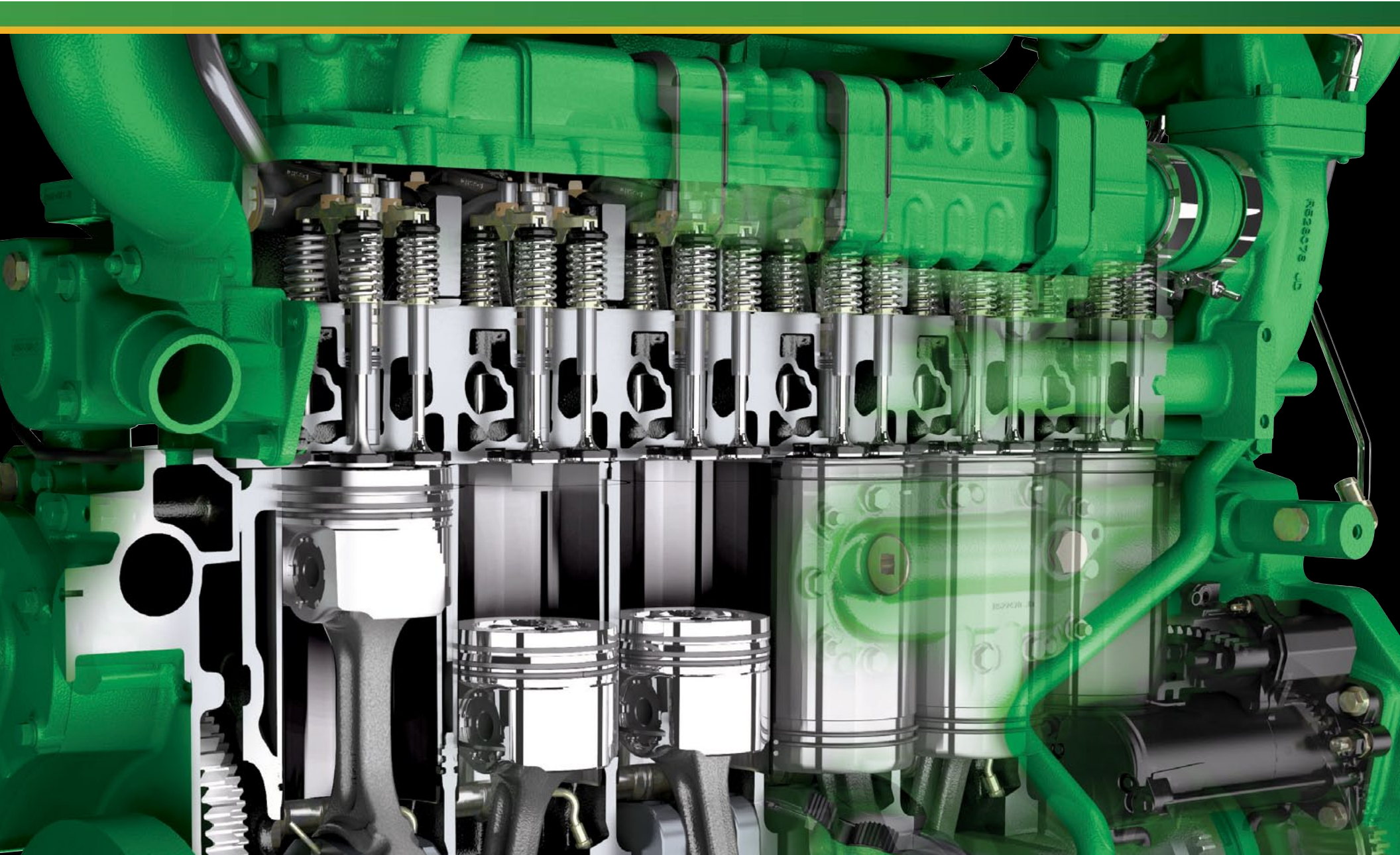


# IT4 Emissions Solutions

New John Deere PowerTech™ Engines, 75 to 560 engine hp



## We've given a lot of thought about IT4 emissions regulations so you don't have to

At John Deere, we understand your concerns about Interim Tier 4 (IT4) emissions regulations. That's why we developed an advanced engine system using cooled exhaust gas recirculation (EGR) and paired it with an exhaust filter. This simple approach to meeting IT4 regulations doesn't compromise on performance, reliability, or ease of operation.

