Preventing Occupational Fatalities

A review of findings from a recent industry forum

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THE FATALITY PREVENTION FORUM was held in early November 2007. Hosted by the Safety Sciences Department at Indiana University of Pennsylvania (IUP) in cooperation with the Alcoa Foundation, the forum examined key aspects of the complex relationships between the work environment, workforce and leadership, and how these relationships affect the safety and health management system as they relate to hazards with the potential for fatal consequences. The goal was to identify contributing causes and organizational weaknesses that increase the likelihood for occupational fatalities. Based on these aspects, solutions and best practices for preventing fatalities were identified as were areas of future research.

Fatality Experience in the U.S.

To provide a framework and some context regarding the extent of fatalities in the workplace, the fatality experience in the U.S. was analyzed. Summary data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) was used to prepare this analysis. The CFOI provides comprehensive counts of fatal work injuries. It is a federal-state cooperative program that has been in place in all 50 states and the District of Columbia since 1992, with data being collected through the various state agencies (BLS, 2007a).

In 2006, 5,840 fatal work injuries were reported in the U.S. This was a slight increase from the revised total of 5,734 fatalities in 2005. The rate of fatal work injuries in 2006 was 4.0 per 100,000 workers, which equaled the rate for 2005 (BLS, 2007b).

Fatalities by Industry

The four industries with the highest fatality rates are agriculture, forestry, fishing and hunting (30.0 fatalities per 100,000 workers); mining (28.1 fatalities per 100,000 workers); transportation and warehousing (16.8 fatalities per 100,000 workers); and construction (10.9 fatalities per 100,000 workers). Additional rates are shown in Table 1 (p. 30).

Fatalities by Event

The four most frequently identified fatal events are highway incidents, homicides, falls and struck-by accidents. Since 1992, highway incidents have been the most frequently cited fatal event each year. While the frequency of these events has increased or decreased year to year, the numbers remained relatively constant until 2006. While highway accidents still account for nearly one of four fatal work injuries, the number of highway incidents fell 8% in 2006. The 1,329 fatal highway incidents in 2006 was the lowest annual total since 1993 (BLS, 2007b).

Occupational fatalities due to falls have seen a modest increase in frequency from 1992 to 2006. The lowest number of fatalities—600—occurred in 1992, and the number has steadily increased, with 809 fatalities reported in 2006. Of these 809 fatalities, almost 40% were due to falls from roofs and ladders. As could be expected, falls account for the greatest percentage of fatalities in the construction industry with approximately 33% of all deaths in that industry due to falls.

Forum Objectives

- Identify contributing causes and organizational weaknesses that increase the risk of fatalities.
- Identify solutions and best practices for preventing fatalities.
- Identify areas of future research that would drive significant improvement in the ability to predict, focus and intervene to interrupt the cycle of events that lead to a fatality.

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Abstract: *Traditional approaches to fatality prevention have not always proven effective. While the number of occupational fatalities has declined, additional work is needed and many questions remain. To identify contributing causes and organizational weaknesses that increase the likelihood of fatalities, Indiana University of Pennsylvania, through a grant from the Alcoa Foundation, hosted a 2-day fatality prevention forum. This article presents the findings from that forum.*

Table 1

Fatalities & Fatality Rates, 2006

Industry	Fatalities	Fatality rate[a]
Agriculture, forestry, fishing, hunting	655	30.0
Mining[b]	192	28.1
Construction	1,239	10.9
Service providing	2,778	3.0
Manufacturing	456	2.8
Government	520	2.4
Total	5,840	4.0

Note. [a]*In deaths per 100,000 workers.* [b]*Mining includes metal and nonmetal mining, and oil and gas extraction.*

Homicides account for approximately 9% of all occupational fatalities. The industries with the highest occupational fatality rates due to homicides are gasoline stations, and food and beverage stores. Approximately 75% of all fatalities in these industries are due to homicides. Occupational fatalities involving homicide have seen the greatest deceases in the frequency of occurrence from 1992 to 2006. Since hitting a high of 1,080 in 1994, occupational homicides have steadily decreased to their lowest level of 516 fatalities in 2006 (a 52% decrease).

