A question often posed by a safety manager is “Are my safety activities working?” Safety performance should be evaluated in an organization in the same manner as productivity and other aspects of the business. Areas to evaluate include determining the overall effectiveness of a particular intervention, where a company’s safety performance stands with regard to other companies, identifying potential impediments to safety success, and determining the trends in accidents and losses over time.

An integral part of any safety activity should include techniques for developing goals and objectives, collecting data to measure the success of the safety interventions, evaluating the results, and implementing the appropriate corrective action. The manner in which safety performance is measured can range from developing safety performance measures unique to a particular organization to using existing performance measures and standards to benchmarks derived from similar industries and organizations.

Regardless of the approach, the measurement and evaluation of safety performance requires a carefully structured program of planning, establishing goals and objectives, identifying valid measures, conducting proper data analysis, and implementing appropriate follow-up measures.

**Intervention Effectiveness**

The overall effectiveness of the safety program in reducing accidents, controlling losses, and improving the overall working conditions in an organization is contingent upon a number of aspects, all of which are interrelated. These aspects can be broken down into seven main categories (Swartz 2000, 42):

1. Management commitment and support
2. Employee participation

**LEARNING OBJECTIVES**

- Develop various leading, trailing, and current indicators that can be used to assess a safety program activity.
- Develop an effective safety performance measurement program designed to address a safety issue in the workplace.
- Evaluate the performance of a safety program activity using a variety of measurement techniques.
- Incorporate a continual improvement process into safety performance activities in the workplace.
**Occupational Safety and Health**

**Management System Cycle**

The American National Standard for Occupational Health and Safety Management Systems (ANSI/AIHA A10) defines an occupational health and safety management-system cycle as an initial planning process and the implementation of the management system, followed by a process for checking the performance of these activities and taking appropriate corrective actions (AIHA 2005). This is then followed by a management review of the system for suitability, adequacy, and effectiveness against its policy and the ANSI standard (AIHA 2005).

Components of this cycle include the plan-do-check-act cycle along with management leadership and employee participation, management planning activities, implementation, checking and corrective action, and management review (AIHA 2005).

The purpose of this cycle is to ensure that continuous improvement activities are systematically incorporated into the organization’s management functions, resulting in a coordinated effort to continually improve safety performance.

**SAFETY CULTURE**

An organization’s culture consists of its values, beliefs, legends, rituals, mission, goals, performance measures, and sense of responsibility to its employees, customers, and community, all of which are translated into a system of expected behavior (Swartz 2000, 18). The safety culture of an organization defines how the organization values and perceives safety in the workplace. This safety culture plays an important role in determining the success of safety and health activities. If management promotes a culture in which safety is perceived as not being important to the organization, then the employees will perceive safety as something that is not important. It is the organization’s culture that determines whether the safety program as a whole will be effective. An assessment of the safety culture should include asking questions such as the following (Weinstein 1997, 24):

- Is there a strong safety culture established with no tolerance for unsafe practices?
- Is the cultural goal zero injuries?
- Are health and safety procedures followed all the time?
- Is there a vision of a safe work environment, and do all employees share in it?
- Do employees value safe behavior, themselves, and their continued well-being?
- Is the management style and culture nonautocratic with a win-win atmosphere?
- Is there a trusting relationship between management and employees?
- Do employees believe that safety is a company priority?

In organizations with a strong safety culture, the following characteristics exist (Weinstein 1997, 24):

- Executives and managers visibly support safety with no contradictory decisions, and they accept full accountability.
- Employees are involved with safety and their views are sought and acted upon.
- Supervisors’ actions support safety, including recognizing and appreciating safe work practices and behaviors.

It is accepted in the safety profession that there is a relationship between an organization’s culture and safety performance and that the organization’s culture can be measured and managed (Swartz 2000, 82–83; Mohamed 2000, 384). Methods used to measure the safety culture in an organization include employee surveys directed at their perceptions about management leadership for safety, reinforcement by management to report hazards, employee attitudes and perceptions about safety, how employees view the management and supervision of safety, and whether they feel there is a real and genuine commitment for safety.

**Measuring Safety Effectiveness**

In occupational safety and health, the need for a particular intervention can be determined by legislation in which a regulation stipulates that a particular safety and health activity be provided in addition to other areas not regulated by standards, such as ergonomics. It can also be determined by analysis and investi-
gation. For example, an analysis of the work site and loss data may indicate the need to prevent back injuries. Once the intervention is in place, many times a more difficult question presents itself: “Is the safety intervention working?”

