DRILLING DOWN ON MINING SAFETY

Why a safety-first culture is essential to achieving zero harm in mining

Honeywell

INTRODUCTION

Zero harm to people shouldn't just be a goal of a mining operation. It should be the minimum safety standard.

In recent years, The US mining industry has seen a reduction in the number of deaths and injuries caused by incidents on mining sites. From 2014-2021, fatalities went from 46 to 37, and injury rates went from 2.47 to 1.91.[1] Nonetheless, the safety standard of zero harm has not yet been achieved. This article examines the status of worker safety in US mining in the context of controls, regulations, and best practices currently in place. It discusses the challenges that mining organizations face when it comes to keeping workers safe and makes the case for a proactive approach to safety where solutions are tailored.

THE VALUE AND COSTS OF MINING

The mining industry supports everyday life in the U.S. It provides raw materials, minerals and metals critical to our economy.

The National Mining Association (NMA) reports that U.S. manufacturers rely on 29 of the 35 critical minerals, as the Department of Interior designated, essential to a strong U.S. economy.[2] Mining also provides the elements for advancing technologies. Many innovations today depend on mined minerals—from lifesaving medical devices to hybrid cars and advanced energy technologies. While the annual GDP share from mining in the United States decreased to 366.20 USD Billion in the second quarter of 2022 from 392 USD Billion in the first quarter of 2022[3], employment in mining continues to grow. The number of people employed in the Mining industry in the US increased 4.7% on average over the five years between 2017 and 2022. Today, there are 834,721 people employed in the US Mining industry (2022).[4]

THE DANGERS ARE REAL

There have been 249 US mining fatalities from 2014- 20214

As one of the most dangerous and unpredictable workplaces in the world, mines demand the highest levels of protection from hazards such as coal dust, cave-ins, explosions, toxic air, excessive noise, slips, trips and falls, extreme temperatures, chemical hazards and more. Emergencies such as leaks of methane, hydrogen sulfide, or other dangerous gases are constant threats.

Mining in the United States remains one of the most hazardous industries, despite significant reductions in fatal injury rates over the last century. Coal mine fatality rates, for example, have dropped almost a thousandfold since their peak in 1908.[5]

From a global standpoint, despite labor regulations and the efforts of unions, mining accidents take the lives of thousands of workers every year around the world[6]

Although only accounting for one percent of the global workforce, mining is responsible for about eight percent of fatal accidents at work.[7]

INJURIES BY THE NUMBERS

In terms of injuries, it's not surprising that mining presents elevated rates of lost-time injury (LTI) and disability. Among the highest rates of LTI's are musculoskeletal injuries (hand, back, limbs, fractures, lacerations and muscle contusions), plus slips and falls.[8] In 2021, 25% of all mining workplace injuries resulting in lost workdays were slips and falls causing pain.[9]

NUMBER AND RATE OF NONFATAL LOST-TIME INJURIES PER MINING SECTOR, 2018 – 2021[12]

SECTOR	2018	2019	2020	2021
Coal	1,336	1,307	996	1016
Metal	486	567	474	526
Nonmetal	355	337	282	314
Stone	955	954	863	910
Sand & gravel	358	324	276	299
Coal contractor	179	188	93	116
Noncoal contractor	265	249	209	240
Total	**3,934**	**3,926**	**3,193**	**3,421**

MINING ACCIDENTS

Number and percentage of nonfatal lost-time injuries by accident class, 2021[11]

TOP 5 INJURIES BY ACCIDENT CLASS 2021:

Handling materials – 1,175 (34.35%)

Slip or fall of person – 779 (22.77%)

Machinery – 377 (11.02%)

Powered haulage – 341 (9.97%)

Hand tools – 324 (9.47%)

1. https://www.msha.gov/msha-glance
2. https://www.scotforge.com/Blog/why-is-mining-important-and-what-is-the-impact
3. U.S. Bureau of Economic Analysis (BEA), https://tradingeconomics.com/united-states/gdp-from-mining
4. https://www.ibisworld.com/united-states/market-research-reports/mining-sector/
5. https://www.msha.gov/msha-glance
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7. https://www.industriall-union.org/special-report-why-is-mining-still-so-dangerous
8. https://www.ilo.org/safework/areasofwork/hazardous-work/WCMS_356567/lang--en/index.htm
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10. U.S. Library of Medicine National Institutes of Health
11. https://wwwn.cdc.gov/NIOSH-Mining/MMWC/Injuries/Count
12. https://wwwn.cdc.gov/NIOSH-Mining/MMWC/Injuries/NumberAndRateBySector

MINE SAFETY MANAGEMENT – REGULATIONS AND BEST PRACTICES

Mining is a high-risk industry due to its inherent environmental and operating hazards.