Struck-by incidents include any incident in which the victim was struck by an object, except for a vehicle, the ground as in a fall, a person as in an assault, and material as the result of a fire or explosion (BLS, 1992). Being struck by an object accounted for approximately 10% of all occupational fatalities in 2006 (BLS, 2007b). Struck-by incidents accounted for the greatest percentage of fatalities in the manufacturing industry with 14%. Transportation incidents and falls followed closely behind, each accounting for 13% of the fatalities in this industry.

A Survey of Forum Participants

To identify some underlying causal factors associated with workplace fatalities, attendees were asked to complete a survey before the conference. The purpose was to identify areas of concern regarding workplace fatalities and opportunities for prevention. Participants were asked to describe their organizations' fatality experience, employment history, barriers to fatality prevention and fatality prevention successes. The survey covered the fatality experience during the period from January 2004 to August 2007.

Exposure data included the number of employees, the number of contract employees under the organization's supervision and the number of contract employees on site not under the company's supervision. Fatalities were classified in eight event categories: 1) contact with objects; 2) falls; 3) exposure to harmful environments; 4) electrocutions; 5) transportation accidents; 6) fires and explosions; 7) assaults; and 8) other events.

The 32 responding organizations reported 207 fatalities. Of these, 50% reported belonging to the manufacturing industry (Janicak, 2007).

Fatality Events

The overall results from the survey were similar to the experience reported by U.S. industries. Struck- by and transportation accidents were the two events causing the most occupational fatalities among the respondent group. Because most respondents represented manufacturing companies, contact with equipment or an object was identified as the leading cause of fatalities with 45%. Transportation fatalities were the second leading event for a fatality accounting for approximately 24% of all deaths reported by this group (Janicak, 2007).

Employee vs. Contractor

The survey identified the relationship between the victim and the organization, which cannot be determined using the national CFOI data set. The number of fatalities and the estimated numbers of workers were identified for employees, contract employees under the organization's supervision, and contract employees not under the company's supervision (Janicak, 2007).

While this survey is only a sample of true industry experiences, the fatality rates for contract employees not under an organization's supervision were significantly higher than the fatality rates involving employees of the organization. Fatality rates for employees of the organizations ranged from 1.8 fatalities per 100,000 workers to 3.9 fatalities per 100,000 workers. Fatality rates for contract workers not under the organization's supervision ranged from 7.8 fatalities per 100,000 workers to 100.0 fatalities per 100,000 workers (Janicak, 2007).

Causes for Fatalities & Follow-Up Activities

The survey asked participants to identify why a fatality occurred and what preventive activities were implemented following it. Across all industries represented in this survey, similar reasons were identified. These include employees' failure to follow established procedures; following inadequate procedures; and failure to provide employee protection (Janicak, 2007). Activities implemented following a fatality include establishing accountability for safety processes, performing audits and conducting risk assessments.

To download the survey instrument, visit www.asse.org/psextras.

Opportunities & Barriers

Respondents were asked to identify barriers to achieving 100% fatality prevention in the organization and the industry. Risk taking and the inability to correctly assess risks in job activities were frequently identified, as were safety culture issues such as lack of funding for safety, lack of management support and no accountability for safety (Janicak, 2007).

Respondents were also asked to identify opportunities available to prevent workplace fatalities. Conducting risk assessments, implementing behavior-based safety programs and establishing accountability for safety were among the opportunities identified by respondents.

Breakout Sessions

Breakout sessions were divided into six industry groups: transportation, manufacturing, construction, utilities, mining and chemical processing. The intent of creating the industry groups was to determine whether the groups are similar in terms of their fatality prevention experience.

Before the forum, attendees received a list of questions that would be addressed during the breakout sessions. The number of attendees in each group ranged from 11 in the transportation group to 47 in the general industry group. Attendees were asked to prepare responses to the questions and actively participate in the sessions.

