Development of a Safety Performance Evaluation System to Determine the Effectiveness of the Safety Training Given to Plant Engineering Employees at 3M-Menomonie.

by

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ABSTRACT

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The purpose of this study was to develop a safety performance evaluation system to show the effectiveness of the safety training given to plant engineering employees at 3M-Menomonie. The study was conducted at the 3M facility in Menomonie, Wisconsin.

The review of literature examined the different types of training used throughout different industries as well as covered the different evaluation systems used in conjunction with the training. The review focused on the history of safety, what is training including the purpose, procedures for evaluating training, safety training, and safety training at 3M-Menomonie. The information was gathered from numerous reference and publication materials from the field of safety and training.

The following steps were used to develop the evaluation system: (a) develop a safety training evaluation system for plant-engineering employees, (b) determine a process

of implementation, and (c) implement the system into 3M-Menomonie's safety training procedures.

Conclusions were based on the information taken from the reviews of literature and development and implementation of the evaluation system. The analysis of this information showed areas that were deficient and appropriate recommendations for improvement were given.

Implementation of the system should help the safety department improve deficiencies in the current training policies. In addition, and most importantly, the new system should be able to help improve the effectiveness of the safety training given to plant engineering employees. This will allow them to perform their duties much safer and help to reduce the number of injuries on site as well as the costs of these injuries.

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CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

3M-Menomonie is a manufacturing facility located approximately 60 miles east of Minneapolis, Minnesota in Menomonie, Wisconsin. The facility employs approximately 460 employees and has 15 different departments located at the facility performing a variety of different operations. Training is very important for the employees, due to the variety of jobs performed and the fact if they are not trained they cannot perform their jobs effectively and safely.

According to Webster's Dictionary, to train means "to make prepared (as by exercise) for a test of skill" (Merriam-Webster, 2001). An easier way to understand the definition of training, is to say that it is showing how to apply and use information given. Training can include a variety of topics including how to perform first aid, how to operate a machine, how to install computer software or how to bake a cake. Training is necessary for employees to perform their jobs effectively and safely (Grimaldi and Simonds, 1975). At 3M Corporation, particular training is required for individual jobs due to the duties that are to be performed. This may be a corporate or governmental requirement, but either way the training must be conducted.

One problem with training is determining if the employees receiving the training understand the information. The only effective way to determine if the employees understand the training is for them to correctly demonstrate the activities they have been taught (Rekus, 1999). For example, to become certified in first aid, a person must perform the required tasks and take a written test. This is the Red Cross's technique for evaluating

their training (Rekus, 1999). They are ensuring that you are performing the activities correctly and in the safest way possible for you and the injured person.

In any training session, safety should be the most important topic covered (3M Internal, 1999). All training given should state that activities performed should be done so in the safest way possible. Safety is a major concern of everyone involved including the trainer, the employees, and the company providing the training. This is why companies focus so much on safety training for their employees. All activities that employees perform will have some aspect of risk involved and their health and safety should be the number one priority of any company. If employees cannot perform their jobs safely, the company will lose money. This is due to direct cost, like medical and worker's compensation costs or governmental fines, and indirect costs, like training new employees and equipment down time. At 3M-Menomonie, the Environmental, Health and Safety (EHS) Department has a mission statement that states their purpose and goals. This mission statement shows that the EHS Department and 3M Corporation are dedicated to working with employees to prevent losses and to protect employees and the environment (3M Internal, 1999). With a cooperative agreement between the corporation and employees it is much easier to ensure employees take an active role in safety at the plant.

Part of the active role that employees take in this partnership includes participating in safety training. All employees receive a general training session on overall plant safety policies when they begin work at the facility. They also receive job specific safety training when they being work in their individual department (3M Internal, 2001). This safety training is important because it gives the employees information on what to do in emergency situations when their life or the lives of their coworkers are in danger or when

their job duties may pose a possible risk to their health and safety. It is very important that the training employees receive concerning safety is effective due to the fact their lives may be at risk. Insufficient skills or knowledge are one of the fundamental causes of injuries (Saccaro, 1994).

How are safety and health professionals to know if employees' skills and knowledge are sufficient? That is where an effective evaluation system becomes important. Whether or not an employee can perform a skill that was taught to them in a training session shows the effectiveness of the training. If employees cannot demonstrate the task or performs the task incorrectly, the training has been ineffective. Performance is one way to evaluate a training session's effectiveness. (Rekus,1999).

Statement of the Problem

All employees at the 3M-Menomonie facility receive general safety training along with departmental specific training for their individual job. The problem for the EHS staff at the plant is that they have no practical way of evaluating the effectiveness of the training given.

Many times companies assume that employees involved in Occupational Safety and Health Administration (OSHA) recordable incidents need more training to prevent the incident from occurring again. Traditionally, Environmental, Safety and Health (EHS) departments identify the employees involved and the cause of the incidents. They then try to provide employees with training to help eliminate or reduce the chance of a repeat occurrence. Is this the most effective way to train employees, by focusing on training after incidents occur? Or should the EHS department be able to identify the deficiencies in the training and correct them before employees perform these tasks during their daily duties?

To have a truly effective overall safety program in place, an evaluation system needs to be developed. This way the level of training effectiveness can be determined to ensure that employees are being effectively trained. Then the EHS Department can be assured that employees have received the knowledge they need to perform their jobs safely and help to prevent incidents from occurring in the first place.

Purpose of the Study

The purpose of this study was to develop a safety training evaluation system for plant engineering employees at 3M-Menomonie. There is currently no evaluation system in place and, as a result, no practical way to determine the effectiveness of safety training, except for looking at after-the-fact results.

Goals of the Study

The goals of the study are as follows:

1) Develop a safety training evaluation system for plant engineering employees.
2) Determine a process for implementation.
3) Implement the system into 3M-Menomonie's safety training procedures.

Significance and Limitations of the Study

This study will be focused specifically on safety training and the effectiveness of the training plant engineering employees at the 3M-Menomonie facility receive. All data and conclusions will relate exclusively to these employees.

This study aims at improving the safety training that is given to plant engineering employees at the facility. Results from improved safety training may include improved employee understanding of company safety and health policies, a reduction in the facility's incident and worker's compensation rates, along with improved employee attitudes toward

safety. According to Pete Chaney, director of safety and health services for the Associate General Contractors of America, "Training is the mechanism where you can really ensure enhancement of safety and health." (Smith, 1993).

Definition of Terms

DOT – The United States Department of Transportation, which oversees the transportation of hazardous materials throughout the country.

Evaluation – Determining the amount of knowledge gained from and the effectiveness of a training program.

ISO – Refers to the International Standards Organization. This is an organization that sets international quality, environmental and safety standards for businesses.

NIOSH – Refers to the National Institute for Occupational Safety and Health. This agency performs testing and makes recommendations to OSHA regarding governmental requirements and regulations.

OSHA – Stands for the Occupational Safety and Health Administration, which is part of United States Department of Labor. OSHA is responsible for employee safety at the workplace.

PM – Refers to preventive maintenance (3M Internal, 2000).

PPE – Refers to personal protective equipment (3M Internal, 2000).

Safety training – A basic part to safety programs that identify employee behaviors and make necessary changes to reduce employee risks (Saccaro, 1994).

Training – to make prepared (as by exercise) for a test of skill (Merriam-Webster, 2001).

Williams-Steiger Act – Also known as the Occupational Safety and Health Act of 1970. This law created the Occupational Safety and Health Administration.

Summary

The study attempts to strengthen the training system at the 3M-Menomonie facility. The goal is to help empower the employees at the facility to assist the EHS department in identifying deficiencies in training programs and recommend corrective actions. By involving employees usable and realistic goals for the training can be set by the people who must perform the activities. The most effective education programs are those with goals that are attainable and have practical expectations (Thompson, 2000).

