Investigating for Industrial Safety - A Case Study

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This paper details a case study of a safety review conducted at an industrial facility. The external review team toured the facility conducting informal interviews with employees, interviewed management, reviewed historical records, and conducted focus groups with members at all levels in the organization. Unsafe acts, local working conditions and organizational factors impacting safety were identified.

Introduction

This paper details a case study of a safety review conducted at an industrial facility. Interest in the safety review was initially spurred by a fatality at the facility. The company management was concerned that despite a significant amount of work developing and bench marking safety procedures, serious accidents and deaths continued to occur. While the accident and incident rates at this particular facility were within the average for other facilities in Canada, the management of the facility decided to explore avenues for achieving a world class operation with regards to safety. A decision was made to undertake an independent review of safety issues at the facility. Rather than focus on the recent accident, the review team was asked to examine and to uncover gaps in policy/procedures/practices, identifying broader systemic issues, and to develop recommendations related to these.

Team Composition

The team was composed of a senior consultant with a large safety management firm, a university and professor, a TSB of Canada human performance specialist, a superintendent from a similar facility and a representative from the associated occupational safety and health association. It was hoped that a union representative would also participate on the review team, but the union decided against direct participation, opting instead to attend a final presentation.

Framework for Interpretation

Because of the diverse backgrounds and foci of the team members, the challenge was to find a means of unifying the various perspectives and approaches each of the participants brought to the table, given the short time frame in which to organize ourselves as a group.

All team members were familiar with accident investigation and endorsed the notion of moving from causes proximal to an accident to those further up the organizational chain. As members, we came to a consensus in principal, (though different terminologies were preferred by different members) about the three level taxonomy presented below to describe proximal events (unsafe acts) through to workplace related conditions (Local Workplace Factors) and management and organizational level events and conditions (Organizational Factors).

Unsafe acts

Unsafe acts are the stuff of which accidents are made. Since not all unsafe acts will lead to an accident, the actual numbers of unsafe acts committed are impossible to determine. It is likely that these numbers are large. Of greater value than the number of unsafe acts committed is information relating to the nature and variety of the unsafe acts, particularly in the context within which they occur.

Managing unsafe acts involves applying different kinds of approaches to the various error and violation (adaptation) forms. Errors are essentially information-processing problems and require the provision of better information, either in the person's head or in the workplace. Violations, on the other hand, have in many cases, their origins in motivational, attitudinal, group, and cultural factors. In order to mitigate unsafe acts, it is necessary to consider local workplace factors.

Local workplace factors (unsafe conditions)

Up the line from unsafe acts are their immediate mental and physical precursors - such things as poor workplace design, clumsy automation, inadequate tools, and equipment, unworkable procedures, the absence of effective supervision, high workload, time pressure, inadequate training and experience, unsuitable shift patterns, poor job planning, undermanning, badly calibrated hazard perception, inadequate personal protective equipment, poor teamwork, leadership shortcomings and the like.

Local factors are likely to be fewer in number than the unsafe acts which they generate. As such, they are more easily managed. While local factors are amenable to immediate or interim action, they are still only the local expressions of higher-level organizational problems.

Organizational factors (underlying factors)

It is in the upper levels of the system that it becomes possible to get to grips with the underlying factors that create the downstream local factors and unsafe acts. If these organizational factors remain unaddressed, then efforts to improve things at the workplace and worker level will be lost. While it is possible to reduce the effects of certain kinds of unsafe acts through changes in local workplace factors, the existence of organizational factors (underlying factors) will eventually result in the development of new human and local problems. It is essential therefore to sample organizational factors.

Data Collection Methodology

With accident investigation, there is a clearly defined starting point from which to uncover unsafe acts and then move along to unsafe conditions and underlying factors. In the case of a safety review, it is possible to begin the review either from bottom up (what unsafe acts are being committed and what are the associated local factors and organizational factors) or from the top down (what are the organizational process in the organization and how might they affect the implementation of local working conditions and unsafe acts).

