

Emergency Preparedness for All Industries... Yes, You Too

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Abstract

The common belief prior to the spring of 1972 was that the risk of fire was not a concern in underground hardrock mining. Miners worked in tunnels of stone that they, themselves carved. Unlike their counterparts in coal mines where fire hazards are a serious concern, hardrock miners reassured themselves that “rock doesn’t burn”. Accordingly, their precautions, planning, training and equipment to respond to fires were not a priority. The risk of fire was summarily dismissed behind the rationale that “It can’t happen to us.”

On May 2, 1972, a fire broke out in the old workings of Idaho’s Sunshine silver mine burning support timbers, ventilation stoppings and polyurethane insulation. The fuel-rich fire smoldered, producing toxic smoke and depleting oxygen levels. As the fire compromised the ventilation stoppings, air flow was short circuited causing smoke to be forced into the working areas of the mine by the very fans that were designed to force the bad air out.

In less than two hours, 91 of the 172 miners underground died as a result of carbon monoxide poisoning.

The tragedy not only had a lasting effect on the families and the community it impacted, but the industry as a whole also changed significantly. The Mine Safety and Health Act of 1977 was seen as a direct result of the Sunshine mine fire. This landmark legislation implemented strict enforcement powers that the Mine Act of 1968 did not. More importantly, it included metal and non-metal mines such as Sunshine into its provisions.

A study of the events leading up to the Sunshine mine disaster reveals a host of opportunities where a comprehensive risk assessment and emergency response plan could have benefited the evacuation efforts and surely saved lives. Moreover, it offers an example of how cavalier attitudes and unfounded beliefs that “it can’t happen to me” can be devastating to safety initiatives.

Background

Located in the Coeur d’Alene district in Idaho, the Sunshine silver mine was the largest and richest in the United States. In its 120 years in operation, the mine produced over 360,000,000 ounces of silver, which dwarfed all of its competitors.

The Sunshine was a deep shaft mine that cored more than 5,800 feet vertically into the mountainside with horizontal lifts following silver deposits. The lifts were accessed through a central elevator shaft and were identified by numbers representing their depths below the portal. For example, the 4400 lift was 4,400 feet down and ran horizontally away from the central shaft.

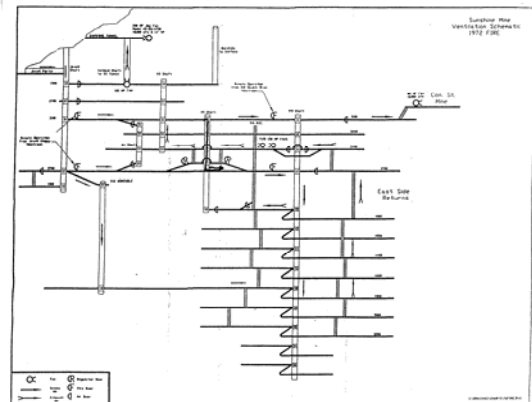
Prior to the fire, the mine had a work force of around 522 miners, 429 of whom worked underground. The vast majority worked as “gyppo miners” (a slang term for miners whose pay is based primarily on how much ore he extracts). The workforce resulting from this structure was not only fiercely independent, but also was highly motivated to stay in the mine as long as possible to uncover as much silver as they could. Since any non-productive working time cost them and their families financially, the gyppos were not inclined to leave their tunnels without just and obvious cause.

Having been active since the late 19th century, the mine was huge and difficult to ventilate due to the number of old workings that must be positively sealed off. To address this issue, Sunshine began applying polyurethane products to the air stoppings throughout the mine in the late 1960’s. The ventilation system is designed to direct fresh air down to all working areas while twin 150 horsepower fans draw air from the bottom to blow it out of the exhaust.

The working environment at the Sunshine mine was often harsh with a natural temperature above 100 degrees, damp conditions and very little light. Communications during the shift relied on miners passing the word to each other as they moved through the lifts.

To access the working levels of the operation from the surface, miners traveled down an elevator where they caught a small train that carried them to the #10 Shaft about a mile back into the mountain.

The #10 shaft continuously ran elevators for both ore and people moving into and out of the mine. The “chippy hoist” had the capacity to transport 75 miners at a time while the main “double drum” hoist was intended primarily for production. The two hoist operators sat in control booths at different levels along the #10 shaft.



Sunshine Mine Ventilation Map 1972

The Morning of May 2, 1972

One hundred and seventy three men arrived to work for the 7:00 to 3:00 shift at sunshine on the day of the fire. Absent from the mine that day were the Plant managers, Marvin Chase and Al Walkup, who were away from the plant at a shareholders meeting.

The miners descended the elevators and went to work. Foremen Harvey Dionne and Gene Johnson managed the mine from an underground office on the 3700 lift adjacent to the #10 shaft. Around 11:30, electricians working near the fans on the 3700 level began to notice persistent smoke in the area although they could not identify the source. Smoke was not an uncommon occurrence in the mine. Beyond the fact that many of the miners smoked cigarettes; drilling, blasting, welding, machine works and any number of production related activities produced smoke. It often took that smoke a while to work its way through the ventilation system and be expelled from the mine.