■ **We focus on you.** We're committed to you more than any other agricultural company. In fact, we're the only North American farm-equipment manufacturer that uses the same brand name under and on the hood of our large-horsepower tractors, combines, and other self-propelled agricultural equipment. We're unique in the industry, and our IT4 solution is unique as well. That's because we don't take on-road engines and adapt them for the off-road market. Instead, we use proven technologies and add innovations to build an integrated solution to meet your needs.

■ **We build on success.** We've been working since 1967 to reduce engine emissions. That's 27 years before the current government standards were set. In 1996, we launched the PowerTech™ family of engines to meet Tier 1 emissions regulations. Building on our success, we pioneered the use of many advanced technologies with Tier 2 and Tier 3 engines. Every step of the way we've delivered reliable engines that reduce emissions while providing improved performance and improved fuel economy. It's no different with IT4. You'll get in the cab and go ... just like you do today.

## Cooled EGR: The right choice for IT4

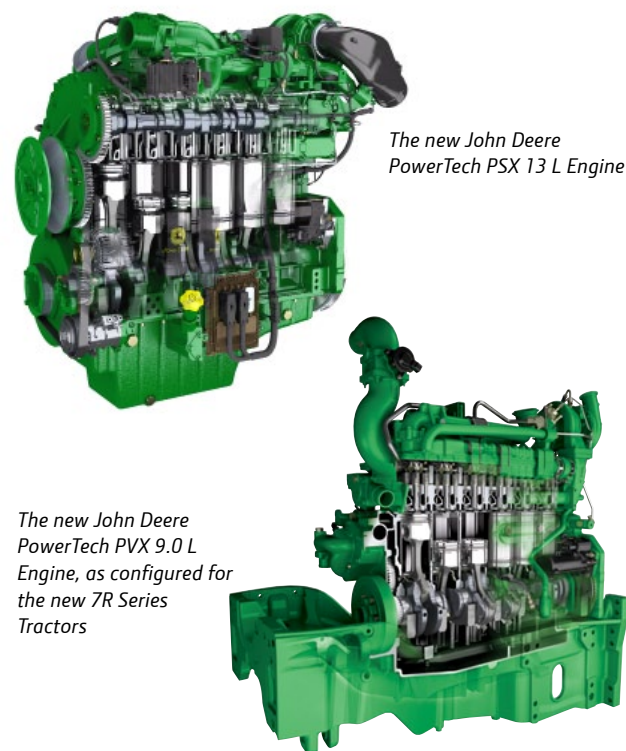
The United States Environmental Protection Agency (EPA) requires diesel engines in new agricultural equipment to meet stringent IT4 emissions regulations. These regulations affect engines with 174 to 750 hp, and require a 90-percent reduction in particulate matter and a 50-percent reduction in oxides of nitrogen emissions from Tier 3 levels.

■ **Particulate matter and oxides of nitrogen.** Particulate matter (PM) is called "smoke" because it comes out of the exhaust pipe in the form of smoke. Oxides of nitrogen, also referred to as nitrogen oxides (NOx), are called "smog" because they contribute to atmospheric pollution.

■ **How cooled EGR works.** As its name implies, cooled EGR cools and mixes measured amounts of exhaust gas with incoming fresh air to lower the engine's peak combustion temperature, thereby reducing oxides of nitrogen to an acceptable level. Exhaust gases are routed through an exhaust filter. Particulate matter is trapped in the filter and – through a process called filter cleaning – oxidized into nitrogen gas and carbon dioxide, then expelled through the exhaust pipe.

■ **The right choice for IT4.** We're using cooled EGR with an exhaust filter because it's simply the right choice for IT4. There's virtually no difference in performance between our Tier 3 and IT4 engines – and that's by design. Many owners of our 2011 8R Series Tractors (our first tractors to meet IT4 regulations) say there's no impact to their operation. What's more, the filter-cleaning process is so simple that you may not notice it happening.