In order to be able to examine the facility from both perspectives, the following steps were undertaken: discussions were held with senior management regarding the safety program in place at the facility, a review of historical records including previous accident investigation reports was conducted, the team members toured the facility and sampled a number of work areas and occupational roles, and focus groups were held with individuals from the various tiers of the organization.

Unsafe Acts Identified

All members of the team had been on accident investigation teams at some point in their career. As a result, all were comfortable with the notion of identifying unsafe acts, and this became a starting point as we toured the facility and examined past accident reports. While touring the facility, the identification of the violations would not have been possible without the participation of the two subject matter experts, with their many years of combined experience.

The majority of the unsafe acts identified tended to be violations (or adaptations) rather than errors. What struck the group very early on in the tour was both the prevalence and the routine nature of the observed violations. In some cases, we were able to identify some local working conditions that would have contributed to the violations. As an example, one

can consider an employee who was not using wheel chocks to ensure his vehicle did not roll.   Upon closer examination of the wheel chocks, it was evident that while the vehicle had been well used and exposed to the elements, the paint on the wheel chocks was unblemished. To extend the example above, the facility superintendent and the safety officer who were giving the team the tour of the facility did not make use of wheel chocks regardless of the severity of the incline on which they parked their vehicle.

Local Factors

Local factors were explored during the tour where it was possible to physically look for potential factors once we had identified an unsafe act. We also explored local factors as part of our focus groups.

Going back to the example of the non-use of wheel chocks, a specific local working condition that affected the worker's use of the wheel chocks was equipment design. The storage location of the wheel chocks and the confined nature of the passage ways in which the vehicle was parked made it difficult and/or inconvenient to make use of the wheel chocks.

Organizational Factors

In order to examine organizational factors, six broad areas of the organization were sampled (safety-specific factors, management factors, technical factors, procedural factors, training factors, and cultural factors). The relationship between these areas is depicted in the figure.

While it was not possible to sample all aspects of the organization, we sampled several issues from within each category.
1.   safety specific factors (incident and accident reporting, safety policy)

2.   management factors (management of change, leadership and administration, communication, incompatibilities between production and safety)
3.   technical factors (maintenance management, human-system interfaces, design)
4.   procedural factors (standards, rules, administrative controls, operating procedures)
5.   training (formal versus informal methods, presence of a training department, skills and competencies required to perform tasks, recurrent training and qualification)
6.   culture (value for procedures, commitment to safety)

Perception Matrix

One of the tools which we used to help us organize some of the key issues which emerged from the focus groups was what we termed a perception matrix. We summarized the key issues that were raised in the various focus groups and then identified, by level of severity, how each strata of the organization had rated them. Such issues included communications (vertical and horizontal), supervisor training effectiveness, accountability/authority mismatch, and value for procedures.

Synthesis of Activities

In accident investigation, the event is used to determine unsafe acts, and the unsafe acts are examines systematically to determine the underlying local and organizational factors. In a safety review, it is possible to turn the process around - to be proactive in a safety management sense. That is, organizational and local factors that are known to facilitate the production of unsafe acts can be identified. Recommendations can then be made to reduce the likelihood of the unsafe acts. The team concluded that standards and procedures were not being applied nor enforced consistently, the commitment to safety was not shared by all employees at all levels, and that clear lines of accountability and authority were not defined in the organization.

The team was able to identify local and organizational factors which could have an impact on safe operations within the facility. The safety issues were closely interrelated and as a result, there was overlap in the local and organizational factors we identified for each. We attempted not to be overly prescriptive in our recommendations. Rather we tried to outline in broad terms the general form of remedial action.

Both the management and the workers endorsement of the review facilitated our investigation as we were given full cooperation by all levels of management and also the unit workers. Such openness allowed the review team a more realistic vision of the day to day operations of the facility and facilitated the identification of safety issues associated with this type of operation.

References

Reason, J., 1997, Managing the Risks of Organizational Accidents, Ashgate, Aldershot.