The common belief was that since “rock won’t burn”, smoke and fires in a hardrock mine were no cause for alarm. However; since the smoke recognized by the electricians seemed fairly steady, they decided to report it to the foremen (Dionne and Johnson) so that they might find out what was burning and put it out before it became a problem.

Neither of the foremen was able to find the source of the fire. It was obviously not coming from any of the active workings which meant that it was most probably obscured by one or more of the wooden stoppings designed to control air flow. Worse still, the smoke quickly intensified.

After 30 minutes of investigating, the foremen decided they should call for an evacuation of the mine. This was a decision that would normally be made by the plant supervisors. Unfortunately, they were off site. If the foremen were wrong and the fire was a small, controllable problem, their decision would be second guessed by not only the supervisors, but also the “Gyppo miners” who would lose out on production time and the heavy bonuses that came with it.

Evacuating Sunshine

At about noon, the foremen began evacuating the miners from Sunshine.

The only means of communication within the mine was a battery operated “party line” telephone system with a receiver located near the #10 shaft on each level. Foreman Gene Johnson called to each of the levels passing the word that there was a fire and everyone needed to head to the #10 shaft and ride out on the “chippy hoist”. Most miners had just finished their lunch and had returned to their headings to get back to work. Many of the experienced “gyppo miners” believed that a fire on an upper level wouldn’t put them at any risk down in the mine. If they stayed on their jobs, they would certainly not lose valuable production time and not risk losing any part of their bonus.

Foreman Greg Dionne rushed toward the surface to facilitate the evacuation and to ask the Safety Director, Bob Lunhardt, to enact the general evacuation alarm. The system to alarm miners at Sunshine was known (affectionately) as “Stench”. This was a foul smelling substance that was injected into the air compressor lines that ran to all areas of the mine. While “Stench” was an effective means of communicating, it took more than 26 minutes to reach all areas of the mine.

The most devastating event was discovered at about 12:05 when the “Chippy hoist” operator was overcome by smoke. This meant that the elevator designed to transport men from the mine would not be serviceable to help in the evacuation. As a back-up, the “double drum” hoist was placed into service. This larger hoist was not intended to move people. It could only move 12 at a time where the “Chippy” could transport 75. There were 173 miners who needed a ride out.

The final problem was that the 3700 level was fully engulfed in smoke. This was the main passage into and out of the mine. Without being able to use it (and the man train that carried personnel on the 1 mile ride out) miners would have to be lifted to an older section where they would have to walk out. Most of the miners at Sunshine had never been to this level before and would have a difficult time finding their way out once they got there.

Most of the miners who evacuated the mine had no idea how bad the situation was. After they reached the surface, most just showered and went home or to a local bar called the “long Shot” that sits near the mine. No one checked in or out. There was no way to determine who made it out or who was inside the mine.

Ventilation works against the miners

Foreman Gene Johnson came to the realization that the smoke from whatever it was that was burning was not being forced out by the ventilation system. In fact, the smoke appeared to be forced backwards (down the #10 shaft) and into the working areas of the mine.

This must have meant that the wooden stoppings must have been somehow compromised by the fire and are now allowing the twin 150 horsepower fans to drive the smoke down into the mine instead of out the exhaust shaft. In short, the fans were exacerbating the problem by providing fresh air to the fire while blowing the toxic smoke down to the levels where the miners were trapped.

Johnson, who was directing evacuees to walk out from the 3100 level, quickly sent two men to the fans which were located on the 3400 level to shut them off. The men never reached the fans but were later found dead near the disconnect.

Self Rescuers at Sunshine

A device known as a “Self-Rescuer” is a small canister containing hopcillite which converts toxic carbon monoxide into breathable carbon dioxide for use in escape situations. The byproduct of this chemical reaction is intense heat (400 degrees) which makes the air difficult to breath and the device painful to use.

Self-rescuers were not required in non-coal mines in 1972, but Sunshine was one of the few mines that purchased them. Unfortunately, there was no training offered in how to use them and they were not consistently or conspicuously located in the mine. Moreover, there was no program to maintain or ensure that the self-rescuers were available for use in an emergency.

There were many stories about the selfless heroics that took place during the evacuation of the Sunshine mine. One of the most prominent involves Greg Dionne (the 24 year old son of foreman Harvey Dionne) who took over the job of “cager” helping people into the elevators and teaching them how to break the seal and use the self-rescuers. He saved dozens of lives but never made it out, himself.

After the fire at the Sunshine mine, self-rescuers were made mandatory at all underground mines (coal or otherwise) and they were required to be carried by each miner. Training requirements on the use and care of the device were also mandated for all people who enter an underground mine.

The Hoisting Operations Cease

At 1:02 PM, the operator's station that controlled the "double drum" hoist was inundated with smoke making it impossible for any more people could be brought up out of the mine. In about an hour, 81 people had safely evacuated the mine. Ninety three would remain trapped inside, unable to escape.

