



PROJECT SITUATION REPORT

SPICE Project, South Pole Antarctica 2014-15

Project: 8341
Project Principal Investigator: Murat Aydin
Report No: 1 **for period** 11/1/2014 **through** 11/8/2014
Prepared by: Tanner Kuhl **Date:** 11/9/2014

IDDO Personnel on Site: Tanner Kuhl
Josh Goetz
Grant Boeckmann
Elizabeth Morton
Dave Ferris
Shawntel Stapleton
Nick Wipperfurth

ACTIVITIES DURING PERIOD

- 11/1 IDD drill crew departed CONUS
- 11/3 Drill crew arrived in Christchurch, NZ
- 11/4 ECW clothing issued at CDC
- 11/5 Flight from CHC to MCM on C-17
- 11/6 Met with Paul Sullivan and Michael Davis to get status of IDD cargo and SPICE project preparations. Prioritized IDD shipping list provided to Paul Sullivan.
- 11/7 Procured satellite phone and BFC items from MCM. TCN'd cargo for shipment to NPX. Bag drag for flight to NPX.
- 11/8 Flight from MCM to NPX. Remainder of day spent acclimatizing and familiarizing crew with station.

SAFETY

- No safety issues to report.

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- Entire drill crew is in good health.
- South Pole Station readiness and cargo shipments are delayed due to poor early season weather in MCM and mechanical issues with LC-130's.
- Not all requested BFC items were available at time of gear pull. Satisfactory alternatives were found for most unavailable items. Remaining necessary items will first be pulled from NPX as available. Science crew may need to pull additional BFC items when in MCM. Further information will be sent regarding this.
- All IDD cargo is in CHC. Best-case scenario has IDD cargo reaching MCM mid-to-late week of 11/10. Priority IDD cargo expected at NPX week of 11/17 at earliest.
- WAIS core storage racks were re-purposed in MCM and not immediately available for packing for shipment to NPX. A new plan to use site-built brittle ice core storage racks has been circulated for approval. IDDO personnel would oversee construction of these racks using spare IDD construction hardware and lumber. Additional hardware/lumber would likely be necessary from NPX. Final ASC approval has not yet been given.
- IDDO personnel to undergo vehicle and other trainings week of 11/10.
- IDDO personnel will likely assist ASC construction to build drill site infrastructure, excluding the drill/core storage trench. This will involve digging-out buildings stored over winter to be moved to the site, MECC set-up, outhouse construction, etc. The aim is to speed camp construction to be ready for drill/core storage trench and drill tent construction as soon as prioritized cargo arrives on site.



PROJECT SITUATION REPORT

SPICE Project, South Pole Antarctica 2014-15

Project:	8341			
Project Principal Investigator:	Murat Aydin			
Report No:	2	for period	11/09/2014	through 11/15/2014
Prepared by:	Tanner Kuhl			Date: 11/16/2014

IDDO Personnel on Site:	Tanner Kuhl Josh Goetz Grant Boeckmann Elizabeth Morton Dave Ferris Shawntel Stapleton Nick Wipperfurth
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ACTIVITIES DURING PERIOD

- 11/09 South Pole Station Tour by winter site manager
- 11/11 First IDDO cargo arrived at NPX
- 11/12 MECC and fuel tank pulled to drill site
- 11/14 Accompanied station surveyor to drill site to stake drill tent and core storage trench corners. Also flagged the “no drill” zone for future firn-air study.
- 11/15 Snowmobile and light vehicle training
- Drillers have aided ASC construction by digging out buildings to be used at the drill site (Graceland, Duke, MECC) and lumber berms. Drillers also volunteered in the VMF, store, and greenhouse to help speed station start-up.

SAFETY

- No safety issues to report

COMMENTS

(Problems, Concerns, Recommendations, Etc.)

- Delays continue to be experienced in getting Priority1 cargo from MCM to NPX, both IDDO cargo and ASC drill site equipment (generators, etc). More than half of the IDDO cargo delivered to Pole as of 11/16/14 was P2 and P3. Multiple key items are still needed before drill tent construction can begin.
- ASC still does not have final drawings for the core storage trench roof construction.
- The early season bad weather in MCM and the late opening of South Pole station continues to impact ASC support of SPICE project construction.



