Ensuring we’re together in electric dreams

Mine operators have long been aware of the challenges of integrating digitalization and electrification at their open-pit and underground sites. Together with their supply chains, original equipment manufacturers and technology developers, they are beginning to recognize the practical steps that can be taken now to turn electric dreams into reality for the benefit of operations, people and the wider world, explain ABB’s Global Head of Mining, Max Luedtke and Mehrzad Ashnagaran, Global Product Line Manager, Electrification and Composite Plant at ABB.

Electrification is not an easy choice for the mining industry but nor is it optional. The largest mining research platform on strategy and innovation in the world State of Play recently reported in its 2021 report that mass adoption of electrification technology and storage systems to power mine sites remains slow, with 63% of industry executives surveyed out of more than 450 participants worldwide citing that risk aversion is holding back implementation, while 88% see cost as the barrier. Yet, 89% of the same group of industry experts believe that mine sites will be electric over the next two decades.

Speaking with customers and partners is always insightful, but over the last 18 months the drive to accelerate the trio of electrification, automation and digitalization has never felt greater. The three go hand-in-hand and at ABB the belief is that electrification is the enabler. Working with the industry at all levels we know that as a technology leader we can help operators’ targets to be met, maintaining high productivity, staying competitive and reaching sustainability goals. The dream of CO2 free and energy efficient mining as we all find a route through energy transition is alive and well. Mines will move away from fossil fuels. At ABB we are drawing on 130 years of experience in the industry to help design mines where electrification and digital are integrated, from hoists to grinding and from conveyors to vehicles. It is possible to optimize all processes and equipment, integrating stable and efficient systems to maximize energy and resources use.

Decision makers will know that a modern mine is not sustainable with diesel machinery alone. Energy costs are high, with underground ventilation systems having to work significantly harder to extract fumes as well as provide fresh air to the extent that they are often 50% of an entire site’s energy use. Meanwhile, estimates show that the industry is responsible for up to 7% of all global greenhouse gas emissions. Electrification provides a chance to move away from this current reality, meeting Paris Agreement and national regulations, but also creating OPEX savings, pioneering mine designs, increased productivity and long-term profitability. Returning to State of Play and 98% believe automation is the technology area that will benefit the most from electrification, which results in more informed decision making, safer working practices, speed, consistency and accuracy.

This article will explore the electrification ingredients needed for successful all-electric operations and discuss how industry collaboration is increasing as part of our industry’s revolution.
Ingredients for successful electric operations

With these requirements in mind, ABB has identified five ingredients that are essential in the transition towards all-electric mines. These are:

Interoperability
Mine fleets comprise vehicles from multiple vendors. ABB charging infrastructure follows open standards, such as CCS and OPPCharge, to remain vendor-agnostic, meaning it can be used across all vehicle types and OEMs. This allows the customer to make a one-off investment, and maximize the uptime, productivity and return on investment of every piece of charging equipment.

Mobility/ flexibility
Strategically placing charging points throughout the mine mean trucks remain charged for longer, optimizing their usage and overall mine productivity, and avoiding the need for additional servicing routes and vehicles. These points of charge need to be able to adapt to changes in the mine’s design throughout the lifetime of the mine.

Energy management
Integrating battery electric vehicles into mines, the final stage of the electrification journey, means energy load requirements are much more volatile. Whilst renewables are becoming more relevant in particular for remote sites, they impose additional constraints. Smart planning of grid infrastructure and battery energy storage systems, combined with mine production forecasting, can be used to minimize load peaks and address possible volatility on the generation side.

Connection interface
Ruggedized and mine-approved automated connection interfaces must be designed to withstand the harsh environmental conditions in many mines and high-power demands of large mining trucks. This requires open mechanical and electrical standards and effective collaboration with vehicle suppliers.

Favorable process and mine design
Adopting new technologies will change how mines and mining assets are operated. Does the civil infrastructure and operational schedule need to be changed to meet the demand of these battery electric vehicles, for example? Early-stage design thinking and planning is crucial to success.

“...through pilots, and technologies such as onboard drivetrain components must be mature enough to be compatible with charging infrastructure or battery swapping stations. Battery evolution is crucial with requirements for high energy and power density, longer electric range and low costs. With the trucks themselves, manufacturers and consumers are considering design, costs, performance and looking at which brands are ahead of the curve in terms of increased performance and efficiencies, reducing carbon footprint and meeting government regulations. For daily operations, fuel economy – ideally independent of fossil fuel reliance and oil price volatility – and maintenance costs in terms of the trucks and wear and tear of components are also part of thinking....

INTRODUCING ABB ABILITY EMINE TO MINING WORLD
From September 2021, ABB has introduced ABB Ability eMine that comprises a portfolio of electrification technologies which makes the all-electric mine possible from mine to port and is integrated with digital applications and services to monitor and optimize energy usage. It can be used to electrically piece of mining equipment across hoisting, grinding, hauling and material handling and the entire process area. Built on decades of electrification experience and expertise, it will include forthcoming ABB Ability eMine FastCharge – currently in pilot phase – which provides high-power electric charging for haul trucks. It also incorporates ABB Ability eMine Trolley System which can reduce diesel consumption by up to 90% while on trolley, lowering energy costs and environmental impact. New flagship technology ABB Ability eMine Trolley System will be significant for the future of mining and will come to market soon.

Aligning with the ingredients mentioned, eMine provides integral design planning and thinking to maximize the value of electrification, helping to design the hauling process in the most optimized way with electrical solutions that match mine constraints and help meet production targets. ABB is supporting mine operators to map their journey towards the all-electric mine from phasing out diesel to embedding a new mindset and new team skills. By fully integrating electrification and digital systems from the mine to the port it is possible to reduce overall costs and improve mine performance as well as significantly lowering environmental impact. Wider benefits include increased safety through automation, lower noise and higher air quality – which results in lower ventilation requirements and associated costs.

In the case of electrification, miners are clear that they cannot go it alone. Partnerships and co-creation of solutions with OEMs, other mining companies and governments are needed to successfully integrate electrification in mines. Through eMine ABB will constantly conduct new collaborations with known partners – OEMs in most cases – but also with others. This effort is to define the best collaborative strategy according to the goals of the project and the specificity of the target market. We believe we can convince many in the supply chain to work together for mutual benefit in meeting important challenges and this work has already started.

We have committed to helping customers realize the all-electric mine, helping mines move towards carbon neutral operations and drawing upon the 130 years of experience in the mining industry. By deploying world-class electrification, automation and digital solutions we are optimizing processes and equipment and integrating stable, efficient systems.

We are on the curve with the mining industry, aligned with its aims and with total belief in the approaches that are needed for the future of mining. Mining companies that can find a way to overcome the initial CAPEX barriers and take a calculated risk on some of the methodologies, be it charging infrastructure, battery swapping, trolley systems or a combination, combined with harnessing the power of digital knowledge, use of data and reliable automated processes, will have an advantage in the market and see returns which will benefit their operations and the world beyond the mine too.

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