The methods safety professionals use to answer this question vary widely. Some companies count the number of people injured at the end of the year, and others may use a continuous improvement process. As with any intervention in the workplace, an organization must determine if the activities implemented are effective in meeting the organization’s goals and objectives. Safety activities are no different than any other business activities. Over the years, it has become more commonplace for the safety professional to tie safety activities to results in an effort to show how improving safety activities equates to improving business operations.

Historically, the effectiveness of a safety activity has been measured in terms of the number of accidents incurred, the organization’s OSHA recordable incidence rates, the dollars spent on accidents, and the costs for insurance coverage. There is no one way to measure safety and health program effectiveness; rather, a systems approach is necessary (Swartz 2000, 98). These multiple methods for measuring safety performance include an approach in which leading, trailing, and current indicators are used.

As methods for continual improvement evolved in the workplace along with statistical process control, the safety profession has slowly moved toward some of these methods now routinely used in other aspects of the organization’s management structure. Safety managers are increasingly held accountable for their activities and must show management how their activities positively impact the organization.

With an ever-increasingly global economy, and international standards becoming the framework by which management practices are designed and monitored, safety practices have evolved to systems approaches for continual improvement. An organization must accurately and validly assess where they are in terms of their safety performance, how they decide where they would like to be, and what needs to be done to get there (Petersen 1996, 3).

In recent years, much research has been conducted to evaluate the effectiveness of interventions designed to improve safety performance (Al-Mutairi and Haight 2009, Iyer et al. 2004). Through modeling techniques and statistical analysis, it is possible to optimize the effects of the safety and health interventions by decreasing injury rates and property damage with less costly programs.

Valid Measurements

Measuring safety performance is a critical step in the safety performance improvement process. The purpose of safety performance measurement is to determine if the goals and objectives have been met. The measures selected to monitor and evaluate safety performance must be valid and reliable. Valid performance measures are measures that are true indicators of performance. There must be a relationship between what is being measured and safety performance.

Because follow-up action is planned and implemented based on the outcomes of the performance measures, it is only logical that the corrective actions are also valid means for improving performance. For example, a safety manager determined that an indicator of the number of cumulative trauma disorder (CTD) injuries reported was the number of employees that successfully completed CTD injury prevention training. Using this measure, the safety manager tracked the number of employees trained each month and the number of CTD injuries reported. The safety manager found that as the number of employees in the facility trained on CTD injuries increased, so did the number of CTDs reported, indicating that the training was unsuccessful in reducing the number of injuries.

What the safety manager failed to take into account was the fact that the training also included early symptom reporting procedures and information about the early symptoms of CTD injuries. Thus, using the completion of CTD training as an indicator of CTD injury prevention may not be considered a valid measure because the training introduced a confounding factor—the early reporting of CTD symptoms. Variables confounding in data research are variables whose individual effects upon an outcome cannot be readily
measured. In some cases, statistical procedures may be used to control for this confounding.

Another important trait of any measure used to evaluate safety performance is reliability. The reliability of a performance measure is the consistency of results obtained through the measurement. This consistency means that the same results are obtained when the measurement is taken multiple times. A measurement used to describe the number of CTD injuries suffered must be well-defined to ensure the reliability of the data collected. An unreliable measure can yield different numbers when measured by different people. Data must first be proven to be reliable before it can be evaluated for validity. Otherwise stated, unreliable data is always considered invalid. Reliable data may or may not be valid.

Reliability of data can be statistically evaluated using a variety of techniques. Two examples of these methods include the test-retest method and the split-half method. In the test-retest method, a performance indicator is measured multiple times. If the measurements are highly correlated, meaning the same results are obtained over the multiple trials, the measurement technique and data can be shown to be reliable.

The split-half method is commonly used with tests and survey instruments. With the split-half method, the items are randomly distributed throughout the instrument. If the items are consistently measuring the same outcome, one would expect to find a strong correlation when comparing the first half of the responses to the second half.