To create these groups, participants were asked when registering to select their first and second choices. Most got their first choice, although the last 15 registrants were placed in their second choice because the first-choice sector was full. A participant guide was provided at the time of registration to help participants prepare for the forum.

The sessions were facilitated by industry coordinators who were selected by the forum planning committee based on their expertise in the industry. To help the industry coordinators, table moderators were assigned to each table within the groups to help guide discussion. The moderators were also selected by the planning committee, again based on their experience in the particular industry group.

A breakout session guide was developed to identify roles and responsibilities of the coordinators and moderators, and these participants completed two training sessions before the forum. The session guide and training covered the following topics:

- roles and responsibilities of the industry coordinator and table moderator;
- resources for the industry coordinator that included fatality data for a given group and a template (PowerPoint) for reporting findings;
- form for recording participant feedback, including the use of a fishbone diagram to address the questions on what needs to be done to prevent fatalities, on root causes of fatalities, and on the role of work environment, culture and leadership in fatalities.

Group discussions during the breakout sessions focused on the following questions:

- What organizational weaknesses lead to fatalities?
- What are the contributing causes for fatalities?
- What are best practices for preventing fatalities?
- What are the future research needs for preventing fatalities?
- What is working within the organization to prevent fatalities?

After two 4-hour sessions, each industry group discussed its findings and developed a consensus answer to each question. These findings were then presented by the industry coordinator to the entire forum audience.

Organizational Weaknesses That Lead to Fatalities

Similarities were noted in several areas pertaining to organizational weaknesses that lead to work-related fatalities. Six key weaknesses were identified by the forum participants:

1) Lack of understanding of the impact of risk-taking behavior was reported by participants from the mining, utility and construction industries. Risk-taking behavior tends to be encouraged via incentives in an effort to try to minimize customer outages and meet expected service levels. The mining industry participants identified a link between a lack of understanding of the risks present and risk-taking behaviors by workers. Participants agreed that in the mining and construction industries understanding about how to conduct a risk assessment is lacking.

2) Participants also stated that management and senior leaders lack knowledge of the connection between an effective safety program and the associated benefits. This was particularly noted in the construction and utility industries.

3) The chemical and general industry participants identified the importance of a safety culture within an organization. The chemical industry participants voiced concerns that their organizations fail to hold safety as a core value, while general industry participants indicated that leadership does not always recognize their effect on the safety culture.

4) Lack of technical competence was identified as a contributing factor to fatalities in the chemical and transportation industries. Transportation industry participants were concerned with a lack of skills at the operator level, while those in the chemical industry were concerned about a lack of skills at all levels.

5) Participants cited business needs and competition as drivers that lead organizations to focus on production rather than safety, particularly in mining and general industry.

6) Accountability for unsafe behavior was reported to be limited or inconsistent according to participants from the utility and construction industries.

Contributing Causes to Fatalities

Similarities were noted in several areas pertaining to the contributing causes of workplace fatalities. Seven key contributing causes for fatalities were identified:

1) Hazard recognition skills appeared to be lacking in general, mining and chemical industries.

Concerns in three areas—risk taking, inadequate training and unsafe equipment—were frequently cited by forum participants as underlying causal factors of work-related fatalities.

2) Participants from the mining industry reported that the controls to protect workers appear to be lacking. In addition, the utility industry appears to rely heavily on PPE, while general industry tends to rely heavily on PPE and administrative controls.

3) The number of contractors on site contributes to safety problems within the transportation, chemical and utility industries. More specifically, the chemical industry participants indicated a growth in the number of contractors present, while the transportation and utility industries reported inconsistent safety rules for contractors.

4) Risk-taking activities appear prevalent in the construction industry, largely attributed to work schedules and lack of project-specific training. Participants from the transportation industry felt poor risk perception and overconfidence among workers leads to risk-taking behaviors, while those from the utility industry reported a long history of accepting and tolerating risk-taking behaviors.

