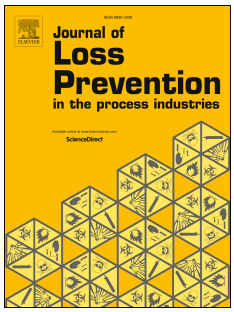
Accepted Manuscript



Kick control reliability analysis of managed pressure drilling operation

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PII: S0950-4230(17)30253-X

DOI: 10.1016/j.jlp.2018.01.007

Reference: JLPP 3645

To appear in: *Journal of Loss Prevention in the Process Industries*

Received Date: 13 March 2017

Revised Date: 9 January 2018

Accepted Date: 9 January 2018

Please cite this article as: Sule, I., Khan, F., Butt, S., Yang, M., Kick control reliability analysis of managed pressure drilling operation, *Journal of Loss Prevention in the Process Industries* (2018), doi: 10.1016/j.jlp.2018.01.007.

Kick Control Reliability Analysis of Managed Pressure Drilling Operation

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Abstract

Offshore drilling involves complex operations and equipment; thus, faces many operational challenges, including well control. Managed pressure drilling has been proved to resolve most of these challenges; however, this technology, for the most part, is still in its infancy. This paper explores the safety and reliability assessment of a managed pressure drilling operation by investigating the kick control operation of constant bottomhole pressure technique of managed pressure drilling. In addition, this study seeks to understand the components interactions in an MPD system and their modes of failure. Failure scenarios are first built using a Fault Tree model and then analyzed using a Bayesian Network model. The reliability assessments of kick control operation are performed in two ways: a basic-components approach and a system-barrier elements approach. The analysis identifies communication related components, including network device damage as the most safety-critical component due to their high-level of influence while flowline and pump line blockages/rupture are ranked second-most critical but with limited-level of influence. However, the system-barrier element approach ranks the managed pressure drilling control system as the most safety-critical equipment. Further detailed analysis confirms that the monitoring equipment are the most safety-critical components of the managed pressure drilling control system with Coriolis flow meter and Rig pump exhibiting the most critical monitoring equipment. Additionally, the managed pressure drilling system's components show