Chapter II

Review of Literature

Introduction

In this chapter, the review of related literature focused on the history of safety, what is training including the purpose, procedures for evaluating training, safety training, and safety training at 3M-Menomonie. The information was gathered from numerous safety and health publications, 3M internal documents, reference materials, and regulatory standards.

History of Safety

The concept of a safe workplace has been around for thousands of years. The first set of "laws" dealing with safety were recorded approximately 2000 B.C. They were the set punishment in Babylon for those responsible for the injuries to workers (Dennis, 1997). For the centuries and millenniums to follow, other great mind of history identified the importance of safety and the risks of many jobs. Two examples are Hippocrates identified lead poisoning and Pliny the Elder advising workers to wear masks to protect themselves from dangerous dusts (Dennis, 1997). In the 15th and 16th Centuries major breakthroughs came about when information about occupational disease was published and investigated (Dennis, 1997).

Throughout all of history, the past three centuries have had the most influence on safety in the workplace. There have been more laws passed to protect workers and more attention brought to this issue than any other time in history. One of the most important legislative initiatives in the development of current safety laws occurred in England in the 18th Century. The Chimney Sweepers Act, passed in 1788, helped to reduce the occurrence

of scrotal cancer, which had been determined to be caused by chimney sweeping (Dennis, 1997). Even though laws were passed and workers' safety was being identified as an important topic for employers, it wasn't for another century that changes actually began to occur.

In the mid-1800's workers' health and safety was becoming a concern in Germany, England and throughout Europe through newly adopted workers' compensation laws (Gloss & Wardle, 1984). Change in the United States did not occur until the early 1900s when workers' compensation laws were passed in this country. Up to this time, unless the injury or death was due to negligence of the employer, the employee was responsible for taking action against the employer to receive reimbursement in the event of an accident (Peterson, 1971).

Gaining reimbursement was tremendously difficult due to common law defenses that employers were able to use in court. The three common defenses used were the "fellow-servant" rule, contributory negligence, and assumption of risk.

> The "fellow-servant" rule showed that a fellow employee was negligent for the incident instead of the employer. Contributory negligence brought forth the concept that the employee has control of actions and these actions influenced the incident; therefore they were responsible for the incident instead of the employer. Assumption of risk stated that employees knew the risks that were involved in the job when they began employment. While knowing these risks they agreed to work in a hazardous environment and the incident was no responsibility of the employer (Gloss & Wardle, 1984).

In the late-1800s and early 1900s, laws in the United States began to be developed to try to reduce injuries to workers. Massachusetts was the first state to pass such laws by implementing required factory inspection and, later, machine guarding requirements (Dennis, 1997). This was also the time of the industrial revolution, employers hired workers off the streets and put them to work in factories to operate the newly developed industrial machines. These employees worked without any training or knowledge about what they were doing or the environment in which they were working. Employees were working in areas that had risks they had never dreamed about. Advancement in technology brought forward new equipment and machines that employees were required to operate. Very few, if any, of these new technologies had safeguards and most were able to seriously harm or fatally injure employees (Gloss & Wardle, 1984). Many employers did not concern themselves with injuring employees. This was due to the immense amount of immigrants that flooded the United States during this time. Workers were able to be lost, as long as the new technology progressed (Gloss & Wardle, 1984). Change really began in with the development of the workers' compensation laws.

In 1911, when Wisconsin and New Jersey passed the first effective workers' compensation laws in the United States, the three common defenses used by employers in workers' reimbursement court cases were rendered useless (Peterson, 1971). These workers' compensation laws shifted the responsibility of employee safety from the worker to the employer. Employers were now required to be responsible for costs due to the injuries that occurred at the workplace. Employer understood that the more they improved employee safety, the less they would be required to pay in workers' compensation (Peterson, 1971). This shift in financial responsibility probably had the most major effect

on the increase of safety awareness in industry. Workers' compensation would become a critical force of safety for years to come (Dennis, 1997).

Workers' compensation was not the only influential factor in the history of safety management. One of the most important factors was Herbet Heinrich's concept of accident causation (Peterson, 1971). In 1931, Heinrich published his book titled *Industrial Accident Prevention* in which he summarized his idea that people caused many more accidents than the conditions they work (Peterson, 1971). Dennis (1997) showed that Heinrich theorized that a sequence of five factors caused accidents:

1. Worker's social environment and ancestry
2. Employee's actions or attitude
3. The unsafe action or condition
4. The accident
5. The injury or incident

Heinrich realized that all five factors could not be fixed. So his focus was on the middle factor and to remove the unsafe act or condition (Dennis, 1997). By doing this, the sequence would be broken and the injury or incident would not occur. Heinrich's theory would be a basis for many of the current safety theories we use today (Gloss & Wardle, 1984).

Workers' safety began to improve over the next forty years with the severity and frequency of injuries and illnesses decreasing. In the late 1960s, these patterns began to increase once again. This brought forth the most dramatic legislative improvement in the advancement of workers' safety, the Williams-Steiger Act of 1970. This act, better known as the Occupational Safety and Health Act, created the Occupational Safety and Health

Administration (OSHA). According to Gloss & Wardle (1984) the aim of the act is to "preserve human resources by which is meant workers".

The OSHA Act states that its goal is to provide workers with a safe and healthy workplace (Gloss & Wardle, 1984). The General Duty Clause summarizes this in the OSHA Act. The General Duty Clause, located in Section 5(a)(1) of the OSHA Act, states that each employer will provide employees with a safe working environment (Daugherty, 1996). This specific clause of the OSHA Act is used to cite violations that are not specifically covered in under other OSHA standards or when interpretation becomes difficult. OSHA also has established more specific standards that are regulated and enforced by the government in attempt to ensure employees work in safe environments.

> They also help workers by providing information, research and results about topics in industrial safety and health. OSHA also sets minimum standards that employers are required to meet and implement to ensure safe workplaces. These include noise exposure, air monitoring, hazardous substance and energy exposure, as well as many others (29 CFR 1910).

OSHA has not been the end all answer for safety management. Injuries and illnesses in the United States are still at a staggering level. According to Dennis (1997), 3.5 million workers were injured in 1994 that cost industry $120.7 billion in 1994 alone. The United States Government realizes that OSHA alone is not the answer, because of that Congress also amended the responsibilities of other government run agencies and created new laws to help ensure workers' safety. Congress set up the National Institute for Occupational Safety and Health to perform research on safety related issues and be a resource for OSHA in the development of standards (Denton, 1982). The Environmental

Protection Agency (EPA), established by Congress in 1970, began to examine safe employee environments and the transportation of hazardous substances. In 1976, Congress passed the Toxic Substances Control Act. This act gave more rights to the EPA and allowed safety laws to result in, both, criminal and civil penalties (Gloss & Wardle, 1984).

What is Training

Training can be defined as "a special form of education that focuses on developing or improving skills" and its objective is to ensure that the trainee is able to perform a new task or perform the task better than they could previously (Rekus, 1999). Training differs from education due to the fact that education attempts to pass on knowledge through an instruction session (29 CFR 1910.155(c)(14)). McGehee and Thayer (1961) identified the purpose of industrial training as a session that will "develop or modify the behavior of employees in such a way that what the employee does at work is effective in the attainment of the goals and objectives of the organization."

