


Epiroc

A power change that changes everything

The Swedish company leads the charge towards sustainability in mining through battery-electric, zero-emission equipment. After more than 60,000 operating hours, Epiroc is expanding his solutions with the second generation in loaders, mine trucks and rigs for face drilling, production drilling and rock reinforcement

by Ettore Zanatta



 Epiroc new generation battery fleet

There is a big change in progress from Epiroc towards a complete conversion of his fleet to electrical machines, capable of ensuring a significant reduction of risks for the operator and the work environment.

Several battery-driven machines are already at work in mines around the world, at the moment. An example? The first-generation electric equipment that Epiroc launched in 2016: it has logged more than 80,000 hours of operation worldwide and many mining companies are using Epiroc's first-generation battery-driven machines. Brazilian mining company Nexa Resources, for example, is using a Scooptram ST7 battery loader in Peru, while the Swedish state-owned mining company LKAB plans to use Epiroc's zero-emission vehicles as it expands its mining operation in northern Sweden in a sustainable way. A year after Epiroc's launch of its new-generation battery electric mining equipment; the company won orders for those machines from customers in several countries including Finland, Australia and Canada. So Epiroc - as well as other leading mining equipment manufacturers - combines to offer battery electric loaders and mine trucks in small, medium and large capacities. Many types of medium and large-face drilling, production drilling and rock reinforcement rigs are actually available in the market. Machines are sized to work together seamlessly within the mines, offering logistical conveniences. The portfolio of these electric machines is continually expanding as well. While the shift to battery electric power underground gains momentum, some mining companies remain relatively unfamiliar with or wary of the technology. Following is an overview of battery electric technology compared to diesel power, from benefits to necessary infrastructure to where to start with implementation.

Benefits of electric equipment

Battery-driven machines offer in real a variety of benefits for top management, mine managers, environmental stakeholders and underground personnel alike.



▶ The Boomer M2 Battery is a battery powered face drill rig with zero emissions

Battery electric vehicles are outperforming their diesel counterparts. The torque and power curves for the electric vehicles are far superior to those of a comparable diesel engine. At zero revolutions per minute, an electric vehicle has full torque while a combustion engine stalls. With a battery-powered machine, the hydraulic functions are separated from the traction, providing on-demand power and making the machines significantly stronger in all its functions. As an example, the torque, acceleration and power deliveries of battery technology give an electric mine truck a large advantage going up a ramp. Furthermore, battery electric vehicles have the capacity of regenerating energy while traveling down the ramp, extending driving range and reducing overall energy consumption. On average, on-ramp haulage for electric vehicles typically offers a 10 percent gain in productivity when all factors are considered.

Improved work environment

The difference in work environment between using diesel powered and battery-powered machines is significant. Noise levels, air quality and heat conditions are all improved dramatically with electric vehicles. Changing out one or two machines can have a profound impact on a specific portion of a mine. Mine-wide implementation benefits all underground personnel.

Then: electric vehicles produce no exhaust, improving worker health and safety while reducing the need for ven-

tilation. Ventilation requirements vary from mine to mine, but by and large, there is a huge benefit to minimizing ventilation needs. Old mines where infrastructures are not large enough to support ventilation for deep or remote areas can find great relief and increased mining potential in battery-run machines. Mines yet to be developed will not need to develop the infrastructure necessary for diesel operations, providing a huge early cost reduction.

Lower cooling requirements. Heat is often a problem in underground mines and all energy that is used ends up in heat. Reducing and optimizing energy consumption reduces heat emissions. Diesel engines generate a large amount of heat, which never becomes any sort of work. Some heat is expelled through the exhaust pipe, while some remains in the system, needing to be cooled by fans and pumps. Electric vehicles produce far less heat and use energy more efficiently.

Energy consumption

Electric vehicles are much more efficient at turning energy into work. 10 kWh of diesel power will only produce around 3 kWh of work while 10 kWh of battery power is able to produce 7 to 8 kWh of work, in part due to a regeneration function. Fires associated with diesel from ruptured hydraulic hoses and diesel lines with a hot surface that ignites the mist. For this reason, with electric vehicles there is no fuel and no surface hot enough to ignite a mist of oil.

