a keynote speaker. To date, Dr. Stewart has taught over*60,000 professionals in 90 countries.*

He has provided **consultation and/or instruction** to well **over 100 oil and gas related companies worldwide** and is currently held on retainer by a number of companies where he regularly provides consultation regarding complex oil and gas issues related to surface production facilities.

He also serves on numerous international committees responsible for developing or revising industry Codes, Standards and Recommended Practices for such organizations as ANSI, API, ASME, ISA, NACE and SPE. Dr. Stewart is currently serving on the following American Petroleum Institute (API) committees: *API RP 14C, RP 14E, RP 14F, RP 14G, RP 14J, RP 500 and RP 75.* Dr. Stewart has developed and taught worldwide short courses for API related to Surface Production Operations. In 1985, Dr. Stewart received the National Society of Professional Engineers *"Engineer-of-the-year"* award.

He is very active in the Society of Petroleum Engineers (SPE). He served on the board of directors for the Delta Section for over 10 years, chairman and committee member of the professional engineering registration committee for five years and chairman of the continuing education committee for eight years. For twelve years he conducted a review course that prepared petroleum engineers for the "Principles and Practice" examination in Petroleum Engineering. He developed and has taught worldwide short courses for SPE related to Surface Production Operations. For his continuous effort in the advancement of Petroleum Engineering he was awarded the SPE Regional Service Award.

Dr. Stewart holds a BS in Mechanical Engineering from Louisiana State University and MS degrees in Mechanical, Civil (Structural Option) and Petroleum Engineering from Tulane University and a PhD in Petroleum Engineering from Tulane University. Dr. Stewart served as a Professor of Petroleum Engineering at Tulane University and Louisiana State University.

To enroll or get more information, please contact

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