Engineers In Management

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INTRODUCTION

Engineers have become the principal source of management material in the petroleum producing industry with the rapid increase in the technical complexity of this industry. The responsibility for developing managerial talent in engineers actually is a partnership between current management and the individual engineer. Management's focus in personnel development is directed toward improving the efficiency of the business through providing for continuity of highly competent management. Management's basic tools for attracting, developing, and retaining competent engineers are an attractive compensation program and a stimulating work environment. While current management does much to meet the development needs of individual engineers, it is not possible to provide all the knowledge and experience required of management either through job experience or formal training. The engineer must supplement this naturally acquired knowledge through personal effort outside of the fundamentals of his engineering assignments. This discussion will concentrate on topics primarily related to work environment and suggest methods by which the effectiveness of this partnership can be improved.

REQUIREMENTS FOR MANAGEMENT

While there is a wide range of basic legal and moral restrictions on the operation of any business, the fundamental purpose of management is to generate maximum profit from the conduct of the business. A successful manager will possess a wide range of desirable individual attributes, but, in the opinion of the author, a high level of competence in the following major areas is essential:

(1) Excellent knowledge of the mechanics of the business and its environment

(2) The initiative and desire to improve the efficiency of his overall operations

(3) A high level of judgment or perspective which permits him to concentrate on the significant

(4) The ability to lead and direct the efforts of a wide variety of people.

Each of these major requirements is interrelated and each involves many individual activities within itself. The roles of the partners in meeting each of these requirements vary somewhat; but, in general, it is management's responsibility to provide opportunities and it is the individual's responsibility to make the most of them. In connection with the individual engineer's responsibility, perhaps the most important is that he make the decision as early as possible whether he wants to be a manager or an engineering specialist. The distinction drawn here is that a manager must be something of a generalist while the topflight professional is more a specialist, along the lines of a medical doctor or lawyer. Success in either requires hard work, dedication, and sacrifice on the part of the individual. While this discussion is directed specifically toward those who choose the management route, the reader is reminded that there are similar attractive opportunities for those preferring the engineering alternative.

DEVELOPMENT OF KNOWLEDGE OF BUSINESS AND ENVIRONMENT

Management's Responsibility

As mentioned previously, one major requirement of management is an excellent knowledge of the mechanics of the business and its environment. So management must provide its engineering employees ample opportunity for learning the business. This is accomplished by a continuing process of new job assignment, evaluation of performance, assessment of individual potential or ability, training, and subsequent reassignment. In this connection, it must be remembered that this program of individual development must always be balanced against the operating needs of the business at any particular time. It

is not possible to give each individual engineer the depth and breadth of job experience he will need as manager of producing operations. Therefore, management must develop a good cross section of experience and rely on the individual to fill in his own experience gaps.

The first assignment of a newly graduated engineer frequently will be one which is closely related to field operations. The purpose of this early assignment is, of course, to provide him with a sound background in fundamental producing operations; however, such assignments are not merely training assignments. Rather, they are, or should be, working assignments involving necessary and meaningful work which at the same time offer an individual the opportunity to greatly broaden his knowledge. While subsequent assignments will carry similar challenges this first assignment could well be as close as he will ever be to actual producing operations. Therefore, it is desirable that this assignment include as wide a variety of individual operations as possible. The trend toward centralization of engineering organizations has required management to take special steps to provide this important first opportunity. These steps have included formal training courses which partially take the place of actual job experience, detached field assignments to accomplish specific jobs, and giving the individual the freedom of going to the field as necessary to accomplish his work. The result on the individual has been a heavier responsibility to take maximum advantage of each opportunity to learn field operations.

The engineer's performance on each new assignment is a basic factor in his further advancement. In this regard, management must have an effective overall system of appraising the individual. While there are many variations throughout the producing industry, these systems are usually designed to evaluate accomplishments, assess potential for successfully accomplishing more responsible work, determine training needs, and to lay plans for further development. Such a program obviously is essential to the individual but is equally essential to the business. Its development and implementation requires participation at all levels of management. Immediately higher levels of supervision or management perform the basic assessments of performance and potential and recommend additional training or experience. Still higher levels of management review these in the light of overall needs and openings and merge the individual programs into the overall plans of the company. Ideally, this process gives the individual as much training and experience as possible and moves him up the ladder of success, whether as a specialist or generalist, about as fast as his capabilities permit. And this is a good system in actual practice. If there is a serious shortcoming, it probably is that the system tends to move people forward before they are ready because of the apparent shortage of good management replacements.

