



Ready For More.

Cummins Tier 4 Final High-Horsepower
Engines For The Mining Industry.



Ready For More. Leadership.

Never before has there been such intense focus on the safe and economical production of mining products. Keeping energy costs down while protecting the environment, with no compromise to performance or reliability, is critical for the industry. For Cummins, this represents an opportunity to demonstrate how our advanced technology provides clear benefits to mining operations while maintaining performance and durability. We're ready to deliver superior products to a mining industry that's ready for more.

Proven Performance Meets Tier 4 Final.

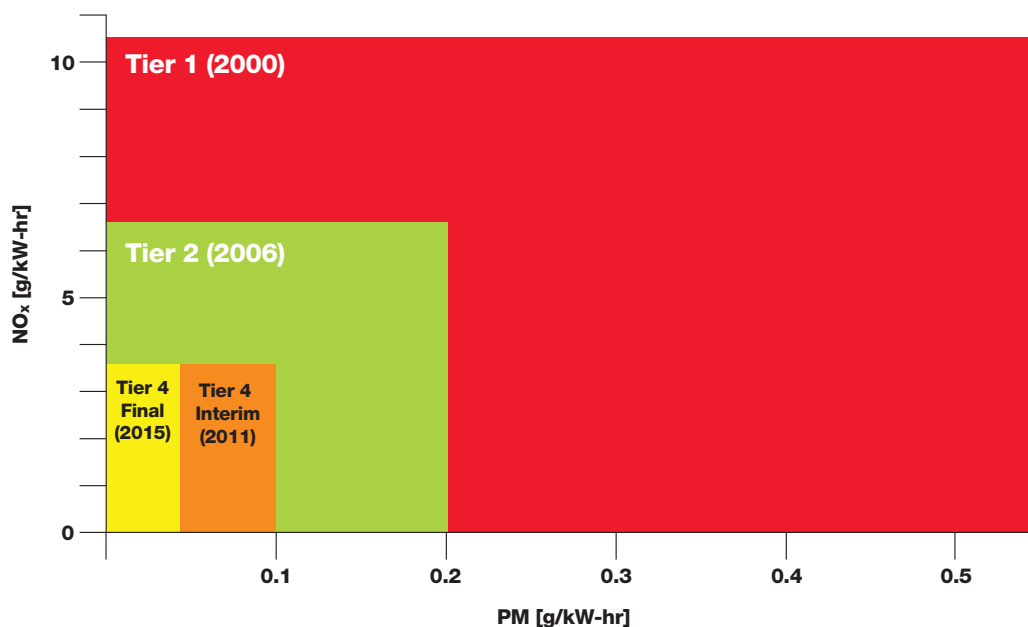
Emissions regulations continue with U.S. Environmental Protection Agency (EPA) Tier 4 Final standards, governing every engine over 751 hp (560 kW) operating in nonroad applications, throughout North America.

Particulate Matter (PM), oxides of nitrogen (NO_x) and hydrocarbon (HC) emissions have been reduced to levels 90 percent lower than those of engines produced before the year 2000.

At Cummins, we have taken great care to understand the concerns of the mining customer, and have developed the Tier 4 Final solution that delivers simplicity of operation and installation, as well as an improvement in productivity and performance. These engines demonstrate our commitment to providing the highest uptime in the industry and reducing total operating costs while simultaneously meeting new emissions requirements.

We determined that the best solution to meet mining customers' needs for engine uptime and reliability is Selective Catalytic Reduction (SCR). Since 2006, Cummins has been a world leader in SCR technology, meeting European on-highway emissions regulations. Today, Cummins has over 400,000 engines operating with SCR around the world. The SCR system is designed with the same durability as the engine — and the SCR design for high-horsepower industrial engines has enhanced protection against the vibration and shock loading encountered by off-road equipment. This decision has been validated by customers in all types of mining apparatus since the launch of our Tier 4 Final solution.

EPA Nonroad Diesel Equipment Emissions Chart.





More Customer Needs. Met.

Tier 4 Final presents major changes for the mining industry. Cummins advanced technology delivers major advantages to our customers.

