A LDI Training Course

“Learn an integrated approach on how to analyze, design, install and test”

Production Safety Systems

Using

And
INSTALL ELECTRICAL EQUIPMENT IN HAZARDOUS (Classified) LOCATIONS

Dr. Maurice Stewart, PE, CSP

Course Objective

- How Safety Engineering activities are an integral part of New Projects, Major Upgrades/Modifications and daily Operations,
- Understand the importance of “Safety Concept,” “Safety Reviews,” and “EB-HAZOPs.”
- 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

NOTE: The workshop maintains a balance between lecture and in-class exercises, and between theory and application. In-class exercise sessions are evenly dispersed throughout the course to emphasize the principles covered.

Dr. Stewart has a storehouse of knowledge and experience that he passes along to help the participants get a unique multidiscipline approach to combine electrical, mechanical, civil and petroleum methods in solving the problems associated with production safety systems and electrical installations in hazardous (classified) locations.
Course Description

This workshop is designed to teach professionals, engineering personnel and supervisors who are involved in safety or production operations 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 in the plant,
- 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
- Develop a better understanding of how to conduct a Safety Analysis, EB-HAZOPs and install electrical equipment in hazardous (Classified) locations

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
- 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

Safety Analysis Concepts
- Why Safety Analysis?
- What are the Main Components of a Safety System?
- Safety Analysis Tables (SAT’s)
- Safety Analysis Checklists (SAC’s)
- Safety Analysis Function Evaluation (SAFE) Charts
- Conducting a Safety Analysis
- SAFE Chart Arrangement (format)
- Reading the SAFE Chart: (SAC ed Devices with Alternate Protection)
- Filling Out a SAFE Chart

Pressure Ratings and Determining Specification Breaks
- Design Procedure
- ANSI B16.5 and API 6A Pressure Ratings
- Determination of Pressure Breaks

High Integrity Pressure Protection Systems (HIPPS)
- Advantages/Disadvantages
- Industry Standards
- Evaluation Procedure
- Applications

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; 521; 526; 2000 and 14J
- 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

Human Factors Engineering

- Human factors considerations
- When to consider human error
Types of human error
- Incidents that could have been prevented
- Human’s strengths and weaknesses
  - By better design
  - By better construction
  - By better maintenance
  - By better methods of operation
- Considerations related to efficiency and safety
- Questions that should be addressed in design and operations
- Common pitfalls found in design and operations
- Review of ASTM F1166

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 in the plant,
- 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.

Your Course Leader
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 in virtually every oil and gas production sector in the world, including the Middle East, UAE, Northern and Western Africa, Angola, Nigeria, North Sea, Western and Southern Europe, China, Central Asia, Democratic Republic of Congo, Indonesia, Malaysia, Myanmar, Thailand, Brunei, India, Kazakhstan, Central and South America, Australia, Canada and throughout the United States.

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. A partial list of his clients include: Abu Dhabi Oil Company, Exxon USA, Esso Producing Malaysia Inc, Petronas, PetronasCarigali, Petronas Gas, Sarawak Shell, Gas Malaysia, BP, DeltaAfrik, Occidental Petroleum, Kuwait Oil Company, Saudi ARAMCO, AMOCO, ADNOC, Qatar Oil Company, Nipon Oil Company, Shell USA, Conoco Inc., Brunei Shell, DeltaAfrik, Oryx Ecuador Energy Company, Petro-Amazones, Petro-Ecuador, British Gas, Texaco, Petro China, Petro Viet Nam, Maxus Indonesia, Maxus Ecuador Inc., CNOOC, Cabinda Gulf Oil Company Ltd., Caltex Pacific Indonesia, Vico Indonesia, Mobil Producing Nigeria Unlimited, PTTEP, Chevron Nigeria Ltd., Chevron Overseas Producing Inc., Chevron USA, Chevron Thailand, Pertamina, UNOCAL Indonesia, UNOCAL USA, Unocal Thailand, Unocal Indonesia, Spirit Energy 76, ChevronTexaco, Medco, Miga, Total Indonesie, TotalFinaElf Myanmar, Total Fina Elf, Total E&P, Sonangol P&P, Exxon Mobil, Spirit Energy 76, Mobil USA and Royal Dutch Shell.

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 rived 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 Ph.D in Petroleum Engineering from Tulane University. Dr. Stewart served as a Professor of Petroleum Engineering at Tulane University and Louisiana State University.