PROJECT SITUATION REPORT

SPICE Project, South Pole Antarctica 2014-15

Project:	NSF# I-164	UW# 8341		
Project Principal Investigator:	Murat Aydin			
Report No:	3	for period	11/16/2014	through 11/22/2014
Prepared by:	Tanner Kuhl		Date:	11/23/2014

IDDO Personnel on Site:	Tanner Kuhl
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	Dave Ferris
	Shawntel Stapleton
	Nick Wipperfurth

ACTIVITIES DURING PERIOD

- IDD cargo arrived over the course of the week. By weeks end all IDD cargo was checked-in at Pole by ASC cargo, except for the Chem Suits that were sent late. Not all cargo had been seen by IDDO crew since most is still palletized for transport to the drill site.
- Tracked vehicle training was attended in order to drive the PB Scout vehicle.
- MECC bldg. and outhouse were placed at drill site and set-up for use by IDDO crew.
- Drillers assisted station by digging out cargo berms, fuel lines, etc. The sled for mounting the two 50 kW generators was also dug out.
- Attended radio training.
- Shawntel and Grant continued volunteering at the VMF to get snowmobiles and van ready for our use.
- Drillers cored 6 firn cores at the drill trench site and measured density of the cores at various intervals. The data was provided to ASC to confirm that the site compaction was sufficient. Firn density was generally 0.4-0.5 grams/cc down to 3 meters depth.
- Attended an emergency response meeting with the station ERT lead to establish communication procedures in case of an emergency at the drill site.
- Drillers and core handlers volunteered to aid the station custodian organize storage areas and ready temporary housing for a visit by a Russian delegation.
- A variety of meetings and telecons were attended to discuss plans for beginning drill site construction. No construction had begun by the end of the week.
- The 50 kW generators for the drill site arrived from MCM, were mounted on a sled, and pulled to the drill site. A limited amount of wiring was completed by the

end of the week. Power was not yet available at the drill site by week's end.

- 36 drums of Estisol140 were on-site at Pole by the end of the week. A request for an additional 12 drums of Estisol140 and 2 drums of Isopark was sent to ASC cargo and is expected next week. Additional drill fluid will be requested as needed.
- One cargo sled of IDD cargo was pulled to the drill site on Saturday. Most IDDO cargo remained at the station cargo yard at week's end.
- NSF released IDDO from further oversight/inspection, allowing UW supplied equipment to be installed and operated at the drill site for the 2014-15 season.

SAFETY

- No safety issues to report.

COMMENTS

(Problems, Concerns, Recommendations, Etc.)

- Cargo prioritization was not followed by MCM cargo. This ended up not having an impact due to the other delays that kept any drill site construction from happening this week.
- Van was found to have a bad master brake cylinder. Waiting on parts.
- ASC drawings for the core storage trench roof are still at 90%. Final approval is expected early next week. Construction will not begin until this approval is given by NSF.
- Station was still not fully operational for the summer season by the end of the week. ASC personnel remained in short supply to aid in SPICE preparations due to needs of station opening, etc.
- Snowmobiles with sleds and van were not fully available for SPICE use by end of week.



PROJECT SITUATION REPORT

SPICE Project, South Pole Antarctica 2014-15

Project:	NSF# I-164	UW# 8341		
Project Principal Investigator:	Murat Aydin			
Report No:	4	for period	11/23/2014	through 11/29/2014
Prepared by:	Tanner Kuhl			Date: 11/30/2014

IDDO Personnel on Site:	Tanner Kuhl
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	Shawntel Stapleton
	Nick Wipperfurth

ACTIVITIES DURING PERIOD

- Aided in transport of IDD cargo from Station to the drill site.
- 46 drums of Estisol140 arrived over the course of the week.
- 953 loader (Felicia) was brought to the drill site for the season.
- Organized the MECC with a break/eating area and shop space.
- Wiring was finished and power established to the MECC from the ASC 50 kW generator. The 3000 gallon fuel tank was pulled into position and a fuel pump installed for refueling the generators and MECC furnace tank.
- The tent footing was installed on 11/25.
- Main drill trench was excavated on 11/26 with a D6.
- Assembled drill tent frame on 11/27.
- ASC carpenters installed bulkhead wall between drill trench and core storage area, along with the first section of core storage trench roof.
- Drill tent fabric and ridge vents/fans were installed on 11/28. Pulled the drill tent into place over the drill trench with aid of a D6. Staked and bermed snow against the tent to secure. Tent installation was very similar to the Greenland Test.
- Began installing geoblock flooring to stabilize the sugary snow in the drill trench bottom.
- Set the winch/tower footing, slot rim board, and core pull-out table footing.
- Installed electrical panels and transformer in the drill trench.
- Installed one set of stairs into the drill trench.
- Thanksgiving dinner was held on 11/29.

