“Finding Petroleum”
Emerging Deepwater Areas

May 26th 2010
The Geoprober System

Coiled Tubing with internal conductor cable

Portable Handling System

Chartered Mono-hull vessel

Tension Frame

Near Surface BOP (NS-BOP)

7-5/8” Drill-in Casing/ Riser

Acoustic controls

“Geo-SOS” Subsea Shut-off System

Workclass ROV Controls

The Geoprober System
**GEOPROBER DRILLING**

**Bit Size**
- 9-7/8”
- 7” (Bi-centred)
- 4-3/4”

**Casing Depth m (TVD)**
- 7 5/8” – 975 m BML
- 7 5/8” – 20 m BML
- 7 5/8” – Riser to 2,500m WD
- 5 1/2” – 3,810 m BML
- 4 3/4” – 4,570 m BML

**Mudline**

- Casing Drilling with 7-5/8” which also forms the riser to surface
- Drilled with 2-7/8” Coiled Tubing with conductor cable inside
- Depths of 6,000m can be reached with Expandable Liners

*Example Geoprober Well*
Current Geoprober Well

30 t

Geoprober Well Expandable Liners

30 t
Perdido Fold Belt

Mississippi Fan Fold Belt

Mexican Ridges Fold Belt

DSDP Wells

Alaminos Canyon

Perdido Fold Belt

Geoprober Drilling

USA

New Orleans

Houston
With Geoprober, drilling below the Surface Casing starts on Day 3
With a conventional BOP and riser on Day 12

Set Conductor, Surface Casing Riser & BOP

Time Savings - Depth Vs Days

With Geoprober, rapid spooling of coiled tubing speeds up trip times & tool changes, run more Evaluation Tools

Depth vs Days

Depth (BRT - ft)

Days

Seabed

Conventional

Geoprober
### Cost Comparison (2004 well)

#### Conventional

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<th>Description</th>
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<th>Drill &amp; P&amp;A</th>
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**Total Cost** $13,864,702

#### Geoprobe

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**Total Cost** $5,735,364
Total Costs: Conventional = $13.9 mm
Geoprober = $5.7 mm (59% Savings)
Exploration Portfolio
Water Depth vs: Geologic POS & Gross Mean Reserves
August 2002

The Geoprober System
**GeoProber Drilling**

- **Bit**
- **Cuttings Returns**
- **Upper Gripper**
- **Lower Gripper**
- **ROV Interface Plate**
- **13-3/8” casing**
- **Anchored Base**
- **Flexible Pipe**
- **Annular Cutting Tool**
- **Dual Seals**
- **Re-entry hub**
- **13-5/8” Double Shear Ram**

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**GeoProber Shut-off System (Geo-SOS)**
Sea floor
Cuttings Returns

Sea floor

Drilling Ahead
Geoprobe Subsea Shut-off System (Geo-SOS)

- Control Pod (4)
- ROV Interface
- Hydrl Shear Rams
- Lower “Geo-SOS”
- Template
- Return Lines
- 13-3/8” Conductor
- Return Line Ports
- Re-entry Hub
GEOPROBER DRILLING

Manufacture & Test Prototype
“Geo-SOS” - Prototype Trials
Battery Powered Variable Displacement Pumps
Dual "O" Ring in Cutting Wheel in Elongated Piston
Annular Cutting Tool
TMR Logic is a hardware voting system, used in aircraft control. It ensures no spurious signal is acted upon.

Accumulators useable fluid & pressure decline exponentially with water depth. Batteries, & VDP pumps (used in ROV’s) far more energy & weight efficient.

Depending on data transmission or control needed, choice of long & short range high & low bandwidth acoustics links. Also direct ROV interface to ensure high system availability and reliability.

GEO PROBER DRILLING

Triple Modular Redundancy (TMR)  |  Energy Storage  |  Broadband acoustic controls

TMR Logic Diagram

10.5 tons  |  0.5 ton

Green Subsea Controls
Geoprober Handling System

- Tensioner/ Dual winches
- Subsea “Reverse Derrick”
- Moveable Drill Deck
- Transporter
- Tension Frame
- Leader Frame
- “A” Frame Tower (Compensated)
  - Injector deployment
  - Pipe Handler
“Reverse Derrick” Principle

- Enables heavy deepwater loads to be run from a small mono-hull vessel
- Conductor, Wellhead/ Casing Hanger, BOP Rams all run together
- Near Surface BOP (NS-BOP) installed under the vessel & top tensioned
Geo-Tensioners

Specifications

*Main Structure*
- Dimensions: 17m x 17m x 12m
- Total Area: 237m²
- Total Weight: 230t
- SWL: 525t

*Drill Floor*
- Dimensions: 7.2m x 7.2m x 1.6m
- Total Area: 52m²
- Total Weight: 70t
- SWL: 375t

*Heave Compensation System (Active/Passive)*
- Operating Parameters
  - Heave: 6m
  - Velocity: 1m/s
  - SWL: 375t
Tension Frame

Specifications

Tension Frame
Dimensions:
7.1m x 7.1m x 5.3m
Internal Clearance:
5m x 5m
Total Weight: 32t
SWL: 375t

Pipe Handling Structure
Dimensions:
5.8m x 5.8m x 1.6m
Max Pipe Size:
533mm (21in)
Total Weight: 12t
SWL: 375t
Leader Frame

Specifications

Frame Structure
Dimensions:
7.2m x 7.2m x 1m
Internal
Clearance:
5m x 5m
Total Weight: 8t

Locking Pads
Dimensions:
3.5m x 0.4m
Stroke: 100mm

Bellmouth
Special Wear Resistant Material
Max Angle: 10°
“A” Frame Tower

Specifications

A-Frame Legs
Dimensions: 9.3m x 13m x 2.5m
Total Clearance: 6m x 8m
Total Weight: 31t

Tower Centre
Dimensions: 3.2m x 16m x 5.4m
Total Weight: 74t

Passive Heave Compensation System
Operating Parameters
Heave: 8m
Velocity: 1m/s

SWL: 150t