The US mining industry is regulated by several agencies. The U.S. Department of Labor Mine Safety and Health Administration (MSHA) regulates worker safety and health. The Department of Interior Office of Surface Mining Reclamation and Enforcement and delegated states regulate coal mining activities. The U.S. Department of Interior Bureau of Land Management and the U.S. Department of Agriculture Forest Service regulate mining activities on federal land managed by these agencies. The U.S. Army Corps of Engineers, EPA, and state agencies also have roles in regulating the mining industry.[13]

Functions of the Mine Safety and Health Administration (MSHA)
The MSHA is responsible for enforcing the Federal Mine Safety and Health Act of 1977 (Mine Act) as amended by the MINER Act of 2006. The Mine Act gives the Secretary of Labor authority to develop, promulgate, and revise health or safety standards for the protection of life and prevention of injuries in the nation's mines

The Mine Safety and Health Act[15]
The Mine Act requires that the U.S. Department of Labor's Mine Safety and Health Administration (MSHA) inspect all mines each year to ensure safe and healthy work environments for miners. In addition to setting safety and health standards for preventing hazardous and unhealthy conditions, MSHA's regulations establish requirements for:

1. Immediate notification by the mine operator of accidents, injuries and illnesses at the mine
2. Training programs that meet the requirements of the Mine Act
3. Obtaining approval for certain equipment used in gassy underground mines.

The Mine Act covers all mine operators and miners throughout the United States, including the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, Guam, and the Trust Territory of the Pacific Islands.

INHERENT RISKS

Work Safe Australia identifies the following inherent risks from mining work:

39%

BODY STRESSING, MANUAL HANDLING AND MUSCULOSKELETAL DISORDERS
% of compensation claims

25%

SLIPS, TRIPS AND FALLS
% of compensation claims

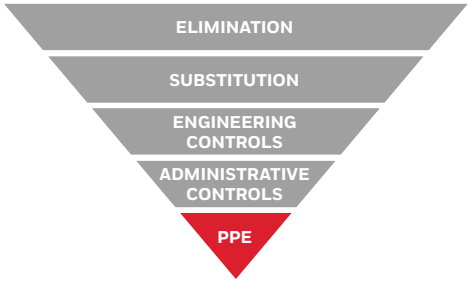
18%

BEING HIT BY MOVING OBJECTS OR MACHINERY
% of compensation claims[16]

13. Mining Sector Information | US EPA
14. https://www.msha.gov/regulations
15. https://www.dol.gov/general/topic/safety- health/mining

THE HIERARCHY OF CONTROLS STRATEGY

In medicine, doctors pledge to “first do no harm”. In mining, operators promise to “first identify and eliminate all risk”. This is a strategy for safety that singles out hazards before work begins. It works by adopting a series of controls called the Hierarchy of Controls.



ELIMINATION

Remove the hazard, or the need to perform the hazardous activity.

SUBSTITUTION

Substitute a safer alternative.

ENGINEERING CONTROLS

Redesign or modify tools or equipment.

ADMINISTRATIVE CONTROLS

Use training, rules, and procedures to reduce the risk of the hazard.

PERSONAL PROTECTIVE EQUIPMENT

Provide suitable protective equipment for the application and identified hazard.

The Hierarchy of Controls is defined by five stages: elimination, substitution, engineering controls, administrative controls and personal protective equipment. It must be applied in that order, with the most effective control being elimination and the least effective being personal protective equipment (PPE).

Despite elimination of the hazard being the ultimate goal, it is not always possible. It’s important to note that if PPE is required – which is the last tier of control –it is no less important than any other control. In fact, it’s arguably more important because it is the last line of defence when all other controls have been applied.

