

CAT[®] 789D

AUTONOMOUS WATER TRUCK







**DEFEAT DUST
REDUCE RISKS
CONTROL COSTS
— THROUGH —
AUTOMATED
WATER DELIVERY**

As miners, you know the importance of watering haul roads to keep dust down. It's a necessary operation that makes travel safer and keeps machines moving as efficiently and quickly as possible.

You also know that it's not without challenges. Over-watering can lead to areas of low traction, which can reduce truck speeds, create safety risks and shorten tire life. In addition, some sites have limited access to water, which is a precious resource that needs to be preserved.

What if there was a better way to water? One that delivers the critical benefits while addressing the risks and challenges?



INTRODUCING THE **CAT[®] 789D**
AUTONOMOUS WATER TRUCK



An industry first, the Cat® Autonomous Water truck is a complete solution that not only automates the truck, but also automates the delivery of the water — optimizing the complete haul road watering process.

- + It delivers only the amount of water required at the site—and at exactly the right time and in the right places.
- + It minimizes dust, uses less water and prevents underwatering or overwatering—eliminating reduced traction events and allowing water trucks to travel at higher speeds for improved efficiency.
- + And it coordinates its speed with haul trucks to ensure it does not impede haul traffic and reduce hourly productivity.



BOOSTS SAFETY

- + Minimizes dust
- + Reduces traction events
- + Removes personnel from potential harm



IMPROVES WATERING OPERATION

- + Helps to ensure compliance with water plan
- + Zero incidences of overwatering



INCREASES PRODUCTIVITY

- + Allows both water trucks and haul trucks to travel more quickly
- + Eliminates need for shift change, breaks, etc.




REDUCES ENVIRONMENTAL IMPACT

- + Automated system uses less water

FULLY INTEGRATED AND AUTONOMOUS WATER DELIVERY SOLUTION

The Cat Autonomous Water Truck is a fully integrated system: an autonomous 789D Mining Truck and Cat Water Delivery & Control System (WDS) connected with Cat MineStar™.




MineStar reports and tracks the amount of water delivered to manage the application of water to keep roads in optimum condition.



The WDS provides variable water flow based on truck speed and determines appropriate flow to conserve water.

Cat MineStar Command for hauling creates a fully autonomous water truck that operates safely around other equipment, light vehicles and personnel — all without an operator on board.



HAULING WATER: THE AUTONOMOUS CAT 789D

A PROVEN TRUCK

The 193-tonne (213-ton) Cat 789D Mining Truck is the base haul truck for the integrated water solution.

The 789D delivers a faster speed on grade than competitive trucks, reducing watering times and lowering overall costs. The 3500 series engine is a 16-cylinder, four-stroke design that uses long, effective power strokes for more complete fuel combustion and optimum efficiency.

The 23% net torque rise provides unequalled lugging force during acceleration, on steep grades and in rough underfoot conditions. Torque rise effectively matches transmission shift points for maximum efficiency and fast cycle times.

Expanded tire options allow mines to take advantage of higher speeds, particularly in flat long-haul high-speed watering applications.

The 789D has a true four-corner braking system proven in thousands of Cat mining trucks under every conceivable condition. With resistive braking power applied to all four corners, the full weight of the truck can be applied for traction—ideal for haul road watering applications.



A PROVEN AUTONOMOUS SYSTEM

The 789D Water Truck is equipped with the Command for hauling autonomous haulage solution, which makes it possible for the truck to drive among other staffed and autonomous machines, along haul road routes and within active load and dump areas.

- + Enhances safety by removing operators from hazardous or remote sites and reduces the number of people required on site.
- + Improves efficiency, enables consistency in operations and provides near-continuous operation through the reduction of operational delays.

The capabilities of Command for hauling are extensive.

PROVEN CAPABILITIES

Command allows trucks to operate in either autonomous or manual mode. Autonomous trucks have the same performance and functionality of the standard truck model when operated in manual mode.

The system creates autonomous operating zones, which define the specific area where automated operations occur and where controlled access is needed. It limits automated truck activity to a specific, controlled area such as load and dump points, fueling and maintenance bays. MineStar also manages interactions between autonomous trucks and staffed mine support vehicles.

MineStar utilizes watering circuits as a way to define a continuous path for the Autonomous Water Truck to follow. Built by the MineStar Controllers, watering circuits may have multiple legs, each with one or more lanes. Legs can be created by selecting a lane or dynamic area as a starting and ending point. The watering circuit does not have to be closed loop and can have a separate beginning and end.

Key to watering operations, MineStar also helps the autonomous truck maintain stability by controlling steering, braking and traction. In addition, an Anti-Lock Brake System (ABS) helps the truck maintain the desired path of travel during braking in a sliding condition.



DELIVERING WATER: THE CAT WATER DELIVERY & CONTROL SYSTEM

The Cat Water Delivery & Control System is designed to put water to the ground in a controlled, intelligent way. This automated system, which is a fully integrated Cat design, controls the amount of water and spray patterns to prevent the hazards common with overwatering. The system improves safety and productivity while saving fuel and conserving water.


