Early Intervention

Preventing Accidents Before They Occur

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Two manufacturing plants, located 75 miles apart, are owned and operated by the same company. They produce the same products. The plants were constructed at the same time and share similar technology. For practical purposes, the plants are identical. They differ significantly, however, in one very important aspect. Twenty one percent of Plant A employees compared to 34% of Plant B employees reported experiencing an accident in the past three years. Although management at Plant B implemented recognition programs to reward employees who work safely, accidents at the plant persist. What factors contributed to these accidents, and what can management do to correct them?

As management consultants, we are frequently asked to identify key factors that relate to the performance of human systems. Over the last ten years, we have attempted to identify factors within organizations that are causally related to accidents, "close calls" or "near misses", and premature equipment failures. We have learned that safety performance and operating reliability result from the complex interaction of factors such as supervisory style, job design, communications, and group norms and expectations (the organizational "culture").

Diagnostic Surveys

The foundations of our research are scientifically-based surveys. Employees are asked to anonymously complete a written survey consisting of approximately 200 questions. Our surveys cover organizational, work group, work place, job level, and safety categories. For example, "Health/well-being" is a work group variable that measures the degree to which employees are prepared both physically and mentally to do their jobs. The variable is measured by asking employees several positive and negatively-worded questions. A sample question is "While at work, the members of my work group are in the best shape possible-no hangovers, no alcohol, no drugs".

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A key component in our analysis is that we also ask the respondents if they have experienced a job-related accident or "close call" within the past three years. Responses to these questions are then statistically compared to responses for other questions, and analyzed by subgroup within the study. In addition, employees' responses are compared to responses from thousands of employees who have completed the survey in the past. Historically, approximately 20% of the employees we have surveyed have experienced an accident, and only about 81 % of those employees reported the accident.

The occurrence of "near misses" or "close calls" is a very important determinant of accidents in the work place. Our research indicates that the number of near misses is significantly higher than organizations realize or care to admit. And, if the causes of the near misses are
not addressed, accidents usually follow.

Employees are frequently reluctant to report accidents and near misses because they believe that management will blame them or their peers will think t4ey are stupid. We recommend to clients that they capture near miss data anonymously, or at least not use self-reported incidents against employees at review time.

When employees do report near misses, they tend to blame defective equipment or a physical hazard rather than human error. On average, about 32% of the employees we have surveyed indicated that they have experienced a near miss. These numbers will vary substantially both within and across organizations.

Factors Relating to Accidents or Near Misses

We have found that employees who have experienced accidents or near misses respond to survey questions differently than those employees who have not. We identify variables that relate to accidents or near misses at a 95% level of significance, which means that the margin of error due to chance is 5% or less.

We have learned that factors that relate to accidents are not the same factors that relate to near misses in the work place. Over the past six years, we have identified approximately 80 variables that have a significant statistical relationship to *accidents*. The most significant variables identified to date are:

- Work place stress

- A measure of the degree of cheerfulness of the work place

- Employee selection practices: the degree to which the organization is careful to hire and promote people who fit in and are comfortable with their jobs.

- A rating of procedures along the natural/awkward dimension.

- Role clarity: the degree to which employees know what is expected of them.

- Job satisfaction: the degree to which employees are satisfied with their jobs and would recommend them to others.

It is interesting to note that the level of safety training is not a key determinant of work place safety in the organizations we have studied. That variable ranks only 37th on the list of variables.

Similarly, we have identified approximately 70 variables that have a significant relationship to *near misses.* The most consistently significant variables are:

- The degree of safety emphasis on the part of the supervisor.

- Management's commitment to safety as perceived by the employees (management typically rates their commitment significantly higher than that perceived by their employees).

- A rating of the work place layout along the good/poor dimension.

- A measure of the riskiness of procedures.

- A measure of work place noise.

- Job satisfaction: the degree to which employees are satisfied with their jobs and would recommend them to others.

- A measure of efficacy: the extent to which people believe that through their own efforts they can reduce accidents and have a positive effect on safety.

The "efficacy" variable is particularly interesting. People who believe that "accidents just happen" score low in this measure. To reduce accidents and injuries, we have implemented programs to teach employees that all accidents can be prevented. We use an approach that heightens both personal and group awareness of the factors that cause accidents, similar to the concepts taught in total quality management programs. As a result of this training, the level of accidents and near misses frequently

Factors Impacting Accidents/Near Misses
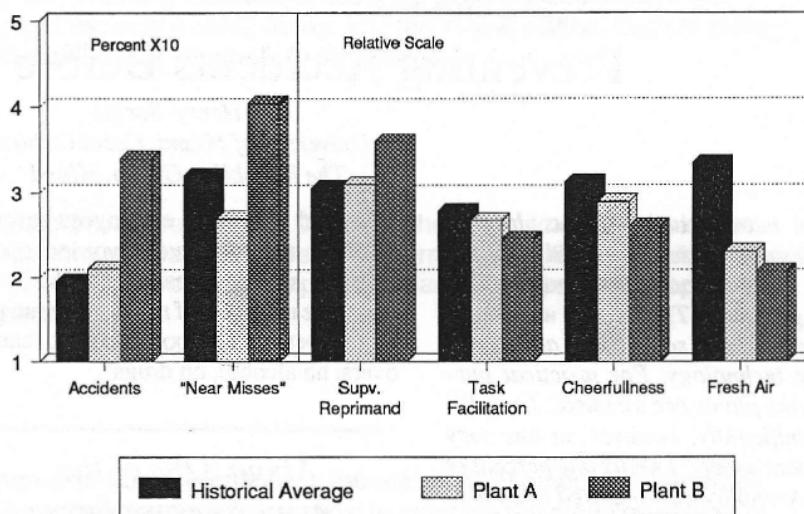### Plant A vs. Plant B - Selected Factors

Figure 1.

decreases dramatically. For this to occur, however, employees must believe that positive results are within their control.

