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ISO 9001:2008 Certified

DRILLING SYSTEMS SEMINAR DETAILED COURSE OUTLINE

3-4 DAY SEMINAR

Presented at WEST Engineering's Brookshire, Texas Location

Manuals provided during the seminar include the following:

- Drilling Equipment and Related Systems - Course Manual
- Specific PETEX primers can be supplied before the course, upon request

During the seminar, there will be many references made to various standards and regulations. It would be greatly beneficial for each attendee to review the following documents and familiarize himself with the following API specifications or recommended practices:

Primary:

API Spec 4F 3rd Edition, "Drilling and Well Servicing Structures"
API RP 4G 3rd Edition, "Maintenance and Use of Drilling and Well Servicing Structures"
API Spec 7K 4th Edition, "Drilling and Well Servicing Equipment"
API RP 7L 1st Edition, "Inspection, Maintenance, Repair, and Remanufacture of Drilling Equipment"
API Spec 8A 13th Edition, "Drilling and Production Hoisting Equipment"
API RP 8B/ISO 13534:2000, 7th Edition, "Procedures for Inspections, Maintenance, Repair, and Remanufacture of Hoisting Equipment"
API Spec 8C 4th Edition, "Drilling and Production Hoisting Equipment"
API RP 53 3rd Edition, "Recommended Practices for Blowout Prevention Equipment Systems for Drilling Wells" (American Petroleum Institute).

Secondary:

API Spec 2C 5th Edition, "Offshore Cranes"
API RP 2D 4th Edition, "Operation and Maintenance of Offshore Cranes"
API RP 7C-11F 5th Edition, "Installation, Maintenance, and Operation of Internal- Combustion Engines"
API Spec 9A 25th Edition, "Wire Rope"
API RP 9B 12th Edition, "Application, Care, and Use of Wire Rope for Oilfield Service"
API RP 68 1st Edition, "Oil and Gas Well Servicing and Workover Operations Involving Hydrogen Sulfide"
API RP 2003 7th Edition, "Protection Against Ignitions Arising Out of Static, Lightning and Stray Currents"
API Spec 16A 3rd Edition, "Specification for Drill Through Equipment".
API Spec 16C 1st Edition, "Specification for Choke and Kill Systems".
API RP 16D 1st Edition, "Design of Control Systems for Drilling Well Control Equipment".
API RP 54 3rd Edition, "Occupational Safety for Oil and Gas Well Drilling and Servicing Operations"
API RP 64 2nd Edition, "Recommended Practices for Diverter Systems Equipment & Operations".

The content of the seminar will be derived from over 1800 rig assessments that WEST has performed over the last 15 years. As such, three concepts will be addressed with each discussion:

1. How it works, using cross sections
2. Various lessons learned (what to look for), and
3. Solutions available.

When specific equipment failures are discussed -- the solution will be discussed. *It's always less expensive when you learn from the experience of others!*

DAY 1:

INTRODUCTION

Seminar Basis and What's Different

- A. Safety in the "Cotton Gin"
- B. Understanding WEST's information systems
 1. ITP's = "Inspection and Test Procedures" - information available
 2. Anomaly Data Base - Lesson's learned, so as not to be repeated
 3. "RigLore" - Engineering Bulletins and Product Alerts "at your fingertips"
- C. Where and when does downtime occur?
- D. Direct and indirect costs

Quality Management

- A. Risk analysis and how to minimize downtime
- B. Let's be a learning industry; product performance reports, reference API Spec 16A, API RP 53 ISO 9000; API Q1 program
- C. Document Control: O & M manuals, engineering bulletins and product alerts
- D. Operational management
- E. Why are the API quality systems not working? (API Q1, API RP 53 and API Spec 16A)
- F. What should your response be when they say "Certified"?
- G. Planned Maintenance Systems and OEM standards
- H. Regulatory issues and industry standards

Inspection types and techniques

1. How can items be assessed
2. NDE inspections – theory behind the different types

Hoisting, Rotating, and Pipe Handling Equipment

1. API Spec 8A, RP 8B and Spec 8C requirements
2. Derrick and Substructure
 - a. Raising and lowering systems
 - b. Derrick inspections (API 4G)
 - c. Fingerboards
 - d. Dropped objects
3. Top Drive
 - a. Electrical vs. Hydraulic
 - b. Wash pipe
 - c. Modular top drives

***DEC Building: Top Drive Inspection upon completion of discussion**

DAY 2:

Hoisting, Rotating, and Pipe Handling Equipment (Cont.)

