A LDI Training Course

OIL & GAS PROCESSING PLANT DESIGN, OPERATION And Trouble-Shooting

By

DR. Maurice Stewart, PE., CSP.

WHAT YOU WILL LEARN

- Develop a “feel” for the important parameters in designing, operating, maintaining and trouble-shooting surface production facilities, specifically oil, gas and water handling facilities
- Understand the practical, technical and safety considerations in the design, operation and maintenance of economical onshore and offshore production facilities
- Understand the uncertainties and assumptions inherent in designing and operating the equipment in these systems and the limitations, advantages and disadvantages associated with their use
- How to size, select, specify, operate, maintain, test and trouble-shoot surface equipment used in surface production facilities, such as the wing valve at the Xmas tree, separators, heater treaters, storage tanks, pumps, ACT units, meter provers, hydrocyclones, plate separators, flotation cells, sparger units, CPI units and water injection equipment
- How to design and trouble-shoot gathering stations, pump/compressor booster stations, gas plants, water disposal/injection stations, pipelines, and measurement stations
- How to use a “multi-disciplined” approach to combine electrical, mechanical, chemical and petroleum methods

COURSE OUTLINE

Fundamentals Controlling Production
- Physical Properties
- Basic Hydrocarbon Chemistry
- Hydrocarbon Fluid Mixtures
Phase Behavior
Flash Calculations

Overview of Production Processes
Hydrocarbon reservoirs and reservoir fluid characteristics
Major operational functions
Process and equipment description
Oil and water handling facilities
Gas handling facilities
Process Description
Power Generation Considerations
Pipelines
Operating Problems and Practical Solutions

Review of Typical Oil and Gas Facilities
Overview
Offshore platforms and MWP’s
Offshore trunklines
Process Area (PA)
Gas trains
Condensate trains
Water trains
Glycol Regeneration trains
Refrigerant Cycle trains
Export lines
Export Area interfaces

Separators and Mechanical Design of Pressure Vessels
Factors affecting separation
Separator construction
Gas-liquid separation (2-Phase)
Vessel operation
Vessel internals
Separator operation considerations
Liquid-liquid separation (3-Phase)
Two-phase sizing
Three-phase sizing
Mechanical design using the ASME Pressure Vessel Code
Division 1
Division 2

Emulsions and Oil treating
Emulsion theory
Factors affecting emulsion stability
Emulsion treating methods
Emulsion treating equipment
FWKO’s
Gun-barrels
Wash Tanks with external gas boots
Vertical/horizontal heater treaters
Electrostatic heater treaters
Oil Dehydrators and Desalters
Emulsion treating equipment sizing
Practical design of an oil treating system

**Water Treating**
- Basic considerations
- Pre-treatment considerations
- Upstream equipment considerations
- Process considerations
- Water treating equipment
  - API Separators
  - Skimmer Tanks and Vessels
  - Plate Separators (Downflow/Upflow/Crossflow)
  - Free-flow Turbulent Coalescers
  - Induced Gas Flotation Units (Mechanical/Hydraulic)
  - Sparger Units
  - Hydrocyclones

**Filtration**
- Solids removal principles
- Water injection system treatment steps
- Solids removal equipment
- Equipment selection and performance

**Rotating Equipment**
- **Pumps**
  - Fluid principles and hydraulics
  - Hydrostatics
  - Hydrodynamics
  - NPSH requirements
  - Power requirements
  - Pump selection
- **Compressors**
  - Classification
  - Application of Compression theory
  - Determination of Inter-Stage Pressure Loss
  - Compressor Selection
  - Reciprocating Compressors
  - Centrifugal Compressors
  - Vapor Recovery Units
  - Piping considerations
  - Compressor Station Design Considerations
  - Safety system Considerations and Determining Sensor Set-Points
  - Maintenance and Trouble-Shooting Considerations

**Glycol Dehydration and Regeneration System**
- Principles of Operation
Effect of Operating Variables  
System Design  
Moisture Content Determination  
Glycol Maintenance, care and Trouble-Shooting  
Glycol System Cleaning  
Glycol Dehydration System Design  
Maintenance and Trouble-shooting

**Gas Sweetening**  
Acid gas considerations  
Treating methods  
Process description  
Process selection

**Plant Piping and Pipelines**  
Determination of ID  
Pressure drop considerations  
Velocity considerations  
Determination of Wall Thickness  
Plant/Offshore facilities  
Gas pipelines and flowlines  
Liquid pipelines  
Review of Piping/Pipeline Codes and Recommended Practices  
ASME B.31.3  
ASME B31.4  
ASME B31.8  
Other International codes  
Pressure ratings  
Determination of spec breaks

**Measurement**  
Inferred vs direct measurement  
Accuracy  
Types of meters  
Differential pressure  
Positive displacement  
Ultrasonic measurement  
Turbine meters  
ACT Unit Components and Operation  
Basis of meter proving

**Process Control and Safety Systems**  
Elements of a process control system  
Control loops  
Control modes  
PID  
Advanced control  
Production Safety Systems  
Undesirable Events
Safety Analysis
SAFE Charts
SIL

COURSE MATERIALS

- A comprehensive set of lecture notes for after course reading and reference
- An extensive set of practical in-class “case study” exercises specifically developed 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.

WHO SHOULD ATTEND

- Project and construction engineers, rotating equipment specialists, I&E engineers, Capital Projects team members, team leaders/coordinators, operations engineers, construction coordinators, maintenance team leaders/engineers, operations team leaders and other personnel who are or will be responsible for the designing, selecting, sizing, specifying, installing, testing, operating and maintaining of oil, gas and water handling facilities,
- Experienced professionals who want to review or broaden their understanding of oil, gas and water handling facilities
- Professionals with little to moderate surface production facility experience and/or operations background
- Other professionals who want a better understanding of the subject matter

Your Course Leader

Dr. Maurice Stewart, PE, CSP, a Registered Professional Engineer with over 45 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 gas handling facilities, 2) facility piping and oil, gas and water pipeline systems, 3) pumps, compressors and drivers, 4) instrumentation, process control and safety systems, 5) oil and gas measurement and metering systems and 6) conducting safety audits, hazards reviews and risk assessments. Dr. Stewart is one of the co-authors of the SPE Petroleum Engineering Handbook, Volume 3-surface Production Operations. 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 70,000 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, Northern and Western Africa, North Sea, Western and Southern Europe,
China, Indonesia, Malaysia, Thailand, India, 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, Petronas Carigali, Petronas Gas, Gas Malaysia, Occidental Petroleum, Shell USA, CONOCO Inc., Oryx Ecuador Energy Company, Petro-Amazonas, Petro-Ecuador, British Gas, Texaco, CNOOC SES Ltd., MAXUS Ecuador Inc., Cabinda Gulf Oil Company Ltd., Chevron Pacific Indonesia, VICO Indonesia, Mobil Producing Nigeria Unlimited, Chevron Nigerian Ltd., Chevron Overseas Producing Inc., Chevron USA, Pertamina, UNOCAL, UNOCAL Thailand, Chevron Indonesia Company, MIGAS, Medco E&P Indonesia, TOTAL E&P Indonesie, Total Myanmar, Spirit Energy 76, PTTEP, 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 API committees: API RP 14C, RP 14E, RP 14F, RP 14G, RP 14J, RP 500 and RP 75. 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. 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 is an adjunct Professor of Petroleum Engineering at Louisiana State University.

For Details Information Please Contact To:
PT. Loka Datamas Indah
LDI Training

Phone : +62 21 6326911
Fax : +62 21 6305074
E-mail : Lditrain@indo.net.id
Website : www.Lditraining.com