Data Mining Application in Drilling Engineering through Real Rig Data Analysis

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Abstract

The fundamental goal of this experiment was to investigate data mining application in drilling engineering through real rig data analysis. In addition, to become familiar with the challenges associated with large rig data. In Drilling engineering, data mining and advanced technologies are the focal points for capital optimization and the fuel for global competitiveness. With that being said, drilling companies allocate resources to improve well planning, drilling schedules, and rig management. Well planning includes; drilling performance, and the reduction of drill string vibration. Henceforth, to achieve the optimum well planning, modeling correlation of drill string vibrations, rate of penetration (ROP), weight on bit (WOB) among others are analyzed to determine the ideal bottom hole assembly (BHA). In addition, attention to non-productive time (NPT) and drilling equipment wear is required, as it too impacts the drilling operations. The experiment conducted consisted of different Data Acquisition Sensors (DAQ) that were used to extract drilling parameters from the acquired signals. The tachometer sensor was used to obtain the RPM data, while the flight sensor was used to find the block position. Meanwhile, the torque sensor measured the torque and the chains on the drilling rig were used to measure the WOB. Once the data was generated from the various sensors, advanced data analysis applications such as Spotfire were used to process the data and generate graphical representations of the different relationships. In this report, rig data analysis is performed on drilling logs obtained from an experimental mine. The analysis in this paper covers various relationships between drill string vibrations and other measurements while drilling (MWD). Statistical analysis was used to examine correlations of drilling parameters and vibrational data. The results of this experiment included, vibrational models relating to the drilling string vibration as a function of different drilling parameters, and geological formation. It was found that Rate of Penetration (ROP) increased when the formation being drilled was a hard rock. Moreover, it was found that axial vibrations were found in the global X coordinates, while the torsional vibrations were seen in the global theta- axis, Lastly, the lateral vibrations were found in the global cylindrical R axis. The results of this experiment also indicated that the lithology, plays a major role on measurement of ROP, and Mechanical Specific Energy (MSE) among other parameters. In other words, as the formation becomes hard the ROP could become negative and could cause the MSE to increase in value.