THE COLLECTION AND INTERPRETATION OF DRILL CUTTINGS

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Even before Drake drilled his famous well, drill cuttings were a by-product of wells and borings made for other purposes than the discovery of petroleum. Until about seven years ago they were considered as such in the petroleum industry and little attention was given to their collection, preservation and examination. Prior to this time only the cores taken in core drilling operations and the samples and cores of producing horizons were considered worthy of anything more than a casual examination. Today, however, the converse is more nearly true, at least in the Mid-Continent fields, where thousands upon thousands of samples of drill cuttings are being collected and examined daily.

Methods of obtaining cuttings from the slush produced by either the rotary or cable method of drilling is relatively simple. In the cable method, the slush needs only washing to remove the extremely fine particles of rock flour. In the rotary method, the cuttings may be caught in a box or other container properly introduced into the stream of slush as it issues from the well, and the sample washed to remove the coating of rotary mud. All samples of cuttings should be collected, washed, dried, sacked and labeled carefully and accurately for their value depends almost wholly on these operations. They can be obtained correctly only at the time when they first come from the mouth of the well. Once in the slush pits they are practically valueless. That the operating companies of today believe they are of value is attested to by the fact that most of the larger companies now maintain a considerable force of men, some of them highly specialized, technical men, and a separate branch to their geological department to care for this particular part of their geological work. "Sample grabbing," as this activity of the geologist is termed in the field, was more or less forced on the oil producer. He had obtained production in so many different sandstones and limestones there came a time when he was at a loss to know which sand was which and which limestone was the other. This was particularly true in his hazardous wildcat operations and he was often puzzled to know when he had reached the last known producing horizon. Often the geologist could give him little definite information. The geologists might have logs of other wells but often these logs were from wells drilled by the rotary methods and gave no more than the criptic data, "lime," "shale," "shale and shells," "sand," etc. In some cases this information was sufficient, and correct and satisfactory correlations could be made, but, as developments progressed farther and farther away from areas of known geology, correlations became more and more speculative. Finally, a few samples were saved from the deepest wells for comparison with outcrop samples, and marked similarities were found, not only with outcrop samples but with samples from other deep wells. A limestone became something more than a 'lime." It became an "individual" with recognizable lithographic and petrographic characteristics.

Because the fragments in drill cuttings are usually too small for their characteristics to be distinguished with the naked eye, the microspoope is almost universally used in their examination. The procedure is simple. All samples from a well are listed together consecutively according to depth. The different kinds of rocks found in each sample is listed and described. If need be, thin sections are made or the sample otherwise examined under the petrographic microscope. Fossils, if found are listed and described. The best practice is to preserve all samples for future reference.

At first, the fossils found in cuttings presented quite a problem. They were minute forms which could be discerned only with the microscope. Very little was known of them. Most of them were strangers to even the best of paleontologists, so there has developed a relatively new branch of paleontology, micro-paleontology. This branch of paleontology has advanced so rapidly that today it is possible to recognize by their microfossils all the major periods and many single beds, some of them quite thin.

Sandstones present the most difficulty in correlations. They seldom contain more than the most meagre fauna and their physical characteristics are often very similar. Most sandstones do contain, however, appreciable amounts of minerals of high specific gravity, known as "heavy minerals." By a careful study of these minerals and their association with each other, the petrographer is able to make fairly accurate correlations. The application of this method is limited, however, and must be used with greatest care as the "heavy minerals" in any given sandstone may change quite rapidly latterly due to changes in the source of the material, changes in the condition of sedimentation, et cetera.

Experience has shown, however, that the lithology and fauna of many beds are persistent over wide areas and that with careful study these beds may be recognized and correlated with beds of the same age hundreds of miles away, either at the outcrop or in other wells. Not only can they be correlated but a careful study and cataloguing of their characteristics and properties enables the geologist to form a very good idea of their value as producing horizons, the source of the material which they contain, their mode of deposition and in some cases even a clue to the amount and magnitude of the orogenic movement which have affected them. These are often vital questions with the economic geologist.

All the benefits derived from the study of drill cuttings have not been economic for the study of this material has added greatly to our knowledge of the geological history of the areas studied, to the existence of unconformities and disconformities, suspected but unproven, to the discovery of buried hills, old islands, faults, anticlines, synclines and other geological features which were but poorly reflected or totally obliterated in later sedimentation. The fact is, it seems safe to say, that the general geology of the State of Oklahoma is better and more extensively known today than the geology of any other state of the Union. From an economic Standpoint, the study of drill cuttings has furnished the means of saving the oil industry millions of dollars. It has proven its worth from a scientifio and economic standpoint and, as time goes on, is certain to become of increasing importance to the science of geology and the petroleum industry.