

THE FUTURE OF MINING IS SAFER, SMARTER AND SUSTAINABLE.

Improve safety, reduce operational risk,
achieve energy efficiency and add productivity

TABLE OF CONTENTS

- 3 Mining Industry Overview**
- 5 Changing Industry Landscape**
- 6 Sustainability Role of Mining**
- 8 Value Realization with Digital**
- 10 Utilizing Honeywell Forge**
- 12 Recommended Next Steps**
- 13 The Author**

MINING INDUSTRY OVERVIEW

1

In recent years, the mining industry has faced increasing demands for change from society, government and investors.

Mining, one of the oldest industries on planet earth, is at an inflection point. The business of mining is difficult and complex from an environmental, social, political, and technological perspective. All parts of the industry from exploration, production, processing and transportation is undergoing a transformation. Today, we observe that mining companies are repositioning themselves for the future with digital technologies as an enabling lever.

Over the past several years, the mining industry has been challenged from an uncertain geopolitical landscape and technological disruption coming from increasing demands for change from society, government and investors. Three challenges that mining companies face are:

1. **First**, the ability for mining companies to maintain their license to operate is one of the critical challenges faced by executives. Society no longer trusts miners



The business of mining has always been difficult and complex around the world.

to proactively do the right thing. They've stopped listening to the companies themselves or their industry associations. Instead, they are increasing pressure on regulators to keep the mining industry accountable to society.

2. **Second**, lower trust extends to capital. Funding for capital expenditure is getting harder for the mining industry. We are observing increased scrutiny in projects with a high carbon footprint, unsustainable supply chains, and those with low localization in workforces. Some financial institutions do not lend to specific natural resources or for projects in regions where there are environmental sensitivities.
3. **Third**, there are growing workforce challenges in terms of competency, productivity and safety in the mining industry. Developing an effective approach to recruit, train and retain a diverse workforce is a high priority. Executives still see challenges in ensuring that employees are trained to adapt to the technological changes in the industry while existing experts are retained for their deep domain knowledge. Safety of the workforce is also an area of prime importance which executives are trying to improve.

Because of these challenges, the mining industry is preparing for a shift that would lead to transformational improvements in safety, sustainability and operational excellence.

Each mining company has its own set of unique requirements based on where and how they operate.

Consumer demand affects what resources a mining company must produce, at what cost, and under what operating conditions. Consumer demand trends play an important role in the competitive environment for mining companies. For example, the growing use of electronic devices and batteries have seen shares in rare earth and lithium miners to grow. The growth in natural gas and the drive for renewables has pushed down the price for thermal coal very low. Such trends are causing many of the mid-tier and smaller miners to be forced out of the sector, unable to afford the high cost of compliance and starved of capital for change or expansion. Those that remain specialize in niche products, hard to mine reserves, and end-to-end customer services.

Competitive advantage in the mining sector is usually confined to the ability to explore and appraise resource bodies, execute new capital projects, adopt advances in production technology, and own different elements in the supply chain. Those companies using digital technologies to deliver best-in-class productivity, efficiency and mining techniques have made the difference between the very best performers and the rest. Digital technologies also help mid-tier and smaller miners to remain competitive.



Adopting the right set of technologies is a transformative process for mining companies.

Mining has a dual role in sustainability: decarbonize own operations and responsibly supply commodities enabling decarbonization.

Establishing the industry's role in sustainability is essential to maintain license to operate and gain trust among investors. The industry also must take the lead in developing and adopting new technologies to both increase its own productivity and accelerate emission reductions. Additionally, environmental accords like the COP 21 Paris Agreement, places even more pressure on mining companies to address sustainability. There are two things that mining companies can do:

1. **First**, mining companies must transform their own operations to become efficient with a low carbon footprint. Reducing carbon footprint from operations consists of several levers mainly around energy efficiency, switching to lower carbon energy sources, reducing fugitive emissions, and carbon capture & storage. Energy costs represent between 20-40% of the total cost of production for mines. Reducing energy costs, bringing low-carbon energy sources to the mix, operational efficiency and implementing carbon capture & storage infrastructure all help reduce the overall carbon footprint. Additionally, technologies that help reduce fuel consumption in mobile equipment and reduce waste, and water use in mining operations also help in sustainability.





2. **Second**, mining companies can efficiently supply commodities such as copper, nickel, lithium, cobalt and rare earth metals which enable global decarbonization. For a sustainable world, mining is even more relevant by providing the resources needed to decarbonize energy underpinning electricity distribution, distributed assets, battery-backed energy storage, and electrification of mobility. As an example, cobalt is a key lithium-ion battery raw material which is essential for electric vehicles. These resources are also distributed geographically and ensuring long term availability which is responsibly sourced is key for a sustainable world.

Digital technologies also enable both these sustainability levers with tools and technologies which enable safety, energy management, supply chain visibility and remote autonomous operations. Decarbonizing the industry requires a lot of investment and digital technologies help make these investments cost efficient and efficient in operations.