Customer Needs	Cummins Tier 4 Final Engines
More Fuel Efficiency	Improved efficiency in-cylinder and the use of Cummins SCR aftertreatment result in best-in-class fuel economy, with up to 3 percent to 5 percent better fuel efficiency than our Tier 2 engines.
More Durability And Reliability	Cummins Tier 4 Final engines utilize proven Cummins high-horsepower components, resulting in more reliability and improved engine life.
More Power	Cummins Tier 4 Final engines not only achieve the same horsepower output as Cummins Tier 2 engines, but the range has been extended with the addition of the QSK95 (4200 hp/3132 kW), using proven technology to meet Tier 4 Final emissions standards with no compromise to engine power.
More Simplicity For Integration	Compared with alternate technologies, Tier 4 Final base engines have undergone minimal change, and the SCR units are a drop-in replacement for most current mufflers, resulting in minimal redesign to existing equipment.
More Efficiency In Operations	Cummins solution has more thermal efficiency than alternative approaches. There is no significant change in heat rejection from Tier 2, so there's no redesign needed to accommodate a larger cooling package. Our SCR aftertreatment enables low emissions levels without compromising reliability, performance, fuel efficiency or durability.

More Fuel Efficiency.

Cummins understands that total cost of ownership is a key driver in purchasing decisions. Our Tier 4 Final solution reduces diesel fuel consumption by up to 3 percent to 7 percent compared with our own Tier 2 engines, depending on duty cycle.

The SCR aftertreatment system is a highly robust, fully integrated package designed in-house by Cummins Emission Solutions specifically for nonroad applications. It operates as a fully passive, flow-through system and is capable of high NOx conversion with low backpressure, enabling enhanced fuel economy.

The SCR aftertreatment system features an integrated, proprietary Diesel Exhaust Fluid (DEF) dosing injector with a high-efficiency spray pattern. DEF decomposition is achieved in a compact package that facilitates overall equipment integration while ensuring that low NOx emissions levels are achieved.

SCR logic control is driven by the QSK electronic engine management system, upgraded with extra processing power for Tier 4 Final. The engine and SCR aftertreatment system operate as a single, integrated system to maximize engine performance while minimizing DEF consumption.

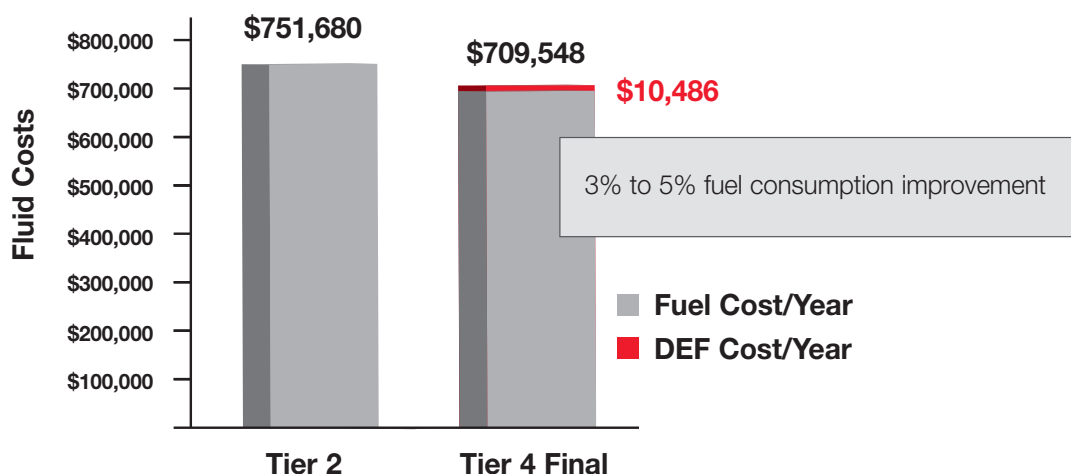


More Durability And Reliability.

Cummins engines operating today are the industry leaders, delivering over 90 percent availability in mining operations around the world. This doesn't change with Tier 4 Final. Customers can expect the same uptime as with previous generations of Cummins engines. Our Tier 4 Final engines use the same base architecture as our Tier 2 engines that mines rely on to power their equipment.