SAFETY

- No safety issues to report.

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- The drill tent fabric shrunk considerably more in the colder temperatures of South Pole (-40 to -35 F so far). The length of the main fabric cover was adequate to provide about 3 inches of overlap of the end walls, which appears sufficient. However the width of the main cover was reduced to the point that the snow valance on the sides of the tent barely reaches to the tent footing along much of the length of the tent. It proved impossible to tension the cover by hooking the base cable on the side under the base frame tabs due to this, and because shrinkage of the fabric along the long axis resulted in misalignment between the cut-outs in the fabric at the base cable and the base frame tabs. Our immediate fix was to secure the base cable to the base frame tabs with P-cord and heavily berm the tent sides with snow. This appears to be sufficient at least for now, but this may need to be reevaluated prior to winter. At least one small tear was made to the fabric at the base cable reinforcement attempting to tension the cover.
- Core storage trench was not fully excavated at the same time as the drill trench. The plan is to now use an excavator to dig the remainder of the core storage trench this coming week.



PROJECT SITUATION REPORT

SPICE Project, South Pole Antarctica 2014-15

Project:	NSF# I-164	UW# 8341		
Project Principal Investigator:	Murat Aydin			
Report No:	5	for period	11/30/2014	through 12/6/2014
Prepared by:	Tanner Kuhl		Date:	12/7/2014

IDDO Personnel on Site:	Tanner Kuhl
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	Dave Ferris
	Shawntel Stapleton
	Nick Wipperfurth

ACTIVITIES DURING PERIOD

- Excavated slot for drill tower with shovel and chainsaw.
- Electrical power was established to the drill tent.
- Set winch/tower base and installed cable drum in winch.
- Constructed control room structure and ERV with ducting and heaters.
- Installed control box and operators console. Routed all cables.
- Assembled tower sections and crown sheave assembly. Adjusted tilt-limiting switches and rests.
- Built an entry landing at the man-door on the core storage trench end of the tent.
- Installed handrails around slot and entry landings.
- Completed laying geoblock on the drill trench floor.
- ASC carpenters and HEO completed the core storage trench, except for stairs connecting it to the drill trench.
- Slot and centrifuge ventilation were installed.
- Hoses were run from centrifuge and drilling fluid drum staging area into the slot.
- Installed core processing tables, tray rails, drip pans, chop saw, FED, vacuum, and hoses.
- Installed core pull-out table.
- Assembled drill sonde on tower and verified correct operation.
- Confirmed correct operation of Labview-based drilling data logging program.
- Assisted science team in collecting two 10-meter firn cores from the surface.
- Received a van and 2nd snowmobile for use in commuting between station and the drill site.

SAFETY

- No safety issues to report.

COMMENTS

(Problems, Concerns, Recommendations, Etc.)

- Found an electrical short in the operators console that initially prevented operation of the tower actuator, etc. The short was isolated and correct operation of all drill system controls restored.
- The tower actuator appeared to be making contact with the back of the tower when the tower was tilted to near vertical. Some material was removed from the back of the tower to reduce the interference of the two components. No damage appears to have occurred.
- A minor electrical issue in the control box was found and eliminated by bonding the ground and neutral bars in the 480-volt electrical panel in the drilling tent.



PROJECT SITUATION REPORT

SPICE Project, South Pole Antarctica 2014-15

Project:	NSF# I-164	UW# 8341		
Project Principal Investigator:	Murat Aydin			
Report No:	6	for period	12/7/2014	through 12/13/2014
Prepared by:	Tanner Kuhl		Date:	12/14/2014

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ACTIVITIES DURING PERIOD

- Began dry coring of the pilot hole. Reached approx. 80 meters depth on 12/13. Core quality has consistently been excellent or very good. 2 meter cores and 100% core recovery on the first attempt have been the norm.
- ASC completed stairs from drill trench to core storage trench. Installed lights in core storage trench.
- Completed set-up of centrifuge control.
- Organized empty cargo cases to store for duration of project.
- Completed various tasks to prepare for reaming, casing setting, and wet drilling.

