



Technology tools can change mining's Health & Safety record

Making use of software, sensors and
robotics will improve Health
and Safety standards in the mining
sector, according to exclusive research

A special report by Mining Magazine on behalf of OSIsoft

Mining Magazine

Table of Contents

- 03** Introduction and executive summary
- 05** Health and Safety is a concern of critical importance
- 06** Accidents are common and the fall-out from them is big and broad
- 08** CEOs are taking a leading role in safety
- 09** Many accidents are unnecessary and could be prevented
- 11** Technology is a key part of the solution
- 13** Safety programs are a work in progress but most have invested
- 16** Next steps include plans to invest
- 17** Conclusion



Introduction and executive summary

In 2001, Carolyn Stephens and Mike Ahern of the London School of Hygiene and Tropical Medicine wrote that, “Mining remains one of the most hazardous occupations in the world, both in terms of short-term injuries and fatalities, but also due to long-term impacts.” A few years later, in an article for Occupational Medicine, AM Donoghue wrote that, “Mining remains an important industrial sector in many parts of the world and although substantial progress has been made... there remains room for further risk reduction.” But the good news is that we have the technology and know-how to improve the safety record of the sector greatly.

Whether we're talking about industrial mining or at the artisanal scale, risks are everywhere: nobody is in mining for the good of their health. But, even if we accept that this will always be an inherently risky business, how are companies getting to grips with sources of risks? How seriously is Health and Safety being taken and what is being done to improve the industry's track record?

“Mining remains an important industrial sector in many parts of the world and although substantial progress has been made... there remains room for further risk reduction.”



In this report, OSIsoft asked Mining Magazine to survey and report back on Health and Safety in mining today, with specific reference to potential mitigating technology impacts. We wanted to know to what extent an audience from the mining sector felt the environment they work in could be improved and how far along are they to thinking about next steps. Mining Magazine explored the topic via a survey where questions left respondents free to give honest opinions and experiences.

In total, 192 respondents from around the world came back with views. The short take on what they told us is in the bulleted list below. We hope you will find food for thought from the report and look forward to your feedback.

-
- **92% of sample view Health and Safety as the most important, or one of the most important, challenges they face**
 - **70% have invested in a safety programme**
 - **Technology is seen as the key enabler for Health and Safety**
 - **The biggest impact of injuries to companies relate to cost and reputation**
 - **24% believe that over \$1m in savings could be made by improvements**
 - **CEOs lead the Health and Safety decision-making process**
 - **Wireless networks and better event tracking and logging lead the way in technologies being piloted or under consideration**
 - **Improved training, especially in software programs, is seen as a key area of investment.**
-



Health and Safety is a concern of critical importance

Health and Safety has always been of enormous relevance to the mining sector. Fire, flood, blasts, thermal effects, microbe inhalation, infection, structural collapse, vibration effects and cramped working conditions leading to musculoskeletal disorders are among the many ways that mines and miners can be impacted.

Realistically, mining will always be a challenging sector but by removing human inputs so far as possible and using computer intelligence to detect issues and opportunities, we can mitigate risks in a more effective way than ever before. At the heart of this will be fast access to operational data to inform strategy and deliver the nimbleness to make changes on the fly. Today, with regulations tighter than ever, every sinew must be strained to reduce the number of accidents and illnesses.

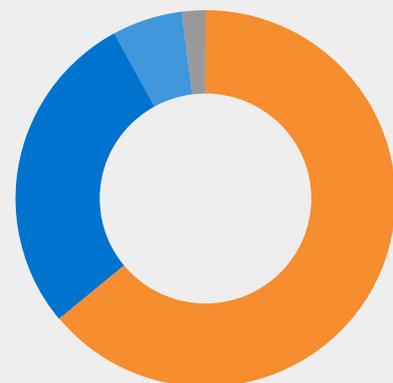
The criticality of safety appears to be recognised by respondents, however, with more than one in four of the audience indicating that this is the most important challenge they confront today. In all, 92% of respondents view the issue as either one of the most important challenges they face, or the biggest. If a necessary first step in any recovery process is to accept that there is a problem, then that step has been taken by the vast majority of those we contacted for this survey.

64%

It's one of the most important challenges we face today



Which of the following statements most closely matches your view of improving Health and Safety?



- 64% One of the most important challenges we face
- 28% The most important
- 6% Fairly important
- 2% Not important

Accidents are common and the fall-out from them is big and broad

When Health and Safety is breached, the outcomes can be brutal, resulting in loss of human life, trauma and pain for individuals. However, the results of our poll suggest a widespread reluctance to acknowledge the true scale of the challenge with just 50% saying they have seen recordable injuries. There was also a notable dropping off in those electing to answer the question. The effects on mining organisations are, in a very different way, also very serious, however.

