

## IceCube Project Monthly Report June 2005

### Accomplishments

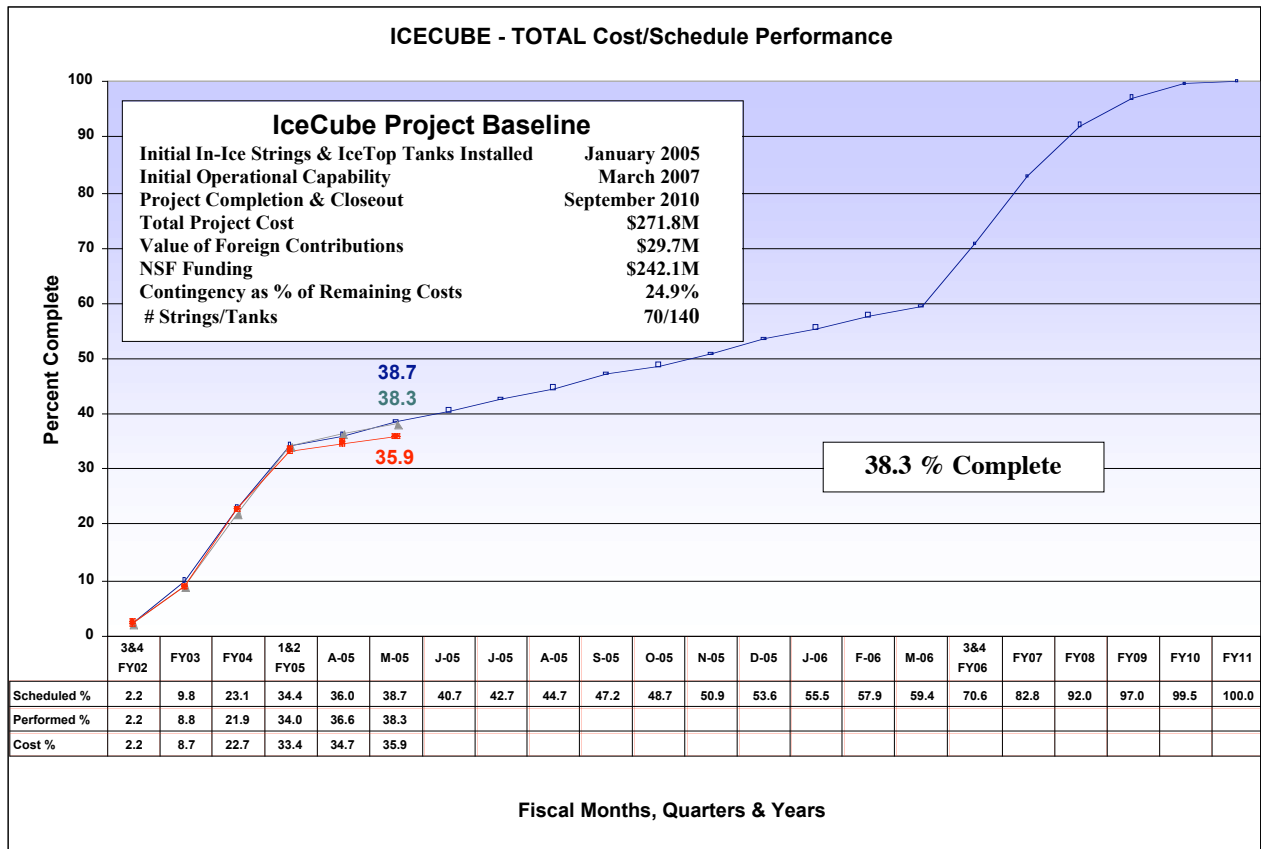
All DOMs installed at the South Pole continue to produce physics quality data (60 DOMs in the ice and 16 DOMs in surface tanks). Faculty and students at collaborating institutions are analyzing data from down-going muon events and data from AMANDA neutrino events in an effort to verify that the instrumentation installed meets performance requirements.

