

# BUILT FOR THE NEXT GENERATION

CAT® STAGE IIIB TECHNOLOGIES









# THE POWER OF INNOVATION

## HIGHER PERFORMANCE, LOWER EMISSIONS

At Caterpillar, we know you're under constant pressure to do more work at a lower total cost with less environmental impact. Our Stage IIIB solutions help you do that. We redesigned the product line from the inside out, putting decades of innovation expertise to work on your behalf. The result is a new generation of engines that meets your high expectations for reliability, performance, fuel efficiency and component life, while producing significantly fewer emissions.

### **Systems integration boosts power, saves fuel**

Caterpillar product designers work collaboratively, using advanced modeling and analysis tools to integrate components, systems, electronics and aftertreatment technologies. Our integration experience allows us to optimize power, fuel economy and emissions reduction.

### **Integrated manufacturing improves quality**

Our position as the largest vertically integrated manufacturer in our business gives us the power to build premium-quality products. We integrate manufacturing advancement into product designs and use common production processes across the manufacturing base. As a result, we can deliver exceptional quality right from the start.

### **Testing and validation enhance reliability**

The newest generation of Cat engines has been subjected to the largest testing and validation program in Caterpillar history. Powerful design tools allow sophisticated simulation and analysis, and a comprehensive field-testing program provides real-world validation. With more than one million operating hours logged on test units, you can be confident in the quality and value of your Cat Stage IIIB investment.



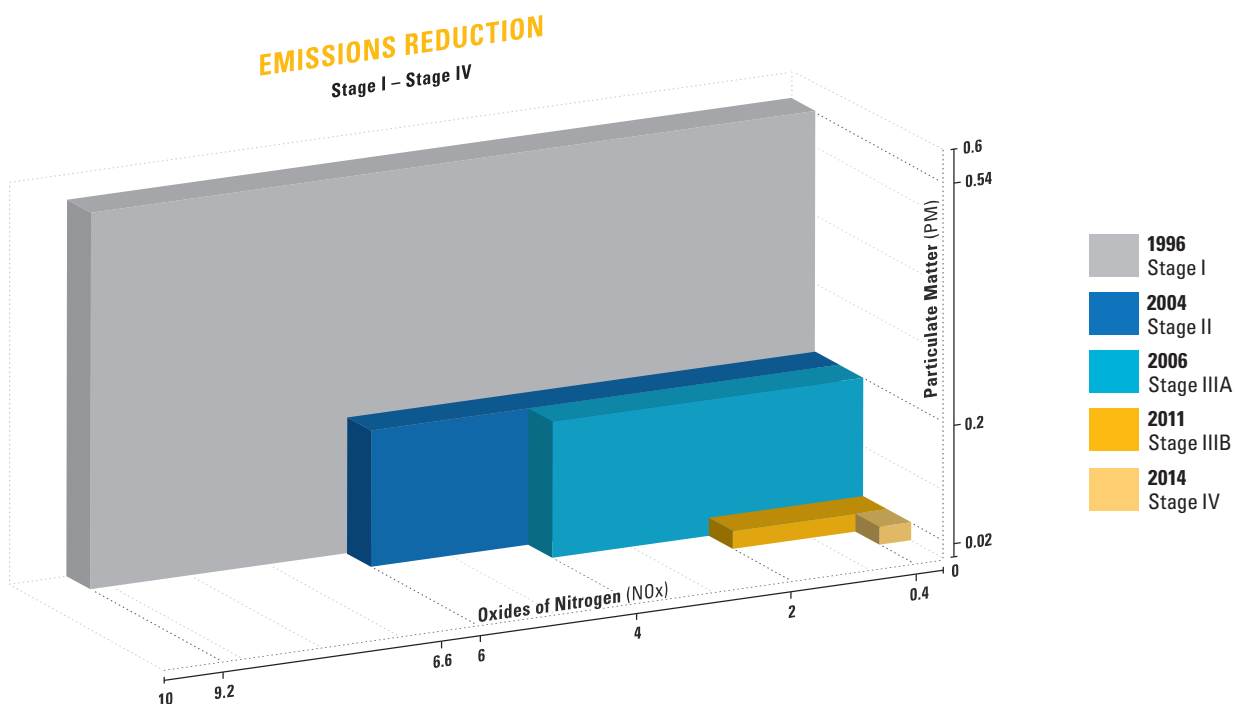
### Stage IIIB Emissions Reduction

Cat Stage IIIB engines meet tough emissions standards and deliver the performance and efficiency that successful businesses demand.

Like all manufacturers of diesel engines, Caterpillar is required to deliver engines that meet government emissions standards that are being phased-in throughout the United States, Canada, European Union and Japan.