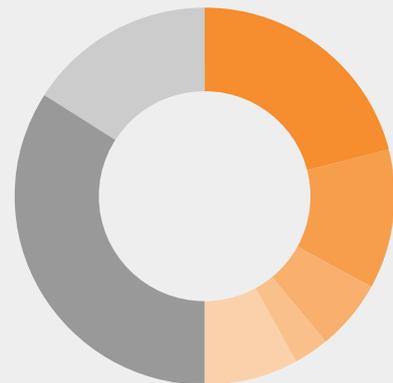
First and foremost, productivity is impacted by the need to make closures or investigate causes of accidents. A related development here is soaring costs and expensive equipment can be damaged, leading to yet higher costs and yet more harm to productivity. As we shall see in the next section, cost savings can be significant if accidents are reduced.

50%

Have seen recordable injuries
in the past 12 months



How many recordable injuries
have taken place in the past
12 months at your organisation that
required medical intervention?



21%	1-5
12%	6-10
6%	11-15
3%	16-20
8%	20+
34%	None
16%	Don't know

However, “softer” issues should not be ignored. Penalties and regulatory pay-outs will impact the bottom line, but tarnished reputations are harder to restore, and the effects can be hard to pin down. What we do know is that a loss of brand equity can lead to hugely damaging downstream events.

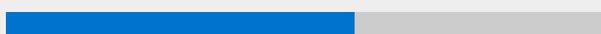
Protecting brand is particularly important at a time when the mining sector is under unprecedented scrutiny for its environmental, sustainability, human rights records and ethical values. Although most mining firms have little to no consumer awareness, the knock-on effects of their supplies to countries and companies are often carefully watched.

We have already seen, for example, BMW work with BASF and Samsung on a project to ensure responsible cobalt mining in Congo. In the formal announcement of the project, Member of the Board of Management of BMW AG, Purchasing and Supplier Network, said: “We are fully aware of our responsibility: Cobalt and other commodities must be extracted and processed under ethically responsible conditions.”

▼ What have been the effects of these accidents? (Select as many as apply)

58%

Reduced productivity



35%

Reputational damage



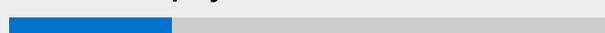
50%

Increased costs



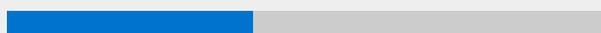
27%

Insurance pay-outs



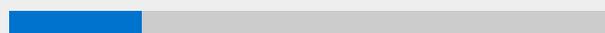
41%

Damage to equipment



22%

Regulatory penalties



CEOs are taking a leading role in safety

We have already established that there is a broad desire to change the face of safety in mining but how seriously are companies taking on that task? One way of finding out is to check the seniority of the individuals responsible for strategy in the safety realm and the good news is that in more than four out of 10 cases, it's the chief executive officer who is taking charge.

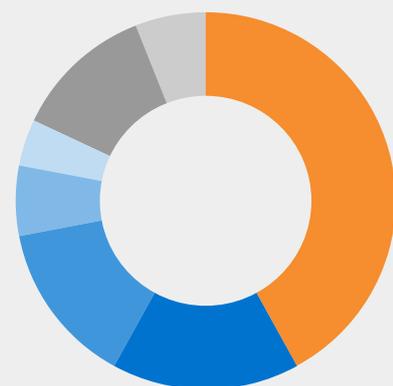
This is again a very interesting finding, suggesting that safety is such an important area that the top person within the corporation has it under his or her remit. In some companies (perhaps the larger enterprises), this responsibility is being devolved to senior operations, IT or risk executives, which again points to high levels of seriousness in the challenge to improve Health and Safety.

42%

CEOs have the most influence over technology-enabled safety decisions.



Who has most influence over technology-enabled safety decisions?



- 42% CEO
- 16% Chief risk officer
- 14% COO
- 6% Chief security officer
- 5% CIO/IT leader
- 12% Other
- 5% Don't know

Many accidents are unnecessary and could be prevented

The dream of the mining sector is to move to a zero-accident operations model. We wanted to know how many of today's accidents were avoidable and we discovered that the highest percentage of respondents—about four in 10 of those polled—believe that a large majority of accidents and injuries could have been prevented. About two-thirds of respondents (66%) estimate that they could prevent at least 25% of accidents.

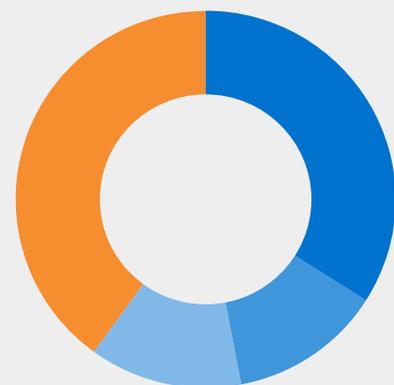
“...about four in 10 of those polled believe that a large majority of accidents and injuries could have been prevented.”