■ **A fuel-efficient solution.** Our cooled EGR approach leverages the proven fuel efficiency of our Tier-3-compliant PowerTech Plus engine platform,

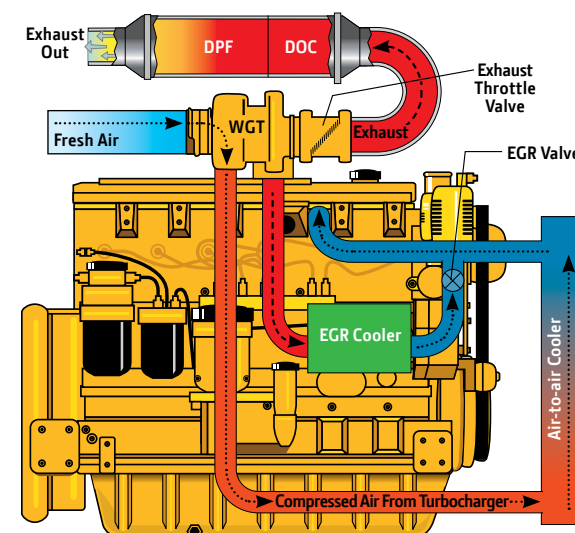


The new John Deere PowerTech PVX 9.0 L Engine, as configured for the new 7R Series Tractors

which achieved best-in-class fuel economy at the Nebraska Tractor Test Lab on the 7030 Series Large-Frame, 8030 Series, and 2010 8R Series Tractors. Our IT4-compliant 2011 8R Series continue to set the pace: The 8335R Tractor built with the PowerTech PSX 9.0 L Engine set new standards in fuel efficiency and power compared to its predecessor, the 8320R,\* and is up to 28-percent more fuel efficient than comparable Tier 3 tractors.

\*John Deere 8335R with PowerShift at 75% of pull at maximum power, 15.45 hp-hr/gal. (Official Nebraska OECD Tractor Test 1990 – Summary 758) compared to John Deere 8320R with PowerShift at 75% of pull at maximum power, 15.11 hp-hr/gal. (Official Nebraska OECD Tractor Test 1963 – Summary 660).

## John Deere PowerTech engine technology



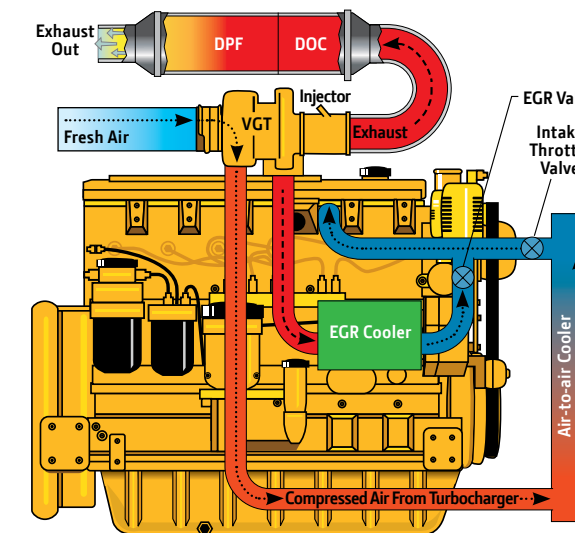
The PowerTech PWX Engine (left) uses a wastegated turbocharger (WGT) while the PowerTech PVX Engine (right) uses a variable-geometry turbocharger. The VGT allows for higher power density, while the WGT allows this in a more compact size.

The advanced designs of the new PowerTech PWX, PVX and PSX engines provide the best IT4 emissions solution for farmers like you. They're built upon the legendary performance of the PowerTech Plus engine platform with all the power and performance you've come to expect from a John Deere.

■ **Increased cooled EGR flow rates.** To meet IT4 regulations, we've increased the cooled EGR flow rates, which are precisely measured by a new venturi and controlled by a new engine control unit. This highly evolved and patented system also provides outstanding fuel economy and improved engine performance.

