Course Progression Matrices

WELL CONSTRUCTION / DRILLING ENGINEERING

	COMPLETIONS AND WORKOVER OPERATIONS	WELL DESIGN / PLANNING	WELLSITE OPERATIONS / SUPERVISION	WELL CONSTRUCTION MANAGEMENT	RIG SELECTION, PROCUREMENT LOGISTICS
SPECIALIZED	HML2-Horizontal and Multilateral Wells: Completions and Stimulation	ACD-Advanced Casing Design SCS-Solids Control Systems			
INTERMEDIATE		DSD-Drill String Design and Optimization	CEP-Cementing Practices - Cementing II MWC-Managing Wellsite Operations PDS-Practical Drilling Skills		DHD-Directional, Horizontal and Multilateral Drilling
FOUNDATION		WDE-Well Design and Engineering FTD-Fundamentals of Tubular Design PCE-Primary Cementing - Cementing I DFT-Drilling Fluids Technology DP-Drilling Practices	SPP-Stuck Pipe Prevention - Train Wreck Avoidance		
BASIC	BDC - Basic Drilling, Completion and Workover Operations BDT-Basic Drilling Technology BE - Basic Petroleum Engineering Practices EPB - Exploration and Production Process Basics: Understanding the Petroleum Industry Value Cycle BPT - Basic Petroleum Technology				

DRILLING OPERATIONS

	FLOORMAN	DERRICKMAN	DRILLER	RIG MANAGER	DRILLING SUPERVISOR
TECHNICAL / OPERATIONAL	INTRO - Intro to Drilling	RS1-RigSMARTS™ 1	RS2-RigSMARTS™ 2	RS3-RigSMARTS™ 3 - Well Bore Pressure Management	
	DMM1 - Drilling Mechanics and Math 1		DMM2 - Drilling Mechanics and Math 2		
	DSF1-Drill String Failure Prevention 1		DSF2-Drill String Failure Prevention 2		
	ODO-Offshore Drilling Operations				
				DSD-Drill String Design and Optimization	
				MWC-Managing Wellsite Operations	
				PDS-Practical Drilling Skills	
			SPP-Stuck Pipe Prevention - Train Wreck Avoidance		
				DP-Drilling Practices	
				BDT-Basic Drilling Technology	
PERFORMANCE			ALIGN-Alignment		
	TL - Technical Limit				
	DWOP-Drill the Well on Paper				
	CWOP-Complete the Well on Paper				
	AAR-After Action Review				
INTERPERSONAL / LEADERSHIP / SAFETY	HOL1-Hands-On Leadership™ 1		HOL2-Hands-On Leadership™ 2		
	LMCW - Leading a Multi-Cultural Workforce				
	HID-Hazard Identification				
			SL - Safety Leadership		
	SOR-Safety Observation Refresher				

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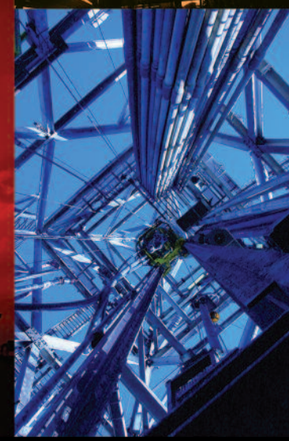

DRILLER'S 6-PACK

A Program Designed to Accelerate your career in Drilling and Well Construction

DRILLER'S 6-PACK - BUILDING DRILLING ENGINEERS - NOW!

THIS PROGRAM IS DESIGNED TO DELIVER COMPETENT WELL CONSTRUCTION ENGINEERS WHO ARE THOROUGHLY DEVELOPED AND CAN DO THE WORK - NOW.

Accelerate Your Career in Drilling and Well Construction with the Driller's 6-Pack.

As part of the "big crew change," engineers are joining our industry with lots of energy and potential, but little specific knowledge of drilling and well construction processes. PetroSkills "6-Pack" programs of modular courses is designed to transform new recruits into qualified drilling engineers in the first few years of their career. As a part of the PetroSkills Alliance, this program has been reviewed and endorsed by a network of E&P drilling professionals.

To enable this program to meet the mission of PetroSkills (high quality and frequently available training), 6-Pack courses are taught as a series at least twice a year. This allows students to attend multiple courses on consecutive weeks to minimize travel expenses. An ideal sequence would be to take 2 courses every 6 months to complete 6-Pack No. 1 in 18 months.

Successful graduates of the 6-Pack programs are prepared and ready to take over engineering responsibilities for developmental drilling campaigns. Optional testing at the end of the program can be provided by PetroSkills as a way to confirm this level of competence.

Program Designed For:

- Drilling engineers, supervisors and managers involved in drilling operations
- Service personnel involved in developing well plans
- Managers interested in learning about the well design process
- Petroleum and production engineers
- Geologists, geophysicists, and technical supervisors

Basic Drilling Technology - the introductory course of the program covers all components and procedures related to drilling, explaining the interacting variables involved in drilling wells. This basic knowledge, plus 6-12 months on the job, prepares the participant for *Drilling Practices*, the bedrock of the Driller's 6-Packs. *Basic Drilling Technology* is also an excellent technical foundation for wellsite supervision and office technical support staff development.

