INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI SHORT ABSTRACT OF THESIS		
Name of the Student	:	**Viswanth Ramba**
Roll Number	:	**156151010**
Programme of Study	:	Ph.D.
Thesis Title: Prediction and Prevention of Downhole Complications in Real-time Oil Well Drilling		
Name of Thesis Supervisor(s)	:	Prof. Senthilmurugan Subbiah Prof. Muthukumar Palanisamy
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SHORT ABSTRACT

The drilling industry is forced to drill high angled and extended-reach wells both offshore and onshore to explore the deeper origins of hydrocarbons to meet the global energy demand. While drilling high-angle wells, the operators are expected to have downhole complications such as stuck pipe, string washout, kick, loss circulation, and other drilling-related problems at a higher rate. These wellbore complications during drilling activities would lead to unwanted incidents, which indirectly increases the overall drilling costs and non-productive time (NPT). The detection of some of the downhole complications well advance may help to reduce the drilling cost. Hence, there is an apparent requirement for developing new drilling technologies to detect the upcoming wellbore and drill string complications. This thesis work aims to develop an innovative method to help drilling engineers detect abnormal drilling conditions in real-time. In this work, three approaches are presented to detect the wellbore complications in real-time. The first approach of this work is focused on developing a robust drag model that would determine the hookload acting on the deadline by using the Aadnoy's model and neutral point along the drill string. And these determined forces are utilized to identify the downhole complications in actual drilling conditions. The modified Aadnoy's model doesn't consider the impact

of the mud effects on the drill string. To incorporate the same, in second approach, the true tension and effective tensional model was utilized to evaluate the structural integrity of the tubular in directional wellbores. The proposed models are validated for vertical and directional wells during the rotary drilling operation using standard drilling data obtained from ONGC Ltd. The third approach presented in the thesis mainly focuses on minimizing the NPT and overall drilling costs by reducing the total expended specific energy by improved play-back methodology. And this was achieved by optimizing the rate of penetration (ROP) and the drilling efficiency. The improved play-back methodology is formulated to provide optimum drilling parameters for the development wells based on real-time optimization of drilling rates, drilling efficiency, and bit hydraulics of exploratory well data analysis. The efficacy of the proposed model was validated and tested in a development well drilled in the north-eastern parts of India. All the above-developed models were integrated with the Decision Support System (DSS) to have dynamic predictions of anomalies by calculating hookload at the surface and neutral point. The DSS would provide optimum drilling parameters to achieve the best performance in real-time drilling activity.