5) The chemical and mining industry participants identified a lack of support personnel to perform necessary safety activities and functions within the organization as a factor in workplace fatalities.

6) The mining and general industry participants identified aging and technically inadequate equipment as a factor in workplace fatalities.

7) In addition, a high turnover rate, which can affect the availability of technically competent personnel, was identified by the mining and general industry participants as a leading factor for workplace fatalities. Participants from the chemical industry also identified a concern for lack of training; however, it was not necessarily linked to a high turnover rate.

Best Practices for Preventing Fatalities

Similarities were noted in several areas pertaining to best practices for preventing fatalities in the workplace. Six best practices were identified by participants.

1) Leadership training is needed in general industry, mining and the utility industry. The training should help leaders better understand root causes of fatalities and how resources—over which these leadeers have influence—can affect fatalities.

2) Collecting and reviewing data through such processes as audits was stressed—with a focus on fatality-producing events—by the mining, general industry and chemical industry participants.

3) Participants from the construction, utility, chemical and mining groups specifically identified accountability was a best practice. In most cases, accountability was stressed at all levels.

4) The importance of designing safety into the process during the engineering or prejob/task planning stages was stressed by the construction, utility and chemical industry participants.

5) Participants from general industry, mining, chemical, construction and the utility industry stressed the importance of conducting risk assessments, particularly during pretask/prejob planning efforts. Those nonroutine tasks were of significant importance to general industry and the construction industry participants.

6) The importance of determining root causes of incidents was stressed by the chemical and mining industry participants.

Future Research for Preventing Fatalities

Three similarities were noted with regard to future research needs:

1) Concerns about risk-taking behaviors were prevalent. Participants from the mining, chemical and utility industries indicated a need to not only know how to conduct risk assessments, but also how to change a culture that supports risk-taking behaviors.

2) Several industries (transportation, construction and mining) need to explore specific technology. While the technologies themselves vary, the importance of keeping abreast of new technology was indicative in the role in helping to prevent fatalities.

3) There is a need for improved training for a diverse workforce.

Conclusion

Each industry group at the forum discussed four primary areas affecting fatalities: organization weaknesses, contributing causes, best practices and future research needs. Several similarities were noted in each category among the industry groups. Furthermore, across these four areas several distinct patterns were identified. Concerns in three areas—risk taking, inadequate training and unsafe equipment—were frequently cited as underlying causal factors.

When the groups were asked about future research needs, attention again was focused on risk taking, training and equipment.

This indicates that to address fatalities in the future, current research should focus on these three areas. SH&E professionals need a solid understanding of the risk assessment process and must determine why risk-taking behavior occurs. Organizations must also ensure that training is adequate and that workers have the required technical competence for completing a task safely. Finally, the equipment used in the workplace must be adequate—and research on new and improved technology is needed to further prevent fatalities in the future. ■

References

Bureau of Labor Statistics (BLS). (1992). *Occupational injury and illness classification manual.* Washington, DC: U.S. Department of Labor (DOL), Author.

BLS. (2006, Aug. 10). Bureau of Labor Statistics News. Washington, DC: DOL, Author.

BLS. (2007a). *Census of fatal occupational injuries.* Washington, DC: DOL, Author. Retrieved Jan. 29, 2009, from http://www.bls.gov/iif/oshfat1.htm.

BLS. (2007b). Bureau of Labor Statistics News. Washington, DC: U.S. DOL, Author.

Janicak, C. (2007, Nov. 1). Occupational fatalities in the U.S. Paper presented at Fatality Prevention Forum, Coraopolis, PA, USA.

Krause, T. (2007, Nov. 1). Leading with safety and fatality prevention. Paper presented at Fatality Prevention Forum, Coraopolis, PA, USA.

Manuele, F. (2007, Nov. 1). Recognizing predictive indicators for fatalities. Paper presented at Fatality Prevention Forum, Coraopolis, PA, USA.