VALUE REALIZATION WITH DIGITAL

4

Digital technologies help mining companies achieve become competitive by providing tools and enabling processes that make operations safer, sustainable and smarter.

Digital technologies can help eliminate fatalities and injuries by enabling remote monitoring, process & worker safety and enabling autonomy by moving the worker away from hazardous locations. It can also provide a significant reduction in operating costs. Implementing digital technologies is often an expensive and time-consuming process. Within the mining industry, there are several crucial impediments to adopting digital technologies:

1. Realizing value from technology requires moving away from point solutions or proof-of-concepts. Many companies have started with proof-of-concepts in specific parts of the business to identify value that can be created in their business. Often, this is not scalable across the business and leads to expensive projects to enable adoption of these technologies.
2. Implementing these technologies is an expensive and time-consuming process. When they look for technology that can be implemented, the products are often not open and extensible. They also do not come with configurable pre-built knowledge that allows companies to eliminate the need for customizations for their own operations.
3. User adoption is a challenge and getting their workforce to realize value from these new technologies is difficult.



Additionally, from a technology viewpoint, there are three main problems standing in the way:

1. Siloed operating systems must be integrated. Generally, mines have several industry-specific solutions at each site. This makes it difficult to achieve efficiencies through an integrated view across the mining company.
2. Enterprise complexity must be overcome. Technology footprint at each mining company has evolved over time. Custom systems requiring constant upkeep to stay modern have been implemented. The need to continuously implement custom projects delays return on investment.
3. Manual control must be replaced with higher autonomy. Human decision-making can't keep up with the pace of business. Having manual processes and controls also results in lost opportunity to realize value.

Choosing the right technologies and having the right set of partners is necessary to achieve this digitally-enabled transformation. Digital technologies provide them with the necessary enablers to enable this transformation. Mining companies are using digital technologies to optimize their assets for enhancing operating efficiency, improving mining decisions to improve margins, and simulating scenarios to improve business performance. They are also reducing operational risk by moving people away from hazardous zones in mining facilities. Additionally, mining companies are revisiting their workforce and diversity strategies, seeking to engage with society, and finding ways to create value beyond compliance.

One of the keys to maximizing returns from digital technologies lies in the ability of mining companies to quickly choose the right technologies and make necessary changes in their operations. Adopting the right technology that can scale across the enterprise is difficult. With many choices available in market today, each mining company has its own set of unique requirements based on where they operate. Several technology providers offer industry-specific solutions while there are others bringing in data and analytics capabilities to deliver additional value to the mining industry. Some focus on a platform for Industrial Internet of Things (IIoT) services while others emphasize added functionality like machine learning, advanced queries and bespoke visualization. Having rich domain expertise, superior software capabilities and the ability to quickly scale up across the enterprise while transforming each process will meet the challenges of executives in the industry who are seeking to achieve a fast return on their investment.

UTILIZING HONEYWELL FORGE

5

While mining executives typically make large-scale investment decisions with long timeframes, the fast-paced and disruptive nature of technology requires a solution that evolves with the pace of technology while requiring minimal effort from the companies themselves. Honeywell Forge for Industrial is one such solution which has been built with decades of experience in industrial know-how and software technology to transform processes, operations, assets, and people.

Honeywell Forge is an enterprise performance management solution that enables mining companies to improve reliability, increase production and reduce operational risk while enabling safety, energy efficiency and workforce management. This secure, standard, out-of-the-box solution provides an integrated platform, which is open and extensible to support every operational aspect of the company through its own applications and the ability to bring any third-party software application within its ecosystem. It integrates underlying proprietary and open-source models with comprehensive recommendations to quickly identify the best path to peak performance. Via the digital twin, Honeywell Forge for Industrial uses the mining company's real-time data to benchmark performance against best practice models, identifying opportunities that have previously gone unnoticed. It then provides decision support to close the gap in performance, by integrating potential economic value and actionable guidance based on deep domain expertise. Users can prioritize opportunities that will capture the largest impact on operations and have structured feedback on how to perform the task. By learning the actions taken, future recommendations can incorporate past actions to achieve the desired outcome. This information available on Honeywell Forge for Industrial is presented in a form that enables the most economic operation every minute of every day.

For mining companies seeking to become safer, smarter and sustainable, a few key end-to-end capabilities act as a differentiator:

1. Enterprise-level profitability requirements are considered by integrating across processes, operations, assets and people to create efficiencies in every aspect of



Honeywell Forge improves the safety, sustainability and reliability of operations and includes deskless field workers.

operations. End-to-end simulation models enable continuously optimizing every part of the operations and form a key component in building a digital twin which extends from design to operations.

2. Sustainability requirements are considered with energy efficiency, emissions monitoring and waste reduction within processes and asset operations. Enterprise-level visibility also allows optimizing across the supply chain and focusing on those resources that meet customer demands related to sustainability.
3. Autonomy and remote operations are also fully enabled. It also brings the ability to train operators for the future of mining which is remote and autonomous.
4. A connected worker is created by extending these capabilities to end-users anywhere in the field. The safety, competency and productivity of the workforce is enabled through these capabilities.
5. All of this is integrated with maintenance capabilities to ensure the lowest cost to maintain and eliminate any event which requires unplanned maintenance. All these enable a safer, smarter and more sustainable mining company.

