SANDVIK

Batteries for the underground

Load and Haul



Battery design for underground mining



The future of mining is electric. To meet industry needs, Sandvik designs its battery-electric loaders and trucks specifically to meet the demands of the harsh underground mining environment. A key success factor for the performance, durability and safety of BEV equipment is their batteries.

Sandvik develops its own BEV loader and truck batteries in-house. This gives Sandvik full control over R&D and enables rapid response to customer requests and aftermarket needs.

The goal of the design is to minimize the likelihood of incidents and have an efficient battery system. This is done by utilizing chemistry that best fits the load and haul application. The Artisan® battery packs are purpose-designed for underground use.

As a cell supplier, Sandvik uses a world-leading electric vehicle cell manufacturer. The supplier ensures the cells meet the strictest quality and environmental requirements and holds a variety of certificates and patents aimed at guaranteeing product quality. The cells are then further tested at our battery factory before assembling into a battery pack (AB240L or AB240T).

Our BEVs are backed by over 15 years of battery design expertise. In addition, they have undergone extensive field testing and usage in underground hard rock mines throughout the world.



Innovative system design

- In-house design and manufacturing by Sandvik
- Robust mechanical protection
- Patented AutoSwap and AutoConnect functionalities
- No cobalt or scarce minerals
- Voltage and temperature monitoring
- Cooling and isolation system for increased safety
- Built-in fire suppression and containment system

Testing and certifications

- CE compliance
- Regulation (EU) 2023/1542 concerning batteries and waste batteries
- Low Voltage Directive 2014/35/EU
- EMC Directive 2014/30/EU
- ROHS Restriction of hazardous substances
- UL 2580 Batteries for use in electric vehicles
- IEC 62485-6 Battery installations used for electric off-road vehicles
- IEC 60204-1 Safety requirements for secondary batteries and battery installations
- IEC 62619 Industrial application testing
- UN 38.3 Transport safety

In-house battery production

Manufacturing Load and Haul BEV batteries in-house enables seamless collaboration between R&D and production. Sandvik's battery production facility is based in Camarillo, California, while the division headquarters is located in Turku, Finland. The geographical spread offers flexibility and is aimed at ensuring smooth global supply and customer support. Both locations are open to customer tours.

Sandvik sites in Turku and Camarillo also have test tracks to simulate mining conditions. Every BEV unit is tested before shipping to customers. Additionally, during the design phase, the batteries undergo a wide variety of tests.



Battery testing

- Crush
- Shock
- Vibration
- Overcharge
- Thermal test
- Forced discharge
- Altitude simulation
- External short circuit


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The right kind of chemistry

Sandvik batteries for loaders and trucks use the lithium-iron phosphate (LFP) chemistry. LFP batteries are a type of rechargeable battery that have a longer lifetime than the more commonly used cobalt-based lithium-ion chemistry.

Sandvik chose LFP for safety reasons. This chemistry reduces the likelihood and intensity of thermal events and is known for its structural stability. In the case of a battery cell thermal event, the energy, heating rate and maximum temperature are considerably lower than that of other lithium-ion chemistries.





Aftermarket solutions

To support the industry's electric transition, Sandvik has designed its battery aftermarket solutions specifically to address the major concerns related to this new technology. Battery as a Service and the Capacity Guarantee products allow Sandvik to partner with customers to support the transition to BEVs.

Battery as a Service:
Battery as a Service reduces CAPEX during start-up. Sandvik retains ownership of the batteries and chargers and you pay a monthly fee to support your operations. This allows for predictable monthly battery expenses and no capital expenses for the duration of the agreement. Further, the assets have a Capacity Guarantee which ensures the batteries will meet the application needs throughout the life of the contract.

Capacity Guarantee:
For customers who decide to purchase their own batteries, Sandvik has stand-alone Capacity Guarantee products. Sandvik will ensure the batteries retain more than 60% of their original capacity for 3 years or 5,000 operating hours. This provides peace of mind and financial security that your capital assets will maintain their performance for their intended life.