Their only hope would be to find a pocket of good air and wait for rescuers to reclaim the mine.

The Response from the Surface

Immediately after hearing the call for an evacuation, Safety Director Bob Lunhardt assembled the necessary equipment for the mine rescue team (or "helmet crew") to re-enter the mine. Additionally, a call went out to the Bunker Hill mine to request that they send their "helmet crew" to help in the process. Since rescue operations for underground mines require specialized equipment and knowledge of the environment, operations such as Sunshine maintained their own response crew. As a matter of practicality, mines that operate as competitors relied on each other for a coordinated rescue.

These crews were made up of volunteer miners who agreed to participate in the required training. Most who signed on for the duty reported to have done so only for the overtime pay. All training was done on the surface and the volunteers spent almost no time actually wearing the 40 pound breathing devices. The objectives of the "Helmet Crew" was to first stay safe, then to secure the mine which would entail recovering the ventilation and other vital systems.

Immediate rescue efforts were manned by miners who, themselves had just escaped the mine. These efforts proved slow and fruitless even resulting in the death of one of the rescuers who became disoriented and offered his own mask to a miner.

The rescue efforts took seven days and culminated in the successful recovery of two miners, Tom Wilkerson and Ron Flory. In all, 91 miner's bodies were discovered by the "Helmet Crew".

United States Bureau of Mines "Final Report"

The governing body for the provisions of the 1968 Mine Safety and Health Act was the Bureau of Mines. The bureau was on the scene in Kellogg on May 3rd and aided in the coordination of the mine recovery.

The final report published in 1973 by the USBM cited nine primary deficiencies in the mine and its emergency preparedness that contributed to the severity of the fire. The following are the nine points identified in the report.

1. The emergency escape way system was not adequate for rapid evacuation.

2. Top mine officials were not at the mine on the day of the fire and no person had been designated as being in charge of the entire operation.
3. Company personnel delayed ordering evacuation of the mine for about 20 minutes while they searched for the fire.
4. The series ventilation system used in the mine caused all persons to be exposed to smoke and carbon monoxide.
5. Most of the underground employees had not been trained in the use of the provided self rescuers and had difficulty using them. Some self rescuers provided by the company had not been maintained in useable condition.
6. Mine survival training, including evacuation procedures, barricading, and hazards of gases had not been given mine employees.
7. The emergency fire plan developed by the company was not effective. The company had not conducted evacuation drills.
8. Abandoned areas of the mine had not been sealed to exclude contaminated air from entering the ventilation air stream.
9. The controls built into the ventilation system did not allow the isolation of No. 10 Shaft and its hoist rooms and service raises or the compartmentalization of the mine. Smoke and gas from this fire was thus able to move unrestricted into almost all workings and travelways.

Assessment

From the 34 year old accounts available, it would be difficult to offer a valid critique of the response from the rescuers or the Bureau of Mines. It is clear that the only two miners who survived the initial fire found the one location with fresh air and were eventually rescued. It is also worth considering that there was no similar rescue scenario to learn from nor were there any experienced mine rescuers available to contribute to the efforts.

There are plenty of opportunities; however, to find missteps on the part of the company that created the conditions whereby the risks associated with the fire grew unchecked. Further, the cavalier attitude towards emergency response planning complicated the evacuation in a way that can assuredly be measured in human lives.

First, the Mine Foremen (Gene Johnson & Harvey Dionne) were the ranking company officials on site when the smoke was initially detected on May 2nd. They were alerted by employees at around 11:30 and had 90 minutes to manage an evacuation before the hoist operator's station was overcome at 1:02 PM. Whether predicated by skepticism of the hazard that the smoke represented or by the confusion as to their level of authority, the foremen failed to conduct an orderly evacuation of the mine in the time they had available.

Second, communication within the mine was severely limited and ineffective at alerting miners of an emergency and incapable of facilitating clear two-way communication. The "stench" warning system that put an odor in the air compressor lines took a full 26 minutes to reach all extremes of the mine. The other warnings were to be announced to whoever answered the party line phones with the hope that they would relay verbally the need for an evacuation to others in the drift. There was no procedure for clearing the party line of traffic so that important information could take precedent. This poor communication added to the confusion of the evacuation.

The third significant concern was that the mine planning did not allow for the isolation of the “chippy” hoist controls. Once that work station was compromised, the means of escape were summarily constricted. Additionally, the mine plan had only one true escape way (the #10 shaft).

Most importantly, the risk assessment for the Sunshine mine was flawed which allowed the hazard of smoke from a remote fire to be ignored. The risk of a fire in the #10 shaft; however, was an obvious concern and was well planned for. The fire that caused this tragic loss of life occurred in an obscure section of the mine and was fueled by a short-circuit in the ventilation system. Had either of these two failures been addressed as a plausible scenario in the Emergency response plan, the response to the fire might have been very different.

In the end, the Sunshine mine was a victim of confidence and complacency. The predominant belief that such a disaster could not happen in a hard-rock mine instilled a false sense of security in the miners and the management that led to a cavalier attitude towards emergency preparedness.

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