Production of cables at vendors and DOMs at the production sites (UW-Madison, Stockholm University, and DESY-Zeuthen) is underway. The project has produced over 500 DOMs out of over 900 planned for this year. Final Acceptance Testing in dark freezers is in progress. Production and testing rates are close to schedule and all DOMs accepted meet specifications.

A training program for IceCube drillers and string installation staff is planned for August 15<sup>th</sup> – 26<sup>th</sup> with August 22<sup>nd</sup>-23<sup>rd</sup> devoted to string deployment training.

The initial IceCube population plan that includes individual names and deployment dates for the South Pole 2005/2006 season is now available. The plan plateaus at roughly 45 persons during most of the season (excluding Raytheon direct and indirect support personnel). Significant trimming was needed to fall within the planning targets previously agreed upon with NSF.

The report from the NSF Annual Progress Review of the IceCube Construction Project was received and a formal response is in preparation.



**Cost and Schedule Performance** – The project is roughly 38% complete when measured using earned value measurement techniques. The measurement includes all tasks completed to date such as design and development, procured materials, and the construction of the infrastructure that supports the current seasonal installation plan, e.g., the hot water drill, cargo shipments, etc. The detailed plan for Project Year 4 (April 1, 2005 – March 31, 2006) is approved and incorporates changes to the detailed performance baseline for the duration of the project. These changes resulted in an assignment of contingency to the budget baseline for work scheduled. There is no change to the total project cost baseline or completion schedule. The remaining contingency is adequate to address the remaining cost and schedule risk. The cumulative percent scheduled, cost percent, and percent complete are all reduced by a small fraction relative to the previous month’s plan as a result of the detailed baseline changes.

**Drill Construction and Operation** – The program of improvements to the reliability of the hot water drill is nearing completion at the University of Wisconsin’s Physical Sciences Laboratory with completion planned by the end of August. Final acceptance tests of the new sections of hose will be completed in July at the vendor’s factory in Italy. The fabrication of strain relief coils that will be placed at the hose joints is underway, along with new crescents for the second tower plus a spare. The coils will eliminate the potential for deformation of the hose, so called “necking,” under full loading. There is excellent progress on writing operations procedures for the drill. The goal is to install ten strings next season according to the following plan:

- Set up the drill camp and prepare for the start of drilling by December 10<sup>th</sup>.
- Drill and install strings over seven weeks (December 11<sup>th</sup> – January 28<sup>th</sup>).
- Improve the drill speed to enable higher hole production rates in future seasons.
- Install 2 strings per week with a total of 12 strings possible at this rate.

The work for this summer was prioritized into three categories: work we must complete before the next season, work we should do to enhance the chances of successfully drilling ten holes, and work that would be useful, but not essential. All work in the first two categories is on track for completion prior to the next season of drilling.