A training program is developed in a series of steps. There are many theories and opinions on the true number of steps, but there are six basic steps (Sparhawk, 1994). Other authors and trainers may include more, but additional steps may or may not be necessary depending on the organization. According to Sparhawk (1994), the six basic steps, also called the High-IMPACT Training Model, include:

1. Identify Training Needs
2. Map the Approach
3. Produce Learning Tools
4. Apply Training Techniques
5. Calculate Measurable Results

6. Track Ongoing Follow-Through

Effective training begins with a deficient portion in a program being identified and determining that training would improve that deficient element (Rae, 1986). Identifying this deficient portion and the solution is referred to as a needs analysis (Sparhawk, 1994). This needs analysis is an effective tool because it allows a person to determine if the aspects identified will bring forth a sufficient solution. According to Sparhawk (1994), a needs analysis will assist in doing three things: "ensure your solution addresses the issue, effectively focus your resources, time, and effort toward a targeted training solution, and eliminate the necessity of having to look for another job."

The second step in the model is to map the training approach. This step is when objectives of the training are developed and a training plan is designed to meet these objectives (Sparhawk, 1994).

> One of the most common tools in developing a program is using performance-based training, which is organizing, identifying and focusing on tasks that are determined to be necessary if the tasks attempted are to be successful. It is very beneficial when training adults due to the fact that it focuses on hands-on learning and techniques that will be used on the job (Carnvale, Gainer, & Meltzer, 1990).

Once the objectives are identified, the techniques that will be used to convey the information can be established.

The techniques to be used are developed in the third phase of the High-IMPACT Training Model and performed in the forth phase. The third step will develop the training techniques and processes chosen (Sparhawk, 1994). One of the first steps that should be taken in this phase is to prepare a course outline that will give a summary of the techniques

to be used and when they are to be used (Carnvale et al., 1990). This will allow the employees in the training to know what is to be expected and the topics to be covered in the training. According to Thompson (2000), the ability of people to learn and remember what they have been taught is proportional to the method of instruction and should be taken into account when developing training techniques:

> "People remember:
>
> 10% of what they read,
>
> 20% of what they hear,
>
> 30% of what they see,
>
> 50% of what they see and hear,
>
> 70% of what they verbalize, and
>
> 90% of what they say and do."

There are many different techniques used in training in phase four. To determine the most effective techniques will depend on the training topic, the person performing the training, and the employees who are receiving the training (Carnvale et al., 1990). According to studies from Galbraith and James (1985) there are seven main learning styles:

1. Print – learning from text, pencil, and paper. This type of training can use book, handouts, and magazine articles.
2. Visual – learning through slides, films, videos, and charts. Videotapes and powerpoint presentations dealing with specific topics can be effective in this type of training session.
3. Aural – using tapes and lectures in learning. Videos, powerpoints, computers, and other audio-visual equipment can be used effectively in these sessions.

4. Interactive – having group discussions and question-and-answers sessions. This type of session will work best with larger groups and can be effective using interactive television.
5. Tactile – learning through hands-on techniques. On-the-job training is a good example of this type of training session.
6. Kinesthetic – training through role playing and physical activities. This works with on-the-job training, in an interactive television class or a small class room atmosphere.
7. Olfactory – learning through smelling and tasting. This type of session is reserved for specific topic training sessions.

Not all of these styles will be applicable for every training session, each session will need specific styles depending on the topic being covered.

The fifth step in the model is developing measurable results to determine if the training is effective. Often training programs have started and reached their current point without having any real purpose for the training (McGehee & Thayer, 1961). A way of evaluating the effectiveness of training is one of the most important elements of a program (Daugherty, 1996). Evaluation of training is done in many ways, but the majority of evaluation techniques are based on one model: The Kirkpatrick Model. This model will be discussed in a later section of this literature review.

The final step of the High-IMPACT Training Model is to track ongoing follow-through. This is ensuring continuous improvement of the training programs (Sparhawk, 1994). This is sometimes called program monitoring. It allows the trainers and program developers to establish which course objectives the employees have and have not fulfilled,

informs of the training effectiveness, and helps to develop improved activities (Carnvale et al., 1990).

The National Institute of Occupational Safety and Health (NIOSH) has developed a training model. According to Cohen and Colligan (1998), this model's evaluation section is also based on Kirkpatrick's Model and has a likeness to the High-IMPACT Model. There are seven sections of the NIOSH training model:

1. Needs Assessment
2. Establishing Training Objectives
3. Specifying Training Content and Media
4. Accounting for Individual Differences
5. Specifying Learning Conditions
6. Evaluating Training
7. Revising the Training

The Occupational Safety and Health Administration (OSHA) has also developed a training model to help the employer in their training needs. The OSHA Model resembles the High-IMPACT Model, has an evaluation section similar to Kirkpatrick's Model, and is proportionate to the NIOSH Model. This model helps to determine the training needed, how to perform the training and to determine if the company will be in compliance. According to Daugherty (1996), there are also seven steps to the full training model:

1. Determine if Training is Needed
2. Identify Training Needs
3. Identify Goals and Objectives

4. Develop Learning Activities
5. Conduct the Training
6. Evaluate Program Effectiveness
7. Improve the Program

There are two simple models that this overall model can be broken-down into and summarized (Daugherty, 1996). The first consists of three parts: delivering the training, testing the employees knowledge, and keeping proof that employees have been trained. The second part identifies the level of training: primary, collateral and incidental. Primary training is for employees that work with the hazard, collateral training are for employees that work around the hazard but not directly with it, and incidental training is for employees that need to know the hazard is present (Rae, 1986).

Evaluation of Training

The Kirkpatrick model was developed in 1958 by Donald Kirkpatrick and is used by many companies and industries to evaluate training programs (Oberman, 1996). The Kirkpatrick Model is made up of four levels: reaction, learning, behavior, and results (Medsker and Roberts, 1992). The first level, student reaction, is trying to determine the students opinions and satisfaction about the training and its outcomes (Medsker and Roberts, 1992). One common method of doing this is using questionnaires. These questionnaires look at topics like the significance of the training in regards to the trainees' responsibilities, how much the training helped them understand the topic better, and how easy the material is to understand (Oberman, 1996).

The next level, learning assessment, focuses on the extent the instructor met the objective of the course (Medsker and Roberts, 1992). This level tries to determine how well the trainee has grasped the topic covered. This is measured, quite often, by written and "hands on" pre and post-tests (Oberman, 1996). The trainee takes a written test that reviews the topics that were studied. They are then required to perform the skills that they have been taught and informed about. This demonstration is observed by the instructor and is analyzed for any errors. This can show the instructor that the trainee has understood the topics covered and can perform the required tasks (Oberman, 1996).

The third level, behavior, concentrates on the students ability to use the skills taught in the training in their work setting (Medsker and Roberts, 1992). The most important concept for this level of Kirkpatrick's Model is ensuring that there is a baseline of employee performance to which the student's new skills can be compared. This baseline can be developed in Level Two by using the employee's pre-test (Oberman, 1996). Other methods of developing a baseline include using worker's peers and supervisors, talking to the student themselves, or analyzing a job safety analysis (Oberman, 1996). The difference of knowledge before and after the training session can show the effectiveness of the training.

The final level of the Kirkpatrick Model, training impact, analyzes the effect of the training session on the organization (Medsker and Roberts, 1992). This level may look at the monetary savings of the training or the improvement of quality or productivity (Oberman, 1996). The upper levels of management in an organization may consider this level the most important. This is due to the savings of direct and indirect cost that can be attributed to safety training and an effective safety program.

Kirkpatrick's Model is a basis for many different evaluation methods, for example the "Bridge Over Troubled Waters", which is used by Johnson Wax or the HRD Model, which seems to be a more detailed extension of Kirkpatrick's Model.

