HPHT Drilling Design and Operations

Sharpen your skills for HPHT and Well procedures required to ensure equipment integrity!

OCS Training Instructor

Almost more than 40-years experienced Drilling & Well Design / Performance Adviser to Operators, Drilling Contractors & Service Companies as to how to maximise drilling and well performance, safety, teamwork and improve the bottom line.

Currently looking to assist the drilling industry further through Advice, Training, DWOP's, & the Technical Limit process etc. Difficult (e.g. HPHT, Deepwater, Long-Reach Directional & Horizontal Wells) a speciality. Track record of solving very difficult problems worldwide and "Brownfield Re-development".

Excellent advisory, teaching and interpersonal skills from Management to Roughneck. IADC WellCap Plus (Facilitator) & MSc (Offshore Engineering) / PhD (HPHT Drilling) certified. Recently completed ERD Project in Lithuania

Extensive experience both onshore and offshore in engineering and operations for Operators and Drilling Contractors on exploration, appraisal & development wells.

Who Should Attend :

This course is specifically designed for, but not limited to employees in the oil and gas industry who holds the following roles:

- Drilling Engineers
- Drilling Managers
- Drilling Superintendents
- Senior Drilling
- Integrated Services Drilling Contractor
- IPM Services Companies

Course Overview:

This course covers the key aspects of HPHT Drilling Engineering through the media of:

1) Lectures (the Trainer began his career 35 years ago and has worked on HPHT Projects both on and offshore the USA; offshore to the North Sea (UK & Norwegian Sectors) and has advised many Asian Operators & Drilling Contractors regarding HPHT Wells);
2) PowerPoints (written by the Trainer);
3) Videos;
4) Case history examples;
5) Teamwork exercises.
New technologies available to the Industry are also covered.

Provision is also made for delegates to discuss any aspect of engineering and operations which are pertinent to their particular up-coming projects in order to secure maximum success first time.

For each subject area, benefits of certain industry practices are covered in detail as well as why difficulties are encountered on the rig.

Solutions are presented (e.g. well design) so that the delegate's wells are su essful first-time.

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Course Objectives:

By the end of the course, delegates will understand the key drivers behind successful HPHT Drilling Engineering so that the well to be drilled is a success first time and without incident.

Delegates will also benefit from reviewing previously designed HPHT wells and Drilling Programs where wells have been a great success.

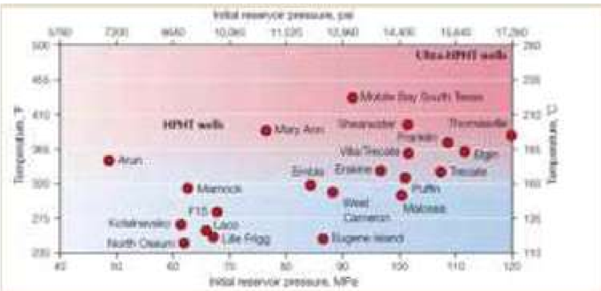
Consultancy services can be provided both before the course (e.g. certain wells / problems can be looked at), during the course (e.g. certain problems can be reviewed) or after the course (e.g. advice / well review) should the delegates require.

Course Agenda :

DAY 1

SECTION 1 INTRODUCTION
Industry Definition of High Pressure High Temperature

1.0 Industry Definitions in terms of Pressure & Temperature
2.0 Key Characteristics
3.0 Key Challenges
4.0 Application & Benefits
5.0 Evolution / Developments / Achievements



How Developments have progressed over the Years

6.0 The Necessity for Total Teamwork
7.0 Why HPHT Wells Fail

SECTION 2 WELL DESIGN
SECTION 2.1 OUTLINE RIG CONSIDERATIONS

1.0 Outline Rig Considerations from a Well Control perspective
2.0 What's Important from the Rig & Its Equipment (BOPE)
3.0 What's Important from the Drilling Contractor (HPHT Well Control wise)
4.0 What's Important regarding the Rig Crew (WellControl Competency)

6th Generation Semi-Submersible (Courtesy of Maersk Drilling)

SECTON 2.2 GEOLOGY & GEOPHYSICS CONSIDERATIONS

1.0 Target Location
2.0 Geological Hazards
3.0 Well Trajectory
4.0 The Difficulties of HPHT Designer Wells
5.0 Geological Formations & Rock Characteristics
6.0 Reservoir Fluid Characteristics
7.0 Fracture Pressure
8.0 Pore Pressure
9.0 The Difficult to Manage Transition Zone
10.0 Overburden Pressure
11.0 Wellbore Stability / Instability Analysis
12.0 Wellbore Ballooning / Supercharging

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Course Agenda :

