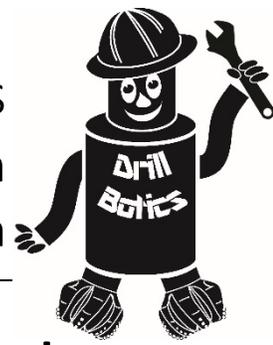




Society of Petroleum Engineers
Drilling Systems Automation Technical Section
Drillbotics™ International Student Competition



2019-2020 Drillbotics™ Competition Announcement

Introduction

As the Drillbotics competition enters sixth academic year, it continues to expand with a newly gained support from SPE. This year, the students can compete in one of the two offerings. Group A refines the previous year's directional drilling challenge with more focus on automation and control. Group B provides a new alternative for Universities that have limited resources to build miniature rigs – the challenge is focused on modeling and simulation with no physical rig construction. In addition to this announcement, the 2018-2019 Drillbotics Guidelines should be referred for understanding the scope and rules of the competition. The 2019-2020 Drillbotics Guidelines will be released over the next few weeks.

Challenge Statements

Group A: Design and build a miniature drilling rig and autonomously drill a directional well through a homogeneous rock sample to a given plan

Group B: Design, model, and simulate controls for a miniature directional drilling rig and demonstrate on a virtual drilling system.

Group A Challenge Information

The challenge for Group A has the following changes from the last year:

Rig Construction

An attempt has been made to simplify rig construction so that students can focus more on automation controls, and experimentation.

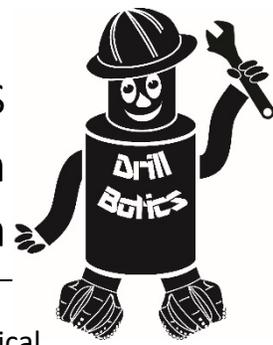
- The hole size has been increased from 1.25" to 1.5" to provide additional space for sensors and steering mechanism
- The material for pipe has been changed to steel for higher resistance to buckling and twist offs
- Students can use rig, BHA, bit, etc. designs from prior years (with due credits) if not protected by original designers/schools through means such as IP and copyrights. However, designs cannot be outsourced to third parties or sponsors. If using whipstocks, the



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calculation of whipstock positioning should be done by algorithms, although its physical placement need not be fully autonomous. Any efforts above and beyond (e.g. whipstock automation, realistic BHA) are eligible for extra points on general novelty in the competition, but lack of it won't attract penalties. Note that the final judging will consider drilling to the given plan with a good wellbore quality – which is impacted by the rig, BHA, and the bit. Therefore, although not the primary focus, rig construction is an important piece.

- The final testing for the competition will take place at regional centers similar to last year. Steps will be taken to minimize logistics issues encountered by last year's teams. Nevertheless, please contact the organizers if centralized testing is not feasible for your case.

Automation and controls

This year's challenge focuses on the automation and controls piece of the system.

- The drilling plan will be presented to the teams on the day of competition. The plan will involve up to 30 degrees inclination, 15 degrees azimuth, and 10" displacement (departure from the vertical axis). The competition will use homogeneous rock samples similar to last year. The teams are given a maximum of three hours to complete the well. Students are allowed to repair/adjust/modify the system and use multiple attempts within the allotted time.
- Use of downhole sensors is mandatory. Use of data from downhole measurements in control algorithms is mandatory. Lack of these things is a disqualifier. The type of measurements include drilling parameters, vibrations, and wellbore positioning. More specifics on minimum measurement and control system requirements will be released as a part of the full competition guidelines.
- Real-time display of the drilling parameters and wellbore positioning during the final testing is mandatory. End of well report immediately after the competition is mandatory.
- Use of analysis, modeling, and simulation is highly encouraged. Modeling could include, but not limited to, drilling process, dynamics, and automation. In essence, simulation and optimization to minimize trial-and-error will be rewarded.

Safety

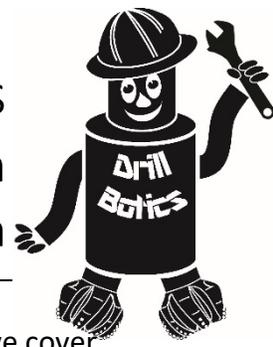
The team's safety plan should consider all foreseeable hazards and how they can be mitigated. Personal protective equipment is part of a safety plan but is far from sufficient. Teams must consider risks due to handling the rock, avoiding injury from rotating machinery, electrical shock and more. How the team communicates before and during rig operations is also important. Judges will grade each team on its comprehensive safety case.



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Because most of the rigs have equipment spinning at high RPMs, some form of protective cover must be included in the team's rig design. A broken coupling, a loose screw or similar item becomes a projectile that can lead to serious injury to the team members, judges or visitors. Judges may decide to deny a team from competing if their design is unsafe.

Group B Challenge Information

The Group B challenge does not involve building a rig or drilling system. The teams will design automation and control similar to Group A, but will use virtual systems (i.e. computer models) to test and demonstrate the controls. More specifics on the requirements and judging will be included in the 2019-2020 Drillbotics Guidelines.

Learning Resources

One of the primary objectives of Drillbotics is learning. To accelerate learning during the Phase I of the competition, material such as existing or new webinars, list of papers, best practices, and other literature will be provided to the participating teams. Additionally, the teams will have access to a central group of subject matter experts for mentoring. Monthly Q&A session will also be held with the team leads.

Contact

Drillbotics Chair: Shashi Talya at shashi.talya@halliburton.com

Drillbotics Co-chair: Fred Florence at fflorence@rigops.com