**Leading Indicators, Trailing Indicators, and Current Indicators**

The effectiveness of a safety activity should be measured via three indicators: leading indicators, current indicators, and trailing indicators. Trailing indicators are the most common measures used by safety professionals. **Trailing indicators** are those measures that indicate the results of an intervention strategy after the fact. Examples of trailing indicators include lost-workday rates, the number of injuries over a period of time, and the losses incurred by the organization. Some reasons why trailing indicators are so widely used to measure safety performance include the availability of data to make such measurements, the influence of OSHA's record-keeping guidelines, and use of various OSHA rates and measures of safety performance in the United States. One major downside of using trailing indicators is that they are measuring unwanted events after the fact, thus providing no means for implementing improvement strategies to impact their outcomes.

**Current indicators** measure the current status of the organization's safety performance. An example of a current indicator is the number of safety audits conducted up to a particular point in time. A positive outcome from using current indicators is that as soon as the measure is obtained, action can be taken immediately to improve the measure and thus improve safety performance.

**Leading indicators** are those measures that are correlated to future safety performance. For example, participation in safety training may be an indicator as to whether employees suffer back injuries on the job. Measuring the number of workers trained at a point in time may be indicative of the number of back injuries expected in the future. As with current indicators, leading indicators provide the safety manager with information that can be acted upon today with positive results on the safety performance in the future. A key to using current and leading indicators is that these measures must be directly correlated to safety performance. Without this relationship, a safety manager may find that activities taken to improve safety performance based on uncorrelated measures will have no effect on safety performance.

Safety performance should **not** be measured using only one or two performance measures. Instead, it should be measured with a variety of leading, current, and trailing indicators that have been shown to be correlated to safety performance in the workplace. When selecting these performance measures, keep in mind that the data needed for the performance measure should be valid, reliable, and readily available.

When using multiple measures, the data's main effects and interactive effects become important when interpreting the results. Main effects are the variables examined separately in order to determine their role in influencing the outcome measure. For example, a
safety manager wishes to determine the influence the age of the worker and the number of training sessions attended have on the number of injuries reported over a given period. The age of the worker and the number of training sessions attended can be considered the main effects. Next, the safety manager wishes to determine the influence that both age and number of training sessions attended together have on the number of injuries reported. When examining the two variables simultaneously, the safety manager is assessing the interactive effects of the two variables.

**Benchmarking**

Benchmarking, measurement, and evaluation are all essential for program success (Lack 2002, 684). The benchmarking process establishes a standard that the company has determined signifies successful performance. Benchmarking is a technique for measuring an organization’s products, services, and operations against those of its competitors, resulting in a search for best practices that will lead to superior performance (Hoyle 2003, 15). Benchmarking safety performance entails identifying similar organizations with outstanding safety performance and identifying the key aspects of their activities that make them stand out.

Benchmarking is more than taking another organization’s safety programs and copying them. Much research is necessary to be able to identify those aspects of safety activities that result in superior performance, and much work is required to tailor them so similar outcomes can be duplicated in another organization. Meaningful benchmarks are typically set using successful performance results from similar industries and other facilities. The benchmarking process can be completed in six steps (Pierce 1995, 177–178): survey programs, identify solutions, prioritize, develop a plan, implement the plan, and then follow up.

**Surveying**

The first part of benchmarking is surveying front-running programs or organizations. This step is the most crucial in the entire process. Identifying who the best organizations are and what they are doing to generate exemplary safety performance is critical in establishing benchmarks and program priorities.

**Identifying Solutions**

The second part of benchmarking is identifying the complementary solutions used by the target organization or program. As stated previously, the benchmarking process is not merely copying what other successful organizations are doing, but incorporating their programs into your organization in a manner that fits the organization structure and goals.

**Prioritizing**

Part three of benchmarking is prioritizing growth opportunities from the list of complementary solutions. The purpose of prioritization is to determine which program changes will provide the organization with the largest improvement in business and safety performance.

**Planning**

The next part of the process involves developing a plan to achieve the goals. Incorporating changes in an organization will take time and careful planning. The programs identified as being crucial for success must be tailored to the organization.

**Implementing**

Implement the plan. Adequate personnel and resources must be made available to ensure the benchmarking plan is carried out. Inadequate resources in the implementation phase, a lack of commitment, and a lack of motivation to continue implementing the benchmarking plan will result in poor results.

**Following Up**

Benchmarking is a dynamic process. Follow-up activities include monitoring to ensure the changes are meeting the needs of the organization. Just because they were found to be successful in one organization...