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A FINAL NOTE

Since problem solving as described in this book is not an intuitive process, there will be a learning period or an induction period before it can be done efficiently. Because of this learning period, the first few problems or calculations that are done using this process will be slow and labor intensive. My personal assessment is that the first time a new calculation technique is utilized, it will often take five to ten times as long to do the calculation as it will after the calculation technique becomes second nature. This is because the problem solver often will not have a feel for what the magnitude of the value that he is calculating should be and he will conservatively check his calculations against some known standard. However, as experience is gained with this technique, speed will increase and some of the labor intensive steps will become almost automatic. Best of all, problems will be solved one time for all time. In addition, as indicated in earlier chapters, this approach is not to be used for every plant problem-solving activity. There will always be questions of optimum technical depth to consider.

There are some guidelines that should be considered prior to beginning to either implement these techniques as an individual or, as a manager, to implement these techniques throughout an organization. Some of these guidelines have been mentioned in earlier chapters. The purpose of this chapter is to present some of these guidelines together in one location.

The problem solver and his management should realize that the first time these techniques are used, more time will be required. The process of using a list of questions such as those in Chapter 6 to develop a working hypothesis will be cumbersome until it is done a few times. There will be calculation

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techniques that the problem solver is not familiar with. He may want to check his calculations because he has not yet developed an intuitive feel for the particular calculation. Management can be a great assistance in this area by insisting that they want the problem solver to take the time to do it right and insist on using the techniques described in this book. Our culture demands quick answers in almost all areas. From video games to interactive, computer-aided learning, we have become an iterative society. The high school student who is using the computer to study can often keep trying to get the answer without any thought or calculation until he gets it right. It will take strong management action to insist on replacing this "quick answer" culture with a "do it right" culture.

The data that an operator or mechanic has are invaluable in developing a theoretically sound working hypothesis. They have first-hand experience and have made observations that are not available through any other means such as process control computers, instrumentation, or laboratory results. They may at times have problems putting their observations or experiences into quantitative descriptions.

There will be times when it is necessary to make assumptions. Many times in industrial problem solving, the direction of the change and the order of magnitude of the impact is all that is required. An exact value may not be required. For example, it may be necessary to assume the constant in the relationship between the rate and the driving force. The problem solver should not be discouraged by the need to make an assumption. It is often more important to get the form of the driving force correct than it is to get the constant correct. As described in Example Problem 14-1, knowing the relationship between chloride production and residence time was much more important than knowing the actual rate constant.

Bureaucracy should be avoided at all costs. There will be a tendency for management to micromanage the exact wording of the document described in Table 3-3. This problem specification is meant to be used by the problem solver to provide the best description possible of the problem that he is trying to solve. Wording changes will no doubt end up diluting and confusing his efforts. On the other hand, a review of the final conclusions and proposals to conduct tests to prove the hypothesis is mandatory. These reviews should focus on the technical accuracy of the calculations and the preparation for any proposed plant tests. Safety should be a major component of this review.

The concept of "one riot, one ranger," as described in Section 6.6, should be utilized. While committees are of value, management should make it absolutely clear who has responsibility for developing a problem solution.

There may be value in initially having an individual assigned as the sponsor for utilization of these problem-solving procedures. This individual would be available to consult in the utilization of each of the procedural steps and calculation techniques. He would not necessarily be an expert in the process of interest or in the utilization of equipment calculations. However, he would have sufficient knowledge of the techniques to ensure that all the steps in the process were adequately considered.