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Recovery Control - Closing the Loop in Automated Control Systems



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Abstract

Drilling process automation has been a trending topic within the technical community, most recently discussed in SPE-212565-MS (Cayeux et al. 2023). Recovery control - specifically in the case of motor stalls - is not only integral to consistently completing automation control system execution, but also building confidence for the control system users and ultimate automation benefactors. Predicting, preventing, detecting, mitigating, and recovering motor stalls through automated recovery control solves an issue affecting most operators, contributing to additional bottom-hole assembly (BHA) damage and unplanned trips.

The recovery control system was designed with six major process control interfaces, two of which occur during on-bottom drilling: drilling while rotating and drilling while sliding. Each control interface is a means by which an external system can control the rig tools in a coordinated fashion, managing what control is currently active and ensuring the driller can ultimately assume control at any given time. The recovery control is customized and preconfigured with an observation window to execute the recovery process once the stall criteria has been breached while on-bottom drilling, sliding or rotating. The result is mitigated motor stalls that are consistently managed with a configurable automation system, less BHA damage, and no motor stall related unplanned trips - displaying both time and cost value.

After two years of testing the recovery control system internally, there were no undetected stalls, no false detections, and no unplanned trips due to motor stall, displaying detailed accuracy. The recovery control complements the process control, limit control, and manual control components of the automation control system to drill a stand effectively and consistently.

A complete and effective automation control system gives time back to the rig crew and allows for leadership development opportunities. The reliability gained through recovery control, faster than manual attempts, allows the driller to focus more time on safety and training the rig crew instead of monitoring differential pressure in the hopes of manually preventing a motor stall. In nearly all cases, stalls were detected faster with the automatic recovery control system compared to manual detection by the driller. Drillers cannot be expected to pay attention to the hundreds of potential drilling problems - a control system can.

There are systems claiming to identify motor stalls, but this recovery control is the only technology to date that actively detects and recovers the system from the stall.