Drilling Practices is an operationally-focused 10-day course providing participants with the tools to work in teams to develop and implement all operational aspects of a well plan in the field, including critical path and performance management. Teams will analyze and mitigate operational challenges in several hole intervals of a well plan while optimizing performance improvement opportunities.

6-Pack No. 1 (Years 1-3) consists of 6 more narrowly-focused 5-day courses which develop skilled application in each crucial aspect of the well construction and drilling process. These courses can be taken in any order:

- Directional, Horizontal and Multilateral Drilling (DHD)
- Drill String Design and Optimization (DSD)
- Drilling Fluids Technology (DFT)
- Fundamentals of Casing Design (FCD)
- Primary Cementing (PCE)
- Stuck Pipe Prevention: Train Wreck Avoidance™ (SPP)

Well Design and Engineering is a 10-day course which provides participants the opportunity to build a well plan utilizing all major well construction technologies, while gaining foundational application skills in each. This course is considered the capstone learning event of the first 6-Pack as it imbeds each of these technologies within the context of a comprehensive well planning process. Participants work in a team environment, wrapping up the course with a presentation of their well plan to a panel of experts. Well Design and Engineering is recommended for engineers and operational supervisors who have been in function for at least 18 months and have demonstrated competency in at least half of the first 6-Pack course technologies.

6-Pack No. 2 (Years 2-5) further develops skills with a selection of intermediate and specialized well construction/drilling courses, and a foundation Completion and Workovers program.

- Completions and Workovers (CAW)
- Cementing Practices (CEP)
- Advanced Casing Design (ACD)
- Practical Drilling Skills (PDS)
- Solids Control Systems (SCS)
- Managing Wellsite Operations (MWC)

BUILDING THE FOUNDATION

Basic Drilling Technology

YOU WILL LEARN

- About drilling equipment and how it is used
- Drilling terminology and abbreviations
- Keys to planning a successful well
- How to read a morning report
- Technology behind information on the morning report
- Common drilling problems and how to avoid them

Drilling Practices

YOU WILL LEARN HOW TO

- Review drilling data and plan the well from spud to runningproduction casing
- Incorporate the completion plans into the drilling plan
- Drill a well cost effectively and maximize penetration rate
- Evaluate stuck pipe problem and avoid potential problems
- Evaluate and maintain drilling fluids
- Optimize hole cleaning
- Design BAHs, drill string and BOP/wellheads
- Evaluate and implement cementing programs
- Design and implement bit and hydraulics programs
- Incorporate directional drilling and deviation control
- Recognize and evaluate well control problems

6-PACK NO. 1

Directional, Horizontal and Multilateral Drilling

YOU WILL LEARN HOW TO

- Make survey calculations
- Interpret TVD, polar and rectangular coordinates and vertical section
- Interpret dogleg severity and the problems associated with dogleg severity
- Plan a two-dimensional directional well
- Plan horizontal wells based on the objectives of the well
- Determine the best multi-lateral completion for an application
- Determine declination and non-magnetic drilling collar selection
- Apply the best survey instrument for the job
- Directionally drill with rotary BHA's, jetting, whipstocks, motor, steerable motors, and rotary steerable systems
- Drill horizontally underbalanced
- Interpret torque and drag and determine what factors will affect the torque and drag
- Determine cementing requirements for directional wells

Drilling Fluids Technology

YOU WILL LEARN HOW TO

- Use clay and polymers to achieve desired mud properties
- Apply water chemistry to the treatment of drilling fluids
- Perform complete API water-based mud and non-aqueous drilling fluids tests
- Evaluate the information on an API water-based and non-aqueous drilling fluid report
- Identify drilling fluid contaminants and prescribe corrective treatments
- Select water phase salinity and activity for bore hole stability
- Select non-aqueous fluids to meet drilling requirements and environmental concerns
- Manage non-aqueous drilling fluid systems

Drill String Design and Optimization

YOU WILL LEARN HOW TO

- Place the drill string design process in context with other planning and operational considerations
- Refresh underlying physics of drill string failures and mechanical properties of drill string materials
- Clarify performance properties of drill string components and how to apply design margins
- Design cost-effective BHAs and match them to your bit
- Gain specific application experience analyzing common load cases for both near-vertical and high-angle situations: Tension loads, Torque loads, Combined tension-torque loads, Fatigue loads, Buckling loads
- Understand the basis for industry software design tools, including torque and drag, casing wear, and hydraulics
- Where available, perform parameter studies with the latest software tools to optimize tool selection related to both mechanical and hydraulic design criteria
- Identify drilling tools and operational practices to reduce both torque and drag and casing wear
- Diagnose and mitigate vibration to reduce drill string damage and failure
- Optimize your drill string inspection program using the latest industry standards
- Gain insight into emerging drill string technologies and the possible benefits to your operations

