Seafloor Drill Presentation

Autonomous Underwater Technology  October 22, 2015
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Seafloor Drill I (SFD-I)

- Water Depth Rating: 4,000m
- Weight in Air: 8,000kg or 9T
- System Dimensions:
  - $W = 3.8m$, $L = 5.4m$, $H = 6.6m$
- Drilling Specifications:
  - Standard Geotechnical Samplers
  - Sample Diameter = 73mm
  - Fugro In-Situ Testing Tools
  - 80kN Thrust Capacity at 2cm/s
  - Polymer Mud Injection System at 140L Capacity
• Water Depth Rating: 4,000m

• Weight in Air: 7,200kg or 8T

• System Dimensions:
  • W = 4.3m, L = 5.4m, H = 7.0m

• Main Differences:
  • Automatic Carousel Rod Handling System
  • Loading Arm
  • Reduced LARS Footprint
  • Increased Mud Capacity Inside the Carousels
Seafloor Drills

- Ability to pump mud downhole from a vessel-mounted tank to maintain borehole stability in flowing sand formations

- Flexibility to use a crane deployment option in order to reduce mobilization and demobilization durations

- Variety of sampling tools to ensure optimal recovery and data quality in stratified borehole conditions

- Samples remain vertical during recovery back to deck, which limits soil disturbance per AS best practice
• Combines proven drilling and testing technology with Schilling ROV subsea technology

• Few customized components means off the shelf spares availability, reduced maintenance time and an established workforce of skilled technicians

• Schilling telemetry system enables easy integration of additional sensors and tools
The SFDs use patented wireline drilling methods. Advantages include:

- Improved borehole stability by keeping the drill string downhole
- Increased productivity at deeper borehole depths
- Flexibility to alter the sampling and testing program
- Collection of real-time in situ testing data
Patented braided termination achieves 95% strength, which makes the use of a synthetic umbilical possible.

- Neutrally buoyant design and bend restrictor create catenary loop without the need for syntactic floats.
- Being light-weight allows for increased water depth capabilities.
- Allows for heave compensated land outs while the Seafloor Drills are hanging above bottom.
• Four (4) stabilizing jacks and different foot configurations allow for work on very soft seabeds as well as steep slopes

• SFDs have landed on soft seabeds with shear strengths in the order of 1.0 kPa

• SFDs have operated on a maximum slope of 25 degrees
**SFD Vessel Deployment**

**VESEL REQUIREMENTS:**
- DP2 Preferred
- 600m² deck space
- Minimum beam of 16m

*Mid-ship SFD Deck Layout*
SFD Vessel Deployment

*Stern SFD Deck Layout*
SFD-II Control Van
## Recent SFD Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
<th>Water Depth</th>
<th>Scope of Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offshore Geotechnical Site Investigation with SFD-II</td>
<td>North West Shelf, Australia</td>
<td>112m</td>
<td>Drilled a total of 323m with Downhole PCPT and Sampling</td>
</tr>
<tr>
<td>Offshore Geotechnical Site Investigation with SFD-I</td>
<td>Gulf of Mexico</td>
<td>2,923m</td>
<td><strong>WATER DEPTH RECORD FOR A SEAFLOOR DRILL</strong></td>
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<td></td>
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<td>Drilled a total of 62m with Downhole PCPT and Sampling</td>
</tr>
<tr>
<td>Offshore Geotechnical Site Investigation with SFD-I</td>
<td>Gulf of Mexico</td>
<td>1,320m</td>
<td>Drilled a total of 575m with Downhole PCPT and Sampling</td>
</tr>
<tr>
<td>Offshore Geotechnical Site Investigation with SFD-I</td>
<td>Gulf of Mexico</td>
<td>2,250m</td>
<td>Drilled a total of 530m with Downhole PCPT, Sampling and Ball Probe Testing</td>
</tr>
<tr>
<td>Offshore Geohazard Survey with SFD-I</td>
<td>Caspian Sea</td>
<td>600m</td>
<td>Drilled a total of 700m with Downhole PCPT, Sampling, Seismic PCPT and Ball Probe Testing</td>
</tr>
<tr>
<td>Offshore Geotechnical and Geohazard Site Investigation with SFD-I</td>
<td>East Africa</td>
<td>1,600m</td>
<td>Drilled a total of 1,250m with Downhole PCPT and Sampling</td>
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SFD Data Quality

- **Moisture Content Data**
- **Undisturbed Shear Strength Data**
- **Soil Sensitivity Data**

*Graphs showing data points for moisture content, shear strength, and soil sensitivity, with data comparisons for different drilling methods.*
SFD Recovery Data

Net Cone Resistance, $q_{net}$ (MPa)

Depth (m)

ROCK
SAND/Silty SAND
SILT/MUD
SAND/Silty SAND
SILT/MUD
ROCK

Sampled $q_{net}$
Recovered $Bq$

EXN
EXN-f
RC
Shelby
EXN
EXN-f
RC
Shelby
RC
15.20 m to 17.35 m - intermixed CALCARENITE, light grey, fine grained, well cemented, very weak to weak with grey, fine grained, well cemented, weak at 25.05 m - End of Borehole
Thank you!