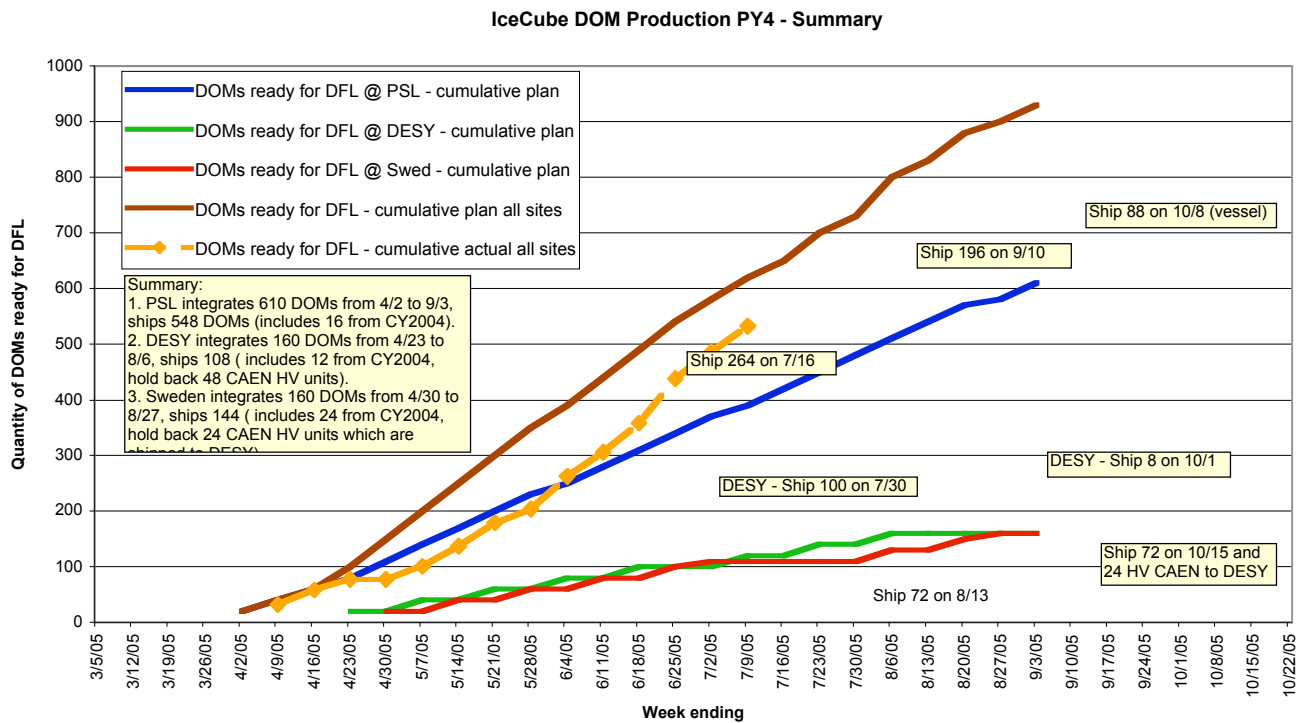
There is a significant increase in effort directed toward understanding the current performance limitations in the drill. HyTech, a company based in Santa Fe, is producing a thermal model that can be used to model the performance of the drill and to evaluate the sensitivity of the drill performance to various parameters including drill speed, drill head design, etc. A report is due by the end of July. A drill workshop will be conducted the end of July. A number of experts are invited with the prospect of forming a standing drill advisory panel. The outside experts include:

Drilling	Hermann Engelhardt - Caltech/Kamb-HW drill, Neil Humphrey (Humphrey/Echelmeyer) – Wyoming, Will Felckenstein - Colorado School of Mines
Engineering	Fred Best, Technical Director, UW Space Sciences, Alex Shturmakov, ICDS
Industrial Process	Randy Hamburger, Natural Gas Production
Software	Bill Hibbard, Retired SSEC
Safety	Keith Burdick - UW Safety

**Instrumentation Production, Testing, and Shipping** – The production goals for this calendar year are to produce 16 surface-DOM cables, 16 surface cables, and 930 DOMs. Approximately 800 DOMs and all cables will be sent to McMurdo Station with over one hundred DOMs sent by the supply vessel. More than 500 DOMs are already produced with roughly 400 DOMs in final acceptance testing.