The WDS provides variable water flow based on truck speed and determines appropriate flow to conserve water. The system reduces water volume as ground speed is reduced—preventing overwatering at haul road intersections, at the start of grades or when traffic is encountered. When the truck speed drops below 4.8 kph (3 mph), the system shuts off automatically to prevent overwatering, and then automatically re-starts as speed increases.

The constant, flat controlled spray pattern delivers optimal liters per square meter (gallons per square yard) across the haul road to reduce water consumption by 25-50% over conventional systems. In addition, less spray is lost to wind and evaporation because the system produces larger, heavier water droplets designed to reach the ground. The WDS features seven different automated spray pattern pre-configurations, including intermittent spray.

The water cannon operates at idle, reducing fuel consumption by up to 50%. Cannon capacity is 2,839 liters per minute up to 60 meters (750 gallons per minute up to 200 feet). Water coverage is 0.8 L/m² at speeds of 4 to 40 kph (0.02 gal/ft² at speeds of 3 to 25 mph).

The WDS is simple to maintain. It features stainless steel components and self-cleaning spray nozzles that open wide to eject debris, and the patented spray head design eliminates diaphragm and associated maintenance. The pump features soft startup and shuts off automatically when the tank is empty, eliminating damage and preventing the pump from running dry. Troubleshooting is made simple by self-diagnostics regarding water, hydraulics and electrical issues.



 **25-50%**
REDUCTION
IN WATER
CONSUMPTION
OVER CONVENTIONAL SYSTEMS





MONITORING WATER: CAT MINESTAR

The Cat Autonomous Water Truck is equipped with Cat MineStar, which collects and communicates real-time information and provides data logging capabilities critical to minimizing safety-related liability. Water solutions data can help ensure you're meeting regulatory requirements.

MineStar provides information on truck location and utilization data, fuel and water level, whether or not the truck is spraying water, and WDS utilization.

Optional premium connectivity includes a comprehensive reporting package with data and reports that can help improve watering efficiency. It records:

- + Water usage by truck/fill station
- + Volume of water put down over time, and the area covered
- + Rate of water being put down
- + WDS settings by location, truck and conditions
- + Activity breakdown including time and distance (watering, not watering, stopped, etc.)
- + Water circuits traveled
- + Water application and tank fill time cycles

AN END-TO-END AUTOMATED WATERING SOLUTION

Combining an automated water delivery system with an autonomous truck, powered by MineStar, creates a truly automated solution that takes haul road watering safety and efficiency to a new level.

MineStar doesn't just monitor how much water the trucks have put down. It monitors the actual saturation levels of the haul roads. If the system determines the saturation level is too low, it will assign the truck to put water down. If it determines no watering is necessary based on saturation levels, the truck will park itself.



AUTOMATIC WATERING ASSIGNMENTS

The system assigns autonomous water trucks to their required routes and connects remotely to the WDS, enabling remote selection of pre-configured water delivery rates and spray patterns.

The controller can assign or configure the trucks based on traffic, dust levels or expected evaporation rates. Trucks are assigned to a continuous circuit, and WDS configurations are pre-set based on those watering circuits.

The water truck will track and report water tank levels to MineStar, which will automatically assign trucks to a water refilling station when the water in the tank is substantially exhausted.

ON-DEMAND WATERING

Watering assignments can be amended on request when it's necessary to address watering of specific haul roads or locations. For example, a water truck may be reassigned to a load or dump area to address priority dust suppression needs based on pit personnel requests.

The system also provides the ability to create turnaround lanes on the haul roads at the entry and exit points of load and dump areas. Roads can be constructed through these areas based on the entry and exit points.

AUTO REFILL

The autonomous water truck is aware of its water level at all times during operation. When running low on water, it will be assigned to the most appropriate refilling station either automatically or manually by the controller.

The truck will follow haul roads and water truck roads as it travels to the refill station. Once it arrives, it will position itself under the refill spout and automatically initiate water refill.



INTERACTING WITH OTHER VEHICLES

Traffic permissions allow safe operation among other manually operated and autonomous machines. If the autonomous water truck identifies another vehicle nearby, it will stop the spray of water until the vehicle has passed.



SUPPORTING PRODUCTS— AND PRODUCTIVITY

The Cat Autonomous Water Truck includes the full support of the Cat dealer and parts network. The truck and WDS are covered by a Caterpillar warranty, with service parts available for both. Retrofit kits are available and can be installed by your local dealer.

MAINTENANCE SOLUTIONS FOR YOUR OPERATION

Together with our Cat dealer network, we customize service offerings to provide a maintenance solution that fits your operation—whether you want to perform the majority of service yourself, or you're looking for an on-site expert to manage your maintenance organization. We're also consultants who can help you make smart decisions about buying, operating, maintaining, repairing, rebuilding and replacing equipment.

Autonomous Water Trucks are eligible for Equipment Protection Plans (EPP) and Customer Value Agreements (CVAs).

CVAs help you maximize equipment health, keep your fleet moving and get the most from your investment. With built-in cost controls and a range of guarantees, your dealer can tailor these plans to suit your mine site's needs and bring top results to your business. Your Cat dealer can offer you options for planned maintenance, components and powertrain—all with the flexibility to be shaped for your operation.





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