An Ounce of Prevention: Training Workers to Prevent a Crisis

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This paper introduces a technique for incorporating employee participation into the prevention component of a contingency plan. Companies sometimes focus so much energy on response that they forget to put resources into the basics of emergency prevention. The training program discussed here was designed to make employees part of the prevention system. Examples of training materials from the program are provided, a sample method for introducing risk assessment to employees is shown, and a strategy to address limited training time using short videos is explained. Methods for tailoring the training to any work-site and for specific risks are also included. The program is being designed and tested by the Pittsburgh Research Laboratory/NIOSH and employees of an underground coal mine. Examples are taken from the implementation of the program at the mine during the summer and fall of 1998. Results of the program evaluation and lessons learned during the implementation are discussed.

Introduction

One way to improve an emergency preparedness system is to enhance prevention. This simple idea is often overlooked while elaborate response planning is being conducted. Safety personnel at Cyprus Amax Twentymile Coal Company in western Colorado recognized that they had given a lot of attention to their capability to respond to major emergencies, specifically underground mine fires, but had tended to neglect prevention and the basics of first response. For this portion of their preparedness, mine personnel and researchers from the Pittsburgh Research Laboratory of NIOSH worked together to develop a program focusing on the basics. Implementation of the program at the mine began in July of 1998 and is scheduled to continue into 1999. Components of the program show promise for adaptability to other hazards and to other industries.

The program is built on the underlying message that everyone at a work site is responsible for emergency prevention and response. At the mine where the program was developed there are approximately 300 employees. There are two specially trained teams of volunteers. One is a fire brigade and the other is a mine rescue team. While team members are included in the training, employees who are not part of the special teams are the main focus of the program. The training modules detail basic prevention and first response tasks and introduce some activities that would only be performed under the direction of someone with special training. The expectation is that after training each worker will know his or her responsibility during an emergency and will also understand the overall mine emergency system.

The goal of the program is to prevent emergency situations from starting or if that isn't possible, to control them before a major response effort is needed. Purchasing special response equipment or training elite teams may be more interesting, but the basics of prevention and first response can preclude a costly large-scale response. When developing or reviewing your contingency plan, you should assess your prevention efforts. A complete prevention and response plan will be your best defense against a major emergency.

Training Materials

The concept of a program for prevention and response basics developed out of an effort directed at preparedness for large-scale emergency response. Researchers from NIOSH's Pittsburgh Research Laboratory had been working with mine staff to assess and enhance their advanced underground mine fire response capabilities. The initial work targeted the fire brigade, mine rescue team, and safety staff. The content developed during this effort was used as the starting point for the development of the basic prevention and response program for all employees.

The program started with four training packages consisting of short videos paired with safety talk guides. There are a number of strengths in these modules. First, the content is relevant. Second, they were developed specifically for this work site. Third, they provide both general information and a means to tailor the details to given work locations. Fourth, they take little time from coal production schedules. The first modules were developed with the assistance of outside researchers, but this is not necessary for an effective program. What is required are personnel with sound knowledge of the content and a commitment of resources for materials development, video production, and presentation of the final products.

The first step to an effective program is choosing appropriate topics. Employees are generally interested in training that they see as directly related to their work. In the case of this mine, underground mine fires

were targeted. The geological conditions at this mine lead to spontaneous combustion of the coal. When this tendency for spontaneous combustion is added to routine fire hazards, the mine site could be in danger of a major mine fire. The hazard most in need of attention at another work site may be fires, but it could also be chemical releases, terrorism, floods, or any one of countless other concerns. The important thing is to choose a topic that can be tied to the workplace. If multiple hazards are to be addressed, then sequential training programs can be implemented.

After a topic has been selected, the development of the training materials can begin. Multiple types of knowledge and skills are needed at this point. The Twentymile program was started during a week-long session that included people with skills in the content area, effective training techniques, and video production. The mine personnel and researchers who had been working together on fire response related topics provided the content and training expertise. The fire brigade members involved in this effort were allowed to work on this task instead of their usual jobs or to work overtime before or after their regular shifts. They assisted with script writing and were filmed presenting unscripted segments about their areas of expertise. The mining company hired a contractor to shoot and edit the video footage to create the final videos. The researchers assisted with creating the outlines and scripts for each video. They also developed the safety talk guides that accompany each video.

The safety talk guides are a key component of the prevention and response basics program. The videos briefly introduce topics and touch on concepts that everyone on the mine site should know. The safety talks take the same topics and relate them to specific work locations. For example, one video discusses equipment needed to fight fire with water. It includes information such as types of hoses and nozzles that are stored underground and their approximate locations. The associated safety talk focuses on equipment for fighting fire with water that is available in a given work area. After this talk, the employees should know what equipment is available near their work area and the equipment's exact location. The videos introduce a subject and bring it to the attention of the employees. The safety talks relate the topic to specific work locations and provide a forum for questions and concerns.

