

## PROJECT SITUATION REPORT

### DISC Drill 2012-13 Season

**Project:** T-350-M

**Project Principal Investigator:** Dr. Charles Bentley

**Report No. 4 for period:** 12-2-12 **through:** 12-8-12

**Prepared by:** Kristina Dahnert **Date:** 12-9-12

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#### ACTIVITIES DURING PERIOD

- Disassembled the winch clutch to investigate a noise at certain speeds. No issues were found, the clutch was reassembled with all original parts and the noise is no longer heard. The belt shroud over the clutch area was modified to cover only the clutch as the other half of the shroud was rubbing on the penetration drive pulley.
- Moved the floating crane rail to accommodate easier travel of the cranes
- Assembled borehole camera system. The new LED light ring was found to be too bright and was dimmed by adding a resistor in line on the power line.
- Did several test runs with the borehole camera. Battery life is approximately 2.5 hours and video footage was stunning during the first few runs when the fluid was relatively undisturbed. Also tilted the sonde in 90° intervals with the camera running to ensure the drill can reliably locate the high side of the hole.
- Aligned the core transfer truss
- Fabricated an additional sonde roller for the core transfer truss from spare cable drip pan shroud parts. An additional roller was needed so the core transfer truss could be set up for both one and two meter core barrel configurations.
- Checked bolt torque on the tower, centrifuge and gantry cranes
- Updated the LabView code
- Pulled the fluid hoses and mounted them on the exterior of the Arch.
- Dug out the fluid berm and bulk fluid tanks. Filled both the Isopar K and 141b tanks.
- Prepared the chip hopper pad, placed and hooked up the chip hopper.
- Completed actuator testing just inside the borehole casing to verify the actuators were positioning properly.

- Completed a wide range of bumper testing at 2000 meters depth, the area of the borehole with the highest inclination (approximately 5°). With the broaching cutter and bumper configuration, the drill experienced difficulty on ascent as the cutter is very aggressive and wanted to cut on the way up. This severely limited ascent tripping speeds. After each run, stiffer springs were installed in the bumper pads, ranging from 17N to 92N, but the broaching cutter still wanted to engage during ascent.
- When opening the hole cover during one run as the drill was nearing the surface, cable movement when being pulled away from the cover caused the drill to pendulum in the borehole, thereby causing the aggressive broaching cutter to bite off and recover a small piece of casing, approximately .3" x 3" at a depth of 34 meters. This location was verified by use of the borehole camera and the casing was not found to be compromised.
- To alleviate the ascent issues, a new aluminum cuff and a pump section were machined to hold the cuff up near the pump. The cuff is held in place near the pump section by 4 strings during descent and broaching operations. After broaching operations, the drill cutter motor is rotated, the strings are broken and the cuff slides down the length of the drill and lands on the face of the broaching cutter to shroud the upward facing cutter during ascent. This method proved successful and has greatly increased ascent tripping speeds. We are now able to reach the full 2.0 m/s on ascent.
- Completed the Seasonal Startup Checklist for Arch operations.
- The side entrance to the Arch (a.k.a. the Moose Chute) was fully excavated and is now a working point of entry/egress. Also removed a piece of flooring from immediately inside the Moose Door to allow the door to fully open. There is plywood below the piece removed and the transition in the floor was successfully covered by a large mat.
- Subsequent runs with the borehole camera were completed. While the fluid is now cloudier due to operations in the hole, we are still able to obtain good footage of the borehole wall and chips in the hole.
- Installed a new canvas bulkhead seal around the FED (Fluid Extraction Device) near the core transfer truss to keep the cold air on the refrigerated core processing side of the Arch and to prevent frost from forming on the lead-in cuff for the core barrel.
- Completed a borehole cleaning run with a six screen configuration. 1.75 screens of chips were recovered.
- Relocated tower rollers for ease of use with both the broaching and coring configurations of the drill.
- Instrument section L was replaced by Instrument section J, as there appeared to be a noise issue with section J as the cutter motor would not stay enabled if the pump motor was running. The swap seems to have alleviated the issue.
- Actuator section F was replaced by Actuator section G, as section F was leaking hydraulic oil. Actuator arm forces were recalibrated.
- Arms of the actuator were found to have a little play in them at the location of the nickel pins (fail safe mechanism). One arm was disassembled to ensure the pins were not starting to yield and they appear to be settling in fine.

- Placed nitrogen bottles in the Arch for use with the sonde purge and the centrifuge.
- Completed the first six broaching runs of the season at 3000 meters depth with good success. Cutting force is peaking at 9,000N, a definite increase from what was initially expected when compared with testing performed in Madison over the summer. However, this is not completely unexpected with consideration of the ice fabric encountered at such depths at WAIS Divide. We are now completing two broaching passes per drill run to save time spent tripping in and out of the hole.
- Descent speeds were also increased between runs by removing the upper and lower rings on the actuators. This increased descent speeds from .34 m/s to .76 m/s in the narrower portion of the hole and from .66 m/s to 1.0 m/s in the wider portion of the hole.
- Dave, Jason and Patrick were scheduled to arrive at WAIS on Tuesday, 12/4/12, but were delayed a few days due to weather at both WAIS and McMurdo, finally arriving on Friday, 12/7/12.
- Starting two shifts on Monday and Tuesday of the coming week and anticipate three-shift operations starting on Wednesday, 12/12/12.

## SAFETY

- Don, Elizabeth and Krissy held a meeting with Camp Manager Kaija Webster and Camp Medic Brian Ackerman to discuss Arch emergency evacuation procedures and outline everyone's expectations/roles in the event of an emergency.
- Installed and calibrated the DISC Drill air monitor. The monitor was successfully calibrated for Isopar K and 141b sensing. The oxygen sensor does not function, as was the case during the 2011-2012 season.
- The DISC Drill handheld oxygen monitor is also not functioning properly and a request has been made to McMurdo for two portable oxygen detectors that should arrive soon. Historical data shows that the drilling fluids do not displace oxygen in the Arch and we have a good ventilation and makeup air system in place.

## COMMENTS

### (Problems, Concerns, Recommendations, Etc.)

- The second 225 kW generator is still not operational after failure during the 2011-2012 season. While we only need one for drilling and core processing operations, there is no official backup at this time. Several repair parts arrived in camp this week, but additional parts are still en route from Germany to New Zealand.