

O Earth Scientists, What Changes Hath Thou Seen?

Taking a cue from the inscription over the old geology building at the University of Texas at Austin, the following summary from my point of view outlines many changes that have taken place in the last 50 years in the way we earth scientists look for oil and gas.

In earlier years, we fashioned hand contoured subsurface maps by utilizing old strip and drillers logs that were meticulously descriptive in lithology. The strip logs were plotted by geologists at the wellsite as the bit made its way through the depths of the earth using standard legends that were taught in the geology textbooks. Many early logs were made from cable tool cuttings, and when a show was encountered just about all the subsequent samples also had shows due to contamination. However as the newer drill bits were perfected and specific mud systems were designed, the cuttings became more reliable, and identifiable, and it was fairly easy to make a more accurate hand plotted strip log.

In hard rock country, samples were taken about every 10 feet because the drilling was fairly slow, so the well site geologist had to be on top of every sack of samples taken off the rig shale shaker. In many cases the rig always had a geologist to plot the drilling time alongside the lithology description, and the hand plotted strip log therefore took shape as a correlative instrument.

When any drilling break was encountered in a prospective reservoir, the well site geologist was obligated to tell the driller to circulate the break so that the cuttings could be analyzed for any shows of oil or gas.

It was extremely important for the geologist to immediately utilize the microscope and ultra violet light box to examine the washed samples both under white light and UV light. Some oil trapped between the tiny grains cannot often be seen under the ultraviolet light with the naked eye, so the location geologist often had to cloak a hood over both head and microscope to examine the cuttings while they were under the UV light. Sometimes a mere speck of fluorescence could indicate a prospective reservoir.

Should a show be indicated, it was sometimes advised to cut about 6 to 10 feet of the break and call for a drill stem test. For a good seal, the drill stem test packer was often set in a lime break above the show in a sand if one was present, or in the top foot of sand or limestone that had a drilling break and sample show. When the packer was set and the tool was opened to the surface, the geologist or company man was required to sniff at a hose protruding from the drill stem to report and document the time when gas reached the surface. The well was then turned to the pit to flare the gas and oil if the test proved successful.

By utilizing the above procedures, a good geologist always knew well in advance what he had in the well and how it was running before any electrical well logging

was performed. In those days, running an electric well log often merely became a formality for confirmation of the formations penetrated. Mud logging was in its infancy at the time and was not readily available at the well site, although some gas detectors were used.

In many parts of the country, the well site geologist therefore had to stay at the well site for weeks at a time, and in some cases as much as a year for the deeper tests. Most small rigs had no bunkhouses so the wellsite geologists had to run samples on the rig floor and even sometimes on the hood of cars on location. Often one had to sleep in the company vehicle while waiting for the next round of cuttings to be sacked and delivered by a roughneck.

Many of the early logs were run from a truck with a drum mounted outside on the rear of the vehicle which exhibited a roll of logging paper that recorded spontaneous potential and resistivity curves from a friction mounted stylus much similar to a device that records earthquake waves today. As logging methods improved, images were burned onto the film from an installed camera that featured moving beads of light that could be viewed through a narrow slit in the truck's interior panel. The beads of light moved from right to left depending upon SP and resistivity values. Investors and geologists often bumped heads while attempting to peer into that narrow slit to obtain an early glance of what the resistivity might be in a prospective reservoir. After logging, a curtain was pulled across the truck's small interior darkroom and the canister containing the film was developed. Later, after the film had dried, groups of interested parties could often be seen outside the logging truck unrolling the film to view the results. More waiting was then necessary to have multiple copies of field prints made, and an aroma of ammonia used in the printing process almost always permeated the area around the truck.

As communication was difficult in many remote areas, the well results had to be phoned in by telephone at the nearest town, which was often miles away and behind several arm wrestling post mounted barbed wire gates. There were no cell phones or fax machines and few of the land-drilling contractors had radios. Some logging trucks had radios but often they had a limited signal range. Offshore rigs had communications facilities but the log copies had to be delivered either by helicopter or workboat.

Today, modern technology has made all of the above almost all obsolete. We have computers at the well and at the office with satellite capability to monitor drilling activity, which can be analyzed immediately. Cuttings are examined by sensitive mud logging techniques and well logs come right from the logging truck in color to us through email accounts. Maps and cross sections are made by advanced computer software systems and 3D seismic technology has made those hand contoured maps a thing of the past, and taken the guesswork out of a lot of our business.

It is amazing to have witnessed so many changes in one's lifetime. The earth scientists of today and tomorrow will undoubtedly see further advancements of our

profession in the future, but the tales and reflections of how we got to this point will remain with our older generation as long as we are here. As in all things, change is certain, and we certainly say that our profession has witnessed some of the biggest ones.

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