SAFETY

- No safety issues to report.

COMMENTS (Problems, Concerns, Recommendations, Etc.)

- Air compressor has an issue with the check-valve. Devised a work-around to continue using it. Also have a spare available from Station if needed.
- Experienced a major electrical control issue on 12/9 which required until midday on 12/12 to diagnose and repair. The control issue was traced to a damaged circuit board in the operator's console. The spare circuit board available also proved to be damaged. The ultimate cause of the circuit board failures continues to be investigated and additional circuit boards have been prepared and shipped from Madison. A workable solution to by-pass the circuit board for winch control was devised and implemented with good success. The work-around has had only minor impact on drill cycle times and could be used for the duration of the season if necessary. Winch control is excellent, as is core quality.

PROJECT SITUATION REPORT SPICE Project, South Pole Antarctica 2014-15

Project:	NSF# I-164	UW# 8341		
Project Principal Investigator:	Murat Aydin			
Report No:	7	for period	12/14/2014	through 12/20/2014
Prepared by:	Tanner Kuhl			Date: 12/21/2014

IDDO Personnel on Site:	Tanner Kuhl
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ACTIVITIES DURING PERIOD

- Continued dry coring down to approx. 160 meters below surface. Discontinued dry coring at this depth due to decreasing core quality and length.
- Completed 130mm ream down to 141 meters to prepare for possible use of 130mm cutters for wet coring.
- Began 7-inch ream of the pilot hole. Reached approx. 14 meters depth by end of day Saturday.
- Began preparing to switch to 2 drilling shifts beginning Sunday evening. First shift will work 7am to 5 pm and 2nd shift will work 9pm to 7 am.
- Replacement console and control box circuit boards arrived from Madison.

SAFETY

- On 12/16 the drill sonde landed on the side of the hole cover assembly during descent for the next coring run. This was not immediately noticed by the operators, resulting in enough cable being payed-out to cause the sonde to begin to tip toward the control room. The operators noticed the problem at this point and immediately began paying-in cable which, due to the angle of the sonde, caused the cable to come off the crown sheave and wedge between the sheave bearing and the side support member of the sheave assembly. Winch payout was not ceased quickly enough, and the damaged cable snapped where it was caught in the sheave assembly. The sonde remained suspended at a slight

angle, hanging from the pinched cable. A backup strap was quickly put in place to secure the sonde from slipping, and a series of ratchet straps were used to hoist the drill back to position on the tower so that the tower could be lowered to horizontal. Electrical power was not energized to the sonde during the incident. No injuries resulted and the damage was quickly repaired. Operational errors that lead to the incident were reviewed, and additional safety procedures were put in place.

COMMENTS (Problems, Concerns, Recommendations, Etc.)

- Cable bearing became very stiff rotationally. Loosened pre-load on angular contact bearings, removed energizing springs on shaft seals, and eventually removed the seals entirely. Removing the seals seemed to help appreciably. Cable bearing now rotates freely after the drill has been on the surface between coring runs. It is somewhat stiffer after returning from a coring run, but still acceptably free rotating. Does not appear to be clogging with chips in the dry borehole. There is reason to believe the bearing is stiffening considerably at borehole temperatures during coring runs (see below). Seals will be replaced before beginning wet coring.
- Original electrical control issue reoccurred, whereby the Sorenson power supply began outputting approx. 50 volts to the drill motor regardless of the position of the drill directional toggle switch or the console potentiometer. It appears further degradation of the console circuit board is responsible. Established a procedure to manually put the Sorenson power supply in standby mode whenever drill rotation is unwanted. Coring and reaming has proceeded well with this procedure in place.

- Back-up generator at drill site will not start, likely due to an electronics issue. Parts are on order from MCM but have been delayed getting to SP. Generator currently running is overdue for a PM service.
- Communication between LabView and the Sorenson power supply drops frequently. The cause is unknown and is being investigated.
- Lower valve on hollow shaft seized. Found galling between rotating parts. Stoned all surfaces smooth and locked valve in the closed position for duration of dry drilling.
- Beyond firn-ice transition the chip transport rate away from the coring head appears to not be keeping up with the chip production rate at the head. This manifested itself in jamming core dogs, cores stuck in core barrel, greater amounts of chips on top of recovered cores, and possibly in the coring head seizing in the hole and spinning the AT blades (see below). Pitch was decreased from 3mm to 1.5 mm with no significant improvement. Dry coring was ended due to this issue.

