

Mechanized Percussion Well Drilling

Cole Hiduk and Nathan Henry

Introduction

The goal of the Mechanized Percussion Well Drilling project is to develop an engine powered system that reduces the labor required to manually drill shallow water wells, while retaining system portability and low capital investment. Percussive well drilling technology is currently used by our client in Burkina Faso, West Africa, to drill wells that provide access to water during the dry season for agricultural purposes.

- During the past year, the project focused on two items:
1. increasing the life of the capstan., and
 2. redesign of the casing die to improve pipe belling.



Capstan Improvements

During the summer of 2017, a site team was sent to test our drilling rig in Burkina Faso. The team observed that the sandy soil caused significant wear on the aluminum capstan, a critical component of the rig.



To solve this issue, the capstans were repaired and then anodized, which covered the aluminum in an extremely hard coating. However, additional testing indicated this coating was not effective enough to reduce the wear.

A simple wooden capstan was also tested, but it produced enough heat to quickly melt the nylon rope. The team will continue to test alternate solutions until the wear has been significantly reduced.



Casing Die Redesign

Several issues arose while testing the casing die. The previous design did not effectively align the casing and the die, resulting in concentricity and alignment issues between casing sections. The redesigned die includes a guiding section above the bell to improve alignment. The construction of the new die was also improved to increase durability. Hardwood was used for ease of manufacturing, and cross laminated hardwood allowed us to increase the die's toughness and limit cracking.



Left: Previous Casing Die



Right: Redesigned Casing Die

Through testing of the new die, it became apparent that the belled casing is difficult to remove from the die. A casing removal tool was created to solve this issue. As the bolts are turned, the metal ring is forced up, which will push the casing off the die.



The Casing Removal Tool

Clients

Matt Walsh, Open Door Development, SIM

Matt Walsh was the first Collaboratory Manager. He is now a missionary with SIM in Burkina Faso, West Africa.

Joseph Longenecker, Open Door Development, SIM

Joseph Longenecker will be the future liaison between ODD and the Collaboratory.

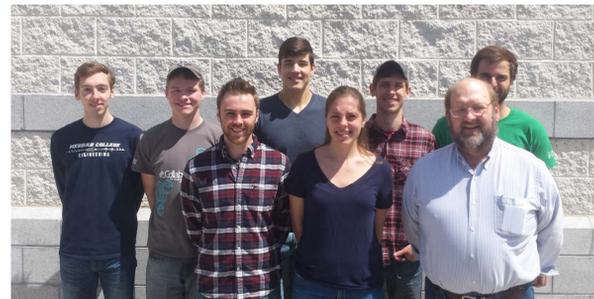
Open Door Development

ODD was officially founded by Dale Johnson and Matt Walsh in 2012 as an SIM community development ministry based in Mahadaga, Burkina Faso. Their mission is to share the gospel by equipping the local church for community service and by ministering to human needs.



Matt & Julie Walsh with their children

Our Team



Back: Nate Henry, Calvin Dunmire, Greg Shirk, Cole Hiduk, Aaron Mishler
Front: John Hannon, Althea Mavros, Prof. Scott Heisey

Conclusions

- **Goal:** Create a mechanized drilling system that reduces the labor required by manual well drillers while retaining the benefits of low capital investment and portability.
- **Progress:** Improved casing die, progressed towards improved capstan
- **Future Goals:** This fall, our team will continue to look for solutions to the capstan wear problem and further test and improve our drilling rig.

Acknowledgements

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- **MVP Panelists:** Doug Flemens, Michael Funck, Damaris Gehman, Andrew Lippert, Amanda Luger, Andrew Parkhurst, Dereck Plante, Jonathan Shenk, Dr. Thomas Soerens, Mr. Bruce Lindsey