Efficient operations and lower emissions

Diesel engines do not function well at high altitudes. The thin air makes it difficult to get proper combustion and creates a lot of smoke. This can bring productivity to a halt. Electric vehicles function well at high altitudes, eliminating these issues.

While it is beneficial to run a diesel engine that meets the latest exhaust emissions regulations, no diesel engine can compare to battery electric power when it comes to carbon dioxide and emissions reductions. There are many additional factors to consider when looking at environmental impact, from battery production and delivery to how the energy that will charge the battery is created. Swedish battery manufacturer Northvolt, an Epiroc partner, is working to build batteries using 100 percent



> Scooptram ST14 Battery, fully battery electric loader with 14-tonne capacity

renewable energy and deliver the batteries using the least taxing method on the environment.

Focus on the operativity

An effective example of where the Epiroc path is heading is represented by Scooptram ST14 Battery, a 100% fossil-free loader for underground application based on the well proven Scooptram ST14 as suitable for development as for production loading. Energy regeneration ensures low energy consumption and extend driving range. With the electric drive, Scooptram ST14 Battery outperforms diesel equivalents, especially on grade. Scooptram ST14 Battery, in particular, improves the environment both locally operations and globally. It means zero exposure for the workforce for diesel particulates and toxic gases such as nitrogen oxides, hydrocarbons and carbon monoxide (NOx, HC and CO). Being fossil-free, this machine makes a difference when it comes to carbon footprint and greenhouse gases. Scooptram ST14 Battery is optimized for productivity in many ways. Trimming is provided by a high power traction motor connected to a high efficiency driveline. Hydraulic functions are powered from a separate auxiliary motor that delivers hydraulic power on-demand. The battery is designed for maximum energy capacity and quick swapping. Scooptram ST14 Battery has a considerably reduced number of service points and moving parts, as well: this results in longer service intervals, lower parts consumption and lower running cost. ■

(The text was elaborated on the article published on Mining Engineering - www.me.smenet.org)

ITALIAN ABSTRACT

"A POWER CHANGE THAT CHANGES EVERYTHING"

È questo il pay-off del costruttore svedese, che sta focalizzando le sue energie e le sue risorse su un grande cambiamento in atto: la completa conversione della sua flotta di macchine diesel in versioni elettriche, in grado di assicurare una riduzione dei rischi per l'operatore e per l'ambiente di lavoro.

Epiroc guida il cambiamento verso l'utilizzo - anche in ambito estrattivo minerario - di apparecchiature elettriche a batteria, a emissioni zero. Dopo oltre 60.000 ore di test di funzionamento, il costruttore svedese sta ora ampliando le sue soluzioni con una nuova generazione di caricatori da galleria, carrelli e piattaforme da miniera e macchine specializzate nella perforazione e il rinforzo di roccia. Molte di queste nuove macchine a batteria, più convenienti dei modelli diesel sotto diversi aspetti, sono già al lavoro nelle miniere di tutto il mondo, al momento. La società mineraria brasiliana Nexa Resources, ad esempio, utilizza un caricatore Scooptram ST7 in Perù, mentre la società mineraria statale svedese LKAB prevede di utilizzare a breve questi veicoli a emissioni zero di Epiroc per espandere le sue attività minerarie nella Svezia settentrionale in modo sostenibile. Un anno dopo il lancio da parte di Epiroc delle sue macchine di estrazione elettrica a batteria di nuova generazione, poi, l'azienda ha ricevuto ordini da clienti in diversi Paesi tra cui Finlandia, Australia e Canada. Un caso esemplare di macchina "sostenibile" ma allo stesso tempo produttiva in quest'ambito è il caricatore Scooptram ST14 Battery, utilizzabile in applicazioni sotterranee al 100% senza combustibile fossile, sviluppato adattando e ottimizzando le potenzialità del collaudato modello Scooptram ST14: ciò implica zero esposizioni a particolati diesel e gas tossici come ossidi di azoto, idrocarburi e monossido di carbonio (NOx, HC e CO). Essendo priva di fossili per ciò che concerne il suo utilizzo, dunque, questa macchina fa la differenza per quanto riguarda l'impatto a livello ambientale e assicura al contempo un'elevata produttività.