- Most coring runs displayed an unusual spiking cable tension of approx. 120 N magnitude from 1.2 to 1.8 meters into the run. The spiking cable tension did not respond to increasing winch payout and was usually accompanied by increased AT slip sensor indications. The only successful strategy was to decrease the winch payout slightly and let the tension gradually decrease. On runs that displayed this tension spike the coring head would usually be packed with chips, the core dogs would often be jammed with chips, chips would occasionally still be stuck to the outside of the outer barrel above the coring head, core breaks were occasionally much higher than expected (>4000N), and the core would often be stuck badly in the core barrel. The most plausible theory at this point is that chips are accumulating around the head and outer barrel to the point that the coring head seizes rotationally, which slips the AT blades. We see some increased AT slip sensor activity, but not enough to indicate badly slipping AT blades. It appears that the cable bearing may be partially seizing due to cold borehole temperatures, and if so, the AT blades could be slipping and winding up the cable enough to register as a tension spike at the crown sheave without the AT slip sensor indicating significant AT slip. If this is occurring it would explain the tension anomalies, and could also explain how the proposed chip jamb clears (core barrel is still transporting chips but no additional material is being created at the head) and allows the tension spike to recover. Some evidence of increased borehole diameter has been indicated by reduced WOB during descent in deeper sections of the borehole. This theory is not conclusively proven, but a better one has not been found so far.
- The theorized slipping of the AT blades caused us to consistently tighten their preload over the course of several days, from a starting setting of 58mm up to 65mm. At the higher setting an instability began developing during tripping at moderate to high speeds resulting in the cable whipping violently between the sonde and crown sheave. At first we believed the borehole wall had been wallowed badly by AT slip. 130mm reaming with the conical tool was begun to smooth the borehole wall. This did not improve the tripping instability. Testing was done on the spare AT section to get a visualization of how the AT blades responded to various pre-loads when deformed to borehole diameter. It was conclusively demonstrated that pre-loading the blades beyond approx. 58mm resulted in deformation in the blade that could cause a vibrational resonance under tripping conditions. The AT preload was reduced to the 58mm setting for future runs, which eliminated the tripping instability and resulted in no more AT slip sensor indications.



PROJECT SITUATION REPORT SPICE Project, South Pole Antarctica 2014-15

Project:	NSF# I-164	UW# 8341		
Project Principal Investigator:	Murat Aydin			
Report No:	8	for period	12/21/2014	through 12/27/2014
Prepared by:	Tanner Kuhl		Date:	12/28/2014

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	Nick Wipperfurth

ACTIVITIES DURING PERIOD

- Completed 7 and 9-inch reaming of the pilot hole and set the casing. Casing shoe sits at 130 meters from the surface.
- Re-tensioned the tent cover on a warm, windless day. The cover tension is significantly improved, however it can still not be fully secured as intended by the manufacturer due to fabric shrinkage and stiffness in the cold. It should be adequately secured now to withstand winter conditions.
- The electrical control system was tested further according to instructions sent from Madison. Everything checked OK and a new console circuit board was installed. Normal function was restored, with only a few small issues remaining.
- Improved stability of the LabView connection to the Sorenson power supply.
- Completed various installations to prepare for coring with Estisol140.
- Added enough fluid to the borehole to fill it to just below the firm-ice transition. It will be kept here until the casing shoe seals have had time to fully swell.
- Began wet coring on 12/26.
- Coring has proceeded to approx. 185 meters from the surface.

SAFETY

- No safety issues to report.

COMMENTS (Problems, Concerns, Recommendations, Etc.)

- Coring success has been modest and inconsistent so far with Estisol140 in the borehole. Approximately 20 meters of 2 meter cores were drilled initially, but the vast majority of coring runs now end after 30-70cm (usually closer to 30cm). Drill motor current is generally 1.6-2.5 amps during the run. WOB increases quickly

unless payout is kept extremely low. Started with 4mm shoes but have quickly come down to 1.5mm pitch, with most runs requiring significant time spent at approx. 0.7 mm/s payout to avoid rapid WOB increases. If WOB is allowed to increase with payout around 1.5mm (theoretically on the shoes), drill motor current will rapidly increase until either the Sorenson current limit is reached or the AT blades will slip. AT slip is clearly being indicated by the AT slip sensor. AT blades have been set at various preloads, with the best success at 64mm so far for wet coring. Core Quality has consistently been good to excellent.

