Pile Dynamics, Inc.
SQUID SYSTEM

Shaft Quantitative Inspection Device
for Drilled Shaft and Bored Hole Inspections

Patent pending
What are some of the methods for inspecting the cleanliness of the bottom of the drilled shaft after the clean out bucket is used?

- Cameras
- Mini-SID
- SID
- “Joe the Construction Worker”
 Inspection Device Examples

• Time consuming
• Deployment is difficult
• Potentially dangerous near open hole
• Still lots of uncertainty
“Joe the Construction Worker”

- OSHA CERTIFICATE FOR CONFINED SPACES
- COSTLY
- DANGEROUS
- UNECESSARY
- RELIABLE???
What Does SQUID Do?

**SQUID** Measures:

- Thickness of debris layer by displacement (max. 6”)
- Cone Tip Pressure on the bearing layer
- Three cone penetrometers with separate depth measurements

- Standard 60° - 10 cm² cones (max. pressure 14 psi/2000 ksf each cone)

Patent pending
• Quickly attaches to Kelly Bar 4”, 6” and 8” adapters
• Quick deployment accelerates inspection and minimizes debris settling from slurry
• Output is cone tip resistance as a function of penetration

Patent pending
Case Study: TIP & SQUID

Location: Pennsylvania
Shaft Details:
• 8 shafts tested
• 36 in. diameter
• 15-16 ft. length
• Wet construction
• Placed via tremie
• Permanently cased to rock

Test Type: Each shaft tested with TIP and inspected with SQUID
SQUID DATA – Before and After Clean out

Failed to meet spec on first 7 tests

Passed on first test after clean out
Temperature vs. Depth Plot

3D Cage View
Debris Layer Thickness

- Debris is suggested to be material with insufficient bearing capacity
- SQUID tip is a circular plate, 1.37” diameter
- Terzaghi
  - $q_u = 1.3cN_c$
  - $\phi=0$, $N_c = 5.7$
  - Threshold Force = $q_u \times A_{\text{plate}}$

<table>
<thead>
<tr>
<th>C (ksf)</th>
<th>$q_u$ (ksf)</th>
<th>SQUID Force (kips)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>3.7</td>
<td>0.04</td>
</tr>
<tr>
<td>1</td>
<td>7.4</td>
<td>0.08</td>
</tr>
<tr>
<td>1.5</td>
<td>11.1</td>
<td>0.12</td>
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<tr>
<td>2</td>
<td>14.8</td>
<td>0.15</td>
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SQUID-S TESTING RESULTS

Project: SALT FORK
Shaft: 1:2
Sequence number: 13

Test Table

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<thead>
<tr>
<th>Depth at 0.15 kips (in)</th>
<th>30003</th>
<th>30005</th>
<th>30004</th>
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</thead>
<tbody>
<tr>
<td>Maximum Penetrometer Force (kips)</td>
<td>3.39</td>
<td>4.43</td>
<td>1.21</td>
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<tr>
<td>Depth (in)</td>
<td>2.47</td>
<td>5.46</td>
<td>2.10</td>
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Collected (UTC): 12/2/2016 10:56:18 AM

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Project: SALT FORK
Shaft: 1.2
Sequence number: 4

Test Table

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<thead>
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<th>30005</th>
<th>30004</th>
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</thead>
<tbody>
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<td></td>
<td>0.53</td>
<td>0.41</td>
<td>0.48</td>
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<tr>
<td>Maximum Penetrometer Force (kips)</td>
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<tr>
<td>Depth (in)</td>
<td>0.81</td>
<td>0.77</td>
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SQUID-S TESTING RESULTS

SQUID-S Version 0.3.5.0
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Other Concerns

• Grooves

• Sidewalls

• Very uneven bottom conditions

• The plate will stop on anything more solid than about 3.5 Mpa (0.5 ksf) shear strength
SQUID TABLET

Size: 12.6” x 9.8” x 2.7”

Weight: 11 lbs.

Display: 10.4” Touch Screen

Video Outputs: HDMI, VGA

Battery Power: 4 Hours
(extra back-up battery pack)

Operating System: Windows 7

Data Storage: 60 GB

Data Ports: Ethernet, 4 USB
The SQUID Provides You With

- Fast Assessment of the Shaft Bottom
- Immediate Quantitative Results
- Depth of Sediment
- Determination of Bearing Layer to compare to the Geotechnical Report
- Quick and Easy Operation of the SQUID
- Allows Safe distance for personnel
- Saves Time with the Ease of Use.
- What is Time? Time is MONEY $$