Most major components have remained unchanged, such as the engine block, crankshaft and camshaft, as well as many external components. The use of SCR to handle emissions in the exhaust system has enabled improvements in combustion efficiency, leading to lower fuel use. Improvements to the fuel system, piston and air handling system provide improved engine life.

Annual Fuel And DEF Cost Savings.



More Power.

Cummins reputation for performance in the global mining industry has been earned over decades of punishing work in mine sites around the world.

Our full range of QSK Tier 4 Final engines, from 506 hp to 4200 hp (560-3132 kW), builds on a legacy of proven performance in every possible application. Cummins engineering team understands that our customers are unwilling to compromise on engine power when meeting tough emissions regulations worldwide.

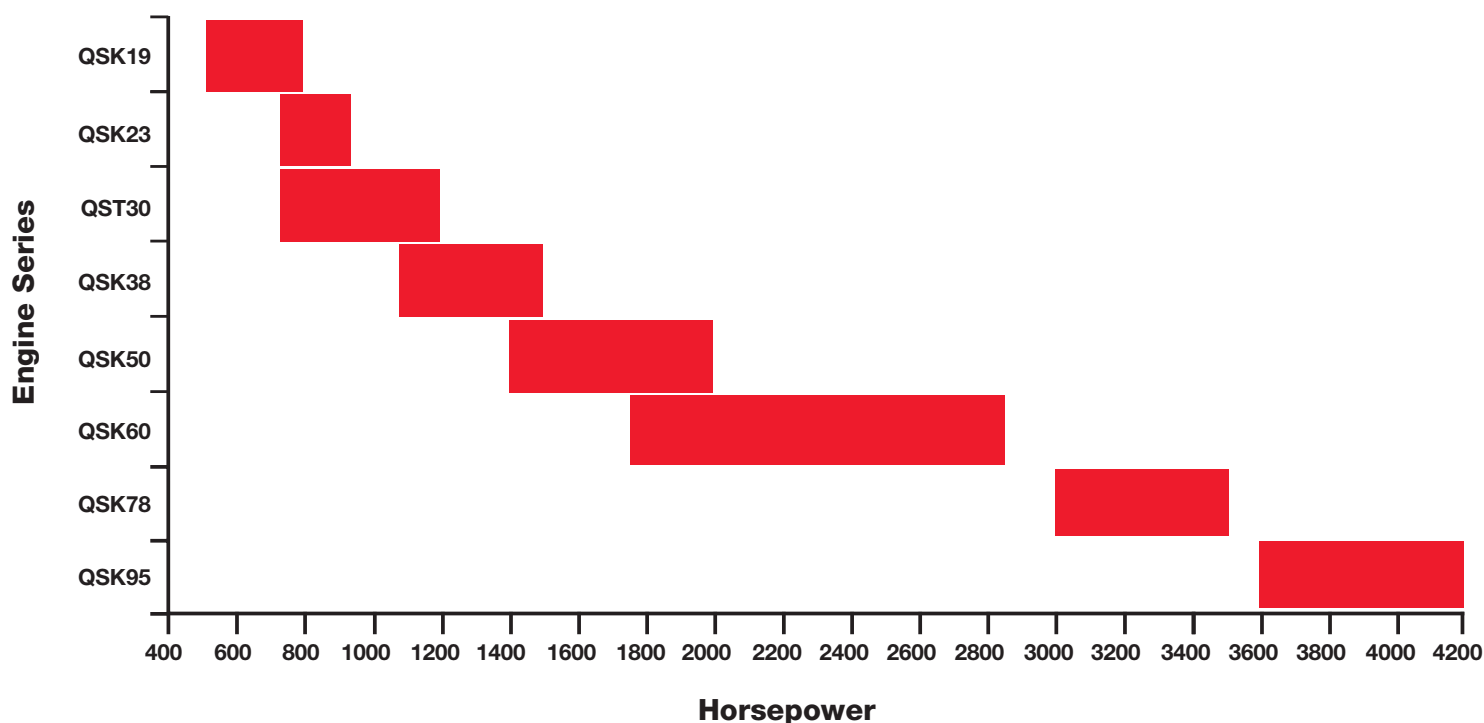
Cummins lineup of Tier 4 Final engines provides the same power output as our Tier 2 engines. By optimizing the combustion cycle, Cummins engineers have protected engine power output by reducing PM inside the cylinder while allowing NOx emissions to be controlled by the exhaust aftertreatment. Trying to control both types of emissions within the engine combustion cycle creates compromises in horsepower and torque that our customers are not willing to make.