Charging station

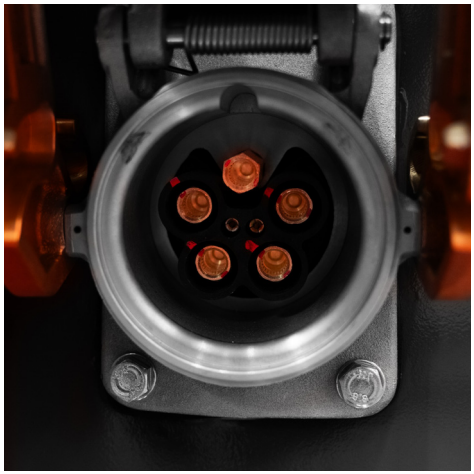
For charging depleted batteries, a Sandvik charging station and a connection to the mine's electric grid are all you need. The charging station consists of at least one charging unit (AG320) and a cooling unit (AC060) that form a functional entity. For maximum flexibility, the same station can be used for charging any Sandvik-branded BEV loader or truck. The units are all the same size, contributing to flexible and organized positioning of the charging station. The units can be placed next to each other on the ground and locked together with a special bar. To save ground space, they can also be stacked, with the cooler on top of the charger.

The charging units and cooling units are easy to relocate with a forklift. The units include side pockets for easy handling and are especially useful when turning and adjusting the unit locations. Additionally, hoisting brackets are located on each corner of the unit.

Investing in multiple swappable batteries delivers certain benefits during charging. For example, having two batteries per machine allows the dropped battery to be charged slowly over the operational duration of the full battery (usually 3-5 hours), which drastically reduces peak power requirement and maximizes battery life. With swappable batteries, mines can avoid costly grid upgrades that fast charging might require.








SANDVIK
DANGER
ELECTRIC SHOCK HAZARD!
WARNING
FALLING LOAD HAZARD!

Newcrest | Brucejack Mine | Canada

”Replacing our diesel fleet with zero-emissions [Z50 trucks] delivers significant environmental benefits and extends the advantages from our use of low-carbon hydro-electric power”



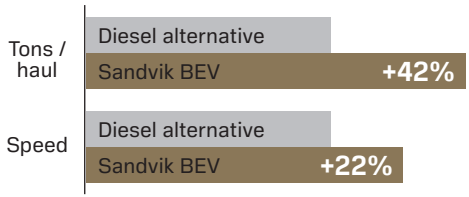
Recognized Potential

- 14 Kph up-ramp vs 9-10 kph (+40-55%)
- 22% Faster cycle time with 2X payload
- 5,000 Litres of fuel saved per day
- Eliminated 3,200 hp of diesel equipment
- 92% Average fleet availability

