

# Cat<sup>®</sup> MineStar<sup>™</sup> Command for hauling manages the autonomous ecosystem to increase haulage efficiency, enhance safety

- Continuous investment and innovation in autonomous haulage
- More than 8.3 billion tonnes (9.1 billion tons) of materials autonomously hauled with no reported injuries
- Autonomous trucks to play crucial role in the energy transition and the mine site of the future

IRVING, Texas, September 20, 2024 – Caterpillar’s continuous investment and innovation in autonomous haulage with Cat<sup>®</sup> MineStar<sup>™</sup> Command for hauling has resulted in hundreds of trucks operating at dozens of sites across three continents. Offering multiple layers of protection to enhance safety at the mine site, the Caterpillar autonomous haulage solution drives hauling consistency and predictability at operations to enhance productivity and reduce cost.

Leveraging decades of development and more than 11 years of operational experience, trucks equipped with Command for hauling have now surpassed 8.3 billion tonnes (9.1 billion tons) of material autonomously hauled. MineStar Command manages the autonomous ecosystem to increase haulage efficiency through less idle time, bunching at the loader, unnecessary empty travel and wasted fuel.

“Caterpillar is an industry leader in autonomous technology, and there is a reason for that. Our deeply integrated solution provides demonstrated value to our customers in the areas of safety, productivity, and efficiency,” says Denise Johnson, group president of Caterpillar Resource Industries. “We continuously improve and push ourselves to be the very best. We know it takes a combined focus on people, process and technology to ensure long-term sustainability.”

As the mining industry navigates the energy transition, Caterpillar recognizes productivity and energy management are interrelated and can drive total cost per ton. To address this, Caterpillar continues to develop and integrate new MineStar capabilities to support battery electric technology and charging solutions. These new offerings will manage the orchestration of energy and production across a mine site.

“The mine site of the future will be more complex than ever before as customers look to achieve the same production goals, while balancing new challenges such as energy management. We believe the linkage

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between automation and electrification will unlock the potential for a complete ecosystem integrating technologies to meet or exceed the demands of today and tomorrow,” Johnson continued.

Cat autonomous technology is key to enhancing mine site safety. Command for hauling enhances safety by removing haul truck operators from potentially hazardous conditions. Cat autonomous trucks can detect and react to surrounding conditions and obstacles as well as interact safely with staffed equipment and light vehicles using a combination of our advanced onboard perception system and proximity awareness. These technologies enable the trucks to maintain optimal following distances and safe operating speeds and, upon detecting an obstacle or anticipating an interaction, automatically stop or slow the truck’s speed.

Marc Cameron, senior vice president of Caterpillar Resource Industries, adds, “Of all the autonomous statistics and milestones Caterpillar has achieved over the past 11-plus years, the most important is that all of this has been reached without any reported injuries resulting from the mining trucks operating autonomously. We know that safety is of the utmost importance to our customers, and it is our top priority at Caterpillar as well.”

Cat MineStar Solutions impact the hauling operation in multiple ways – enabling fleet assignment, fully autonomous haulage, equipment tracking, production recording, material management, business insights, safety solutions, maintenance solutions and more. An optimized hauling strategy leveraging autonomy helps to support sustainable operations by moving more tons with fewer machines.

With retrofit kits available, today’s range of Cat mining trucks capable of fully autonomous operation span the 190- to 370- tonne (210- to 410-ton) class sizes, including the Cat 789D, 793D, 793F and 797F, as well as the electric drive 794 AC and high-altitude 798 AC models. Beyond haul trucks, the Cat 789D water truck platform can be equipped with Command for hauling, providing a fully autonomous solution to manage haul road dust. Soon, Caterpillar will expand autonomous haulage to its 139-tonne (153-ton), Cat 785. These models can be equipped with a portion of the autonomous kit from the factory, making them “Command-ready” to reduce installation time in the field.

Commodities mined around the world using Command for hauling include iron ore, copper, gold, coal, oil sands, lithium and traprock. The trucks face extremely challenging mining conditions, from the 40° C (104° F) heat and red dust in Western Australia to sub-freezing -40° C/F temperatures of the Canadian oil sands. They also operate in the deep pit copper mines of South America.

“We develop software specifically for the application, so the trucks can efficiently drive through the axle-deep ruts of the oil sands or traverse the grades at deep pit mines,” comments Sean McGinnis, vice president and general manager of technology and global sales support. “Our engineers remain in close contact with mining customers and continually enhance software functionality, which is critical in the world of technology to have the latest advancements in real-time.”



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## Commanding reach

Autonomous trucks of the future will play a crucial role in the energy transition, as systems like MineStar Command and Fleet will be essential to managing the battery usage for battery-electric trucks. Planned new capabilities will play a role in helping mines manage power by monitoring and orchestrating the complex balance of onboard energy, available charging assets and production targets to achieve the lowest operating cost. "It's critical that one system manages all the energy usages, so, in the future, we are not just managing ore but managing energy as well," adds McGinnis.

Caterpillar is also scaling into quarry applications, demonstrated by the company's collaboration with Luck Stone to deploy Command for hauling at its Bull Run Plant in Chantilly, Virginia, USA. This is Caterpillar's first autonomous deployment – technology, process and people – in the aggregates industry and will expand the autonomous truck fleet to include the 90-tonne-class (100-ton-class) Cat 777.

"Instead of automating more than 100 trucks on a mine site that operates 24/7, we're automating four trucks in a quarry that work 10 hours a day, so it's not just about the technology," says Johnson. "It's about how to transform our technology and processes to manage a smaller operation, so it makes money for the customer and does it safely. This can be a foundation for how we as a company move forward into autonomy in other industries."

MineStar Solutions offers a range of remote and autonomous applications besides autonomous haulage to help further optimize mine site operations. This includes Command for drilling to automate the drilling operation, Command for dozing to enable remote dozer operation and Command for underground to enable remote operation of load-haul-dump (LHD) machines.

**More information about Cat Command for hauling can be found by contacting a Cat dealer or visiting <https://www.cat.com/minestar>. For more information about Cat Financial solutions tailored to meet the mine site's specific needs for equipment acquisition, technology upgrades and maintenance, visit [www.cat.com/catfinancial](http://www.cat.com/catfinancial).**

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