Deepwater Challenges

NOIA/NEED Offshore Energy Workshop for Teachers

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Topics

- Schlumberger Introduction
- Industry Outlook
- Finding and Understanding the Reservoir
- Reaching the Reservoir
- Connecting the Reservoir
- Schlumberger—Teaching Young People About Energy
Schlumberger Profile

Providing Products, Services and Solutions that Improve Productivity

Three Business Groups

- Reservoir Characterization
- Drilling
- Reservoir Production

2011 Profile

- Revenue: $39.54 billion
- Net Income: $5.01 billion
- 123,000 Employees
- 85 Countries, 168 Nationalities, 2,200 Locations
- $1.1B in Annual Research & Engineering
Long-Term Energy Mix

Source: IEA World Energy Outlook, 2011
The Big Crew Change Is Happening Now

Petrotechnical Professionals (PTPs) by Age Bracket on a Global Basis

Schlumberger Global new hire requirements in 2012:
- 2,100 Engineers
- 675 Scientists

Source: SBC O&G HR Benchmark 2011, SBC analysis
Recent Discoveries and Frontier Exploration

**US Gulf of Mexico**
- **Moccasin, Chevron**
- 380 feet of net pay

**North Sea**
- **Avaldsnes-Aldous, Lundin/Statoil/Maersk**
- Largest discovery on NCS since mid-80s

**Mediterranean**
- **Aphrodite, Noble (310 ft net gas pay)**
- **Leviathan, Noble**

**Angola Pre-salt**
- **Cameia-1, Cobalt and Azul-1, Maersk**
- Under evaluation

**French Guyana**
- **Zaedyus, Tullow**
- 72 meters of net oil pay

**Barents Sea / Arctic Norway**
- **Havis, Statoil/Eni**
- 48 meters of gas; 128 meters of oil

**Mozambique**
- Multiple, Eni/Anadarko
- Under evaluation

**2012 Exploration Projects**
- **Q4 2011 Discovery**
- **Q3 2011 Discovery**

**Established**

**Emerging**

**Frontier**

Variety of Challenges Drilling in Deepwater

- Storms and hurricanes
- Loop and eddy currents cause vortex induced vibrations and motions to drill strings
- Unpredictable high pressure gas charged stringers and faults near surface
- Mobile/flow-able/dissolvable 10,000' thick salt canopy with unpredictable layers of highly variable trapped sediments
- Unpredictable base of salt – rapid pressure differentials
- “Thief zones” of significantly lower pressure which cause lost circulation – fluid loss
- Ultra-deep reservoir with high temperatures, high pressures and low natural flow-ability
Finding the Reservoir

- Illuminating deep, subsalt targets
- Identifying drilling hazards
- Reservoir properties from seismic data
- De-risking targets, particularly WGOM

Year 2000, Narrow Azimuth, Conventional shoot

Year 2011, Full Azimuth, Coil shoot
Reaching the Reservoir

Drilling Technologies

- Mud Logging
- Drilling Tools
- Drillstring
- Drilling Fluid
- Directional
  - MWD
  - LWD
  - Drill Bit

Modeling and Prediction

Execution Expertise
Connecting the Reservoir

- Upside potential in subsea recovery
- Integration and control of subsea and subsurface technology
- Optimizing the entire subsea production system for the life of the field
Schlumberger Approach to the Subsea Market
Deepwater Lifecycle

Finding

Producing

Connecting

Understanding

Reaching

The Prize

Connecting the Reservoir

Customer
Schlumberger’s Commitment to Education

Through a collaboration with the American GeoSciences Institute (AGI) and the “SWITCH Energy Project”, Schlumberger is bringing new, unbiased energy educational videos and training materials to classrooms around the world.
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Through a collaboration with the American GeoSciences Institute (AGI) and the “SWITCH Energy Project”, Schlumberger is bringing new, unbiased energy educational videos and training materials to classrooms around the world.
These topics, like Deepwater Exploration, are key decisions in our future:

- Affordable
- Available
- Reliable
- Clean

Technology will lead us to making Deepwater Development all four.
Thank you