Primary Cementing – Cementing I

YOU WILL LEARN HOW TO

- Design cement slurries using API and/or field adapted procedures and laboratory testing procedures
- The use of cement additives in designing cement slurries to improve job success and/or reduce overall job costs
- Design cement jobs to include casing, multi-stage, liner, and tie-back strings
- Design and perform remedial (squeeze) cement jobs to include selection of tools
- Design cement plug slurries and selection of tools to improve overall job success

Fundamentals of Casing Design

YOU WILL LEARN HOW TO

- Select casing setting depths based on pore and fracture pressure data, as well as other criteria
- Identify and define load cases to meet specific casing design requirements based on specifications and strengths of casing and connections
- Apply standardized design factors and welbore fluid specifications for each load case.
- Use and understand casing and connection specifications and standards
- Clarify and effectively communicate the controlling design load for each string in a well
- Determine required casing and bit sizes, and alternatives for contingencies and special clearance situations
- Determine that the basic casing design will also will also sustain applicable combined loading and understand the limitations of published data based on single load formulas
- Design casing strings for high pressure/volume hydraulic fracturing in horizontal wells

Stuck Pipe Prevention – Train Wreck Avoidance™

YOU WILL LEARN HOW TO

- Identify mechanisms and risk factors that lead to stuck pipe incidents
- Anticipate, prevent, recognize and resolve stuck pipe due to the following:
  - Differential Sticking
  - Wellbore Geometry
  - Wellbore Instability
- Assess mechanics of wellbore stresses and the impact on wellbore stability
- Analyze trends to identify early warning signs of developing wellbore problems
- Use hole cleaning factors in both vertical and deviated wellbores
- Apply mechanics of jars and how to use them effectively
- Implement effective drilling and tripping practices
- Make cost-effective choices in planning fishing operations

CAPSTONE

Well Design and Engineering

YOU WILL LEARN HOW TO

- Understand the responsibilities of a well planner as a designer and project manager
- Review offset analysis and data gathering
- Understand the influence of completion design and production requirements on well design
- Identify trajectory design issues and their influence on torque and drag, wellbore stability, and future intervention
- Develop specific casing design skills including:
  - Casing point selection
  - Design load case development
  - Burst, collapse, and tension calculations
  - Controlling load and safety factor determination
  - Select appropriate size, weight, and grade
- Perform cement slurry and displacement volume calculations
- Complete drill string and BHA designs and failure prevention assessment for each hole section. Review for directional well applications
- Understand different bit types and applications. Perform calculations to support bit run economics
- Optimize hydraulics for each hole interval based upon wellbore, fluids and drill string configurations
- Compile risks to well delivery Develop mitigations and contingency plans
- Develop minimum rig capability specifications to deliver well requirements
- Present and defend a well plan to management

6-PACK NO. 2

Completions and Workovers

YOU WILL LEARN HOW TO

- Develop a high level completion strategy for wells in a variety of situations
- Select tubing, packers, and completion flow control equipment
- Appraise/design a suitable flow barrier strategy
- Make recommendations on installation and retrieval practices for tubing, packers, etc.
- Identify key design features for horizontal, multilateral, HPHT wells, etc.
- Select an appropriate intervention strategy/equipment
- Identify key features/applicability of the main sand control, fracpack and well stimulation options
- Assess/specify concerns/remedial measures for formation damage/skin removal
- Develop and outline overall strategy for a completion program

Managing Wellsite Operations

YOU WILL LEARN HOW TO

- Define a well's technical limit and implement a plan that will work to reach it
- Identify and mitigate hidden risks to reduce lost time
- Apply practical organizational learning techniques to benefit from lessons learned
- Build effective rig site teams

Cementing Practices – Cementing II

YOU WILL LEARN HOW TO

- Use cementing additives properly to improve and reduce job costs
- Interpret laboratory test results
- Perform primary cementing operations to include: casing cementing, liner cementing, multi-stage cementing
- Conduct squeeze jobs and selection of squeeze tools
- Perform cement plug operations to improve overall job success
- Interpret cement sheath evaluation logs

Solids Control Systems

YOU WILL LEARN HOW TO

- Evaluate the effect of drilled solids on the total cost of a well
- Remove drilled solids expeditiously from beneath the drill bit, [solids control starts at the bit]
- Transport drilled solids to the surface
- Arrange each component of a drilling fluid processing plant for proper performance
- Evaluate each component of a drilling fluid processing plant [called mud tanks]
- Determine the Equipment Solids Removal Efficiency of the system
- Understand the new API RP 13C (Solids Control)
- Evaluate the effect of drilled solids on drilling fluid properties
- Minimize drilling fluid discarded – Waste Management

Practical Drilling Skills

YOU WILL LEARN HOW TO

- Tailor your well for improved performance
- Recognize signals to prevent downtime
- Minimize drilling costs and decrease non-productive drilling time

Advanced Casing Design

YOU WILL LEARN HOW TO

- Use traditional WSD (Working Stress Design) and new RBD (Reliability Based Design) methodologies for casing and tubing
- Understand the new ISO TR 10400 document which replaces API 5C3
- Understand proper material applications for critical well design
- Use practical tools for preparing well designs for HPHT, Deepwater and other critical wells at extreme pressure and temperature