THE PETROLEUM PARATECHNOLOGIST AN UNTAPPED RESERVOIR FOR THE PETROLEUM INDUSTRY

Ed Poulter
of
Midland College

and

David R. Skinner
of
BCC Engineering, Inc.

ABSTRACT

The most efficient use of the skills of a petroleum engineer allow him to devote the majority of his time and talents to analysis and interpretation of data, multi-disciplinary activities such as economic evaluations, creative and research-level thinking. A petroleum engineer's skills may be used more efficiently if he is not required to perform mechanical or data-gathering tasks.

Petroleum paratechnologists can absorb most of the mechanical, data gathering, field interpretation and analysis tasks for petroleum engineers. The two (2) year Junior College Petroleum Technology training program yields skills to accomplish these tasks.

INTRODUCTION

Petroleum engineering is one of the youngest engineering disciplines. It grew from the needs for technical and analytical support for the rapidly expanding oil industry. Although American petroleum production began in the 19th century, petroleum engineering did not come into its own until some years into the 20th century.

Petroleum engineering is based primarily on the chemical and physical behavior of fluids and solids and on various mathematical disciplines. Although these studies depend heavily upon theoretical concepts, the basis for early petroleum engineering was largely experimental. In its earliest history, the only real theories for petroleum engineering were hydrology studies of aquifers.

Early petroleum engineers were the most logical choices to gather data necessary to form overall theories for petroleum operations. They possessed the theoretical and analytical skills necessary, plus they were trained in the mechanical arts to the extent that they could perform operational as well as engineering work. They became data gatherers because of the lack of other skilled personnel to perform the mechanical tasks associated with petroleum engineering. Since the discipline is so young, some of those early petroleum engineers are presently managers or other type of supervisors, thus, the concept of requiring them to perform mechanical tasks still exists to a large extent.

PETROLEUM ENGINEERING TRAINING

Most colleges and universities that offer the degree of Bachelor of Science in Petroleum Engineering require an intensive four-year technical curriculum. These include studies in mathematics, physics, chemistry, geology, hydrology, computer science, logic and analysis, economics, and communication skills as well as the electives necessary for an individual to function in society. Most programs have little time for training students in the mechanical skills that were included in many past programs.

Before petroleum engineering graduates with little or no experience can be usefully applied to the petroleum industry, many employers require formal or on-the-job training of several months to several years to provide the practical experience necessary for the graduate to perform adequately. This is generally oriented toward the mechanical aspect, field data gathering and interpretation tasks. After this type of training, many engineers are required to continue with some of these tasks rather than the technical and analytical skills for which they were formerly educated.

The investment of both the petroleum engineer and his employer is extensive. The engineer must spend at least four years of his life and thousands of dollars to qualify for a position as a petroleum engineer. His employer must provide the high levels of salary and benefits and must plan on a delay of several months to several years before he can expect to begin recovering his investment. In addition, the turnover of petroleum engineering graduates is very high. Therefore, it is to the benefit of the employer to utilize all the skills available in the petroleum engineer.

EFFICIENT AND EFFECTIVE USE OF PETROLEUM ENGINEERS

Petroleum engineers like any other graduating students, need some introductory training into the mechanical aspects of petroleum production, along with many other facets of the overall petroleum industry. In order that the engineer can contribute to the activities of his employer as soon as possible it is important that their mechanical training be held to a minimum. Once this introductory phase has been completed, his duties should be restricted to those skills and talents that are available from no other source within an oil company.

The tasks which petroleum engineers are assigned should utilize his skills in analytical/technical evaluation, mathematics, logic, reasoning, creative research-level thinking, and activities such as economic evaluation and managerial decisions. These are the skills for which a petroleum engineer is educated and trained and the ones which require massive investments of time and finances. Any tasks which do not utilize these skills are not efficient applications of his talents and possibly dilute his effectiveness. This would mean the removal of as many mechanical and non-technical tasks as possible from his duties as an engineer.