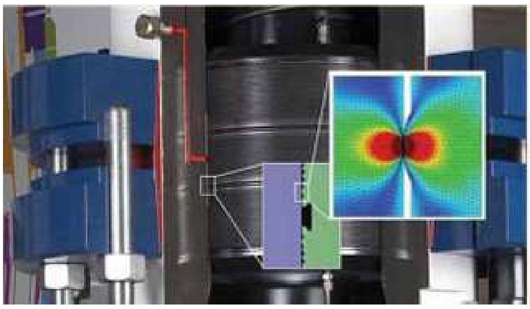
DAY 1

SECTION 2.3 THE IDEAL HPHT WELL DESIGN PROCESS

1.0 Preliminary Desig : Orderi g “L g-lead ite s
2.0 Preliminary Design Review
3.0 Risking the Preliminary Design
4.0 Risk Analysis / QRA
5.0 Final Design Stage
6.0 Peer Review
7.0 Risked Final Design
8.0 Design Approval

SECTION 2.4 WELLHEADS FOR HPHT WELLS

1.0 The stresses imposed upon wellheads whilst drilling and producing HPHT zones
2.0 Sealing mechanisms
3.0 Reliability
4.0 The effects of combined pressure and temperature
5.0 Pressure Testing
6.0 ”Life of Well” Importance



POSGRIP HPHT Wellhead Technology does not involve the use of threads or rotation. It delivers a true metal-to-metal seal based upon Hertzian Contact Principles (Courtesy of Plexus)

20,000 psi HPHT Mudline Tie-back Wellhead System, North Sea (Courtesy of Plexus)

POSGRIP Wellhead System, North Sea (Courtesy of Plexus)

SECTION 2.5
CASING CONSIDERATIONS

1.0 Introduction
1.1 Preliminary HPHT Design
1.2 Casing Setting Depth Determination
1.3 Kick Tolerance
1.4 Kick Intensity (PPG)
1.5 Kick Volume (Barrels)

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Course Agenda :

DAY 2

SECTION 2.5 CASING CONSIDERATIONS (continued)

1.6 Conductor Setting Depth Consideration
1.7 Surface String Setting Depth Considerations
1.8 Intermediate String Setting Depth Considerations
1.9 9 5 /8”/ 9 7/8” Production String Setting Depth Considerations

2.0 Liners / CRA’s orrosio Resista t Allos
2.1 Why steels are de-rated at elevated temperatures
2.2 Corrosion & Corrosion Rates at elevated temperatures
2.3 Design Load Cases
2.4 Installation Loads
2.5 Drilling Loads
2.6 Production Loads
2.7 Design Factors
2.8 The Importance of Considering Buckling
2.9 Thermal Growth
3.0 Hoop Stress
4.0 Casing Wear
5.0 Casing Wear Prediction
6.0 Controlling Casing Wear
6.1 Control of Casing Wear
6.2 Casing Material for HPHT
6.3 Considerations for Corrosion Resistant Alloys
6.4 Shock Loads
6.5 Bending Loads
6.6 Installation Loads
6.7 Over-pull Required to Prevent Buckling
6.8 Contingency Smaller Hole Sizes
7.0 Use of Expandable Casing
8.0 The Use of WellCat (Trademark of Landmark, Halliburton) Software for Design

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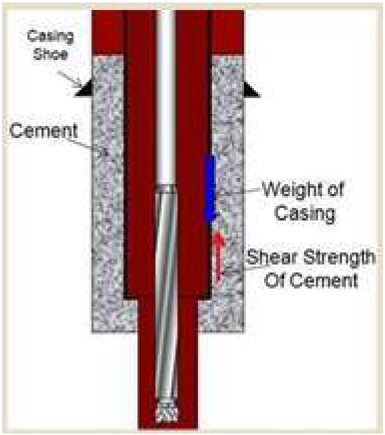
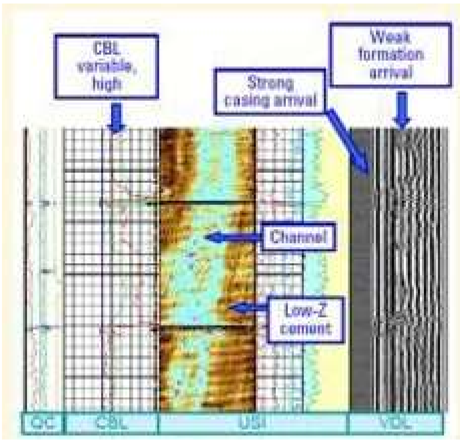
DAY 3

SECTION 2.6 CEMENTING

1.0 Objectives
1.1 Primary HPHT Cementing
1.2 Secondary HPHT Remedial Cementing
2.0 Planning
3.0 Common HPHT Cementing Problems
4.0 Cement Types. Why 35% Silica Flour. Resin-based Cements.
5.0 Cement Properties
5.1 Yield
5.2 Slurry Density
5.3 Mixwater
5.4 Thickening Time (Pumpability)
5.5 Compressive Strength
5.6 Water Loss
5.7 Permeability
6.0 Cement Additives
6.1 Accelerators
6.2 Retarders
6.3 Density Reducing
6.4 Density Increasing
6.5 Fluid Loss Additive
6.6 Dispersants (Friction Reducing)
7.0 Cement Testing
8.0 Single Stage vs 2-Stage Cementation