Before you run off to address the variables we have identified, be warned. Factors that relate to accidents and near misses within your own organization are likely to be different from the factors we have described. Specific variables that are related to accidents or near misses vary from location to location, and can vary within the same location over time.

Plant A Vs. Plant B
Why The Difference?

In the opening example, we described two similar plants having different accident rates. As a result of our analysis, we identified a number of significant differences between Plant A and Plant B. In Plant B, over 40% of the employees reported a near miss, compared to 27% of the employees at Plant A. For both plants, 37% of the supervisors reported experiencing a near miss (which is highly unusual). Employees in both plants complained that supervisors were preempting the workers' authority and routinely operating equipment. Unfortunately, a supervisor at Plant B was killed while attempting to repair a problem while the equipment was operating.

The results of surveys conducted at both plants indicated that it was sign-

ificantly more likely that an employee at Plant B would be reprimanded as a result of an accident The likelihood of an employee at Plant B receiving a reprimand was also significantly higher than the historical average for this variable (see Figure 1). Consequently, only 72% of accidents at Plant B were actua1ly reported (things were worse than management realized). *Scores for the "reprimand" variable were significantly related to accidents.*

In our example, the following variables were found to have a significant relationship to accidents and/or near misses:

- Task facilitation (the extent to which supervisors help employees successfully complete their work) was significantly lower for Plant B than for both Plant A and our historical average.

- Supportiveness (the extent to which supervisors relate to employees in a friendly and constructive manner) was also significantly lower for Plant B than for Plant A and our historical average.

- Job challenge and satisfaction were significantly lower for Plant

B than for both Plant A and our historical average.

Regarding work place characteristics, employees at Plant B rated their work place as:

- more messy than neat

- having a poor layout

- more stressful than pleasant

- more depressing than cheerful, and

- having polluted air.

For this study, these work place characteristics have a significant relationship to accidents and/or near misses.

Employee Health/W ell- Being

In the organizations we have surveyed thus far, employee health/well-being is not, on average, a key indicator. It ranks only 72 out of the 80 variables related to accidents. This was also generally true for this study. Despite the significant difference in their rates of accidents, both Plant A and Plant B had "health/well-being" scores higher than our historical average. When we investigated scores by subgroup, however, we found that *scores for this variable within Plant A's maintenance department were significantly lower than scores for other subgroups in the study.* Members of this maintenance group are most likely experiencing personal problems that are impacting their job performance. This example illustrates a powerful benefit of using a survey across departments-the ability to tailor specific intervention resources and training to the particular needs of employees within your organization.

The low scores for "health/well being" in Plant A's maintenance department mirrors results we have seen in a few other studies-maintenance groups tend to have lower scores for "health/well-being" than employees in other production groups. Since maintenance workers typically are the most experienced operating personnel, perhaps employee seniority is a factor. Unfortunately, based on the research con-

ducted to date, we cannot reach a sound conclusion.

The Organizational Culture

Organizational culture reflects the shared values and beliefs held by employees as well as the norms that guide their thinking and behavior. In our survey, we include questions designed to obtain a preliminary "mapping" of the organizational culture.

For our example, we determined that supervisors at Plant A tend to be both achievement and team oriented. They pursue a standard of excellence, work toward goals, cooperate with others, and use good human relations skills. Supervisors at Plant B are also team oriented, but to a lesser extent than supervisors at Plant A. On the other hand, Plant B supervisors also exhibit relatively strong conventional behaviors -avoid risks, always follow orders, and not "rock the boat".

Employees were also team oriented (to a lesser extent than both supervisory groups), but they also were fairly dependent. They tend to accept goals without question, seldom challenge su-

> *"I'm not a victim of stress in the plant, I' m a carrier."*

periors, and strive to please those in authority. Employees in Plant B were somewhat more dependent than those in Plant A. This supports other data which indicates that Plant B workers have less autonomy of both the work pace and the work process than do workers in Plant A.

Where Do We Go From Here?

Although our recommendations are tailored to a client's specific needs, there are several initiatives that can benefit virtually any organization. We generally recommend that first-line supervisors be given management development training designed to teach leadership skills and make them more facilitative and team oriented. Our research indicates that first-line and mid-level supervisors

impact employees' perception of stress in the work place. A first-line supervisor we know recently remarked "I'm not a victim of stress in the plant, I'm a carrier."

We recommend a "UFO" program (upward feedback opportunity) where employees evaluate their supervisors' performance at least twice a year.

Another recommendation we frequently make is to increase the autonomy and accountability of employees, particularly those employees actually producing the product or service. Lower level operating employees should be involved in the planning of work procedures, the hiring of new employees, and the purchase of new equipment.

A client we are currently working with has formed a division-wide task force made up of hourly employees, first line supervisors, and staff members to address the issues identified in our survey and implement our recommendations. Management has sent a clear signal to employees that they intend to take action and create positive, lasting change.

Occasionally, employees who complete our survey are surprised that most of the questions seem to have little to do with safety (we do include sections in the survey addressing safety recognition, procedures, and safety management). Based on our research, we know that safe and reliable operating performance results from the successful integration of multi-functional factors, in much the same way that total quality management crosses traditional departmental boundaries. Our technique develops "benchmark" values for significant factors and provides a means to monitor improvement. Where does *your* company stand?