Engineer's Responsibility

Before moving into specifics concerning the engineer's responsibility to develop his knowledge of the business it is desirable to emphasize that individual job assignments are not a series of training assignments for management. Regardless of native intellect, results are the only true measure of an individual's ability, and he can demonstrate his ability only by hard work and dedicated effort on each job assignment he receives. In short, he must regard each assignment as a proving ground for advancement rather than as a training ground. Actually, this is true even if the assignment is designated as training.

As indicated, management makes a diligent effort to provide engineers with a broad base of experience concerning the operation of the business. However, this effort is restricted by constantly changing business conditions and manpower availability. The inevitable result is that no engineer moves into higher level technical or general management without some serious gaps in his experience level. For example, an engineer whose experience has largely been in reservoir engineering may find it very difficult to supervise mechanical engineering activities. Transition problems of this nature can be minimized by the engineer's extra effort to broaden his scope of knowledge throughout his career.

In this age of specialization, it is quite common for any given engineering project to be accomplished piecemeal by a number of organizational units. In the petroleum producing industry, a single engineering project frequently requires participation by such groups as reservoir engineers, drilling engineers, mechanical en-

gineers, lawyers, and accountants. It is a fairly common mistake for a person in any of these groups to accomplish his part of the project without giving any particular thought to the parts played by the other groups. While his contribution might be quite valuable of itself, such a person fails to recognize that such contributions are not uncommon. On the other hand, the individual can use this opportunity to get a better feel for other phases of the work. He should confer with the other groups involved at all stages of the project, including before and after his own part is concluded. In addition to expanding his knowledge as well as that of the other groups, he possibly can improve the overall design of the project and probably shorten the overall time required to finish it.

Another example of a frequent experience gap is that of acquiring knowledge of the environment in which the business operates. In the larger companies, there generally are staff assignments for engineers which involve analyses of the business environment and the potential effects on the particular industry or company involved. Much of the economic and planning work carried on in the more familiar engineering work is derived from these analyses. Those engineers who do not get an opportunity for staff assignments such as these must do considerable study and reading to keep abreast of the business environment. For instance, up-to-date industry information is readily available in industry-related publications. Basic and advanced economics can be studied through formal training courses as well as outside reading. And the trends of specific businesses and business generally can be investigated through reading the many worthwhile business magazines on the market. Many companies publish for internal consumption analyses of the business environment as it may affect their company. All of these make for enjoyable reading as well as adding to the individual's understanding of his job.

DEVELOPMENT OF INITIATIVE AND JUDGMENT

The attributes of initiative and judgment are closely related in practice and, for this reason, will be discussed jointly. While effective initiative and judgment are associated with native intellect, they are not necessarily a product of formal education. Both can be developed to a high degree by training and practice. Definitions of these characteristics vary considerably depending upon the points to be made; however, the following definitions prevail for this discussion.

(1) Initiative is that characteristic which impels a person to analyze all situations or conditions encountered for potential improvement and to take appropriate action to implement such improvements.

(2) Judgment is the measure of an individual's ability to quickly recognize the significant aspects of a condition or problem in order to devote the majority of his attention to those aspects.

Management's Responsibility

The requirements of a manager relating to developing the desired initiative and judgment are largely a responsibility of the individual. Current management can assist in a limited way by training and job experience, but its principal contribution comes through providing an environment which stimulates development of these attributes. This is a very difficult subject to describe adequately but it boils down essentially to a philosophy pervading the entire organization. This philosophy has to be one which sincerely encourages curosity and innovative thinking and action. Further, it must be one which emphasizes the important and minimizes trivia. The key practitioners of this philosophy are local supervisors and managers who must actually demonstrate this philosophy in the daily conduct of their activities. Specifically, these leaders must require that engineers, as well as other employees, practice developing these characteristics in completing their assignments. For instance, the supervisor generally should refrain from giving detailed instructions even when he knows (or thinks he knows) exactly how a job should be accomplished. His coaching while the task is being performed and his review of results should be oriented toward teaching the individual to recognize and evaluate only the essential factors involved and toward leading him to investigate potentially attractive alternatives. But, in this regard, the supervisor or manager must be extra careful not to cause overworking of the problem at hand. Additionally, he must be diligent in giving appropriate recognition for accom-

plishments, particularly those involving unusual initiative or judgment.

Engineer's Responsibility

Assuming an adequate intelligence level, initiative and judgment are acquired traits of the individual. Formal training courses as well as published literature can be quite helpful to the individual in formulating techniques. In the end, however, the most important factor to developing these traits is the degree to which the individual disciplines himself to practice these traits in his daily work.