- Hole was baled after about 20 meters of wet coring. Removed about 6 meters of chips in the baler. Hole was cleaned of chips before Estisol140 was added at the beginning of wet coring. Coring success did not improve after baling operation.
- Issues with cable bearing stiffness continue. Bearing assembly rotates stiffly with seals installed (energizing springs removed), especially upon return to surface from a coring run. Chips are not getting inside the assembly when seals are installed (confirmed clear fluid inside bearing housing). Preload on bearings has been adjusted repeatedly with no significant effect. Only solution so far has been to remove the seals, which allows the bearing assembly to rotate freely but also allows chips to enter and clog the bearings (Greenland test situation). This has been mitigated by flushing the bearings before each run with ethanol and then removing the ethanol/water solution from the bearings with Estisol140. This has been mostly successful at keeping the cable bearing freely rotating since implemented. Cable torsion could clearly be felt in the cable during coring runs with the seals in the cable bearing assembly. No torsion is felt in the cable so far with the seals removed and the ethanol/Estisol140 flushing protocol.
- Chip transport appears to be a major contributing factor to coring difficulties. Packed chip passages in the coring head have been evident even with wet drilling. Apparent chip blockages occur even with extremely low feed rates. Multiple booster positions have been tried with no change in performance.
- AT slip, combined with chip transport problems, is also severely limiting coring progress.
- Conical tool with chip plugs was unsuccessful at recovering chips from the bottom of the borehole – AT blades slipped when conical tool blades were engaged in the chips.
- Back-up generator was repaired and used for several days until it developed another issue, requiring us to switch back to the other generator. Work continues to diagnose the problem. A spare generator may be flown in from McMurdo.



PROJECT SITUATION REPORT SPICE Project, South Pole Antarctica 2014-15

Project:	NSF# I-164	UW# 8341		
Project Principal Investigator:	Murat Aydin			
Report No:	9	for period	12/28/2014	through 1/3/2015
Prepared by:	Tanner Kuhl		Date:	1/4/2015

IDDO Personnel on Site:	Tanner Kuhl
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ACTIVITIES DURING PERIOD

- Cored to just over 300 meters below the surface. Core quality has been consistently very good to excellent.
- Steady improvements in drilling stability and core length per run have been achieved. Normal core length per run has increased to about 2-meters.
- Baling chips from the fluid is being done approximately every other day in order to improve coring consistency and stability.
- Step cutters are being made at the science machine shop.

SAFETY

- No safety issues.

COMMENTS (Problems, Concerns, Recommendations, Etc.)

- Mechanical problems with the drill continue, decreasing the amount of time available for coring.
- AT slip continues to be a major issue. Payout speed must be constantly adjusted to limit AT slip.
- The cable bearing assembly continues to be unreliable. Various attempts have been made to free the rotation of the sealed assembly with no success. Significant cable torsion and unstable drilling have resulted from all attempts to use the cable bearing assembly with seals installed. The unsealed cable bearing assembly is continuing to be cleaned with ethanol/E140 between runs but is occasionally becoming stiff.
- Reverse rotation was lost in Motor Section I after several days of normal operation. Motor Section II was installed and normal operation restored.
- All 126mm cutters have been used. All sets have damage to the corners of the cutting edge. Outside corner damage is likely from the casing. Inside corner

damage is less extensive, but potentially more problematic. The only theorized cause is from the core push rod. Operators have been instructed to be extremely careful. Re-sharpening of the cutters does not remove this damage, but does seem to help reduce WOB for several runs following.

- A functional back-up generator is still not available at the drill site. Work continues to make operational one of the two back-up generators currently at Station.



