Mechanized Percussion
Well Drilling

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Project Goals

◇ Obtainable material
◇ Competitive to other drilling system
◇ Cost less than $5,000
Location: Burkina Faso
Clients

Matt & Julie Walsh - Thomas, Tessa, Stephanie, Sarah, & Samuel

Burkinabe Well Drilling Team
2014 Site Trip
Percussion Well Drilling

Hand Drilling

Many people on rope
Why Mechanized?

Reduce effort needed to drill
Mechanized System

Capstan
Current Focus

- Mast and Engine Superstructure
- Drilling Components Manufacture
- Testing and Bit Modifications
Superstructure: Background

Tripod

- Small space underneath
- Driller Location
Superstructure: Current

Mast Advantages

◇ Two person safe assembly
◇ Driller stands close to hole
◇ Obtainable and minimum material
◇ Compact transport
Superstructure: Changes
Transmission

- 3 horse power engine
- Reduces load carried by operator from 120 lb to 5-10 lb
- Size: 3 cubic feet
- Weight: 30 lb
Superstructure: Manufacturing
Transmission: Guard
Testing and Bit Modification

Testing Goals:

◇ Evaluate performance and wear
◇ Analyze data to make design improvements
Depth vs. Time Snapshot
Diabase Rock

Diabase Rock layer at 6 feet

- Not generally present in Burkina Faso.
- Needed to bore through diabase to reach 50ft testing zone
- Rock technology still applicable to sandstone geology
Standard Drill bit

- Simple plus-sign cross-section
- Able to manufacture with client’s in-house shop
Cable Tool Bit Inspiration

Motivation for redesign:

- Extended buttons shatter rock
- Widened cross-section helps put gravel into suspension
Manufactured Imitation
Comparison

12.42 in/hr
12.66 in/hr
Maximizing Depth Over Time

- Increasing slurry viscosity
- Keeping drill bits sharpened
- Minimizing transition between drilling sessions
Drill Bit Loop Failures

- Brittle fatigue failure
- Diabase rock layer increased wear on bit loops
- Uneven attachment contributed to increased fatigue
Solution

- Larger diameter loop
- Attached uniformly to remove stress imbalances
Future work

Test
Superstructure

Site Team
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Questions?