The example mentioned earlier concerning the engineer working on one phase of an engineering project is also an ideal means to practice and demonstrate initiative. Most complex engineering projects have ample opportunity to get off the track and lose effectiveness. The engineer with a high level of initiative will be alert to these possibilities and take prompt remedial action whether or not the problem occurs within his defined area of responsibility. A word of caution is needed here to the effect that this effort must be in conjunction with rather than instead of accomplishing his assigned responsibilities for the project.

Another opportunity for the engineer to practice and demonstrate initiative is to be alert to development of new techniques which might be applicable to his work. Improved technology or techniques are being developed every day in various parts of the country to better resolve old problems or to handle new conditions for which old methods simply won't work. The alert individual will stay abreast of these developments through company or industry literature because many will be readily adaptable to operations in his area of responsibility.

Similarly, the best way to develop the desired characteristics in judgment or perspective is to practice them on every job assignment. A large number of variables will be present in almost any assignment. A young engineer usually will have little feel for the individual effects of these variables; but, if he takes the time to test such effects, he will develop the necessary insight quite rapidly. For example, the attractiveness of a development prospect might be relatively insensitive to rather wide variations in well costs in comparison with sensitivity to producing rates and reserves. In this case, the effective engineer or manager would concentrate on determining the probability of developing adequate reserves and producing rates in deciding whether to embark on the venture, leaving reduction in well costs to be a function of learning if the basic venture is successful. With experience in and diligent practice of this technique, an engineer can save himself and his company much time and money in avoiding investigations of trivial matters having little or no effect on the course of the business. Once acquired, this habit will go with the individual into management and will be invaluable to him in the planning and evaluation aspects of that responsibility.

DEVELOPING LEADERSHIP

The characteristics of effective leadership are also difficult to define because it is a composite of a wide variety of intangible factors. For this reason, it is a difficult subject for classical teaching methods, although many classroom hours are devoted to the subject in both industry and schools. The desired product of good leadership may be described simply as an efficient organization turning out a high volume of good work. This, of course, implies an organization composed of loyal employees dedicated to high standards of performance. The techniques which yield this result with one group or individual might be entirely inappropriate for another.

Management's Responsibility

Here again, management can provide limited direct assistance to the individual through formal training in various styles and techniques of leadership. Beyond this and the establishment of broad guidelines or philosophies dealing with human relations, the best tools that management has for developing leadership are by example on the part of current management and by experience. Stated differently, management should demonstrate in the daily conduct of business the type of leadership desired and provide ample opportunity to individuals to develop leadership abilities in working situations.

This approach works reasonably well as long as the individual stays in a given organizational branch or unit. For example, engineers are able

to get early experience and develop effective leadership abilities through supervisory and management positions within the engineering organization. But the same techniques are not uniformly applicable when the engineering manager moves into general management because he is now directing the efforts of a wide variety of people. For example, he might be charged with the responsibility of directing the efforts of unionized personnel, perhaps including negotiations with the unions. It would be well worth the effort for management to develop additional training aids to help the individual more quickly bridge the gap from technical to general management as it concerns varying type and content of organization.

Engineer's Responsibility

If example and experience are the best tools for developing desired leadership traits, the individual engineer must be an especially discerning and diligent student. The young engineer will learn very quickly the basic guidelines governing human relations in his company. Additionally, he will be exposed to a wide variety of supervisors and managers whose styles or techniques of leadership also vary widely. Despite the best efforts of his company to have nothing but good leaders, he will encounter both good and poor. However, good leaders are not too hard to identify, both by individual reaction to them and by observation of the results they achieve. The engineer whose ambition is to lead should be cataloging individual techniques, good and bad, for his future guidance. If he has demonstrated the other requirements of management, he likely will receive the opportunity to supervise other engineers within the first few years of his career. By that time he should already have a fairly well developed personal style of leadership which he feels will be effective for him. He will find that his preferred style is not uniformly effective with all subordinates and he will have to incorporate modifications to fit the individuals with whom he works. The key point is that he must be alert to the results he is getting, study people, and adapt his leadership techniques to meet both his needs and theirs.

SUMMARY

Rewarding and satisfying career opportunities are plentiful for engineers in the petroleum producing industry in both professional and managerial ranks. This discussion has been concerned, primarily, with the managerial career and has concentrated on the thought that development of managerial talents in engineers results from a partnership between management and the individual engineer. While there are a large number of individual attributes desired of a good manager, four qualities — knowledge of the business, initiative, judgment, and leadership — are suggested as essential requirements. The results of this partnership will be gratifying to both management and the individual if both work hard to develop these qualities.