### Cleaner Fuel & Oils

Also part of the emissions standards, industry technology requires  $\leq 15$  parts per million sulfur (mg/kg) Ultra Low Sulfur Diesel fuel (ULSD) for use in Stage IIIB engines. Not only does ULSD need to be used, but also low sulfated ash oils. These cleaner fuels and oils help reduce ash and maintain service intervals, contributing to low emissions and reduced operating costs. The new Cat engines also have B20 biodiesel capability, adding even greater sustainability where desired or required.



Emissions standards have been systematically reducing levels of Particulate Matter (PM) and Oxides of Nitrogen (NOx) since 1996 when the first standards went into effect.

From Stage I to Stage IIIA, emissions standards required an approximate 65 percent reduction in PM and a 60 percent reduction in NOx.

The current phase of emissions standards, called Stage IIIB, took effect in 2011. Compared to Stage IIIA levels, Stage IIIB standards require a 90 percent reduction in PM and a 50 percent decrease in NOx. Stage IV standards, which will become effective in 2014, reduce NOx by an additional 80 percent, taking PM and NOx emissions to near-zero levels.

\*Engines rated 56–130 kW (75–175 bhp) are required to meet Stage IIIB standards in 2012 and Stage IV regulations in 2015.







# COMMITTED TO CUSTOMER SUCCESS

Caterpillar equips every Stage IIIB engine with ACERT™ Technology—a combination of electronic, fuel, air and aftertreatment components—based on engine size, the type of application and the geographic location in which it will work. Applying technologies systematically and strategically optimizes them to meet our customers' high expectations for productivity, fuel efficiency, reliability and service life. The right technology fine-tuned for the right application results in:

**IMPROVED FUEL EFFICIENCY** Up to 5 percent improvement in fuel efficiency

**POWER AND PERFORMANCE** Integrated design boosts power and performance across applications

**RELIABILITY** through commonality and simplicity of design

**MAXIMIZED UPTIME AND REDUCED COST** with world-class support from the Cat dealer network

**LONG LIFE** Cat durability and long life to overhaul

**MINIMIZED IMPACT** of service and maintenance on operating costs

**SMOOTH TRANSITION** Design and modular aftertreatment pave the way for a smooth transition to Stage IV solution. No additional space required.

**REDUCED EMISSIONS** Up to 90 percent reduction in particulate matter (PM) and 50 percent reduction in Oxides of Nitrogen (NOx)

The entire line of Cat Stage IIIB engines is precisely engineered, rigorously tested and validated and built for the reliability and durability you count on from Caterpillar.

- |  |  |
|--|--|
| ① <b>More Powerful Engine Electronics</b>    | Common features and connections increase quality, reliability and ease of use.                         |
| ② <b>Next Generation Fuel System Options</b> | Precise injection systems deliver maximum fuel efficiency and soot control.                            |
| ③ <b>Innovative Air Management</b>           | Simplified turbocharging optimizes productivity, fuel efficiency and reliability.                      |
| ④ <b>Cat NOx Reduction System</b>            | Rugged, reliable system lowers combustion temperatures and reduces NOx emissions.                      |
| ⑤ <b>Aftertreatment Technologies</b>         | Durable components, designed to withstand demanding applications, reduce pollutants in exhaust stream. |





**① MORE POWERFUL, RELIABLE  
ENGINE ELECTRONICS**

The electronics used in Cat Stage IIIB engines are more powerful and robust than ever.

Increased features and connection commonality improve the customer experience and increase quality and reliability.

Over-foam wiring harness adds to reliability even in the most demanding applications.





High Pressure Common Rail Fuel System

## ② NEXT GENERATION FUEL SYSTEM OPTIONS

As a key component of Cat Stage III Technology, injection timing precisely controls the fuel injection process through a series of carefully timed microbursts. This injection timing provides more control of combustion for the cleanest, most efficient fuel burn. To maximize customer value, Caterpillar engineers specified fuel systems based on the power and performance demands for each engine.

- **High Pressure Common Rail Fuel Systems** with full electronic injection improve precision and control that boost performance and reduce soot for the C4.4 ACERT, C6.6 ACERT, C7.1 ACERT and C9.3 ACERT.
- **Advanced MEUI-C™ injector platforms** handle increased injection pressures and more precise fuel rates. These durable injectors enhance responsiveness while controlling soot in the C13 ACERT, C15 ACERT, C18 ACERT, C27 ACERT and C32 ACERT.

# BUILDING BLOCK TE

## DELIVER FUEL EFFICIENCY,

## ③ INNOVATIVE AIR MANAGEMENT

Cat Stage IIIB engines feature innovative air-management systems that optimize airflow and enhance power, efficiency and reliability. We apply a range of simple, reliable turbocharging solutions, based on engine size and application. This allows us to match turbo performance to rated output for high productivity, excellent fuel efficiency, long life and low operating costs.