The Bridge Over Troubled Waters tries to bring together the problems you may encounter with training and evaluation and find a solution or idea for improvement. It uses the same four basic steps as Kirkpatrick's Model but uses a few different names: reaction, learning, behavior change, and organization results. By connecting these four steps a "bridge" is constructed from the training or problem and connects to the result. In this model, as it is in the business world, one of the most important components that support the bridge is management support. Without that the bridge will likely collapse (Medsker and Roberts, 1992). According to Medsker and Roberts (1992) there are eighteen steps to the HRD Model and they are as follows:

1. Conduct a Needs Analysis and Develop Tentative Objectives – this is the section in which the program's goals and purpose(s)are determined.
2. Identify the Purposes of the Evaluation –what is an evaluation being conducted for and are they valuable enough to warrant this program.
3. Establish Baseline Data – this includes collecting information before the program begins and when it is concluded. This determines a base that is to be used for a comparison.
4. Select Evaluation Method/Design – this may have an effect on determining the goals of the program. An evaluator must determine how to evaluate.

5. Determine Evaluation Strategy – the people to be evaluated, the locating of evaluation, and time period are determined.
6. Finalize Program Objectives – this will be dependent on the previous two steps. Different methods and strategies will determine different goals and objectives.
7. Estimate Program Cost/Benefits – this must be performed to ensure that the program will be able to be completed and supported.
8. Prepare and Present Proposal – it should be based on information from the baseline and justification of the reasons for the program.
9. Design Evaluation Instruments – these are the tool that will be used to collect data (ie: surveys or questionnaires).
10. Determine and Develop Program Content – this will be dependent on the training subject and goals of the training.
11. Design or Select Training and Development Methods – how is the training going to be conducted and what aides will be used.
12. Test Program and Make Revisions – commonly done in a "pilot" group to ensure will be effective in an real scenario.
13. Implement and Conduct Program – one important note is to ensure that the participants have to aware of the goals of the program so they know what is expected of them.
14. Collect Data in Proper Stages – this is critical to have relevant results for baseline comparison.

15. Analyze and Interpret Data – it is important to know what to do with the data collected and to compare it to similar data.
16. Make Program Adjustments – this will be dependent on the results of the collected data. Adjustment may or may not be needed.
17. Calculate Return on Investment – this will justify the current program and may be a factor in continuation of the program
18. Communicate Program Results – these results need to be reported to the staff involved in the evaluation, the management of the company and the participants of the training.

The HRD Model and Kirkpatrick's Model are not the only methods that are used to determine the effectiveness of training. Other methods include questionnaires, skills assessments, observations, audits, testing, interviews, role-playing and group scenarios (Rae, 1986). These methods allow companies that do not have the resources to implement a system, like Kirkpatrick's Model, to still be able to evaluate their training program.

An observation analysis, audit and interviews may allow a company that has limited staffing to interact with employees in a one-on-one or group scenario with a limited need of observers. Two examples of these types of evaluation methods are appraisal interviews and peer observations. Observations and, possibly, audits may be done with or without the employee(s) knowing depending on the effect would have on the employees' behavior. Interviews will allow the observer to gain a feel for the employees' attitudes and understanding by having a confidential and personal discussion with them. Skill assessments and "hands-on" testing allows employers to better understand the employees' comprehension tasks they are

needed to perform. These evaluation tactics require employees to perform the tasks they have been taught and ensure that the task has been performed correctly. Performing CPR on a mannequin in a first aid class or locking out a piece of machinery would be two examples of these types of evaluation techniques. Role-playing and group scenarios are also excellent tools because they allow employees to react to a situation they may have to face and also help with their teamwork skills. These type of activities require employees to work together to solve a problem that they may encounter during a situation that has been developed by the trainer (Rae, 1986). These techniques are common in emergency response training due to the fact that dangerous situations that occur in these cases may cause damage or injury to personnel.

Safety Training

Training is especially important in safety because it gives employees the knowledge and ability to perform their work and to do it safely. Due to the harmful chemicals, the industrial hazards and the wide variety of activities and jobs being performed on an industrial site a wide range of training is needed. Only when all aspects of a safety training program are in place is the training effective (Saccaro, 1994). Governmental regulations and agencies such as OSHA or the EPA mandate much of this training. OSHA alone mandates training in over 100 areas (Daugherty, 1996)!

The goal of safety training is to bring about awareness of safety hazards in a workplace to employees and visitors (ReVelle, 1980). Information that is determined fundamental by safety personnel should be included in all safety training (Colligan, 1994). The employer is required to provide safety training for new employees, an employee who

changes their job, or whenever changes in an employee's job occurs (ReVelle, 1980). According to Saccaro (1994), additional training should be considered at the following times: new equipment or processes added, accident and insurance rates are on the rise, if the company expands, or a job hazard analysis identifies deficiencies that need to be addressed.

According to Denton (1982), safety training should include, at minimum:

1. Company safety policies and responsibilities
2. Rights and responsibilities via OSHA
3. Personal protective equipment available, how to use the equipment, and when to use it.
4. Locations of emergency equipment
5. Employee rights under workers' compensation and insurance
6. Hazards related to an employee's specific job
7. Safety incentives
8. Disciplinary policy regarding safety

OSHA requires training on a variety of different topics including lockout/tagout, fire extinguisher use, hazard communication and many more different topics (29 CFR 1910). OSHA is not the only governmental agency that requires a company to perform employee training. The Department of Transportation (DOT) requires that certain employees be trained in the packaging of hazardous substance before transport (3M Internal, 1999). The EPA requires training emissions of substances into the atmosphere or environment.

Governmental required training is not the only safety training that occurs in the workplace. Most companies perform other training because they know that they can reduce costs as a result, they need to have documented training for their customer, or they may be required to do so to keep a certification (McGehee & Thayer, 1961). For example, a company may become certified by the International Standards Organization (ISO). To maintain this certification many requirements have to be met initially and then continuously monitored to ensure they stay up-to-date (3M Internal, 2000). This continuous monitoring includes looking at training and ensuring employees have received a refresher course. If this ISO certification was to expire, a company would lose money due to the fact that some of their customers may require them to be certified, i.e. Ford Motors or General Motors Company (3M Internal, 2001).

Safety Training at 3M Menomonie

At the 3M Menomonie facility, all plant engineering employees receive the same basic training. Some employees receive added training due to the fact that their jobs may be specialized or they may have additional duties (i.e. a member of the emergency response team). Table 1 gives the safety training that plant engineering employees receive as well as the time frame for their refresher. An initial orientation session is given to all employees on their first day of work that covers many general company policies and procedures. Employees then receive other training that is specific to their job during departmental training, which may not be given for up to 12 months after an employee's start date, depending on job duties. This is all dependent on the employee's job duties and the training schedule for the plant (3M Internal, 2001).

Table 1: Plant Engineering Employee Training (3M Internal, 1999).

			Refresher (in Months)			
Training Class	**Initial Orientation**	**Initial**	**12**	**24**	**36**	**As Needed**
Confined Space Entry – Awareness	X					
Confined Space Entry – Job Specific		X	X			
Confined Space Entry – Training – Drill & Entry		X				
Electrical Power Transmission & Distribution		X				X
Electrical Safety Work Practices/Intrinsic		X				X
Electrical – Unqualified	X					
Emergency Response – Evacuation	X		X			
Emergency Response – Fire Prevent – Flammables/Static	X		X			
Emergency Response – Severe Weather Assembly	X		X			
Fire Extinguisher Training – Awareness	X		X			
Fire Extinguisher Training – Hands on		X	X			
Lockout/Tagout – Awareness	X					
Lockout/Tagout – Affected		X				
Lockout/Tagout – Authorized		X				
Personal Protective Equipment	X	X	X			
Powered Industrial Truck License		X	X			
Process Safety Management (Management of Change)		X			X	
Radiation – Ionizing		X				X
Radiation – Non ionizing – Laser UV (not CO2 Laser)		X				X
Red Label Room Entry		X	X			
Bloodborne Pathogen – Awareness	X		X			
Bloodborne Pathogen – Job Specific		X	X			
Right to Access Medical Records	X		X			
Hearing Conservation	X	X	X			
Hazcom (Right to Know) MSDS Awareness	X		X			
Hazcom (Right to Know) Department Specific/PPE		X	X			
Designated Rep – Contractor Safety		X		X		
Designated Rep – Site Specific		X		X		
Ergonomics	X	X				X
Speed Rack Inspection		X				X
Open Flame/Spark Permit		X	X			
DOT Dangerous Goods – Packaging, Labeling, Shipping		X		X		
Hazardous Materials – Radiation		X		X		
SARA 312 & 313 Reporting		X	X			
Environmental Awareness Training	X	X				X
Laser Base Eye Exam	X	X		X		
Audiometric Test	X	X		X		X
Respirator Fit Test and Training	X	X				X

