Knowledge Absorption – A Continuous Or A Batch Process

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INTRODUCTION

Many treatises have been written on the subject of knowledge absorption although not under this specific title. Many of these treatises cover narrow as well as broad areas related to methods of teaching specific subject matter as evidenced by numerous articles which have appeared in the Journal of the American Society for Engineering Education as well as in other publications. Most of these publications have dealt with methods of presenting subject matter and have neglected to some extent the final result of the efforts of the instructor, that is the amount of knowledge imparted by the instructor and absorbed by the audience. Generally speaking, it is axiomatic that excellent teaching should lead to a high rate of knowledge absorption. However, there is one factor often beyond the control of the instructor; namely, the desire on the part of the individual to acquire knowledge which will be beneficial to him in furthering his professional accomplishments.

An individual may desire to improve his technical knowledge in order to increase his earnings by virtue of being more valuable to his employer. This can be accomplished in several ways, among which are continued self-education at home and on the job. Self-education at home usually entails additional studies from text books, reference books and current magazines and journals. Self-education on the job involves more than doing one's assigned tasks. The employee must be willing to put forth additional time and effort to learn in detail other phases of the company's operations and the manner in which his specific duties effect these operations. The employee who is content to do only the task assigned him will have little opportunity to advance and will occupy only one position, that of stagnation. The chances for advancement are greatly improved for the employee who continues the process of self-education after completing his formal education regardless of whether formal education ends with high school or college.

ABSORPTION RATES

In some respects, individuals can be compared to the physical processes with which many of you come in contact every day. For example, if a given quantity of gas from a high pressure well head separator is contacted with a specific quantity of absorption oil, certain fractions of the hydrocarbons in the gas will be absorbed in the oil. The oil can be removed from the vessel and a reduction in pressure will result in the absorbed hydrocarbons flashing to vapor which can be condensed to give raw natural gasoline. This process can be repeated over and over again with the same final result in each case.

Obviously, this type of batch operation would be very inefficient from the practical viewpoint because it would be necessary to shut in the well every time the vessel containing absorption oil was filled with gas and brought up to pressure. This operation can be likened to the employee who is content to do the same task every day and makes no attempt to improve his knowledge. In other words, he starts his job with a certain amount of knowledge, and this amount is essentially all that he ever has; thus his output is limited just as the output from the batch operation of the absorption vessel is limited.

The individual who is constantly seeking additional knowledge by one means or another is faced with the same batch process of absorption when he first starts to work. However, by studying the problem, he soon realizes that improvements can be made in the process. With some modifications to the vessel and piping system, he conceives the idea of pumping absorption oil into the top of the vessel and gas into the bottom at constant rates. Oil containing absorbed hydrocarbons is continually removed from the bottom of the vessel, resulting in a continuous process which is nothing more than the simplest form of the conventional gas absorber found in natural gasoline plants and oil refineries. This concept enables the well to produce without interruption, and the overall operation is much more profitable financially. Thus, the individual who continues his education while on the job can be likened to the continuous absorption process in that he is constantly absorbing knowledge and putting it to profitable use.

This analogy can be carried further by analyzing some of the variables effecting the operation of an absorber. In a given operation let us assume that all of the pentanes and heavier components are absorbed from the gas when the column is operating at a given pressure, temperature, inlet gas volume and lean oil rate. The hydrocarbons in the inlet gas can represent a given amount of knowledge which can be absorbed. Admittedly, it would be difficult, though not impossible theoretically, to absorb all of the gas stream. However, the pentanes and heavier components are easily absorbed and they can be compared to knowledge which almost anyone can acquire with a minimum of effort or by rote. Hydrocarbons with decreasing boiling points are analogous to knowledge which is increasingly difficult to acquire.

The lean oil rate to the absorber is analogous to the effort one is willing to put forth to acquire knowledge. If the lean oil rate, or effort on the part of the individual, is increased, the quantity of gas absorbed, or knowledge required, is increased by a proportional amount. There is, of course, a limit to the acquisition of knowledge by one individual just as there are limiting conditions for a particular absorber. The absorption of hydrocarbons can be increased by increasing the absorber pressure, within certain limits of the vessel itself. The increase in pressure can be compared to an increase in the desire of the individual for greater responsibility because greather responsibility requires greater knowledge.

There are many other variables which effect the operation of the absorber just as there are many other variables which effect the absorption of knowledge;

however, this simple example has been used to draw an analogy between a physical process with which some of you are familiar and the absorption of knowledge.

Other analogies with physical processes can also be made. In the operation of an oil field the gas-oil ratio increases as the formation pressure decreases and only a relatively small fraction of the total hydrocarbons in the formation is recovered unless other steps are taken. The total oil recovered can be increased by recycling gas to the formation to maintain pressure by water flooding or by various other means. The individual who has no desire for additional knowledge can be likened to the first case where the oil field is depleted rather rapidly because no effort was made to put anything back into it. The individual who continues his education can be compared to the secondary recovery processes in that there is a definite reward in relation to the amount of effort put into the operation.

In the field of research we sometimes feel that the results of our efforts, both individually and collectively, are somewhat akin to the analogy with the batch operation. This is particularly true when the results of our efforts end in failure, and those of you who are acquainted with research know that on a percentage basis the number of successful conclusions reached are relatively few. Even though the research project may end up to be analogous to the batch operation, the individual research worker will, if he is worth his salt, be analogous to a highly efficient continuous process.

The good research scientist will, in a great many cases, learn more from the failure of a project than from the successful completion. If the project is successfully completed, the road leading to the solution may be relatively easy and not tax the full capabilities of the individual. The unsuccessful project will raise many unanswered questions which furnish the necessary incentive to cause the researcher to delve deeper into the problem and acquire additional knowledge. There are an infinite number of such unanswered problems in both scientific and non-scientific fields. The solution to a single one of these problems may create several entirely new problems.

Tremendous accomplishments have been made during the past two decades in the area of scientific development; however, it is doubtful that we have even scratched the surface. Discoveries and innovations have come about which many scientists of two generations ago would have considered impossible. All the progress which has been made is a result of the desire of many individuals to contribute to man's store of knowledge. These individuals were not content to be satisfied with a static situation, but rather to continue with forward progress. It has often been said that perhaps one of the characteristics common to many inventors is laziness. This is no doubt true since the inventor is usually seeking a quicker and easier way to accomplish a given goal.

I hope that each of you will analyze your own situation and give serious though to whether you feel you are performing in a manner analogous to the continuous process or batch process insofar as absorption of knowledge is concerned.