

Automated Well Control: From Automated Detection to Automated Shut-In

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Abstract

April 2010 in the Gulf of Mexico and January 2017 in Oklahoma brought into sharp focus what can happen if the oil and gas industry gets well control wrong: 16 fatalities, significant environmental damage, loss of assets and reputation. Each year we have multiple blowouts and several fatality events due to a loss of well control. The upstream industry can improve from a personnel safety, environmental and reputation perspective. The Automation of Well Control will bring a significant step change in the area of Process Safety for wells.

A system has been developed which enables Automated Well Control whilst in drilling mode. Pre-determined influx rates, agreed by the operator and drilling contractor, and input by the driller are established. Once an influx is identified, the system takes control of the rig, performing a series of commands to stop the top drive, space out, shut down the mud pumps and shut in the BOP. Designed with the driller in mind, the technology enables the driller to intervene the automation process at any moment.

The Automated Well Control system has been tested on drilling simulators with real drillers. Comparisons tests have shown that the technology enables shut-in times faster than conventional human interface methods, with influx volumes typically 10-20% of those experienced during manual shut-in. Additionally, a comprehensive Field Trial using a traditional rig demonstrated the effectiveness of the system, proving up the functionality under different operational requirements.

This paper summarises the frequency and causes of blowouts whilst identifying the main contributor to blowouts as human factors, and demonstrates that automation can be a step change in the performance of process safety for well control. The purpose of this work is to describe how the Automated Well Control system was developed, its advantages, a subsequent field trial and design verification.

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