PROJECT SITUATION REPORT SPICE Project, South Pole Antarctica 2014-15

Project:	NSF# I-164	UW# 8341		
Project Principal Investigator:	Murat Aydin			
Report No:	10	for period	1/4/2015	through 1/10/2015
Prepared by:	Tanner Kuhl			Date: 1/11/2015

IDDO Personnel on Site:	Tanner Kuhl
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ACTIVITIES DURING PERIOD

- Coring depth is approx. 465 meters below the surface.
- Core quality has remained consistently high, but with some additional breaks occurring due to increasing brittleness.
- Two sets of 126mm cutters were modified into Step Cutters of the Danish design. Coring stability, speed, and chip size were immediately much improved. A consistent penetration rate of 3 mm/s is now possible and drill turn-around on the surface is somewhat faster with the larger cuttings size. AT blade slip is less frequent due to lower cutter torque.
- Bailing is being done every 2nd shift to prevent accumulation of cuttings in the fluid interfering with stable coring and possibly sticking the drill. There has been 4-6 meters of material brought up in the bailer on average each day.
- The fluid level is being kept just below the firn-ice transition in order to conserve drilling fluid. Fluid loss rate is currently 25-29%, depending on the density of E140 used in the calculation.
- Two Air Force pallets containing 320 meters of core were transported to McMurdo on a cold-deck flight accompanied by Murat Aydin.
- Designed and procured lumber for the brittle ice storage rack in the core storage trench.

SAFETY

- No safety issues to report.

COMMENTS (Problems, Concerns, Recommendations, Etc.)

- Damage to cutter corners and rapid dulling continue to be problems, even with the step cutters. The damage appears to be coming from normal cutting of the ice.

- The surface finish of cores drilled with Step Cutters is inferior to standard cutters, with mild helical striping apparent. Depending on the cutter set the striping is up to 0.5mm deep. Step Cutters with a full-height inner cutter edge have less pronounced striping.
- Core dogs are becoming increasingly damaged as core break tension has increased (7-11 kN consistently). Two regular core dogs are unusable and 3 have significant corner chips.
- AT blade slip continues to occur too frequently. Parts are in the machine shop waiting to be modified to offset the blades slightly in hopes of improving their torque-holding capacity.
- Cable bearing seizure continues to occur occasionally, although procedures to mitigate the problem have been improved.
- Hollow shaft valves continue to gall and seize occasionally, requiring disassembly to clean.
- LCI-90i screen freezing occasionally.
- Drillers complain of prolonged headaches, burning eyes, and irritated throats from working in the drill trench and control room for extended periods. This, despite the relatively low readings recorded by the PID.
- Ran out of disposable nitrile gloves and had to procure more from Station.
- Getting about 2 weeks per pair of Dailove gloves, which swell considerably but do not seem to lose strength. Appear to shrink somewhat after drying in the glove box. Green nitrile gloves are not useful – too small, stiff, and cold.



PROJECT SITUATION REPORT SPICE Project, South Pole Antarctica 2014-15

Project:	NSF# I-164	UW# 8341		
Project Principal Investigator:	Murat Aydin			
Report No:	11	for period	1/11/2015	through 1/17/2015
Prepared by:	Tanner Kuhl			Date: 1/18/2015

IDDO Personnel on Site:	Tanner Kuhl
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	Shawntel Stapleton
	Nick Wipperfurth

ACTIVITIES DURING PERIOD

- Coring depth is approx. 624 meters below the surface.
- Drill behavior and core production were consistent with recent weeks.
- Bailing continues every 2nd shift with a consistent amount of material recovered each time.
- An additional set of step cutters was machined and put into service.
- Modifications to one AT section to allow for offset blades were completed. The offset AT blades will be tested next week.
- Began a chip volume study to determine the chip loss rate from the drill. Also hope to establish whether AT slip is creating fine ice shavings and contributing to the bailed volume.
- Measured remaining E140 volume in chips after centrifuging at approx. 15%. Centrifuged bailing chips contain approx. 23% E140 by volume.
- Packed approx. 280 meters of core on 2 air force pallets for retro to MCM. The cold deck flight was canceled and the cores were stored over the weekend under a steel arch near the cargo berms. Temps have been remaining around -28C.
- Built a rack to store brittle ice over winter in the core storage trench.
- Began treating ice as brittle at 619 meters from the surface.

SAFETY

- No safety issues to report.

COMMENTS (Problems, Concerns, Recommendations, Etc.)

- The AT slip sensor has become increasingly unreliable. Rapid, false indications are observed on every drill run. This includes multiple runs where the contact reed on the sensor was bent or broken and could not possibly have contacted the tie-rods on the AT section. There is no indication of excessive AT slip from

WOB/motor current or cable torsion (although the cable bearing appears to be working more reliably).