Presentation of Safety Training

Safety training at the 3M Menomonie facility is conducted primarily by the Environmental, Safety, and Health (EHS) Department. The EHS Department is assisted by the 3M Menomonie Training Department and individual department managers and supervisors. The EHS Department consists of two safety engineers, one part-time trainer, one shipping and receiving representative, and one EHS Department manager (3M Internal, 2001). Each employee of the EHS department that performs training has specialty topics that they will cover with employees. The safety engineers and EHS department manager have backgrounds in industrial safety, health and industrial hygiene. They perform training dealing with OSHA and other governmental related topics. The shipping and receiving representative trains in topics dealing Department of Transportation regulations and other environmental regulations (3M Internal, 2001). With each of the department personnel having knowledge in particular areas, employees at the plant are exposed to a variety of knowledge and training techniques.

Training is presented in an assortment of different ways. The most popular way the EHS Department conducts training is using by Microsoft PowerPoint presentation (3M Internal, 2001). By using PowerPoint, EHS personnel can continuously update these presentations as training requirements change and allow the same training session to be performed in different areas or on different computers. Another useful aspect of PowerPoint is being able to print the presentation onto overhead transparencies. This allows a training session to be conducted if no computer is available.

Along with the use of PowerPoint presentations, the EHS department also uses interactive computer programs in training. This allows the employee to take the training at

a time that is most reasonable for them and allow EHS personnel to concentrate on other duties. Once the employee has finished the interactive computer program, they meet with an EHS representative to discuss the training and ask any questions they may have (3M Internal, 2001).

One of the most common tools that EHS personnel use in training are videocassettes. These videos are focused on specific topics and may go in-depth about a subject. The negative aspect about the use of videocassettes is their costs. It can cost several hundred dollars for an individual video that may be obsolete in a year (3M Internal, 2001).

Training of plant engineering employees is tracked via a computer program. This program, called the Course Registration Record Keeping System (CRS), is an internally developed program that allows the EHS Department to track the training employees have received and identify what employees need refresher training (3M Internal, 2001). This system allows the company to have a printout of training requirements that everyone in the company, from supervisors to EHS personnel to front line employees, can understand and recognize.

Summary

The previous section reviews the training and safety training in industry and throughout history as well as how to have an effective training program at a facility. As stated previously, the goal of training is to ensure that the trainee is able to perform a new task or perform the task better than they previously could (Rekus, 1999). Many times training is performed with no purpose and, therefore, having no positive results for the company or employee (McGehee and Thayer, 1961). This is why having an effective

training and evaluation program in place is essential to help protect employees. This evaluation program can ensure they are knowledgeable in the job they are performing and to guarantee the employer is not wasting money and time on training that is not beneficial to the employee or the company. An evaluation program can help save the company money in direct costs, like medical payments and workers' compensation costs, or indirect costs, like ineffective or obsolete training.

Chapter III

METHODOLOGY

The purpose of the study, as stated in chapter one, was to develop an evaluation system for determining the effectiveness of safety training given to plant engineering employees at 3M-Menomonie. The researcher used the following steps to develop the evaluation system: (a) develop a safety training evaluation system for plant-engineering employees, (b) determine a process of implementation, and (c) implement the system into 3M-Menomonie's safety training procedures.

Develop a safety training evaluation system for plant-engineering employees

This first stage in the methodology was accomplished using the Kirkpatrick Model. As stated in chapter two, there are four levels that make up the Kirkpatrick Model: reaction, learning, behavior, and results (Medsker and Roberts, 1992). In order to develop an evaluation system for the particular topic, each of these levels were reviewed for the following topics: confined space work, electrical work, emergency response, fire extinguisher use, lock out/tag out operations, personal protective equipment use, powered industrial truck, radiation, hearing conservation, hazard communication, ergonomics, knife safety, open flame/spark permit, Department of Transportation requirements, environmental awareness, and respirator use.

The first level, reaction, tries to obtain the employees' views of the training. To accomplish this, a survey was developed. This survey, which can be found in Appendix A, will be given out to employees at the completion of each training

session. It will allow employees to, anonymously, give their input on the training session and will allow them to evaluate the trainer.

The second step, learning, determines how well the employees understood the topic covered. This was accomplished by developing topic specific tests for each of the training sessions. These tests will be given before and after a training session. The pretest will be used as a benchmark to identify the employees' knowledge at the beginning of the training. While the posttest will show the knowledge gained from the training session.

The third level, behavior, shows that the employees can perform the new tasks that have been taught. The benchmark established in level two, the pretest, is again used for comparison. The evaluation tool that will be compared to the benchmark will be dependent on the topic. If applicable, the tool will be a "hands-on" evaluation. Otherwise, the evaluation will be performed using the pre and posttests.

The final level, training impact, show the result of the employees' training on the company. This level's evaluation technique will, again, be dependent on the topic being covered. For example, if the training session covered environmental awareness, a company may look the environmental releases for a six to twelve month period after the training to identify that employees are performing their duties and not allowing releases. The company has many indices that it monitors that will allow them to evaluate employees at this level, such as amount of materials recycled per month, the number of lost workdays, or the number and types of injuries for a particular job classification.

Determine a process of implementation.

This step was implemented after all evaluation techniques had been developed. Since each technique is specific to a particular training topic, assistance will be need from the EHS Department on site due to the fact they perform the majority of the safety training that is conducted on site. The EHS Department personnel were asked to begin using the evaluation techniques in the training sessions so the effectiveness of the training session could be determined and any areas of improvement could be identified.

Implement the system into 3M-Menomonie's safety training procedures.

The topic specific surveys and pretests were to be distributed to the employees attending the training session and the purpose of the tests and surveys would be explained by the session trainer. Upon completion of the training session, the posttest or the "hands-on" practical evaluations were to be utilized. The results were then to be analyzed to identify if the employees increased their level of knowledge on the particular subject. The EHS Department also was asked to monitor particular indices that would relate to training topics, if they were not currently doing so.

Summary

This chapter identifies the methods used to collect data and develop an evaluation system for the safety training given to plant-engineering employees at 3M-Menomonie. A survey was developed, along with other evaluation techniques, to help employees and trainers determine training effectiveness. The methods for implementing this system were also identified.

Chapter IV

The Study

Introduction

The purpose of this study was to develop a system to evaluate the effectiveness of the safety training given to plant-engineering employees. There were three goals of the study and the methods and activities for achieving the goals are detailed in Chapter III:

1. Develop a safety training evaluation system for plant-engineering employees.
2. Determine a process of implementation.
3. Implement the system into 3M-Menomonie's safety procedures.