4. Drawworks
 - a. Mechanical vs. DC vs. AC
 - b. Chains and sprockets
 - c. Gear driven drawworks
 - d. Catheads and sandline
 - e. Drawworks capacity - calculations
5. Auxiliary Braking
 - a. Theory of operation
 - b. Air gap measurements and significance
6. Crown and Traveling Blocks
 - a. Sheave gauging
 - b. Bearing inspection
7. Rotary Table
8. Iron Roughneck
 - a. Overview of available models, pro's and cons
9. Pipe Handling
 - a. Stationary vs Traveling
 - b. Load and size ratings
10. Driller's Console and Zone management systems
 - a. Gauges and automation
 - b. Zone Management system maintenance and setup
 - c. Use of override
11. Running heavy loads – what's the risk and how can we mitigate?

Mud Pumping and Processing

1. API Spec 7K, RP 7L
2. Mud Mixing
 - a. Storage and transfer – transfer pump sizing
 - b. Mixing,
 - c. Agitation
3. Mud Pumps:
 - a. Duplex vs Triplex vs quadruplex
 - b. Charge Pumps – when are they required
 - c. Pulsation dampeners – pre charge calculations
4. Stand Pipe manifold and High pressure lines
 - a. Inspections and required wall thickness calculations
 - b. Hammer unions and threaded connections – what can be used when?
5. Degassers
6. Solids Control
 - a. Return Lines,
 - b. Shakers,
 - c. Desanders/Desilters,
 - d. Centrifuges
7. Endurance testing – what is the most demanding well section?

DAY 3:

Well Control

1. Preventer Types
 - a. Annular
 - b. Ram
2. Preventer Applications
3. BOP Handling Equipment
 - a. Bridge crane vs Wrangler type
 - b. API RP 7L requirements
4. Accumulators/HPU
5. Choke and Kill Manifold

***DEC Building: Koomey unit inspection upon completion of this section**

Power Generation

1. Diesel Engines
 - a. API RP 7C-11F requirements
 - b. Natural aspirated vs. turbo charged
 - c. Fuel systems
 - d. Maintenance and oil sample analysis
2. AC and DC
 - a. DC / SCR theory of operation
 - b. AC / VFD theory of operation
 - c. Comparison of SCR vs VFD systems

Mechanical Systems

1. Cranes, Slings and Lifting/Handling Equipment
 - a. API Spec 2C and API RP 2D requirements
 - b. Knuckleboom vs lattice boom cranes
 - c. Wire rope and synthetic sling inspection
 - d. Padeyes and shackles
2. Winches: Man-riding, Auxiliary
3. Compressors / Rig Air

Safety and Environmental

1. Ex Equipment
 - a. Definitions of areas and required equipment
2. Fire prevention and control:
 - a. Preventative Measures,
 - b. Alarm Systems,
 - c. Extinguishing
3. Safety and Life Saving Equipment
4. Waste Management
5. Pollution Control

DAY 4:**Offshore Drilling Equipment (Optional 1 day Module)**

1. Offshore regulations
 - a. MARPOL
 - b. MODU Code
 - c. Flagstate and classification societies
2. Mooring Systems and towing
 - a. System components and inspection requirements
 - b. Chain, wire and pre lay systems
3. Stability and Ballast Control System
 - a. MODU requirements
4. Dynamic Positioning and Power Management
 - a. Theory of operation and main system components
 - b. DP2 vs DP3
 - c. Taut wire system
5. Jack Up Systems
 - a. Jacking system
 - b. Cantilever and skidding system
 - c. Water tower
6. Motion Compensator
 - a. Theory of Operation
 - b. Drill string compensator
 - c. Crown Mounted compensator
 - d. Active vs passive compensation
7. Emergency Generators
 - a. Class and regulatory requirements