- Step Cutters continue to sustain damage to cutting edges on all cutters, especially at the corners. The step cutters do seem to remain usable longer than the standard design.
- The phasing on the repaired generator was opposite of the previously run generator. This caused the FED blower motor to unexpectedly run backwards when started, expelling a cloud of E140 vapor and ice chips out the vacuum hose. The FED cable was rewired to restore correct rotation direction and the back-up generator wiring was switched to match the current generator.
- Winch gearbox began to have a resonant noise when descending at 0.3 – 0.65 m/s. The noise is similar to when the helical bevel gear is run without any load on the output shaft, however hundreds of Newtons of tension are on the drum at all times.
- LCI-90i freezing briefly on drill descent more frequently as depth increases.



PROJECT SITUATION REPORT SPICE Project, South Pole Antarctica 2014-15

Project:	NSF# I-164	UW# 8341		
Project Principal Investigator:	Murat Aydin			
Report No:	12	for period	1/18/2015	through 1/24/2015
Prepared by:	Tanner Kuhl		Date:	1/25/2015

IDDO Personnel on Site:	Tanner Kuhl
	Josh Goetz
	Grant Boeckmann
	Elizabeth Morton
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	Nick Wipperfurth

ACTIVITIES DURING PERIOD

- Concluded coring for the season with a final hole depth of 736 meters below the surface. Core quality remained very good to excellent, with slightly more pronounced brittle behavior in the final days.
- Tested the AT Section that was modified to offset the blades slightly for better torque-holding capacity. No significant difference was noted, although it has become difficult to discern actual AT slip from erroneous indications from the AT slip sensor.
- Bailed the hole with both the course and fine filter socks after the last core was drilled. Significant quantities of grayish, fine-grained sludge were removed with the fine filter sock.
- The drilling fluid level was raised to 75 meter from the surface. The level will be monitored daily to establish whether the casing seams and/or shoe are sealing fully.
- The 2nd cold deck flight with ice cores made it to MCM in time to ship to NICL on the vessel.
- A reporter and videographer from the Antarctic Sun visited the drill site.
- Disassembled sonde components and moved them into the Graceland building to dry over the weekend in preparation for shipment back to IDDO.

SAFETY

- No safety issues to report.

COMMENTS (Problems, Concerns, Recommendations, Etc.)

- The sonde was “floated” on descent on at least one run. The problem stemmed from an unexpected offset in the load pin tension reading, causing the Effective Drill Weight (EDW) on LabView to read higher than actual. No knotting or kinking of the cable was noted.

- The hanging weight of the sonde on the tower has varied between 800 and 1400 N at various times during the season. Actual value should be around 960 N.
- LCI-90i freezes and blips have continued during descent and coring. The problem has not been noticed on ascent.
- The Cable Tension line on the LabView graphical display has become increasingly “fuzzy” over the course of the season, indicating a regular variation in the signal from the load pin. The frequency of this variation matches exactly the rotation frequency of the crown sheave.
- Continued to break core dogs, including one run where two core dogs were broken.
- Coring penetration rate decreased to between 0.8 and 1.6 mm/s toward the end of the season as the last set of step cutters began to dull. The last set of unmodified 126mm cutters was tried again but without any improvement in penetration rate.



PROJECT SITUATION REPORT SPICE Project, South Pole Antarctica 2014-15

Project:	NSF# I-164	UW# 8341		
Project Principal Investigator:	Murat Aydin			
Report No:	13	for period	1/25/2015	through 1/31/2015
Prepared by:	Tanner Kuhl		Date:	2/1/2015

IDDO Personnel on Site:	Tanner Kuhl
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ACTIVITIES DURING PERIOD

- Packed cargo for COMAIR shipment back to Madison.
- Packed DNF cargo to be stored at SP over the winter.
- Prepared drill tent interior for winter.
- Assisted ASC equipment operators in moving drill site buildings to winter locations and crates to berms.
- Packed BFC items for return to MCM.
- Laundered drill suits and thermals.
- Flew from SP to MCM on 1/30

SAFETY

- No safety issues to report.

COMMENTS (Problems, Concerns, Recommendations, Etc.)

- The casing is not sealing, either at a seam or at the terminal shoe. The fluid level started at about 78 meters below the surface on 1/26 and had dropped to 87 meters on 1/28, the last day it was checked.
- A large rip was created in the main tent cover above the guying loop on the downwind end when attempting to secure the tent for winter. The rip was repaired with a length of cargo strap webbing and the speedy-stitcher. The plan to secure the tent with guylines attached to the end guying loops was abandoned.