40%

Between 76–100% of accidents and injuries could have been prevented



What percentage of accidents and injuries do you estimate you could have prevented?



- 34% 0–25%
- 13% 26–50%
- 13% 51–75%
- 40% 76–100%

Already, collision avoidance, proximity detection and fatigue detection systems save many accidents, but there is a huge opportunity to go further, using operational data captured in real time to anticipate and capture risks at their source.

These findings suggest a widespread belief that there are better paths to take that could massively reduce the number of incidents and their impacts. The effects of a large improvement would be broad: safer employees, better governance and compliance records, improved reputations but also significant cost savings with almost a quarter of respondents estimating savings of over \$1m per annum. Some 44% see savings of at least \$100,000.

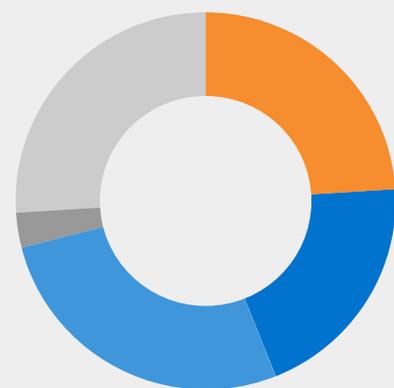
“...there are better paths to take that could massively reduce the number of incidents and their impacts.”

24%

Improvements could lead to more than \$1m in cost savings.



And what cost savings would that improvement lead to?



- 24% More than \$1m
- 20% \$100-999,000
- 27% Under \$100,000
- 3% None
- 26% Don't know

Technology is a key part of the solution

Asked about potential Health and Safety impacts of technology tools, 95% of respondents see technology as a key enabler and almost three in 10 of the panel view it as the number-one strategy for improving. This is an encouraging finding as technology plays an increasing part in abetting Health and Safety in mining and the use of digital intelligence will be key to the future of mining everywhere from exploration to innovation in extraction and better use of resources and people.

The range of software, networking, hardware and embedded tools is vast, from basic record checking automation to specialist software programs and high-tech equipment such as driver-less vehicles, sensors and drilling gear that can be controlled remotely. Remote operations will be a boon at a time of pandemic such as COVID-19 and other virus outbreaks, as well as protecting users in hazardous environments.

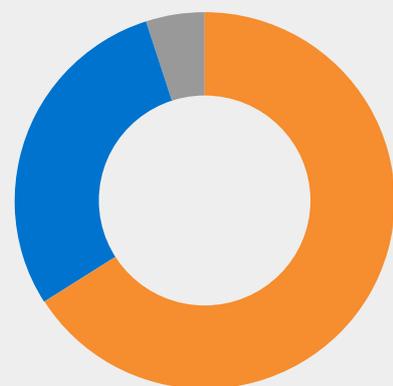
Technology is a hugely effective way to re-engineer any process and by automating more, calculating risks based on empirical data and using technology as a form of protection and fast insight, mines can become safer, smarter environments. Notably, real-time operational data when combined with emerging tools categories such as wearable devices, predictive analytics and AI can help to anticipate and prevent accidents.

66%

Technology is a critical component of Health and Safety in mining



[How important is technology as an enabler of Health and Safety in mining?](#)



- **66%** It's a critical component
- **29%** It's our best chance to improve
- **5%** It plays little or no role

In the future of mining, just as in every other sector, winners and losers will increasingly be separated between those that have made best use of technologies and those that have failed to recognise the momentous importance of technology-enabled change. These changes are everywhere. Think, for example, of the surging availability and quality of drones for surveillance. Then there is the emergence of driver-less vehicles and other equipment that doesn't need physical control. In the fast-changing 'Internet of Things' sensors for monitoring activity without the need for human access to sites are making it simpler to get reliable access to status data. And improved ability to analyse huge data sets in real time and hasten time-to-insight will, quite literally, change everything.

“...Improved ability to analyse huge data sets in real time and hasten time-to-insight will, quite literally, change everything.”



Safety programs are a work in progress but most have invested

So, to test out hypothesis that companies are taking health and safety seriously, who is doing what? We wanted to gauge activities to establish to what extent companies were walking the walk as well as talking the talk.

Once again, our findings were positive. Almost seven in 10 have already invested in a formal safety programme and most of the rest have plans to invest or are in the process of doing so. Companies should be building to an ideal state where safety tools and processes are embedded end-to-end in mining work-flows with regular monitoring and reviewing for continuous improvement.