Simple office procedures such as the use of dictation equipment, effective use of stenographic and clerical personnel, and effective use of the computer systems eliminates a number of the mechanical tasks from engineers without special training or retraining of existing office personnel. A more critical group of tasks can also be eliminated. These include field data gathering functions such as witnessing well tests, logging and perforating activities, witnessing and inspecting cores, performing or witnessing pressure and temperature tests, witnessing drilling activities and mud preparation and witnessing activities involving well completions. In addition, work involving field interpretation of data and preparation of data for analysis (i.e. plotting or tabulating data) could be removed from a petroleum engineer's responsibilities.

The removal of these tasks form an engineer's duties requires the use of a different type employee that is not presently being fully utilized by many oil companies. The tasks require special training in mechanical arts and require a fairly high degree of analytical and technical skills which cannot be accomplished by upgrading clerical or operations personnel. This is the petroleum paratechnologist.

The paratechnologist can free engineers from mechanical activities and allow them to exercise their full creative, analytical and technical potential for development of new concepts and their applications in the oil industry. This provides the opportunity for companies and the nation as a whole, to increase its capability to recover additional petroleum reserves, thus, reducing the nations dependence on foreign oil.

PETROLEUM PARATECHNOLOGISTS - KEY TO EFFICIENT ENGINEERING

The paratechnologist is the key to the most efficient use of petroleum engineers. He is capable of mechanical tasks, field data gathering, analysis and interpretations. Such tasks cam be performed by these personnel with less education than engineers, but requiring more than an introduction to the technical and analytical aspects of petroleum technology. Some oil companies, recognizing the need for efficient application of engineering skills, have upgraded more mechanically skilled operating personnel for data gathering functions. This action has improved the situation for engineering personnel, but it has not achieved its full potential. Operating personnel, although mechanically skilled and often far more experienced than engineers, have little theoretical and analytical training and are not able to analyze and interpret some of the data. An extension of this concept would be to use individuals trained both in the mechanics of operations and in the theoretical and analytical aspects of petroleum. These individuals, petroleum paratechnologists, possess some theoretical and analytical skills, though not to the extent of engineering personnel, and some operational and mechanical skills, though not to the extent of operations personnel. Paratechnologist's qualifications fit between those of engineering personnel and those of operating personnel.

Paratechnologist's training includes inspection and analysis of drilling time logs, driller's logs, sample logs and drilling reports. They can test, and analyze drilling mud and monitor mud activities. They have sufficient skills to witness well logging activities, collect data from the logs, perform rudimentary interpretations, and assist in selecting perforations intervals. Petroleum paratechnologists can assist in coring activities including recovery, site inspection, packaging, transportation, and are familiar with laboratory testing.

Paratechnologists are qualified to work with well completions, recompletions, and have sufficient skills to perform field analysis and interpretation of well stimulation procedures. In addition they are familiar with the chemicals and additives used in stimulations, cementing, oil emulsions, and can make many field decisions regarding their application. Paratechnologists are so trained, that with very little experience in production operations, they are qualified to interpret various aspects of flowing and artificial lift systems. These include gas lift operations, mechanical behavior of surface and subsurface equipment in sucker rod pumping, hydraulic, and electric submersible pumping systems. They have training in the fluid mechanics associated with fluid gathering and distribution systems. These type personnel are familiar with most methods of liquid and gas separation, treating mechanisms, and with the fundamental concepts of gas processing. They have sufficient technical understanding of primary, secondary and enhanced recovery to sometimes assist in modifying operation methods to achieve maximum recoveries. Petroleum paratechnologists are versed in production and injection well testing techniques. They can, if necessary, perform such tests, and can interpret data to determine if the tests were valid.

Paratechnologists are aware of the detailed engineering analysis and interpretation techniques of field data. They can tabulate and plot the data in a format ready for use by petroleum engineers. The training familiarizes them with property and reservoir evaluation techniques which can be utilized by engineers and management.

Petroleum paratechnologists are qualified for some economic evaluation of production operations, which could lead to recommendations regarding various operational modifications, testing techniques, and supplemental equipment in production operations.

Some of these tasks are being performed by operating personnel. In such cases, utilizing the paratechnologist provides more efficient use of operators by freeing them from data gathering functions and allows them to perform the mechanical skills in which they are experts.

