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OIL INDUSTRY PROFESSIONS

Mud Logging

by Gionata Ferroni - Geolog International

The first day in the professional life of a Mud Logger is usually a dirty one.

The first-day Mud Logger is normally a fresh university graduate. He (or she, these days) has been given a coverall, usually bright orange, hard hat, boots, safety glasses and rubber gloves. He is a little uncomfortable. He is now walking towards a steaming and noisy drilling rig, walking up narrow and greasy stairs to the shale shakers where large vibrating metal nets (*the shale shakers*) are separating the drilled cuttings from the mud flowing out of the well. He carries a bucket and a trowel, fills the bucket with the cuttings, gets abundantly splashed with oily mud and walks back to his laboratory. Here, he washes away the remains of the drilling fluid from his rock samples, and puts a minute amount of the material on a watch tray, observing it under the microscope and describing it. Then he packs the rest of it for further analysis to be carried out in remote specialized laboratories. He repeats this task every half an hour or so for 12 hours. Every day, for a month, before he can go home for some rest. It may sound a bit of an unpleasant chore. It is not. In reality, Mud Logging, or Surface Logging, is a rather varied job, and has moved forward immensely from its humble origins, when all that the job involved was more or less what we have just described. The geological analysis of drilled cuttings while drilling oil and gas wells is, in fact, only the starting point for a mudlogging team on a rig site.

In recent years, the Mud Logger has become the watchdog of a drilling rig: through a series of electronic sensors, the Mud Logging laboratory monitors 24 hours a day all the parameters of the drilling unit.



Fig. 1: Rock sample geological analysis.

Pressures, fluid levels, weights, torque, temperatures, flows: a total of 30 up to 80 parameters are acquired at high frequency by the Mud Logging server and then displayed on the monitors of all the personnel in charge of the drilling rig, on site and anywhere in the world, in Real-Time. This sensing system is constituted of

equipment which must be in the same time very accurate and very rugged, having to withstand extreme temperature excursions and all the possible atmospheric agents, while operating uninterruptedly for months on end.



Fig. 2: Dozens of sensors connect the rig equipment to the Mud Logging data management system.

Any anomaly, occurring with any of the parameters, triggers an alarm and the mud logging crew will, therefore, inform the rig manager and the client representative of a potential problem with the well. In this sense, the role of the mud logging service in recent years has become more and more crucial from the rig safety point of view: the first line of defence when any gas starts flowing up the well, or when a fracture is encountered, is the sensor system of the mud logging laboratory. A flow anomaly of as little as 50 litres, over a volume of hundreds of cubic meters, can be spotted and acted upon thanks to the mud logging sensing system.

In the post-Macondo world, oil companies are realizing that advanced and delicate multi-million dollar drilling operations need to be monitored by equally advanced logging systems. This has pushed upwards the technology bar for mud logging companies and has created a positive cycle, where selection is guided not only by service cost, but also by technology and quality.



Fig. 3: Drillships are the most expensive drilling units and require advanced mud logging monitoring systems for their operational safety.

We left our first-day Mud Logger collecting rock cuttings with a bucket. In reality, he is usually a geologist or an electronic engineer. He will soon move on to become responsible for the functioning of the entire laboratory and its sensing system. He will also learn how to maintain the complex system which is carrying out the delicate job of extracting the drilled gas from the mud and conveying it to the gas analyzers, a series of detectors and chromatographs capable of measuring gas compounds down to one part per million. These

gases provide crucial information regarding the type of fluid that is contained in the rock downhole, so they are an early indicator of the presence of an oil or gas reservoir. Mud Logging is a great professional experience both for the variety of skills that it requires and for the wide professional opportunities that it opens up for young field engineers and geologists. A mudlogging service laboratory requires its personnel to learn the basics of numerous crafts: apart from the geological knowledge, personnel have to be decent electricians and mechanics. They have to understand how networks function and have to deal with a variety of electronic sensing systems. The Mud Logger also has to control stock and supply of materials in his laboratory; therefore, some managerial skills are involved. All the while he is watching a live well, so the work done invariably has a time constraint, and this teaches personnel to manage pressure.



Fig. 5: Calibration of a Flame Ionization-type chromatograph for the measurement of hydrocarbons while drilling.

Honing these skills comes handy both for developing a career within the mudlogging business and also for potential opportunities considering a wider oilfield career. In fact, the

Mud Logger, as he watches over the rig operations, acquires a varied knowledge of all the equipment, technology, techniques, procedures and services involved in drilling a well. As a matter of fact, ex-Mud Loggers are found everywhere in the oil business, both onsite or remotely from the operations: from the consulting geology business to drilling engineers. Many petrophysics and reservoir engineers have started off catching samples.



Fig. 4: The opportunity of experiencing remote places and environments is one of the positive sides of the mud logging job.

Mud Loggers move on to become oil company reps on rigs or bit and oil tools salesmen. They switch to directional services and mud engineering. They design IT and data transmission systems and more. Some are now running oil companies. I guess they all still remember that first day, under the rain, holding a bucket and a trowel, looking up at the rig as the crown block moved down, crushing more rock for them to catch.

Quick Bio: Gionata Ferroni has an MSc in Structural Geology and works at Geolog International, heading the Formation Evaluation Services Dept. He has published papers on gas detection. He serves as a member of SPE and SPWLA.