Instrumented Surface Sub
DOE Project (DE-FC26-03NT41782)

Project Objective

> **To refine and field test the Instrumented Surface Sub, and collect critical drilling data during the field tests to begin development of algorithms to process these critical data so penetration rate can be optimize and BHA life can be maximized.**

What Is Instrumented Sub

- ➢ **Data Collection Device**
- ➢ **Fits In Drill String Below Top Drive**
- ➢ **Measures Critical Drilling Parameters**
- ➢ **Wireless Communications To Computer**
- ➢ **Enhancement To Drilling Performance**
- ➢ **Prevents Damage To Drill String & BHA**

Instrumented Surface Sub

Recorded Drilling Parameters

- **String Weight (Direct Measurement)**
- **Rotary Torque (Direct Measurement)**
- **Rotary Speed**
- **String Vibration**
  - Tri-axial Accelerometer Package
- **Drill String Surface Pressure**
- **Mud Temperature**

Sub Electronics

Sub Specifications

- **Length**   **20 in. Shoulder to Shoulder**
- **Diameter**   **13.5 in. (Cover Flanges)**
- **Top Connection**   **7-5/8 API Box**
- **Bottom Connection**   **7-5/8 API Pin**
- **Power Source**   **Internal Battery**
- **Batter Life**   **(Life 40 to 48 hours)**
- **Communications**   **Wireless (900 KHz)**
- **Transmission Rate**   **38,400 bits/sec**

Sub Specifications (Con't)

- **Max String Weight**   **0-1,300,000 lbf**
- **Max Torque**   **0-100,000 ft-lbf**
- **Pressure**   **0-8000 psi**
- **Temperature Range**   **32-400 $^\circ$F**
- **Max Vibration**   **50 g's**
- **Rotary Speed**   **0-200 rpm**

What Do We Want To Accomplish

- **Improve Drilling Data**
  - Direct measurement vs inferred
  - Better resolution
- **Additional Data**
  - Vibration
  - Trend
- **Present In Meaningful Manner**
  - Useful To Driller
  - Expose Obscure Or Unknown Information
  - Automate Changes In Drilling Parameters

What Do We Need

- **Top Drive Land Or Offshore Rig**
- **Well To Take Data**
- **Baker MWD (Optional On First Test)**
- **Varying Drilling Conditions**
  - Increasing Well Depth
  - Changing Formations
  - Difficult BHA Conditions (e.g. Stick Slip)
- **Space To Setup Computer**

What We Provide

- ➢ **Instrumented Drill Sub**
- ➢ **Expertise To Oversee Installation**
- ➢ **Addition Of VSS^{sm} Service To Baker MWD**
- ➢ **Operator To Monitor & Service System**
- ➢ **Improved Drilling Data**
- ➢ **Drill Graph Services**

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