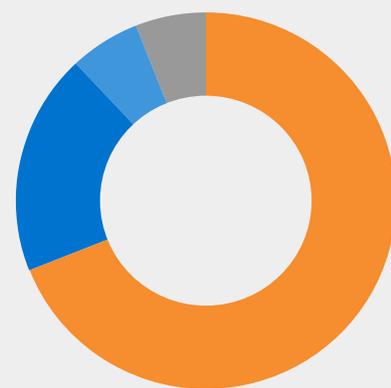
Steps taken extend from physical testing to software tracking, sensors, robots and automated equipment. We can say confidently that more use of drones and remotely-controlled equipment will improve safety in the coming years, effectively meaning that fewer manual inputs are required and high levels of surveillance can be automated. This will be enhanced by deeper penetration of advanced wireless network protocols such as 5G to expedite the relaying of data.

69%

Have already invested in a safety program



Which of the following statements is an accurate description of your position in terms of investing in Health and Safety programs?



- 69% Already invested
- 19% Currently in the process
- 6% Plan to review in the next 12 months
- 6% No plans or no need to invest

Also, real-time operational data consoles with analytics, especially when enhanced by AI, will provide the ability to model risk and anticipate injuries and illnesses, providing a powerful defence for miners.

“What is clear from our data is that there are clearly plans to invest more over time and the net result should be safer, more efficient environments for all.”

- ▼ What technology tools for Health and Safety do you currently have in use?
- ▼ And which of these are being piloted or considered?

88% 13%

Spreadsheet software for accident tracking/reporting



86% 16%

Wireless communications networks



86% 14%

Logs of accident causes



85% 18%

Guarding installation and pedestrian protection



83% 19%

Gas detection sensor



81% 20%

Emergency communications devices



76% 24%

GPS



73% 27%

Mine management software



71% 30%

Proximity warning systems



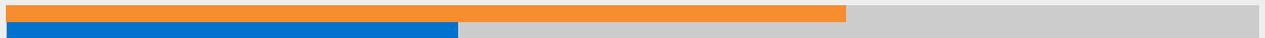
70% 31%

Identity management and authentication



67% 36%

Tubes to detect gas levels in sealed areas



62% 38%

Safety management software for accident tracking/reporting



61% 41%

Real-time fleet tracking and scheduling



61% 41%

Automated machines and robotics



50% 52%

Computer modelling to detect obstacles



44% 56%

Satellite network



38% 63%

Robotics



Next steps include plans to invest

The plans to invest more, referred to in the previous section, are backed up by the responses to our final question, covering areas of planned investment over the next three years.

Increased spend on relevant areas of technology are front and centre, as will physical safeguards and continued funding of risk analysis. But increased training will also be critical to encourage responsible behaviours and encourage users to buy in to new and unfamiliar processes. As with any major change programme, soft issues will be critical to success.

One further note: GPS, drones, handsets and tagging are making tracking of people and assets easier than ever before. Together with real-time operational data, these technologies can add an extra dimension to monitoring.

- ▼ What plans do you have to improve Health and Safety over the next three years.
 - ▼ What will be a key priority?
-

85% **25%**

Increased investment in relevant technology



73% **31%**

More tracking of people movement



69% **32%**

Pedestrian safety e.g. walkways, guards



66% **39%**

More detailed risk analysis



65% **45%**

More or improved training programmes



Conclusion

Health and Safety is clearly an area of huge concern in the mining sector and there is, equally clearly, a desire to use new thinking, processes and technologies to reduce risks.

Thankfully, this is a golden age for technology developments that are highly relevant to the sector. Most notably, the Internet of Things is augmenting human capabilities by making every object smart so it is possible to measure vibration, to 'smell' gas emissions, to 'see' beyond rock formations and to detect likely sources of minerals. Drones provide a 'flying eye' to monitor activity below, and drilling and exploratory equipment is becoming more adaptive to remote control.

By automating more and taking advantage of real-time operational data and using pattern detection software to analyse those data sets, levels of risk can be sharply lowered. Augment these new capabilities with improved tracking of human activities and there is scope to make mining a far safer environment than ever before.

“Health and Safety is clearly an area of huge concern in the mining sector and there is, equally clearly, a desire to use new thinking, processes and technologies to reduce risks.”



This report is based on an online survey conducted in late 2019 with over 192 respondents in the mining sector or related segments, each from companies with at least 500 staff.

Next Steps:

Find out more about how OSIsoft technology can help people use data to transform mining and metals in [this video](#).

See the results of this research at a glance in our [free infographic](#).

About OSIsoft:

For 40 years, OSIsoft has been dedicated to supporting critical operations and people behind them transform their world through data. Our software and cloud services turn operations data streams generated by utilities, manufacturers and other industrial customers into rich, real-time insights for saving money, making critical decisions or developing new products. 100% of the Global Fortune top 10 companies in Mining and Metals rely on the PI System to get the most out of their businesses. Worldwide, the PI System manages over 1.5 billion data streams. www.osisoft.com



IN ASSOCIATION WITH

Minjng Magazine