Cement jobs are critical on HPHT Wells (Courtesy of Drilling Formulas)



Poor cement as seen via the high amplitude on the CBL; low acoustic impedance (blue) indicates large void space filled ith ud (Courtesy of Crai ’s Petrophysical Handbook)

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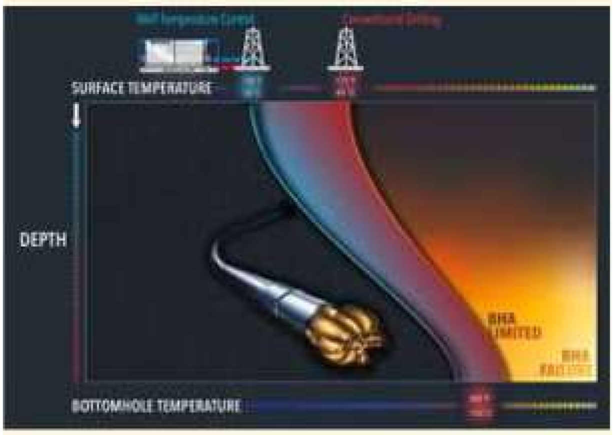
Course Agenda :

DAY 3

SECTION 2.7 DRILLING FLUIDS CONSIDERATIONS (continued)

5.5 Dispersed Mud Systems
5.6 XCD Polymer Milling Fluid
5.7 Treatment Guidelines for Contamination & Lost Circulation
5.8 Treatment Guidelines for High Rotary Torque
5.9 General Operation Guidelines for Water Base Muds
6.0 Oil Base Drilling Fluids
6.1 High O/W Ratio Invert Emulsion Muds (O/W Ratio > 70/30)
6.2 Low O/W Ratio Invert Emulsion Muds (O/W Ratio > 50/50)
6.3 Procedures for Minimising Oil Mud Discharges
6.4 Oil Base Muds Regulatory Requirements
6.5 Procedures for Minimizing Oil Mud Discharges
7.0 Completion & Well Testing Fluids
7.1 Water Base Muds
7.2 Oil Base Muds
7.3 Completion & Well Testing Brines
8.0 Solids Control Equipment Requirements
9.0 Procedures for Control of Severe Lost Circulation & Underground Blowouts
10.0 Caesium Formate
11.0 Stress Caging



"S-shaped Temperature Profiling with Mud Cooler & Conventionally (Courtesy of Drillcool)

SECTION 2.8 BHA CONSIDERATIONS

1.0 BHA Design for Vertical Exploration Wells
2.0 BHA Design for Directional Drilling
3.0 Temperature Considerations for MWD / LWD / Motors etc.

Temperature Considerations are crucial for downhole motors and MWD / FEWD

Course Schedule

08:00	Registration (Day1)
08:00 – 09:45	Session I
09:45 – 10:00	Refreshment & Networking
10:00 – 12:00	Session II
12:00 – 12:30	Session II
12:30 – 14:30	Session III
14:30 – 14:45	Refreshment & Networking
14:45 – 16:45	Session IV
17:00	End of Day

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Course Agenda :

DAY 4

SECTION 3: HPHT WELL DESIGNS:
CASE HISTORIES

During this section we will be going through a number of previously designed HPHT wells drilled with a Jack-Up which will cover the following areas:

- Exploration well uncertainties & how to accommodate these uncertainties
- How to determine long-lead items (e.g. wellheads, casing, liners etc.)
- Casing Design
- Cementing
- Drilling Fluids
- The Problems encountered whilst drilling – specifically Well Control Problems
- How the drilling problems were “designed” out the next well

Well Design from Elgin / Franklin in the North Sea will be reviewed among others

DAY 5

SECTION 4 KEY LEARNINGS FROM CASE HISTORIES

1.0 Past Examples Illustrating Successes & Failures
2.0 Literature
3.0 Case Histories: HPHT Well Control
4.0 The Problems associated with HPHT Well Control

SECTION 5 YOUR WELL(S) –Q & A

1.0 This se tio allows parti ipa ts the opportu it to disuss what’s i porta t to ou regarding your up-coming well(s). The Trainer will spend as much time as possi le to disuss what is important to you and will give as much advice as possible.

The emphasis during this section will be upon HPHT Well Control / Influx prevention but also what to consider doing should a well control event occur from an Engineering perspective.

The well integrity problem / leak in 2012 which caused the evacuated of the workforce on the Elgin Platform will be discussed from a design issue and operational viewpoint

Contact us

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