## ④ CAT NOx REDUCTION SYSTEM

The Cat NOx Reduction System (NRS) captures and cools a small quantity of exhaust gas, then routes it back into the combustion chamber where it drives down combustion temperatures and reduces NOx emissions. The result of more than a decade of Caterpillar engineering research into this technology, the Cat NOx Reduction System is designed to be the most reliable system of its type.

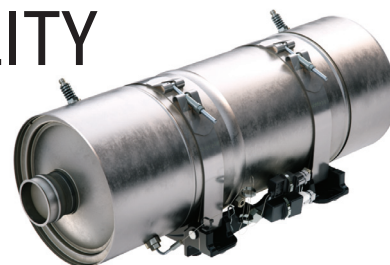


Air Management and Cat NOx Reduction System



# CHNOLOGIES

## RELIABILITY AND DURABILITY



### 5 AFTERTREATMENT TECHNOLOGIES

Cat aftertreatment components include:

- **Clean Emissions Module (CEM)**

The CEM protects interior components, minimizes the aftertreatment footprint and simplifies maintenance.

- **Diesel Oxidation Catalyst (DOC)**

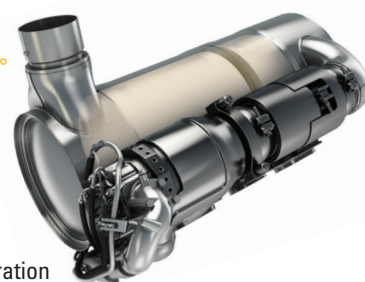
The DOC uses a chemical process to transform pollutants in the exhaust stream into less harmful components. The DOC does not require maintenance because it is a “flow-through” device and the pollutants do not get trapped in the component.

- **Diesel Particulate Filter (DPF)**

A DPF traps additional particulate matter that’s carried in the exhaust stream, preventing it from being released into the atmosphere. Inside the DPF, particulate matter, sometimes referred to as “soot,” is trapped until it is oxidized during regeneration.

#### For 4.4 ACERT & 6.6 ACERT applications:

- DOC/DPF
- Passive regeneration only
- Service-free DPF



#### For C7.1–C18 ACERT applications:

- DOC/DPF
- Active and passive regeneration
- CRS is automatic



#### For 3.4B & 3.8 applications:

- DOC/DPF
- Active and passive regeneration



#### For C27 ACERT & C32 ACERT applications:

- DOC only
- No regeneration needed

# REGENERATION

## THE CAT REGENERATION SYSTEM (CRS) IS AUTOMATIC AND FUEL EFFICIENT

Regeneration is the process of removing trapped soot from the Diesel Particulate Filter (DPF). Soot is removed with **passive** regeneration using normal heat from the engine exhaust while the machine is operating. Sometimes **active** regeneration is also required to fully remove the soot.

Our regeneration systems work quickly, safely and reliably in all load conditions, even in cold ambient temperatures.

### The Cat Regeneration System is:

**Transparent to the operator.** Works automatically without operator intervention.

**Fuel efficient.** Regeneration is initiated during idle time for fast regeneration with minimal fuel consumed. If needed, the system will automatically regenerate during machine operation so production is not affected.

**Interruptible.** An operator can stop the regeneration process at any time.

**Automatic.** In the automatic mode, no operator intervention is required.

**Easy to operate.** Should an operator choose to control regeneration manually, the system is very simple.



Soot Level Monitor



Regen Switch

#### To FORCE regeneration:

1. Stop machine.
2. Put transmission in neutral.
3. Check soot level monitor to make sure DPF is at least 15 percent full.
4. Apply parking brake.
5. Press and hold top portion of Regen Switch for minimum of two seconds.

#### To DISABLE regeneration:

1. Press and hold bottom position of Regen Switch for minimum of two seconds.

### Learn more about regeneration

Scan the QR Code with your smartphone or visit [www.cat.com/technology/tier-4](http://www.cat.com/technology/tier-4) to view an operator training video on regeneration.











# HELPING YOUR BUSINESS REACH THE NEXT LEVEL

We believe that part of our commitment to our customers is to understand your needs and your business. We know that maintenance, service and support are critical not just to power and performance but to achieving the lowest total cost of ownership. Your Cat dealer is dedicated to delivering value for the life of your machine.

## World-class Service and Support

The Cat dealer network supports your machine and your operations. Field technicians have been expertly trained to support the technologies of Stage IIIB machines.

