

BRIEF NOTES ABOUT THE BEGINNINGS OF WELL LOGGING

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Sensu stricto, the first record of a person who did some logs for scientific measures was perhaps Professor James David Forbes from the Edinburgh Observatory. In the time from 1837 to 1842 Forbes lowered some temperature sensors into three shafts up to 7.3 m deep into the ground, to record temperature variation with depth and time. These data were then analyzed by the famous physicist Lord Kelvin, who needed them to calculate the age of the earth. In 1846, Kelvin began experiments on the temperature of the earth at different depths and in different soils near Edinburgh, which yielded determinations of the thermal conductivity.

Well logging started to become commercial with two French brothers, Conrad Schlumberger (1878-1936), who graduated from the Ecole Polytechnique France as a physicist, and Marcel Schlumberger (1884-1953), an engineer from the Ecole Centrale de Paris. Their father Paul, a business man, supported their ideas and experiments. It was them, who tried the first electrical measurements (at the surface), in particular for locating iron and copper deposits.

It took until 1920 for Conrad Schlumberger to publish the results of the experimental surface resistivity measurements he had carried out since 1911. Marcel tried the first resistivity tool in a borehole in 1921. Conrad was so passionate about his work that he quit his job as a professor in 1923 at École des Mines, Paris in 1923. Over the next three years, Conrad and Marcel spent the time conducting geophysical surveys in Romania, Serbia, South Africa, Congo, Canada and US. Also, in 1923 they successfully tested their new method at the prolific Aricestii field near Ploiesti, Romania, where they used electrical prospecting to map an oil-producing salt dome for the first time.

The Schlumberger brothers started in 1926 the company Société de Prospection Électrique (SPE), or “Pros” as it was nicknamed, to use electricity to find minerals and oil. The newly created Société had its first office and headquarters at 30 rue Fabert in Paris. Initially, the Société carried out surface prospecting for the metal ore mining industry, but gradually extended its activities to embrace exploration of possible oil-bearing structures. To better understand measurements made at the surface, the Schlumberger brothers needed to incorporate resistivity information from deeper formations, so they soon wanted to find oil deeper underground. To do this, Conrad came up with the idea of lowering an electrical probe, or sonde into a drilled well to measure the resistivity directly from the rocks below.

Everything happened when a Director of the Pechlbronn Oil Company in France asked Conrad Schlumberger if his method could help them obtain more detailed information on the geological formations drilled by an exploratory well. Conrad Schlumberger immediately recognized that electrical prospecting techniques could be applied to measurements inside wells.

In 1927, Conrad outlined the principle of “electrical coring”. They hired a team led by experimental physicist Henri Doll (Conrad’s son-in-law), to develop the equipment and conduct the first oil well operation which was made on September 5, (1927). The operation took place in Pechelbronn (Alsace region), where the oil industry just started to grow (The Pechelbronn oil field was active until 1964). The well, usually being called “the Pechelbronn well” (well No 2905/Tower 7), was located at the site of a today monument at the intersection of Route de Wœrth with Rue de Preuschorf in Dieffenbach-

lès-Wœrth, about 3 km west of Merkwiller-Pechelbronn. Henri Doll, lowered an electrical sonde and logged the well with the help of Roger Jost and Charles Scheibli, using rudimentary equipment. The team logged about 140 m of the 488 m hole, starting at 279 m MD, taking a reading every meter and plotting the log by hand. The entire operation took five hours.

The hand drawn resulting log represented a turning point in oil exploration. Furthermore, the technique had potential for detecting hydrocarbon bearing layers, but this could not be demonstrated in Pechelbronn, because the pay zones were too thin. The measurements were carried out point by point. The instruments were raised and lowered by an electric cable managed by some workers. The significance of this log was immediately evident when comparing data from nearby wells. The characteristic resistivity variations could be correlated very easily, clearly related to the geological formations of the area. These data, was acquired easily and at low cost, eliminating the costly mechanical sampling method used to obtain direct geological information in oil wells. However, it took some time before such a radical idea was accepted by the oil industry. A new term was coined to describe the results of this multidepth survey: It was called an electrical resistivity well log.

In 1929, engineers and electrical logging teams were sent to 3 different countries, to test such equipment. The first test occurred in Venezuela (March 6), the second in the United States (August 17), and third in the Soviet Union (December 24). The first electrical recording in the Western Hemisphere was made that March 6th, in a La Rosa well (R-216), belonging to the Venezuelan Oil Concessions Company, Ltd. (SHELL), in Cabimas, Zulia State.

The numerous electrical logging jobs in those oil fields soon demonstrated the value of Schlumberger technology. Initial operations in the US were not so successful due to the economic depression of that time. While engineers struggled to achieve success with this new oil service, a very important discovery in 1931 called spontaneous potential increased the effectiveness of the electrical logging. Permeable and impermeable layers, such as sand and clay or limestone and clay, could be clearly distinguished using the combination of measurements. This combination of spontaneous potential and resistivity curves was of much more value in locating oil and calculating production possibilities than the resistivity log alone. This greatly helped Schlumberger to successfully introduce the new recording technique.

Since the first electrical recording in March 1929, Schlumberger continued working in Venezuela without interruption. The excellent results obtained in Venezuela convinced the Royal Dutch Shell group and other companies to use Schlumberger's methods in other countries. In 1931, they began working in Romania and southern Sumatra; in 1932, in Trinidad, and the rest is a story for another article.



Figure 1. Logging survey at the Pechelbronn oil field (1928), Alsace, France. This is the same well in which Henri Doll, Roger Jost and Charles Scheibli, conducted the first electrical resistivity well logging operation in September, 1927. Source: Schlumberger.