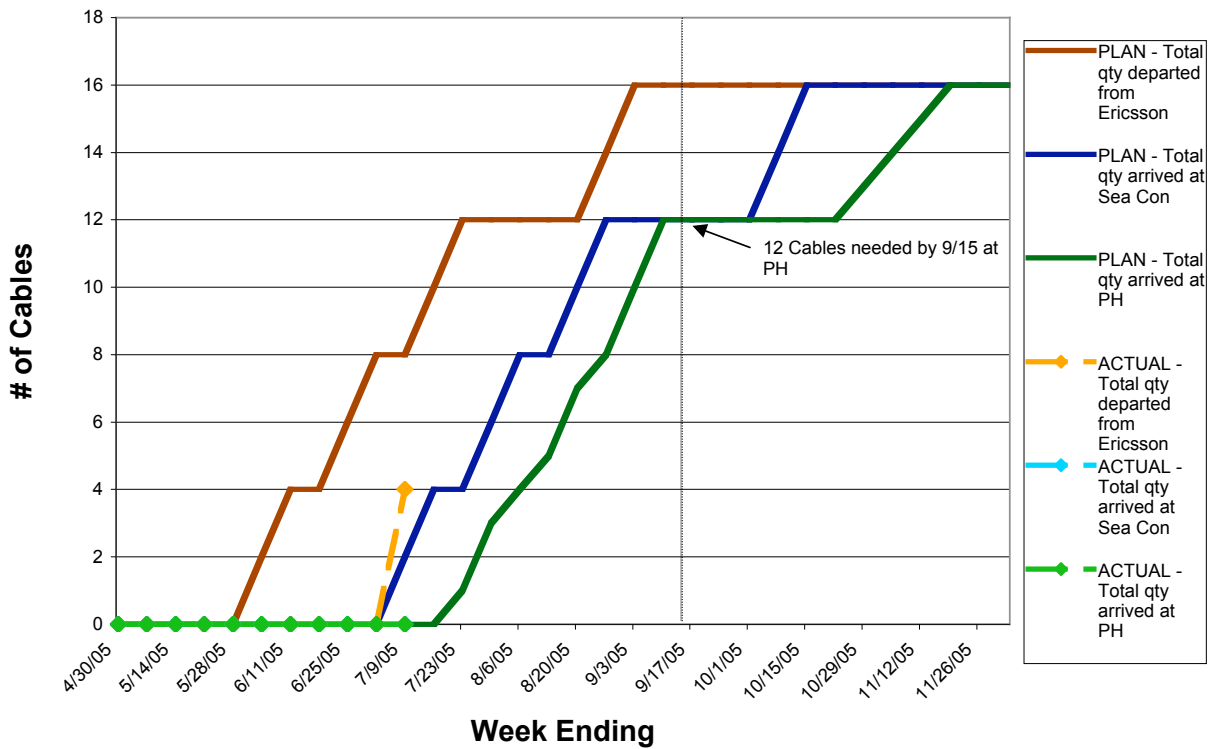
The yield from final acceptance testing of DOMs has been lower than planned. The lower yields are due to a variety of causes that are addressed by the production engineering team. There is high confidence that the number of DOMs that will be accepted for delivery to the South Pole and installation will be more than adequate to meet the goals for this season. Yield issues related to nonconforming materials, for example the quality of the gel used for PMT placement, noise in the PMT readout, and also commissioning of the production and testing systems for higher volume production.

The DOM production plans and current status are shown in the following graphs.