Develop a safety training evaluation system for plant-engineering employees

The first goal was accomplished by analyzing the topics of training sessions that plant-engineering employees attend. These topics include: confined space entry, electrical power safety, emergency response, fire extinguisher use, lockout/tagout, personal protective equipment use, powered industrial truck licensing, process safety management, radiation exposure, red label room entry, bloodborne pathogen safety, employees' right to access medical access, hearing conservation, hazard communication, designated representative, ergonomics, knife safety, open flame/ spark permit, DOT dangerous goods requirements, SARA reporting, environmental awareness, laser base eye exam, audiometric test, and respirator training. These topics were being analyzed to identify the goals of the training session, what information is looked at, is there an evaluation system in place for that topic and, if no evaluation system is in place, what information should be covered in an

evaluation system. It was determined that the following training topics currently had evaluation systems in the presentations: fire extinguisher training, lockout/tagout, powered industrial truck licensing, and respirator training. Therefore, this study developed no evaluation techniques for these topics. It was also concluded that the following topics, laser beam eye exam and audiometric testing, were not applicable to this study due to the fact the topics were not training, rather a testing media to identify changes in the employees' physical conditions that may be related to their job duties.

After each applicable session was analyzed, a written test and, if relevant, hands-on requirements were developed that focused on the obtaining the goals of the training. These tests and hands-on requirements are found in Appendixes B through O and help to fulfill the second and third levels of Kirkpatrick's Model, learning and behavior. The employees' behavior after the training session, measured by the hands-on requirements, would be an indicator of the effectiveness of the training session. Due to the fact that some of the training sessions are combined, to save the company money and resources, some of the tests and hands-on requirements are combined to accommodate the training sessions.

A survey was also developed that will assist in reaching the first level of Kirkpatrick's Model, reaction. The survey, found in Appendix A, will be given at the conclusion of the training session. This survey will allow the trainee to evaluate the trainer and the training session. This evaluation will allow the trainer to identify deficiencies of the training sessions and modify the sessions into a more effective training program.

The final level of Kirkpatrick's Model was attained by identifying the most relevant indices that would show improvements in employee performance. The following were the indices identified: lost time rate, restricted work day rate, incident rate, workers'

compensation costs per employee and environmental air emissions. By tracking these indices before and after training sessions, any positive or negative changes can be identified.

Determine a process of implementation

The final two goals of the study, to determine a process of implementation and implementing the system into 3M-Menomonie's safety procedures, were both completed with assistance from the Menomonie EHS Department. To determine the process of implementation the safety training evaluation system that has been developed for plant-engineering employees was introduced to and reviewed by the researcher and EHS Department personnel. Each training topic evaluation technique was explained to the department personnel and they were shown how to perform the activities effectively. It was important to get input from the EHS Department because they perform the safety training for the plant-engineering employees.

Implement the system into 3M-Menomonie's safety procedures.

After each training topic was reviewed and explained, the EHS Department personnel agreed to use the evaluation techniques during the next year of training sessions. Once the one-year time frame was reached, the evaluation program would be reviewed to determine the effectiveness and determine if the use of the systems should be continued.

Summary

This chapter reviewed the purpose and the goals of the study. The procedures used to accomplish the goals are identified. The data from this chapter, along with other resources, will mold the recommendations that will be given in chapter five.

Chapter V

Summary/Conclusions and Recommendations

Summary

The purpose of this study was to develop a safety performance evaluation system to show the effectiveness of the safety training given to plant engineering employees at 3M-Menomonie. The study was conducted at the 3M facility in Menomonie, Wisconsin.

The review of literature examined the different types of training used throughout different industries as well as covered the different evaluation systems used in conjunction with the training. The review focused on the history of safety, what is training including the purpose, procedures for evaluating training, safety training, and safety training at 3M-Menomonie. The information was gathered from numerous reference and publication materials from the field of safety and training.

The following steps were used to develop the evaluation system: (a) develop a safety training evaluation system for plant-engineering employees, (b) determine a process of implementation, and (c) implement the system into 3M-Menomonie's safety training procedures. The evaluation system was developed by analyzing the training topics and looking at the goals of the training sessions given to plant-engineering employees. Once the evaluations were complete and the goals of the sessions were identified, evaluation techniques were customized to apply to each training session. These techniques include tests and a survey, which can be found in Appendixes A through O. Indices that would identify changes in employee knowledge and actions were also identified.

Developing a process for implementation and implementing the system was conducted with the assistance of the EHS Department at the 3M-Menomonie facility. The

department personnel conduct the training that the plant-engineering employees receive. They agreed to use the tests and survey for the next 12 months of training. At the completion of the 12-month time period, the evaluation system would be looked at to determine if the effectiveness warranted continued use.

Conclusions were based on the information taken from the reviews of literature and development and implementation of the evaluation system. The analysis of this information showed areas that were deficient and appropriate recommendations for improvement were given. The evaluation system is comprised of an employee survey, a pre and posttest, and trackable indices. The employee survey, which can be found in Appendix A, is a tool for the trainees to use to audit the training session. The pre and posttest, which are found in Appendixes B through O, are used by the trainer to identify the knowledge that the employees have gained from the training session. Finally, the traceable indices are used to monitor the change in employee activities and knowledge.

Implementation of the system should help the safety department improve deficiencies in the current training policies. In addition, and most importantly, the new system should be able to help improve the effectiveness of the safety training given to plant engineering employees. This will allow them to perform their duties much safer and help to reduce the number of injuries on site as well as the costs of these injuries.

Conclusions

Several conclusions can be made based on this study. The researcher found that plant-engineering supervisors felt that a hands-on evaluation system would be useful in determining employees' understanding of the training given. Therefore, it can be

concluded that the evaluation system developed will be a useful tool to ensure that employees are receiving the most effective training possible.

The researcher also found that the effectiveness of the safety training is related to the deficiencies in the training sessions the employees attend. It can be concluded that the survey that is included in the evaluation system will allow the trainers identify problems that the employees have in particular sessions.

It was found that the results of employees' actions, both positive and negative, can be an aid in determining the effectiveness of safety training. It is concluded that tracking indices, such as incident rate, lost time rate and restricted work day rate, can be tools in identifying deficient training sessions. The behavior of the employees can also be tracked by analyzing the results of the hands-on requirements of each training session.

It was also found that the EHS Department performs the different safety training sessions given to plant-engineering employees in addition to their normal duties. It can be concluded that some of the deficiencies in training sessions are due to the large amount and variety of different job duties that these personnel are needed to perform.

Recommendations

1. The EHS Department at the 3M-Menomonie facility should implement the evaluation system developed in this study. After looking at the training system in place at the facility and reviewing literature on the subject, it can be determined that to ensure that employees receive effective training, an evaluation system should be implemented to monitor the effectiveness of the training.

2. A system to continuously monitor the effectiveness of the evaluation system should be developed and implemented to ensure the evaluation system is performing the way it was designed.
3. Twelve months after implementation, the system should be reviewed to make any necessary updates or changes to the system. The system should also be analyzed to ensure that it is appropriate for the 3M-Menomonie facility.
4. The EHS Department should assign or hire one person to perform safety training on site. This employee would focus specifically on safety training and not be involved in day to day safety issues on site. Having an employee that would focus on training would allow other members of the EHS Department to concentrate on their primary duties as safety engineers. This would also allow for more effort to be spent on developing the most effective safety training possible. This employee would also be responsible for updating and the upkeep of the evaluation system.
5. Each member of the EHS Department should have access to and be trained in using the CRS system that tracks the training employees receive. This would allow all personnel in the EHS Department identify when they need to perform the training they are responsible for.
6. Better communication between the plant-engineering employees and supervisors and the EHS Department is needed to ensure an effective safety training system is continued at 3M-Menomonie. By having plant-engineering personnel and the EHS Department communicate more, employees would be able to identify the training they need and would not have to be as concerned about what personnel require training in what month of the year. Better communication would also allow the

departments to identify other, non-required training that would aid employees in performing their jobs in the safest manner possible.