Experience has shown that Honeywell Forge for Industrial is a key enabler of improved business results. Mining customers can expect to achieve increased profitability through better asset utilization and lower maintenance expenditures. They can also reduce operational risk through improved safety. Mining sites become more sustainable with improved operating efficiency and reduced energy consumption. Some capabilities and recent success stories include:

1. Increasing asset performance and reducing downtime:

Mobile equipment and fixed equipment failures lead to increased downtimes, higher maintenance expenditure and lost opportunity. Honeywell Forge for Industrial integrates existing condition monitoring or asset-specific data acquisition systems with modern machine learning and predictive analytics, which augment traditional physical models. This creates predictive capabilities allowing for pre-emptive maintenance and improved asset reliability. As an example, a mining company was facing mobile truck damage through secondary equipment failures and frame damage due to freeze/thaw cycles on Canadian mountain roads. Implementing Honeywell Forge for Industrial enabled pre-emptive road repair, truck maintenance and re-routes, thus reducing downtime and repair costs and avoiding lost production. This saved the mining company up to \$3M annually.

2. Reducing unaccounted production losses:

Mining industries suffer from a lack of accurate production data, equipment downtime and clear supply chain visibility. This situation results in unaccounted losses, large inventories and inefficient plant operations. Honeywell Forge for Industrial tracks production, captures equipment downtime and decreases inventory to drive wall-to-wall process improvements. Mining companies have been shown to gain over \$5M annually through these capabilities.

3. Reducing losses due to process variability:

The mining industry suffers from quality issues because of process variability. Honeywell Forge for Industrial provides Advanced Process Control (APC), which reduces process variability by continuously monitoring several variables to optimize performance in real-time. As an example, a copper mine in Chile sought to optimize its semi-autogenous grinding (SAG) mill to squeeze the most value out of its process. Honeywell Forge for Industrial increased the mine's throughput by 2.6%. They achieved a reduction in particle size and reduced feed rate variability, which subsequently led to operational savings of \$4M annually.

Having the right technologies and partners in an open ecosystem can accelerate value realization from digital technologies in the future of mining.

The future of mining is digital. Realizing value from digital technologies for a mining company requires a step-change in the current thinking and a structured plan to execute. The following steps can help with faster value realization:

- 1. Set transformation objectives that begin with business strategy and extend to mining operations**
Create transformation objectives with clear value drivers that build the case for selecting and adopting digital technologies across mining operations. Objectives such as eliminating production accounting losses, minimizing haulage costs or reducing maintenance expenditure are better value drivers than setting an objective to just implement software products.
- 2. Include mining operations and all the workers in both planning and execution**
While planning and executing the transformation, include different operating regions, all types of mines & its processes, and the requirements of people across the organization. Inclusion ensures that adoption is easier and helps make changes stick. Including field workers ensures that the last mile is also included in closing the loop of any technology-enabled transformation.
- 3. Extend across the enterprise from HQ to the mine across organizational boundaries**
Scaling quickly across the organization from the headquarters to each of the mines & processing facilities. Including all suppliers and contractors across organizational boundaries will also help in achieving objectives such as safety and sustainability allowing end-to-end visibility and compliance.
- 4. Choose the right technology and set of partners to help with the journey**
Having the right set of technologies and partners who bring capabilities in digital transformation can help accelerate time to value. Having the most open ecosystem which allows the mining company to bring best-in-class technologies and protect their own data helps in achieving scale.
- 5. Organize for adoption and change**
Building the right business process will ensure adoption and continuous improvement. As an example, while implementing an autonomous and remote mine it is important to rethink operator training and standard operating procedures. Having the right organization will help ensure that changes stick with the company while ensuring the wellness of all people.

In 2020, this doesn't seem too far-fetched or too distant in the future. The next 5 years are exciting times for our industry.

THE AUTHOR

Praveen Samraj is a Strategic Marketing leader for Connected Industrial at Honeywell where he focuses on strategic planning by advising product development and product portfolio management. He has over a decade of industrial software experience in oil & gas, mining, and heavy engineering industries. In a prior role, he was a business consultant leading large digital transformation programs with experience in the industrial sector with projects in London, Aberdeen, Muscat, Baku, Oslo and Houston. He has also published thought leadership in industry forums.

Praveen holds an MBA from the IMD Business School in Switzerland. He also holds a Master's degree in management from NTU in Singapore and a Bachelor's degree in engineering from Anna University in India. He is currently based in Rolle in Switzerland.



For More Information

Learn more about how Honeywell can improve the performance of your operations, visit www.honeywellprocess.com/iiot or contact your Honeywell Account Manager

Contact Us:

715 Peachtree St NE
Atlanta GA 30308
1 (877) 841-2840
www.honeywell.com

WP-20-13-ENG | 05/20
© 2020 Honeywell International Inc.

**THE
FUTURE
IS
WHAT
WE
MAKE IT**

Honeywell