The pairing of videos and safety talks allows material to be introduced to large groups and then targeted to small groups with neither training segment taking much time. At the mine, the videos were presented as part of routine monthly production meetings. Every month or two a 5 to 10 minute video would be shown during the pre-shift meeting. The safety talk guides were given to supervisors who already had a responsibility to provide such training on a regular basis. The length of the talks would vary by presenter and audience participation, but were designed to take five to ten minutes to complete. With this method, training was incorporated into the daily routine rather than waiting for special training classes that require employees to be away from their jobs for hours or even days.

Example Training Modules – Risk Assessment and Fire Prevention

One of the training packages focuses on risk assessment. The concepts of likelihood and severity are introduced in the video. The video also explains that the fire brigade members are being trained to assess fire risk throughout the mine. The follow-up safety talk is a guided discussion of risk identification in a specific work area (see Attachment A). This guide was used at the cooperating mine. Supervisors gave the safety talk and documented answers that their crews gave to the questions on the guide. They then submitted this information to the safety department. This activity resulted in lists of fire risks specific to each area of the mine and means to reduce those risks. The lists are being analyzed to inform future prevention and response efforts.

Fire prevention is another topic covered by a training package. The content of this package includes precautions that can be taken to prevent fires from occurring and routine tasks that should be conducted to ensure that fire fighting equipment is available if it is needed. The video covers basic prevention information and shows some of the equipment available on the mine site. One of the fire brigade members shows the types of equipment that are available on the fire trailers stored at various locations in the mine. The safety talk is directed at work site specific issues such as the exact location of the fire trailers in given areas (see Attachment B). The overall message of this package is that everyone is responsible for preventing fires and for keeping fire fighting equipment in good working order.

Evaluation

In conjunction with showing the first video, a questionnaire was given to all employees to assess their level of knowledge and interest in fire prevention and response topics. A follow-up questionnaire is planned for early 1999 after completion of the fourth training package. Analysis of the resulting data will be conducted by NIOSH researchers who will provide their findings to the mine and to other interested parties.

Topics that should be highlighted during the subsequent training were identified during preliminary analysis of the data from the pre-questionnaire. For example, a substantial number of miners reported that a fire warning message should include directions for the appropriate evacuation route. While this would be helpful, it is not practical to expect such information. Miners must know the possible evacuation routes from their work areas and must understand the ventilation system well enough to deduce the direction smoke will travel. With this knowledge and any information available about the location of the fire, miners must choose their escape routes. Furthermore, they must re-evaluate their choices throughout the evacuation. The mine safety staff was concerned at the number of miners who did not seem

to realize they had the responsibility to choose an evacuation route from their work area. This issue will be highlighted during the safety talks about emergency communication. While pretests are not necessary for effective programs, in this case the information gathered in this manner proved worthwhile.

During the showing of the first videos an unintended effect was documented. Questions raised by employees after viewing the video revealed deficiencies in their knowledge about fire prevention and response. The managers were concerned by the questions that were asked and saw the need for the program. Mine management voiced strong support and even suggested that the safety staff develop supplementary skills training in using fire hoses. Raising the mine managers' awareness was not the focus of the training packages, but assisted with effective implementation of them.

Two training packages have been presented at the mine. Initial response to the program has been very positive. The mine's safety staff and production managers are supportive of the effort. Four additional training packages related to basic first response are under development. Miners' responses will be assessed on the post-questionnaire early in 1999.

Lessons Learned

1. Fire brigade members were willing and able to convey what they had learned in their special training. They knew what key points should be covered and were able to talk through the topics while being videotaped. Using them to help develop scripts and as "actors" greatly improved the return on the investment in their fire fighting training.
2. Production managers were asked to give introductory remarks on the videos. Each manager was given a prepared script for a single video.

   They all agreed, but seemed somewhat uncomfortable with the task. Perhaps they should have received the scripts sooner or have been asked to give the introductions in their own words.

3. Producing training videos in a production environment requires maximum flexibility. Frequently the person needed for a given segment isn't available or a location can not be used as planned. Schedules are constantly changing and an alternate plan should always be developed.

4. Scripts should be written in advance of shooting video footage whenever possible. The scripts will then guide the needed footage. This is particularly important if a contract videographer is to be employed.

5. Safety professionals, production managers, trained response personnel, and other employees all have ideas about emergency prevention and response. The issues important to each group can vary greatly. It is by gathering the concerns and solutions from all these groups that the most complete planning can be accomplished.

Tailoring the Program

The prevention and basic response program was designed to target a given work site and a specific hazard. The basic concepts and methods can be adapted to other companies and/or hazards. The experts and video locations come from the chosen site. The local experts should choose the targeted hazard and develop the content of the training. Outside assistance may be required to capture the video footage and there are consultants who can provide that service. The final product, a unique training package that meets targeted needs, cannot be gotten off the shelf.