Petroleum paratechnologists are not engineers, however, they can be closely associated with engineers and may even be supervised by petroleum engineers. Paratechnologists are not operators any more than they are engineers. They are not trained in the "nuts and bolts" mechanical aspects of all phases of operations as are the conventional operating personnel, however, they have acquired through two years of college more technical and analytical skills than most operations personnel. In addition to assisting both operating and engineering petroleum paratechnologists present additional opportunities to employers in terms of future career paths such as: engineering aids, well analyst, pumpers and specialist in many areas. The combination of experience and training of a paratechnologist presents a unique opportunity for management when selecting supervisory and managerial personnel.

PETROLEUM PARATECHNOLOGIST TRAINING

The most important factors in the effective application of petroleum paratechnologists is the manner in which they are educated, trained and utilized. It must be done with minimal investment of time and money to themselves and their employers and at the same time, they must be ready for practical application with a minimum on-the-job training.

Petroleum paratechnologists must have a solid background of basic mathematics consisting of college algebra and trigonometry. They like anyone else, should be educated in the basics necessary for them to function as productive citizens in society. Communications are important to the paratechnologists throughout their careers, therefore,grammar and technical writing are very essential in their education.

The petroleum paratechnologist must be trained in a number of areas unique to his field. He must be introduced to the basic operation and structure of the petroleum industry and must be trained in the various phases of production operations, drilling and completion technology. He must be familiar with both the engineering and practical aspects of drilling muds, as well as chemicals used in the oil industry. He must have a thorough understanding of lease activity, well evaluation and must have an understanding of reservoir behavior and analysis as well as being familiar with logging, testing and other measuring techniques required for evaluation of all phases of production. His training must include basics of gas processing, oil refining, techniques of gas testing, gas measurements, sampling, and analysis. Finally, he must be introduced to the economic and financial aspects of the industry so he may understand their impact upon his company and upon his future work. To provide the oil industry with trained paratechnologist graduates, the training program must be vocational in nature to emphasize real applications, yet involve some theoretical concepts. The training program can be accomplished in a two year period. Such a program is now operating out of Midland College.

MIDLAND COLLEGE PETROLEUM PARATECHNOLOGY PROGRAM

Midland College, in Midland, Texas, offers a two (2) year paratechnology program designed to meet the needs of the oil industry. The college is fully accredited by the Southern Association of Schools and Colleges and the Texas Educational Agency, and fully enjoys a favorable reputation nationally. All of its petroleum graduates have been employed by oil companies in the West Texas and/or Eastern New Mexico areas.

The paratechnologist program requires entry students to be high school graduates possessing conventional mathematics and science prerequisites. The program includes all technical and non-technical subjects necessary to prepare students for a realistic career in the oil industry as a paratechnologists. Students are given the necessary introductions to analysis, applications, and logic early in the program and then required to reinforce the concepts by repeated use throughout the curriculum.

The program introduces the mechanical skills necessary for petroleum production operations, but the program de-emphasizes the "nuts and bolts" activities. Those mechanical and mental skills necessary to operate certain production equipment are covered, but students do not spend large amounts of time with the mechanics and tools of the industry. They are expected to learn these topics by experience, thus, allowing concentration on the analytical and technical aspects.

Midland College maintains a small permanent staff in its petroleum technology department in order to utilize industry specialists in many courses as guest instructors. Therefore, the students are exposed to the experience and training of some of the most qualified people available in one of the most active production areas in the United States.

Upon completion of the two year program, petroleum paratechnologists are available for almost immediate application by petroleum producers with little on-the-job training beyond the indoctrination period. The two year program minimizes the investment of both the student and the future employers.

CONCLUSION

1. Trained petroleum paratechnologists can absorb many mechanical tasks from petroleum engineers.

2. Trained petroleum paratechnologists can absorb many analytical and data-gathering tasks from petroleum engineers.

3. With mechanical and data-gathering tasks transferred to other personnel, petroleum engineers are able to spend more time in technical, analytical and creative activities and are more effective and efficient in managing and producing petroleum reserves.

4. Operations personnel are not burdened with data-gathering tasks when petroleum paratechnologists are available for such tasks.

5. Petroleum paratechnologists can fill a need in both operations and engineering areas.

6. The petroleum paratechnology program at Midland College provides trained petroleum paratechnologists to the industry available for immediate utilization with little on-the-job training required.