ABSTRACT

“How did we get into this situation?” How many times has this question been asked at the outset of an investigation, or more importantly, at the completion of an investigation? If the answer isn’t readily and thoroughly apparent, the investigation is not complete. Subsequently, those who will have the responsibility for correction of the conditions leading to the incident will not have all the information necessary to properly complete their task.

For many years, in many writings, the human/machine interaction and its impact on process design has been discussed. The same impact should be examined when performing incident investigations. Consideration of the interaction of human and machine along with the environment in which they are used has long been recommended by the National Safety Council, in both design and investigation.

This paper will discuss techniques for examining this interaction and results via a nine-element matrix (Figure 1) addressing the human, the machine, and the environment before, during and after the incident. Methods for setting and selecting criteria for each of the nine elements will be explored. Examples of type and depth of data and information for each of the nine elements (cells) will be examined. For instance: How is the appropriate time frame for the “before” incident period selected? Why do we look at the after incident time period? How do we collect and store data using these methods? How do we analyze data using these methods? How does this correlate with the scientific method?

While the nine-element matrix provides an excellent framework for identification and categorization of important issues in each of the three areas on which design must focus, we must also examine the interactions of the elements. Many issues do not fall neatly within the broad categories of human, machine, or environment, but rather are interactions between two or even all three of these areas. A second complementary method of categorizing data (Figure 2) that highlights these interactions will also be presented, along with a discussion of how it can be synergistically employed with the nine-element matrix approach to place all aspects of the design or investigation process into better focus.
This paper will be illustrated with practical examples utilizing both of these tools. Additionally, the benefits of using these methods with the scientific method and other programs such as TapRoot will be discussed.