More Simplicity For Integration.

Mining OEMs, along with mining companies, require standardization in order to drive down costs and increase profitability. Cummins Tier 4 Final engines require little to no change to the equipment. Service intervals, including those for fuel and oil filters and coolant and oil drain intervals, are improved or remain unchanged. Minimizing change is central to our goal of optimizing productivity and equipment availability.

Our compact in-cylinder solution, together with the Cummins SCR aftertreatment performing as a silencer, makes machine integration simpler for the equipment manufacturer. The OEM doesn't have to design new machines to accommodate additional cooling needs or extra engine hardware. The DEF tank and lines are integrated on the equipment to provide ready access and long life. Minimal change supports a more robust equipment design and the OEM's goal of having a common platform for all emissions globally.

Cummins – Tier 4 Off-Highway Engines.



The SCR system is modular in design, and is scalable to the complete QSK engine lineup to ease integration and assembly by the equipment manufacturer. Depending on the horsepower rating, a single assembly SCR system or a twin-assembly system SCR system may be used in varying lengths, and matched to engine power output.



Improved efficiency in-cylinder and the use of the SCR aftertreatment result in best-in-class fuel economy, with a decrease in overall costs of operation, depending on the engine and application. Diesel Exhaust Fluid (DEF) utilization in our high-horsepower engines is expected to be at a rate of approximately 4 percent to 6 percent of the fuel burned.

DEF is a urea-based chemical reactant designed specifically for use in SCR systems to reduce NOx emissions. The DEF formula is designed so that it can endure freezing and thawing without its effectiveness being altered. Even though DEF will freeze, the supply tank and lines are heated, ensuring NOx conversion, even at freezing temperatures. DEF is readily available throughout North America and Europe, as it is used in automotive diesel engines, as well as industrial equipment.

More Efficiency In Operations.

At Cummins, we listen very closely to our mining customers. We know that they would prefer not to deal with additional fluids. However, after much work in the laboratory and in field testing, Cummins engineers concluded that reaching Tier 4 Final regulations using increased amounts of cooled Exhaust Gas Recirculation (EGR) in large-Vee engines could jeopardize:

- Power density
- Fuel consumption
- Reliability
- Cooling package



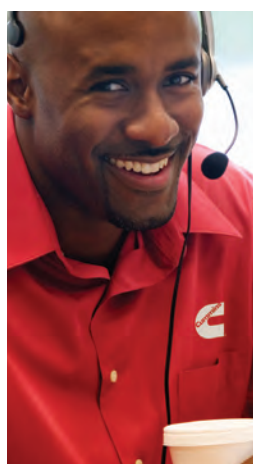
More Customer Support.

Cummins high-horsepower engines are supported through our network of more than 600 authorized distributors that deliver consistent, legendary, world-class support. Cummins-certified technicians are fully trained and experienced at working on this type of heavy-duty equipment, and they are equipped with the latest diagnostic tools to provide fast, accurate service. A full inventory of Genuine Cummins parts and swing engines are ready. And we operate our own rebuild centers, so even when you need to rebuild an engine, you can be assured of Cummins quality and performance.

Ready For More.

We are committed to delivering the solution that best drives value to the bottom lines of our mining customers. Cummins Tier 4 Final solution is simple, and it protects the characteristics that matter most to mining companies – fuel economy and engine availability. Cummins Tier 4 Final solution is reliable,

and provides the best operational advantages with maximum productivity, improved fuel efficiency and the lowest total cost of operation. Avoiding the complex designs and new components required by other emissions technology ensures that mines utilizing Cummins Tier 4 Final engines will experience the lowest cost of operation and the maximum productivity available.



More Answers.

If you'd like to know more about Cummins global mining support, our rebuild centers or our high-horsepower engines, please visit cumminsengines.com or call our Customer Assistance Center at 1-800-DIESELS™ (1-800-343-7357). When you're ready for more, we're ready to take good care of you.





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