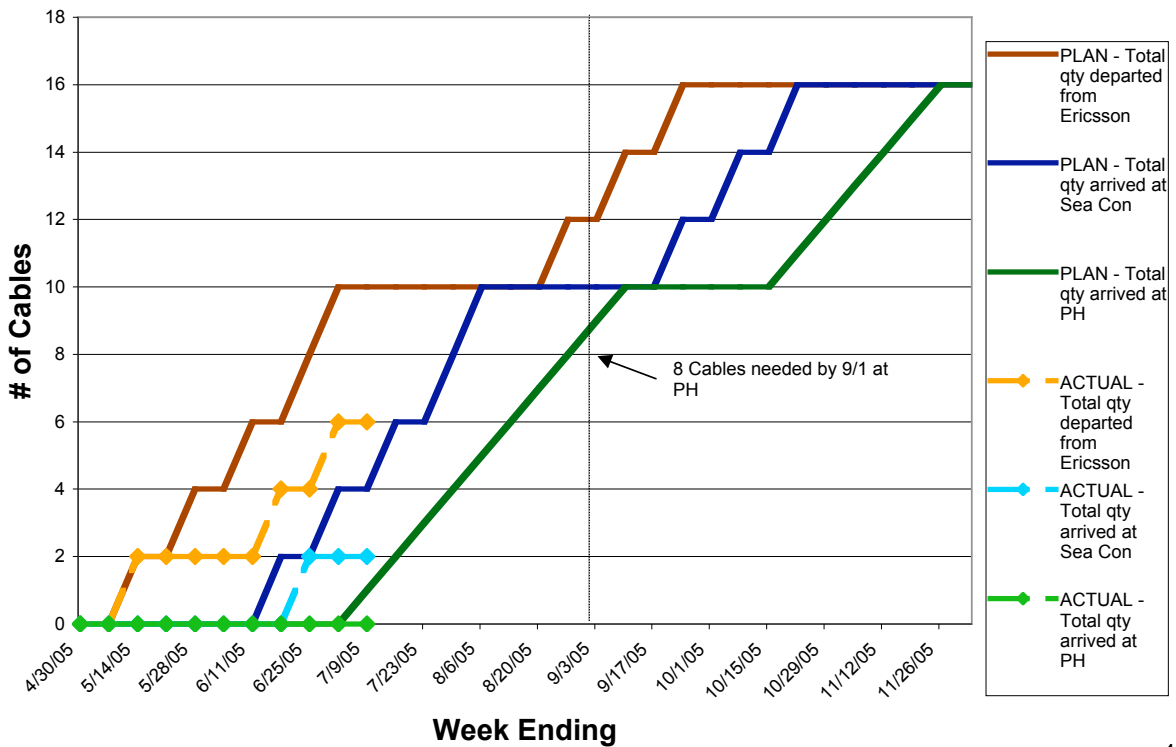


The status of surface cable and surface to DOM cable production is shown in the following charts.

### Surface Cable PY4 Production



### Surface to DOM Cable PY4 Production



***String and IceTop Commissioning*** – All 76 DOMs are operating and reading data (60 DOMs on the string and 16 DOMs in 8 surface tanks). Overall, the data from the first string and IceTop tanks supports the production and instrumentation installation plans for 2005. String and surface tank performance verification work is proceeding well and simulations and commissioning plans for next season when over 700 DOMs will be installed is ongoing. A recent IceCube event is shown at the end of this report.

***Instrumentation System Test Status*** – The South Pole Test System located at the Physical Sciences Laboratory was relocated to the UW Physics Department (Chamberlin Hall). The test system is an important test bed for data acquisition and data handling software. The DOM-Cable test facility at PSL continues to operate as a test environment for both software and for more general system performance testing.

***Data Systems*** – The data handling systems are installed in the temporary counting house (future optical module laboratory) and the software is operational. Due to cargo shipment limitations it was decided to postpone build out of the interior of the permanent counting house until next year. It is taking a significant effort to be able to use the temporary facilities for the second season due to large numbers of computers to be installed within very limited space.

***Quality Assurance*** – The Quality Assurance Manager, Michael Zernick, is working with the DOM production and engineering teams to investigate issues with nonconforming materials identified during material acceptance tests, DOM production, and final acceptance testing. This production year there has been a somewhat unexpectedly high number of failures identified during testing resulting in lower yields than planned.

***Safety*** – A safety workshop was conducted on June 27-28. The workshop focused on preparation activities for the next season of IceCube installation at the South Pole. Along with IceCube project staff, five representatives from Raytheon Polar Services Corporation and two external consultants from Fermi National Accelerator Laboratory also participated in the workshop with Hank Leweling, IceCube Safety Manager, moderating the discussion.

The workshop produced a general consensus on priorities in many areas with fourteen action items recorded. The IceCube Safety Manual will be revised by August 1 in advance of an NSF safety review scheduled for August 10-11. The workshop was very helpful at highlighting opportunities for improvement and at establishing priorities for the next few months.

### **Meetings and Events**

UW IceCube Safety Workshop w/ RPSC	June 27-28, 2005
IceCube Drill Workshop with Advisory Group	July 26-27, 2005
NSF Safety Review of the IceCube Project	August 10-11, 2005
IceCube Drill Training	August 15-26, 2005
IceCube String Deployment Training	August 22-23, 2005
International Oversight and Finance Group Meeting @ NSF	tentatively, September 21, 2005

The monthly reports are posted at [IceCube Monthly Reports](#).

# An IceCube Event

