



Crisis Planning and Response:

Benefits Of Hazard Analysis For Underground Mining Companies



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The recent Chilean mine cave-in and successful rescue of 33 miners stirs up both old and new questions for risk managers of mining companies: Are we effectively monitoring and maintaining our current operations? Can we build mines even safer in the future? Do we have a proven crisis management procedure for handling an accident? What's the best way to handle the media scrutiny after an incident?

Answering questions like these are critical right now, as underground mining executives are under pressure to aggressively expand exploration and development to meet the world's growing demand for energy and precious minerals. Much of the opportunity lies in places like South America, Russia and Africa. For North American-based companies, this means crisis management after an accident could require simultaneous decision-making on two continents. While the media reports around the Chilean incident were sympathetic, this is not always the case—especially when mass casualties or environmental damage occurs.

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Performing a hazard analysis upfront

In the U.S., the Mine Safety and Health Administration (MSHA) regulates many aspects of mine operations. In addition, MSHA's Accident Prevention Program provides tips and materials on how to improve safety at mines. (Visit www.msha.org to access these resources). However, it may not be enough for a mining operation to simply meet these regulations or review a general checklist. Mines are increasingly using complex procedures and sophisticated technology that require more detailed hazard analysis. Additionally, each mine has its own unique set of challenges such as rock competency, location next to abandoned mines, and others, requiring a more customized review of each mine's hazards.

For both existing and new mining operations, it's critical to conduct a comprehensive and systemic hazard analysis. This is a planning methodology that helps determine potential gaps in operating procedures, as well as assess an organization's level of acceptable risk. Existing operations can use a hazard analysis as a means to improve current procedures. A hazard analysis used for new mines can help identify potential exposures.

The purpose of the hazard analysis methodology is to establish what each mine's principle exposures are, and come up with a systematic plan to help mitigate these risks. The following steps are typically included in a hazard analysis:

1. **Choose members of the hazard analysis team and a leader** – A team comprised of four to eight experts from different departments and disciplines of the mine operation is created. The team leader should have the skills to implement the hazard analysis methodology, stimulate risk identification and bring the team to consensus on the gap analysis.
2. **Identify and assess hazards** – The members of the team should be able to work together to identify inherent hazardous factors (e.g. pressure), malfunction issues (e.g. structural failures), environmental influences (e.g. humidity and other external factors), use and operation (people factors) and lifecycle (time factors).

3. **Create a risk profile** – This is a written communication tool that spells out the risks, and the organization's tolerance for the risk as determined by the team, or a company's risk policy.
4. **Risk improvement actions** – These are the actions that will be taken to help mitigate the identified risks, starting with those of the highest risk priority, and following a logical sequence from there.

Although each mine has its own unique risk situation, some issues that are commonly assessed during a hazard analysis include:

- **Ground control** – To help decrease risk of collapse, determine the stability of the mine roof and rock. Some mines are surrounded by hard rock, where there is little need for extra bolts or mesh. Rock that is very soft and fractured comes under stress more easily. Discussing ground control issues with geotechnical experts is often recommended during risk assessment.
- **Fire fighting** – Is your mine prepared to fight a fire? Every mine should have an underground fire response plan, and one that includes fire brigades. Issues such as surface access to the mine for fire fighters are also important to consider.
- **Ventilation** – This assessment should include both everyday ventilation issues as handling toxic gases that could be present from diesel equipment, as well as the critical need of maintaining a breathable environment during a mine fire.
- **Electrical issues** – The loss of electricity during operations can affect all areas of the mine, including the possibility of miners being stuck in the hoist during an outage or pumping facilities shutting down in the middle of a storm. Having a generator for back-up power can help prevent electrical failures.
- **Underground inundation** – An intersection with an old mine or an aquifer can cause a mass rush of water into your operations. Having adequate pumping systems and good mapping of old mines are some of the risk mitigation techniques for underground inundation.
- **Shaft collapse** – Although mines in the U.S. are required to have two means of egress, making sure your company is keeping up with the specific maintenance on the hoists is a critical task. New technologies in headlamps can help detect miners' locations during a collapse.
- **Blasting** – Checking for improper blasting procedures can help prevent such issues as excess toxic blasting fumes, roof control issues and rock bursts. Installing seismic monitors can help evaluate shifts in rock between blasts.

Creating an effective crisis response plan

It's important that every underground mine has a fully developed emergency response plan. For new operations, this plan should be in place before operations start up. For existing operations that already have an emergency response plan in place, but haven't reviewed it for some time, you may want to consider scheduling an update soon.

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Some tips for creating an effective crisis response plan include:

- Create a methodical approach and process that is precisely implemented in a timely, but not rushed manner.
- Access a team of outside expert resources to assist with hazard analysis such as geotechnical issues and psychological support for trapped miners. In the case of the Chilean miners, experts ranging from the U.S. National Aeronautics and Space Administration to the Chilean submarine service were engaged.
- Have two rescue teams available at all times, who are well trained and can execute the rescue plan. Ideally, monthly drills should be scheduled.
- Check to make sure rescue chambers have ample supplies of oxygen, food, water and toilet facilities. Most rescue chambers are designed to withstand a fire (typically 48 hours). But in the case of the trapped miners in Chile, the release can take a much longer period, so establishing food stores outside of the typical rescue chamber to support non-fire incidents should be considered.
- If economics allow, construct an elevator shaft in the emergency shelter area.
- Conduct emergency rescue drills that both miners and rescue teams take seriously. As the Chilean incident demonstrated, it's important that supervisors convey a strong sense of leadership and confidence during a drill, and most importantly, during an incident.

Managing your media response during a crisis

A mining incident puts your company's reputation at risk as well. Developing an effective media response plan goes hand-in-hand with developing your emergency response plan in the mine itself. One of the most important things to do is to organize a crisis communications team. Appoint a company spokesperson whose job it is to gather all available information (who, what, where, when, how, and what's next) on each incident and handle news media inquiries. The spokesperson should be accessible around the clock and be prepared to go to the scene of an incident.

Remember, any attempts to cover up an incident or provide incomplete or incorrect information can come back and bite you if a reporter finds out the full story from another source. By being open and responsive, you control the information instead of another less knowledgeable source.

Preventing worker injury or casualty

A piece of equipment failing or being destroyed at a mine is likely to get little to no media coverage. But when workers are seriously injured or killed, your operation is likely to come under heavy scrutiny in the media as well as from state and federal regulators.

A comprehensive analysis of workers' comp risks is recommended, and should include such areas as:

Safety program review

- Program structure
- Site internal safety observation program
- Personal protective equipment program (respiratory, hearing, vision, body, etc.)
- Procedures for work in or on confined spaces, heights, energized equipment
- Training program
- Emergency response capabilities, plans, and drills

Underground mine operations

- Employment concentrations and shift rotations
- Mining methods and material transportation methods
- Roof control plan
- Control of blasting and explosives
- Ventilation plan and system arrangements
- Primary and secondary escape ways
- Locations of rescue chambers
- Equipment Check
- Underground transport equipment
- Electrical and ventilation installations
- Explosives storage magazines
- Flammable/combustible liquids storage installations
- Hoisting equipment

Processing and support facilities

- Electrical installations
- Elevated work platforms
- Rotating equipment
- First aid stations
- Chemical storage areas
- Product storage and load-out
- Shop/warehouse
- General work area tour

Human elements programs:

- Hiring practices
- Return-to-work program
- Incentives programs
- Multiple injury tracking
- Workers' Compensation Records Review

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