What can keep a bad situation or potential crisis from developing into a real problem? If everyone knows how to prevent an emergency, the event is less likely to ever happen. If everyone knows how to respond at the initial signs of a problem, the situation is more likely to be controlled early. The employees of one mine are considering this simple formula. Their experience may guide others to include prevention and basic response as key components in their contingency plans.

Safety Talk 2: Fire Risk Assessment

This safety talk focuses on identification and evaluation of fire hazards. Miners will discuss sources of ignition and potential consequences of fire in their work area. First, the leader should present the information below. Then the group should work together to answer the questions that follow.

Introduction: The first step to preventing fire is identifying hazards. Risk assessment is used to establish priorities so that the most likely and most dangerous situations are addressed first. Those least likely to occur and least likely to cause major problems can be considered later.

During this session let's think about our work area and the existing sources of ignition. We can decide how likely those sources are to cause fires and the potential seriousness if the fires occur.

FIRST STEP: Defining the Work Area

- Be sure everyone understands the boundaries you are using. Name the area below.

SECOND STEP: Identifying Ignition Sources

1. List at least 5 sources of ignition in this work area.
   (Give examples like: a power center, a pump motor, or a belt roller)

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

   f. _____

   g. _____

THIRD STEP: Prioritizing Hazards:

2. From your list on question 1, which two sources are most likely to cause a fire?

   a. _____

   b. _____

3. From your list on question 1, which one source could cause the most severe fire?

FOURTH STEP: Making the Work Area Safer

4. For each of the sources of ignition listed in question 2, how can we make it less likely that a fire will start there? *(Give examples like: routine maintenance or good housekeeping)*
   a.

   b.

5. What can we do to make the consequences of a fire caused by the ignition source listed in question 3 less severe? *(Give examples like: sprinkler systems or knowing escapeways)*

FIFTH STEP: Keeping the Assessment Current

Any time the work environment changes, our assessment of fire risk in our work area will need to be updated. If you encounter a source of ignition we have not discussed today, let me know so we can talk about it at our next safety meeting. Fire prevention and preparedness takes all of us working together.

Safety Talk 4: Fire Prevention

INSTRUCTOR'S GUIDE

This safety talk focuses on fire prevention at "Company Name". The leader will present the following information about fire prevention and ask miners to discuss fire prevention in their work area.

Introduction: Fire prevention is the most important part of any fire protection program. Fire prevention tasks include taking precautions to keep fires from occurring and inspecting fire suppression equipment to be sure it is in proper operating condition.

Housekeeping: One way to prevent fires is to follow good housekeeping practices.

1. Are there any locations in our work area that need to be cleaned up?
   (Examples: trash lying around in entries and crosscuts; overflowing trash barrels; spilled oil, fuel, and grease; coal spillage along belts and near feeders; used oil)

2. Is there any location in our work area where coal spillage is commonly found?
   (Possible locations: near belt feeders, at belt drives, along ribs in entries) (*Explain that coal spillage is one of the most common sources of fire.*)

3. Can you think of any ways we could improve housekeeping in our work area?

Fire Safety Trailer: The fire safety trailers allow rapid assembly and transportation of fire suppression equipment and other emergency apparatus to the scene of a fire.

1. Where is the closest fire safety trailer to our work area?

   TIP: Have miners walk around a safety trailer and inspect the equipment for themselves.

2. What kind of fire fighting equipment is carried on the safety trailer?
   (500 feet of 1 2" fire hose, nozzles, turnout gear, and a 150 lb portable dry chemical fire extinguisher)

3. What other safety equipment is found on the safety trailer?
   (14 SCSR's, fire fighters' turnout gear, and a complete first aid box)

4. If you spot damaged or defective equipment on the fire safety trailer, what should you do?

Fire Equipment Inspection: Fire prevention also includes maintaining fire suppression equipment. Fire extinguishers are the most readily available pieces of fire suppression equipment in the mine. It is important that you know where they are and how to inspect and maintain them.

1. Where are the fire extinguishers in our work area?

2. When inspecting a fire extinguisher, what should you look for?
   (Dents, manufacturer's labels coming off, indicator button is up, nozzle doesn't work, inspection tag not current (inspected every six months), no inspection seal, plunger safety pin out)

   TIP: Have a fire extinguisher present and let miners inspect the unit.

3. If you find a fire extinguisher in your work area that is in disrepair, what should you do?
   (Remove the unit from service and replace it. If a replacement extinguisher is not available, notify supervisor so arrangements can be made to replace the unit. Also, be sure to notify coworkers of the problem.)

There's nothing worse that trying to put out a fire with an extinguisher that doesn't work.

Fire Prevention Strategies (review):

1. Remember, housekeeping is your first line of defense. Take the time to cleanup trash, coal spills, and used oil.

2. Protect and inspect the fire suppression and detection equipment in your area regularly to be sure it is in good working order.

3. Be sure to report all damaged and inoperable fire detection, suppression, and communication equipment.