

Increasing Data Rate for Mud Pulse Telemetry: Innovative Concepts & Tools Developed

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The most common method for data transmission in deep boreholes is called the “mud pulse telemetry” which sends information through the drilling mud inside the drill string by means of coded pressure pulses. There are two main types of devices available for downhole pressure pulses generation. The first type is the (positive or negative) pressure pulser which transmits the data by quasi-static variations of the pressure level inside the drill string. The second type is the (rotating or oscillating) mud siren which transmits the data by generating continuous pressure waves at specific frequencies.

The objective of this paper is to showcase research efforts undertaken to investigate data transmission via mud pulse telemetry in a laboratory setting. The paper will also describe innovative concepts and devices developed with the goal of increasing data transmission rate.

The Institute for Drilling Engineering and Fluid Mining of the Technische Universität Bergakademie Freiberg has designed and built a data transmission test facility which can be considered as a unique device in the academic sector to investigate and improve knowledge on Mud Pulse Telemetry. The facility consists of a transmitter section with different modular pulsers, a flow line made of transparent PVC pipes, pressure sensors, a pump, a water tank and a LabVIEW program for running tests and displaying and saving signals from the tests.

A hybrid mud pulse telemetry system consisting of different combination of Mud pulsers and Mud siren was developed, experiments performed and evaluated. The HMPT was able to achieve about 20 bits/s data transmission rate. To further increase this rate, Mathematical and numerical simulations on multi frequency sirens were also developed. Innovative design concepts for the implementation of the multi frequency sirens in series and parallel have also been developed and are undergoing manufacturing.

Till date, the research with the data transmission facility has produced 5 patents and 2 doctorates with more still to come.