

Caterpillar Develops Battery Electric Proof of Concept Load-Haul-Dump (LHD) Loader

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The Underground Mining group within Caterpillar Inc. has shipped a proof of concept battery electric LHD to a mine site located in Canada. The initial build and validation testing of this R1300G test unit began in early 2017 at the Caterpillar Peoria Proving Grounds and continues now, moving muck in a Canadian mine.

The test machine is a proof of concept for packaging and performance of a lithium based energy storage solution Caterpillar plans to bring to the LHD market. The Cat[®] R1300G proof of concept does not represent a final design that will go to market. After testing, Caterpillar will launch a full-fledged new product introduction program that follows a more in-depth, rigorous design and validation process.

"Our customers are planning for deeper mines with very high ambient rock temperatures where ventilation costs are pivotal to making the mine viable," said Jay Armburger, product manager with responsibility for underground technology. "One means of reducing ventilation demand is through electrification of the mining equipment."

With over 250 patents in the electric drive and energy storage fields, and products like the D7E dozer, F-Series asphalt pavers, 794 AC and 795F AC large mining trucks, the recently introduced 988K XE wheel loader, and even microgrid technology, Caterpillar has fully integrated electric drive train technology and components to bring to underground machines.

Setting high performance standards

The program started with a full production study and data analysis of the diesel machine in order to set a baseline. Once this was accomplished, the transformation of the R1300G to a battery electric proof of concept began. The modifications included removing the engine, transmission and torque converter then reconfiguring the engine end frame to accommodate the battery boxes and electric motors. The result is a battery electric powertrain driving a conventional and mechanical drivetrain (drive shafts and axles).

The R1300G proof of concept is an older machine without the benefit of efficient electro-hydraulics. As a result, it will drive worst case scenario loads on the batteries. Of course, the design of the new loader will enhance battery life through the use of load sensing hydraulics driven by piston pumps such as those on the new Cat R1700. The less refined proof of concept machine will yield solid understanding of heat generation

and cooling needs, performance criteria, space claim and safety considerations in the day-to-day operation of the machine.

With the help of several customers who have visited the proof of concept and operated it at the proving grounds, Caterpillar is getting feedback to help drive the program forward. All of the customers who have visited the machine agree that pursuing a system that is rechargeable on the machine is the right path forward. Recharging on the machine prevents the mine from incurring additional infrastructure costs or from having to manage or store replaceable battery packs. Instead, Caterpillar is focusing on fast charging of the batteries on the machine such that an operator can take a quick break and come back to a charged machine. In addition to developing the LHD itself, the program has been prototyping a robust charging station. The technology behind the charging station is unique to Caterpillar and uses Cat components and technology.

As with all new product introductions, Caterpillar will listen to its customers and put new designs through their paces before releasing a machine. The chemistries and technologies behind battery development are evolving rapidly. Change is inevitable, and the development team will continue to evaluate these changing technologies to better serve mining customers.

“We tried hard to break this machine and technology before sending it to Canada in September,” Armburger said. “With the results we’ve seen so far, we’re confident this R1300G proof of concept is giving us the answers we need to develop a machine that is safe and lives up to the Cat brand promise of durability and reliability. In the end, Caterpillar is well positioned to develop an optimized machine—from power generation to tire rotation.”

Source: Caterpillar Corporate Trade Press Relations

Caterpillar D7E On LECTURA Specs