CHALLENGES WITH PPE USE

WORKER BEHAVIOUR

The biggest challenge with PPE is that it relies on worker behavior to be effective 100% of the time. "The first 'P' in the acronym for PPE is personal. For the gear to be effective, it has to be made personal. This means that that person should have confidence in the controls that have been applied, and that the equipment provided is appropriate for the application and work hazard.

While it's common knowledge that everyone has a personal responsibility for the safety and health of themselves and others, it's good practice to adopt an attitude of positive reinforcement when it comes to worker behavior around PPE.

By building a culture around safety, where the focus is on ensuring everyone gets home safe, every day, the responsibility of PPE use is made personal. Instead of viewing PPE as a requirement for compliance, and reinforcing its use in those terms, it is instead reinforced with the message that the individual worker's personal safety is the priority.

INCONSISTENT WORKFORCE

Another key issue for mining operations is that often multiple contractors are hired for different site projects, as well as casual workers. This can affect how successful PPE use is from a work culture perspective and can also lead to inconsistences in the type of products used across the entire workforce. For example, certain PPE might be shelved in the case of a new contractor coming to site who is not familiar or experienced in how to use that particular PPE. Whenever PPE changes, workers must be provided with adequate training and fitting sessions.

ENVIRONMENTAL CONDITIONS

Mining by nature is remote, with many sites located in hard-to-reach places and subject to extreme environmental conditions. This means they are also often rife with hazards that include severe temperatures, excessive noise, vibration, dangerous chemicals, dust, gases, heights, and unstable surfaces. Such environmental challenges can influence how PPE performs, and cause issues regarding access or high turnover of equipment.

DISCOMFORT

While it's established that worker behavior is essential to the effectiveness of PPE, if PPE is not fitted correctly and isn't comfortable, the worker will be inclined to take it off or not wear it properly. And in that instance – even if it's just for a minute – discomfort might be the difference between that worker being harmed or going home alive, free of injury or disease.

Which is why selecting the right PPE is so vital.

CRITERIA FOR SELECTING PPE

WHEN IT COMES TO CHOOSING PPE, THERE ARE TWO QUESTIONS THAT NEED TO BE ANSWERED:

1. Is the equipment appropriate to the application and work hazard?
2. Is it comfortable to wear?

In relation to the first question, equipment is deemed suitable if it is meeting the relevant standards and is designed to withstand the specific conditions and rigors of its application. Workers need to have peace of mind that the gear they are wearing will do its job and keep them safe when it matters most. As for the second question, comfort may seem secondary when it comes to the effectiveness of PPE, but it's not. In fact, the two go together. If the PPE is not comfortable to wear, then it is not suitable because there is a danger that the worker will remove it during the time period in which they're exposed to a risk. For example, if a worker is given earmuffs for the duration of an eight-hour shift, but they take them off for a few minutes two to three times in that shift, they could lose a complete class of protection. So, if it's too tight, or too heavy, or in any way giving the worker cause to remove the PPE, then it's exposing them to a dangerous level of risk.

THE DRINK DRIVING ANALOGY

Honeywell PPE expert Madeleine Rahaley likens removing PPE to drink driving. An individual may feel 'ok' to drive under the influence, but they are putting themselves and others at risk when they are over the legal alcohol limit. And while the consequences may not be immediately felt with PPE, the risks can still be disastrous from just a few moments of not wearing that recommended PPE per day. For example, just a few minutes of silica dust exposure each day over a period of months could turn into silicosis – a deadly and incurable respiratory disease.

A GUIDE TO MINING PPE SOLUTIONS

Mine sites will have different levels of risk depending on their application, and the same selection criteria and questions should be asked when determining appropriate PPE for your organization. PPE can be categorized by the type of injuries it's designed to protect against. Below you'll find a variety of PPE solutions for the mining industry.

WORKING AT HEIGHTS – FALL PROTECTION

Mining operations often require workers to perform duties at a height where there is a risk of falling – either from one level to another, or into openings. This could apply to either surface or underground mining and each will have its own unique set of circumstances and hazards. Employees should always have appropriate fall protection – such as harnesses, if they are working at heights. One of the challenges with harnesses is that they can often be heavy and cumbersome to wear. Honeywell recommends mining companies consider weight and comfort when choosing a harness. A lightweight unit is often preferred, particularly in dusty, hot environments – which is why having an aerated padding can provide a significant difference to comfort. Fall protection needs to do its job and protect workers at height, but if it's too heavy or uncomfortable there is that risk of people removing their harness or not wearing it properly. Don't add that risk to the hazards of the job.