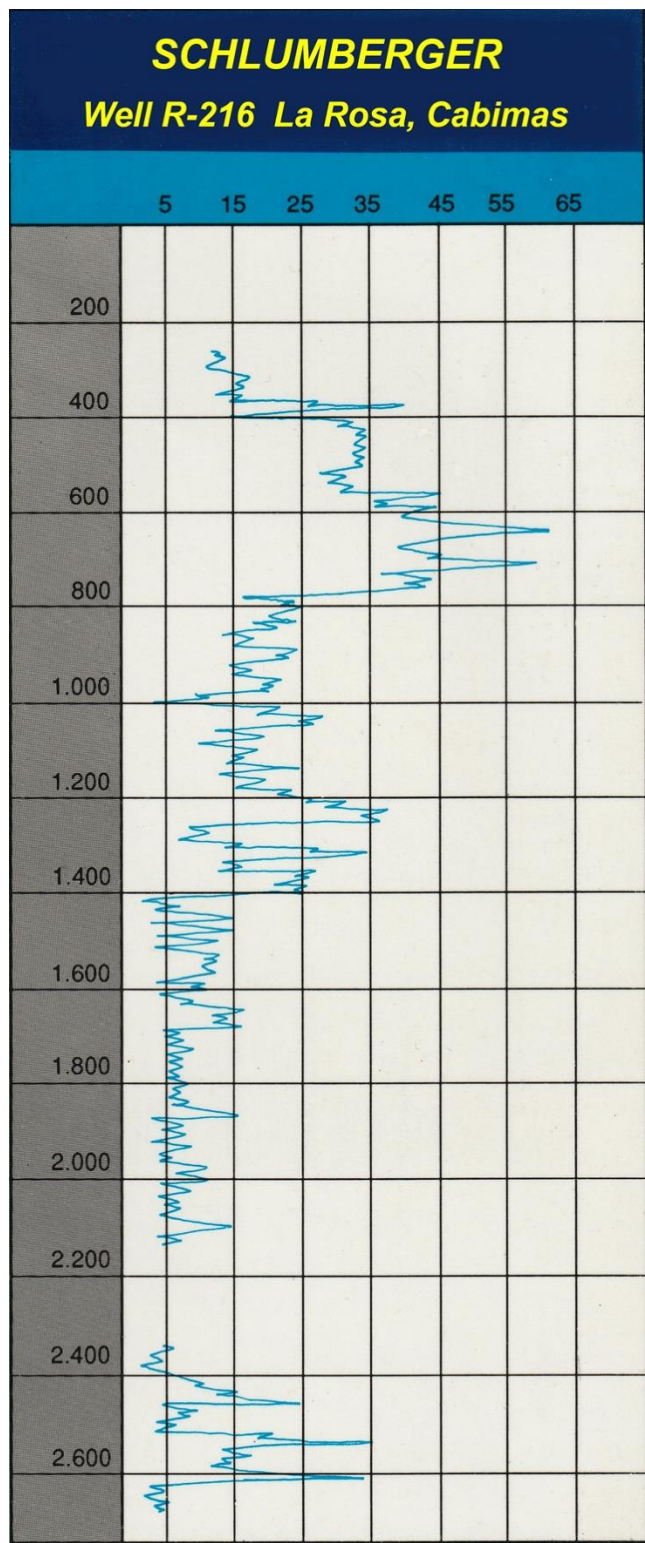


Figure 2. On March 6, 1929, Schlumberger carried out the first electrical logging of the American continent, in the R-216 well in Cabimas, Zulia State, Venezuela. Source: Schlumberger

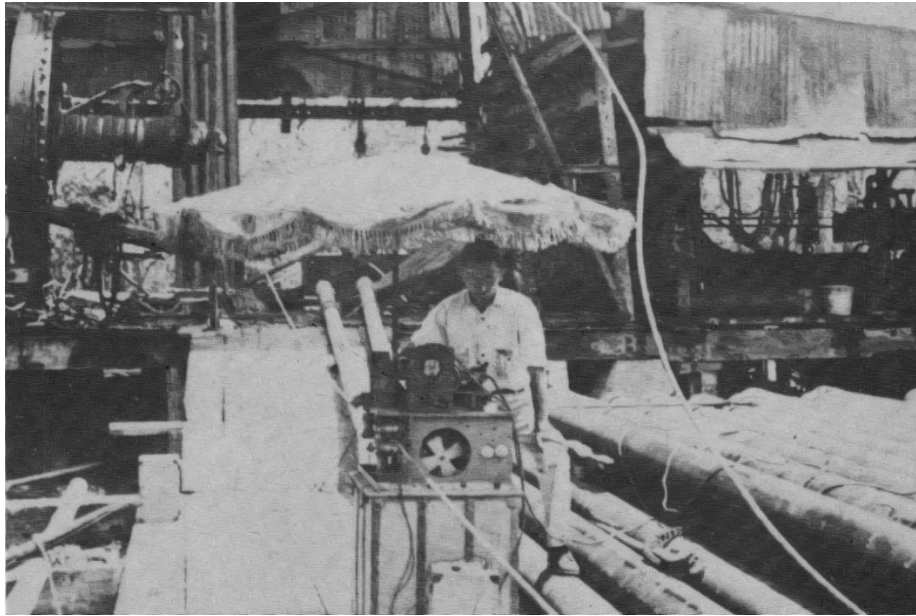


Figure 3. Equipment used in logging the first well in Maracaibo, Venezuela, in March 1929. The engineer plotted the log on chart paper, which was continuously driven by the wireline cable passing through two wheels coupled to the recorded mechanism. Source: Schlumberger.



Figure 4. Old Schlumberger logging truck, used at that time in Venezuela. Source: Schlumberger

References

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