Potential Future Studies

Future studies could focus on the implementing the evaluation system into the non-safety training sessions that plant-engineering employees attend. Developing a continuous improvement program would also benefit the current evaluation system. One of the most applicable studies that could be derived from this would be to apply this evaluation system to the all of the safety training given at the 3M-Menomonie facility. This would determine the effectiveness of all of the safety training on site and allow the safety department to have the most effective training system possible.

Another future study would be to analyze the evaluation system and revise it to apply to a facility that has adopted behavioral based safety as a facility tool. Behavior, which is the third level of Kirkpatrick's Model, is a proactive means of tracking. This means that employees' behavior could be monitored and tracked before incidents occur. Being proactive is more effective due to the fact that it identifies deficiencies and prevents incidents from occurring instead of reacting to an injury or illness to an employee.

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Title 29, Part 1910, Code of Federal Regulations.

- 1910.155(c)(14).

Title 40, Part 173, Code of Federal Regulations.

Appendix A
Safety Training Evaluation Survey

Name of Class:	Date:
Instructor:	
Location:	

Below is a list of statements of opinions. Respond to each on a scale from one to five depending on how you feel about the statement. This survey is for training evaluation purposes only.

1- Strongly Disagree 2- Disagree 3- Unsure 4- Agree 5- Strongly Agree

1) The training covered all of the topics expected and covered the topics fully.

1 2 3 4 5

2) The training was easy to understand and not too technical in nature.

1 2 3 4 5

3) I feel that I could easily perform the tasks taught in the training in a real-time environment without concern for my own or someone else's safety.

1 2 3 4 5

4) I felt comfortable asking about topics I didn't understand during training.

1 2 3 4 5

5) The training answered all questions that I had and provided good information on the topic.

1 2 3 4 5

6) Rate your knowledge and skill level – Before This Course (Low -----High)

1 2 3 4 5

7) Rate your knowledge and skill level – After This Course (Low -----High)

1 2 3 4 5

8) Overall, the training session provided me with a positive and beneficial experience.

1 2 3 4 5

Strong Points of the Course: _____

_____

Weak Points of the Course: _____

_____

Additional Information You Would Have Liked Covered in the Course: _____

_____

Was There Any Material You Felt Was Not Needed: _____

_____

Please List Two Examples of How You Can Apply What You Have Learned Today To Your Job:

1)

2)

How Could Have This Training Been Better: _____

_____

What Other Training Topics Could Help You Perform Your Job Better: _____

_____

What Did You Like the Best About the Training: _____

_____

What Did You Like the Least About the Training: _____

_____

Please Add Any Other Comments Regarding the Training: _____

_____

_____

_____

Appendix B

Confined Space Training

Quiz Questions:

1. Name 3 confined space hazards.
   1. _____ 2. _____ 3. _____
2. Name 3 examples of confined spaces
   1._____ 2. _____ 3. _____
3. True or False. Reaching your arm into a confined space and breaking the plane is not considered entry since your face never broke the plane?
4. What are the 3 requirements that make a space a confined space?
   1._____ 2. _____ 3. _____
5. What confined spaces are in your area?

   _____

   _____
6. What are the 3 jobs that are involved with a confined space entry?
   1._____ 2. _____ 3. _____
7. What range should oxygen levels be between for before access to a space can be granted?

   _____
8. What is the LEL? And what should the level be under to allow entry?

   _____
9. What type of monitor do you use to take readings with?

   _____
10. Where are confined space permits available?

    _____

Hands-On Requirements

1. Fill out a confined space permit
2. Show how to use a monitor
3. Choose appropriate PPE for a particular scenario

Answers:

1. Oxygen deficiency, combustible presence, toxics, mechanical hazards, electricity
2. Tanks, Manholes, Boilers, Furnaces, Sewers, Silos, Hoppers, Vaults, Pipes, Trenches, Tunnels, Ducts, Bins, Pits
3. False
4. Limited access, not designed for continuous human occupancy, and large enough to enter and perform work
5. Vary depending on area working in
6. Entrant, Attendant, Entry Supervisor
7. 19.5% $\leq$ 25.5%
8. Lower Explosive Level and $\leq$ 10%
9. Passport or TMX 412 or Green Wand
10. Supervisor, Plant Engineering and Safety office

Appendix C

Electrical Safety

Quiz Questions

1. Define voltage.

   _____

2. True of False. 50+ milliamp exposure is usually fatal.
3. What are the 3 protective measure to be taken
   1. _____ 2. _____ 3._____
4. What do the initials GFCI represent

   _____

5. True or false. Never remove the grounding prong on electrical equipment.

Answers:

1. The force that causes electrical energy to flow
2. True
3. Isolation, Inspection, and Insulation
4. Ground Fault Circuit Interrupter
5. True

Appendix D

Designated Representative

Quiz Questions

1. Who is the Site Contractor Coordinator?
   _____
2. Name 2 contractors currently working on site.
   1. _____ 2. _____
3. What is the plant's emergency phone number?
   _____
4. Does the corporate policy apply to contract workers that are directly supervised by 3M?
   YES NO
5. Name 2 duties of the Designated Rep.
   1. _____ 2. _____
6. What are the 2 OSHA standards that apply to the work the Designated Rep deals with?
   1. _____ 2. _____
7. Define the term Hazard. _____
8. How often is refresher training needed for Designated Reps? _____
9. Name 2 contractor rates that are looked at when a contractor is being considered for a project. 1. _____ 2. _____
10. True or False. Contractors do not have to adhere to 3M policies and procedures while on site.

Hands-on Requirement

1. Fill out a daily work permit

Answers

1. Glen Nale
2. Will vary depending on current projects
3. 2911
4. No
5. Knowing the 3M Outside Contractor Policy, understanding Corporate and site safety policies, understanding the basic governmental requirements, understand responsibilities of contractors, and monitor contractors' work to ensure fulfilling obligations.
6. 29CFR1910 and 29CFR1926
7. Condition or act that may lead to death, injury or property damage
8. At least every 2 years
9. Lost Time Rate, Incident Rate, EMR, Fatality Rate, and Restricted Work Rate
10. False

Appendix E

Open Flame/Spark Hazard

Quiz Questions

1. When would you find an Open Flame/ Spark Hazard Permit?
   _____
2. True or False. Once filled out, there is no expiration date on the permit.
3. How far from the work area should combustibles be placed?
   _____
4. Name the four types of fire extinguishers used.
   1. _____ 2. _____ 3. _____ 4. _____
5. What copy of the permit is posted in the work area?
   _____

Hands-on Requirements

1. Fill out permit
2. Operate gas monitor
3. Explain and show fire extinguisher operation

Answers

1. EHS Office or Supervisor
2. False
3. 35 feet
4. Water, Carbon Dioxide, Light Water, and Dry Chemical
5. Pink Copy

Appendix F

Emergency Response

Quiz Questions

1. What is the plant's emergency phone number? _____
2. True or False. The Dunn County sirens will be used to send people to the plant shelters.
3. Name 3 shelters in the plant.
   1. _____ 2. _____ 3. _____
4. Where are the assembly points for the plant?

   _____
5. True or False. You should leave the emergency shelters when you think the emergency has passed.

Answers:

1. 2911
2. False
3. Will vary depending on area working in.
4. On the East side of the parking lot
5. False

Appendix G

Personal Protective Equipment

Quiz Questions

1. Why do employees wear PPE? _____
2. Name 3 pieces of PPE that you wear regularly.
   1. _____ 2. _____ 3. _____
3. Name 3 health hazards that may be present in your area.
   1. _____ 2. _____ 3. _____
4. Name 3 sources used to choose PPE.
   1. _____ 2. _____ 3. _____
5. Name 3 injuries that could effect the head if no PPE is used.
   1. _____ 2. _____ 3. _____
6. What is the difference, if any, between a bump cap and a hard hat?
   _____
7. What approval is required for safety glasses to be up to OSHA standards?
   _____
8. Name 3 types of eye protection.
   1. _____ 2. _____ 3. _____
9. Name 2 types of hearing protection.
   1. _____ 2. _____
10. True or False. Everyone in the plant is required to wear steel-toes shoes.