HAZARDOUS NOISE – HEARING SAFEGUARDS

Most workers in mine sites are exposed to noise pollution. Between loud equipment, blasting, traffic or processing, excessive noise can come from a variety of sources. The biggest pain points with hearing protection in the industry is the weight of earmuffs, the tightness of the clamps and the fact that many earmuffs cannot be integrated with other PPE. Mining safety managers are advised to consider whether the earmuffs address those issues when making their PPE selection. Also, it might be surprising to hear this, but overprotection is actually a huge problem when it comes to earmuffs. If you're wearing earmuffs that are beyond what you need, you cannot communicate effectively so that creates a risk because you're more likely to remove them in a shift. It's advisable that mining companies check the correct level of hearing protection required and ensure the earmuffs are properly fitted, comfortable and not 'overprotecting' beyond the established risks.

DUST AND GASES – RESPIRATORY PROTECTION

Exposure to dust in mining can pose a major risk to the health of workers. Breathing in dust, such as coal dust, silica dust and other finely powdered materials, can damage the lungs and airways. Likewise, certain activities or situations may expose workers to toxic fumes or gases. In mining sites where workers are exposed to dust and other gases, a respiratory protection program is required as per the ANSI Z88.2. This will determine the appropriate respiratory protection equipment (RPE). When it comes to reusable RPE, one of the challenges for mine operations can be the necessary spare parts. He recommends that site safety managers look at masks that have interchangeable replacement parts to address that issue.

1. Mining, Safe Work Australia

HAZARDS TO VISION – EYE PROTECTION

Mine workers are commonly subjected to risk of eye injury from exposure to dust, rocks, chemical splashes, metal fragments, and sun. Eye protection is required for a wide range of tasks and may involve masks or goggles for chemical burns or polarized safety sunglasses for glare. As with all PPE, experts recommend proper fitting sessions for eyewear.

GAS DETECTION – WEARABLE MONITORS

In many mining applications, the presence of toxic gases can be dangerous to workers, causing poisoning, contamination or explosions. While some toxic gases are easily recognized, many are difficult to identify, including methane, carbon monoxide and carbon dioxide which are odorless and colorless. Therefore gas detection systems are essential to worker safety. It is recommended that mining operations adopt new gas monitoring technology that is wearable, like PPE. Because gas diffuses easily, gas monitors need to be wireless and mobile so they can be deployed rapidly to any environment. Mobile sensors eliminate the need for lengthy and costly installations and supporting infrastructure. Wireless systems provide personnel with real-time stats and monitoring, allowing faster, more informed decisions to protect workers, prevent a crisis and optimize operations.

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HAND INJURIES – GLOVES

Hand injuries are the second most reported form of injury and source of LTIs (Lost Time Injury) on a mining site. There are many work activities that can cause serious hand injuries such as maintenance of equipment, handling heavy machinery, or using hand and power tools. Safety gloves help protect hands from sharp objects and other hazards that can lead to lacerations, burns or cuts. The following features are worth considering when choosing safety gloves: cut resistance, breathability, touch screen capability and whether they are ergonomically designed to sync with the hand's natural movements

SUMMARY

TO REALIZE A VISION OF ZERO HARM, THE US MINING INDUSTRY NEEDS TO IMPROVE ITS APPROACH TO SAFETY.

As this paper has illustrated, a safety-first culture is essential to achieving this standard, along with a proactive approach to identifying, controlling and eliminating risk. As the last line of defense in any safety plan, PPE is arguably the most important. It's the part of the plan that must go right when everything else has gone wrong. Therefore, investing in PPE solutions that are suitable and comfortable to wear is a vital part of the strategy in achieving the zero-harm safety standard.

At Honeywell, safety is in our DNA. For over a century, Honeywell has been protecting workers with head-to-toe safety offerings, rooted in our industry experience and relentless drive to innovate. Today, our safety solutions protect the future of 500 million workers.

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