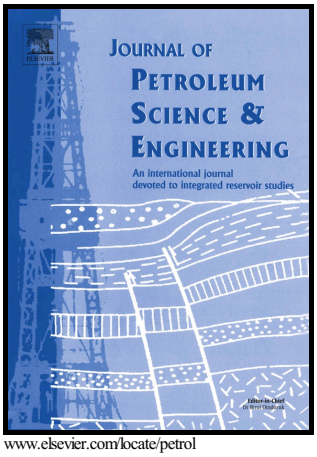

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Differential Signal Extraction for Continuous Wave Mud Pulse Telemetry

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Abstract

Continuous wave mud pulse telemetry system with a transmission rate of more than 12bps, is an irreplaceable high-speed data transmission technology for Measurement While Drilling (MWD) and Logging While Drilling (LWD) instruments used in modern oil drilling services. However, the valid signal is difficult to be obtained because of the disturbing of pump noise in the data transmission. Here, a differential signal extraction method for continuous wave mud pulse generator is applied to extract the effective mud pulse signal from pump noise. It utilizes dual sensor and a differential algorithm to extract the signal. To verify this method, the robustness was analyzed in the numerical simulation. In the actual test, a continuous wave mud pulse generator was designed, and a hydraulic circulation laboratory was built. The Signal to Noise Ratio (SNR) was risen from -13dB up to 25dB. The experimental results demonstrated the effectiveness of the designed mud pulse generator, and proved that this method can be a feasible way to solve the problem of signal extraction from pump noise.

1. Introduction

Down-hole telemetry system transfers drilling data to the ground in drilling process. These technologies fall into two categories: wired and wireless. Wired telemetry system has a high transmission speed, such as cable, fiber and intelligent drilling pipe, but its high maintenance costs are prohibitive. Wireless telemetry system includes electromagnetic, acoustic and mud pulse, and its low costs and simple operations are suitable for many drilling service companies. Whereas, Electromagnetic has a limited transmission distance in water environment, and acoustic transmission technology has not been mature yet. Mud pulse