Hands-on Requirements

1. Show how to choose and use correct PPE for a given situation.

Answers

1. To protect themselves from illness and injury
2. Depends on area working in
3. Depends on area working in
4. Safety Department, Company recommendations, vendor recommendations
5. Laceration, Concussion, etc
6. A hard hat uses a suspension system, a bump cap does not
7. ANZI Z-87
8. Glasses, Goggles, Faceshield
9. Muffs, Plugs
10. False

Appendix H

Environmental Awareness, SARA and DOT Labeling

Quiz Questions

1. What does EMS stand for? _____
2. Who is the site EMS Coordinator? _____
3. Name two significant aspects in the plant.
   1. _____ 2. _____
4. What is ISO 14000? _____
5. Where are copies of the environmental policy located?
   _____
6. Name 2 item that are recyclable.
   1. _____ 2. _____
7. Name 2 non-recyclable items.
   1. _____ 2. _____
8. What does RCRA stand for? _____
9. What governmental agency is responsible for the transportation of hazardous materials?
   _____
10. What does SARA stand for? _____

Hands-on Requirements

1. Fill out DOT label
2. Identify plants significant aspects

Answers

1. Environmental Management System
2. Mike Wendt
3. See Card
4. International environmental certification
5. On card, on server, posted in Learning Center and Front Offices
6. See List
7. See List
8. Resource Conservation and Recovery Act
9. Department of Transportation
10. Superfund Amendment and Reauthorization Act

Appendix I

Management of Change

Quiz Questions

1. Name 2 areas covered by MOC.
   1. _____ 2. _____
2. What is replacement-in-kind? _____
3. Give 2 examples of replacement-in-kind.
   1. _____ 2. _____
4. What does PSM stand for? _____
5. What areas of the plant are covered under OSHA PSM?
   _____
6. True or False. MOC has no effect on changes to covered areas.
7. Where are MOC request forms kept? _____
8. Name one of the 3 Division PSM Coordinators. _____
9. True or False. To work in a process covered area, a person must be trained.
10. True or False. Only a Division PSM Coordinator can fill out a MOC request form.

Answers

1. LSD, RLR, TMD, Fuel Cell
2. Replacement of a system, equipment, or procedure with one identical to the one being replaced.
3. Variety of examples
4. Process Safety Management
5. None (under OSHA). LSD, TMD and RLR under 3M standards
6. False
7. On the server
8. Mike Wendt, Terri Krueger, Rita Lunderville
9. True
10. False

Appendix J

Hand/Knife Training

Quiz Questions

1. Name 2 common hand hazards.
   1. _____ 2. _____
2. True or False. The #1 cause of hand injuries is faulty equipment.
3. True or False. When using a screwdriver, put the piece you are working on into a vise.
4. True or False. It is appropriate to operate a machine with the guards removed.
5. True or False. Gloves should always be worn to protect the hands/

Answers

1. nip points, hot spots, rotating machine surfaces
2. False
3. True
4. False
5. False

Appendix K

Hearing Protection

Quiz Questions

1. List 5 ways hearing can be lost.
   1. _____ 2. _____ 3. _____ 4. _____ 5. _____
2. Name 3 types of hearing protection.
   1. _____ 2. _____ 3. _____
3. True or False. If you have hearing loss, it is useless to wear hearing protection.
4. What is the OSHA level that requires hearing protection? _____
5. True or False. It is appropriate to wear an ear plug in only the ear closest to the noise.

Answers

1. See presentation
2. Muffs, plugs, canal caps
3. False
4. 85 dB
5. False

Appendix L

Hazard Communication, Bloodborne Pathogens, Access to Medical Records

Quiz Questions

1. Name 2 of the 5 components of a HazCom program.
   1. _____ 2. _____
2. What is the most immediate source of information about a substance?

   _____
3. Name 2 containers that require labels.
   1. _____ 2. _____
4. What is the color of the flammable area on the NFPA 704 diamond? _____
5. Name 2 routes of chemical exposure.
   1. _____ 2. _____
6. Name 1 of the records that can be obtained for information about exposure.

   _____
7. True or False. An acute exposure occurs over a long period of time.
8. Give 1 example of the 4 chemical hazards.

   _____
9. True or False. If you know a person who has been injured, you do not have to worry about their body fluids being infectious.
10. Name 2 of the 6 forms that chemicals take.
    1. _____ 2. _____

Hands-on Requirements

1. Fill out a label using an MSDS
2. Choose appropriate PPE to clean up a infectious fluid spill.

Answers

1. Inventory, MSDS, Labeling, Training, and Written Program
2. Label
3. Bags, barrels, bottles, boxes, cans, cylinders, drums, storage tanks
4. Red
5. Inhalation, injection, ingestion, absorption
6. MSDS, exposure monitoring records, medical records
7. False
8. Toxic, reactive, flammable, corrosive
9. False
10. Liquid, gas, mist, dust, fume, vapor

Appendix M

Red Label Room

Quiz Questions

1. True or False. A label should be on the side of an empty drum?
2. Name 2 chemicals stored in the RLR.
   1. _____ 2. _____
3. Name the 3 types of chemicals that will not be stored in the RLR.
   1. _____ 2. _____ 3. _____
4. Is a flammable liquid a liquid with a flashpoint above or below 100°F?
   _____
5. Define Grounding. _____
6. True or False. Only trained employees are allowed in the RLR.
7. What type of fork truck is allowed in the RLR? _____
8. True or False. ESD shoes are not required in the RLR.
9. Hazardous waste labels are to be attached on what to areas of a drum?
   _____
10. Who is the RLR Coordinator? _____

Hands-on Requirements

1. Show how to check shoes for conductivity.
2. Fill out empty drum label.
3. Show how to ground a drum.

Answers.

1. True
2. See list of RLR chemicals
3. Acids, Alkalines
4. Oxidizing Agents
5. Contact between a container and the ground, usually by a wire.
6. True
7. EE
8. False
9. Top and sides
10. Mike Wendt

Appendix N

Ergonomics

Quiz Questions

1. Is there a governmentally regulated Ergonomics Standard? _____
2. What is ergonomics? _____
3. Name 3 work factors
   1. _____ 2. _____ 3. _____
4. True or False. Back injuries are acute injuries.
5. Name 2 MSDs.
   1. _____ 2. _____
6. Name 2 MSD symptoms.
   1. _____ 2. _____
7. True or False. Ergonomic injuries cost an estimated $2 million a year.
8. True or False. Carpal Tunnel Syndrome and Repetitive Motion Syndrome are small problems for businesses.
9. True of False. Few Americans suffer from lower back pain in their lives.
10. Name 2 risk factors of lower back pain.
    1. _____ 2. _____

Hands-on Requirements

1. Show proper stretching techniques.
2. Identify ergonomically correct tools.

Answers

1. No
2. The process of fitting the machine to the human
3. Repetitive motion, vibration, excessive force, awkward postures, temperature extremes.
4. False.
5. See presentation
6. See presentation
7. False, $20 billion
8. False
9. False
10. See presentation

Appendix O

Radiation

Quiz Questions

1. What are the 3 types of radiation?
2. Name one area of the plant with radiation sources. _____
3. What term is used to measure amounts of radiation? _____
4. What is the 3M radiation exposure guideline? _____
5. What type of radiation is most dangerous (without ingesting)? _____

Answers

1. Alpha, beta, gamma
2. See presentation
3. mrem
4. 100 mrem/yr
5. Gamma