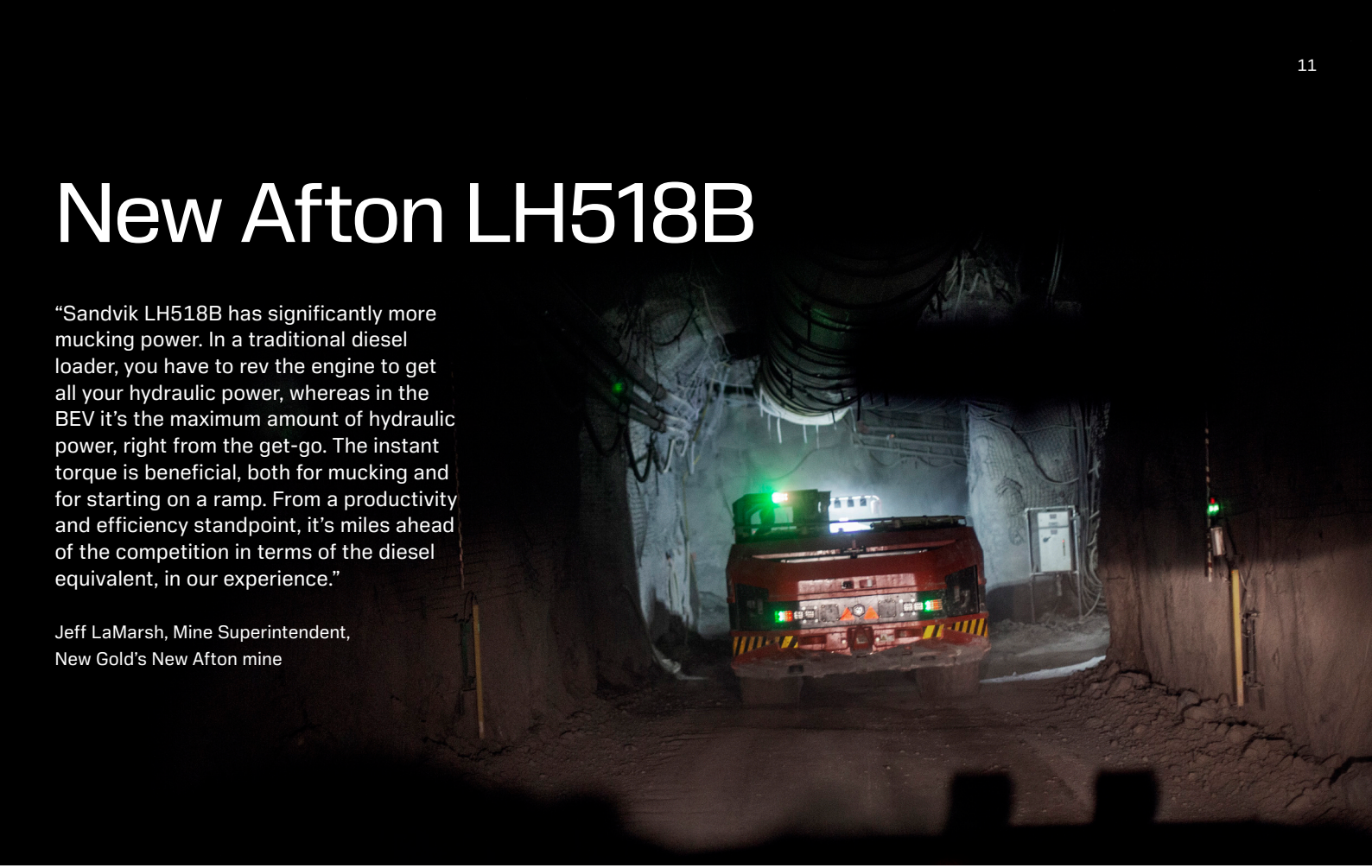
Availability
90%

Productivity
9.5 km/h on 15% grade, 42 tonnes load

Efficiency
Battery swap <10 min



New Afton LH518B



"Sandvik LH518B has significantly more mucking power. In a traditional diesel loader, you have to rev the engine to get all your hydraulic power, whereas in the BEV it's the maximum amount of hydraulic power, right from the get-go. The instant torque is beneficial, both for mucking and for starting on a ramp. From a productivity and efficiency standpoint, it's miles ahead of the competition in terms of the diesel equivalent, in our experience."

Jeff LaMarsh, Mine Superintendent,
New Gold's New Afton mine

Performance results with v. 3.0 battery modules

Ramp work

	Diesel	BEV
Duration	4h 56m	4h 49m
Average speed	7.0 km/h	11.4 km/h
Buckets	37	45
Diesel	254.5l	0l
Energy use	2545 kwh	692 kwh

Production level work

	Diesel	BEV
Duration	3h 46m	3h 50m
Average speed	5.8 km/h	7.3 km/h
Buckets	35	40
Diesel	159.6l	0l
Energy use	1.596 kwh	383 kwh

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