The parts commonality built into the Stage IIIB line of machines enables common service tooling and parts stock coverage, further enhancing the value that product support can deliver. With industry-leading parts availability, cost-saving Reman options and Cat Certified Rebuild programs, you can keep your machine performance high and your operating costs lower.

Caterpillar has taken every possible step to effectively manage service and maintenance issues and minimize the impact of those activities on operating costs.

**Basic oil and filter change** intervals remain at 500 hours.

Eliminated 500-hour initial **valve lash service requirement**.

Engines are required to use **Ultra Low Sulfur Diesel (ULSD)** fuel and also accommodate **B20 biodiesel** when blended with ULSD.\*

New emissions standards drive new **service intervals and maintenance activity**:

CEM aftertreatment is designed with a removable center section to allow easy access to the DPF for **ash service**.

- DPF ash removal intervals:
  - 3,000 hours or 5 years (C3.4B ACERT, C3.8 ACERT)
  - Maintenance free (C4.4 ACERT, C6.6 ACERT)
  - 5,000 hours (C7.1 ACERT–C18 ACERT)
- DPF ash removal options:
  - Mobile ash-removal tool
  - Stationary ash-removal tool
  - Cat Reman

Cat dealers also offer Customer Support Agreements and fleet and business management expertise that can help you reduce overall costs and manage your business even more effectively...which may take your success to a whole new level.

\*Refer to Caterpillar Machine Fluids Recommendations SEBU6250 for more information.





**Stage IIIB engineering minimizes additional maintenance and maximizes efficiency to lower operating costs.** Testing and analysis results, along with customer feedback, show that total owning and operating costs have been reduced. This reduction is due to improvements in serviceability. Improvements in fuel efficiency offset costs associated with aftertreatment maintenance.



# STAGE IIIB ENGINE PRODUCT LINE

For more information on these technologies see pages 8 and 9.

	C3.4B	C3.8	C4.4 ACERT	C6.6 ACERT	C7.1 ACERT
					
<b>Power</b>	45–86 bkW (60.3–115.3 bhp)	73 kW (98 hp) & 82 kW (110 hp)	60–130 bkW (80–174 bhp)	89–130 bkW (120–174 bhp)	130–225 bkW (175–300 bhp)
<b>Fuel System</b>	Common Rail	Common Rail	Common Rail	Common Rail	Common Rail
<b>Air System</b>	Single Turbo Smart Wastegate	Single Turbo Mechanical Wastegate	Smart Wastegate	Smart Wastegate	Series/Smart Wastegate
<b>NOx Reduction Technology</b>	Cat NOx Reduction System**	Cat NOx Reduction System	Cat NOx Reduction System	Cat NOx Reduction System	Cat NOx Reduction System
<b>PM Reduction Technology</b>	DOC/DPF***	DOC/DPF	DOC/DPF	DOC/DPF	DOC/DPF
<b>Regeneration Technology</b>	Passive and Active	Passive and Active	Passive	Passive	Cat Regeneration System****

\*Single High-Efficiency Turbocharger below 522 bkW (700 bhp). Series above 522 bkW (700 bhp); first is fixed, second is the new High-Efficiency Turbocharger.

\*\*Also referred to as NRS

\*\*\*Diesel Oxidation Catalyst/Diesel Particulate Filter

\*\*\*\*Also referred to as CRS



C9.3 ACERT	C13 ACERT	C15 ACERT	C18 ACERT	C27 ACERT	C32 ACERT
					
205–305 bkW (275–410 bhp)	287–354 bkW (385–475 bhp)	328–433 bkW (440–580 bhp)	429–571 bkW (575–765 bhp)	597–800 bkW (800–1050 bhp)	705–950 bkW (950–1200 bhp)
Common Rail	MEUI-C	MEUI-C	MEUI-C	MEUI-C	MEUI-C
New High-Efficiency Turbocharger*	New High-Efficiency Turbocharger	New High-Efficiency Turbocharger	New High-Efficiency Turbocharger	New High-Efficiency Turbocharger	New High-Efficiency Turbocharger
Cat NOx Reduction System	Cat NOx Reduction System	Cat NOx Reduction System	Cat NOx Reduction System	Cat NOx Reduction System	Cat NOx Reduction System
DOC/DPF	DOC/DPF	DOC/DPF	DOC/DPF	DOC only	DOC only
Cat Regeneration System	Cat Regeneration System	Cat Regeneration System	Cat Regeneration System	Not Required	Not Required



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# GENERATIONS AHEAD

## PERFORMANCE. RELIABILITY. VALUE.

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For reliable performance, long life, excellent fuel efficiency and reduced emissions, see your Cat dealer and choose Cat Stage IIIB machines. Let us help you meet your economic and environmental objectives, so you can build an even stronger business...today and in generations to come.