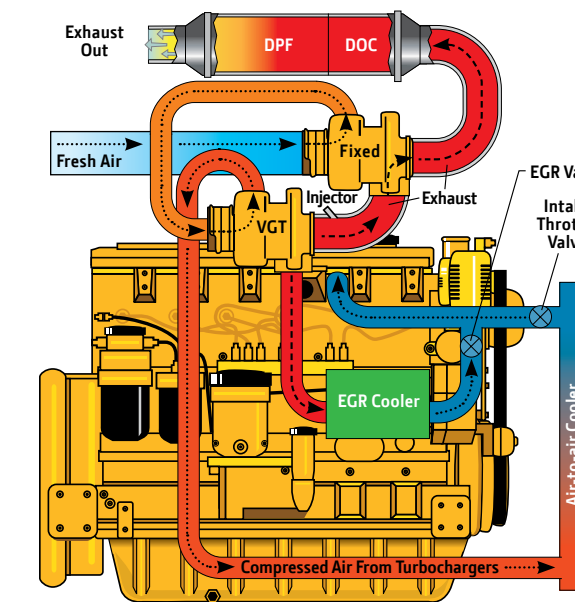
■ **Air-to-air aftercooled aspiration** lowers in-cylinder temperatures, reduces NOx, and increases power density.

■ **Turbochargers** provide outstanding low-speed torque, quicker transient response, higher-peak torque, and fuel



economy. PowerTech PWX engines use a wastegated turbocharger (WGT). The wastegate control device bleeds off a portion of the exhaust flow at higher engine speeds. PowerTech PVX engines use a variable-geometry turbocharger (VGT). The VGT varies exhaust pressure based on load and speed to ensure proper EGR flow. PowerTech PSX engines use two turbochargers in a series, a fixed turbo and a VGT. Two turbos enable much higher intake air pressure and broadens the engine's operating range.

■ **Electronic unit injectors or high-pressure common-rail fuel system.** The PowerTech PSX 13.5 L Engine uses electronic unit injectors, while all other engines are built with a high-pressure common-rail fuel system. Both provide increased fuel pressures for more efficient combustion and PM reduction. These fuel systems provide constant control over fuel injection



The PowerTech PSX Engine uses a fixed turbocharger to broaden the engine's operating range.

variables such as pressure, timing, and duration. Delivering higher injection pressures results in a more complete and efficient combustion to improve fuel economy and helps reduce particulate matter emissions. Other advancements include high-strength steel pistons with an integrated oil-cooled gallery for improved durability, and a four-valve cylinder head for excellent airflow plus greater low-speed torque.

■ **Smart exhaust filter.** While the engine's more efficient fuel-delivery system reduces particulate matter, the exhaust filter removes the remaining particulate matter to meet IT4 requirements. The exhaust filter contains a diesel oxidation catalyst (DOC) and a diesel particulate filter (DPF). The filter automatically cleans itself during normal machine operation. There's little operator involvement during this process and tractor performance is not impacted.



## The John Deere advantage

- **Optimized.** Our approach is optimized to meet current emissions regulations while delivering the performance, reliability, and durability you expect from John Deere.
- **Proven.** John Deere was the first engine manufacturer to widely commercialize off-road Tier 3 cooled EGR diesel engines. We were the first manufacturer to incorporate a cooled EGR system with VGT technologies for off-road use. The new exhaust filter is designed specifically to meet the high demands of off-road applications.
- **Fluid-efficient.** Our cooled EGR approach leverages the proven fuel efficiency of our PowerTech Plus engine platform, which achieved best-in-class fuel economy at the Nebraska Tractor Test Lab on the 7030 Series Large-Frame, 8030 Series, and 2010 8R Series Tractors. The 2011 8335R Tractor, built with the PowerTech PSX 9.0 L Engine, set new standards in fuel efficiency and power compared to its predecessor, the 8320R.\* Our engines operate efficiently with ultra-low sulfur diesel as well as B5-B20 blends, providing optimal performance and fuel-choice flexibility.

- **Integrated.** John Deere designs, builds, and services the engine, drivetrain, hydraulics, cooling system, and other vehicle systems as part of a complete solution to improve performance, convenience, and value. You can count on all the components working together because they were designed in tandem.
- **Fully supported.** With more than 1,600 service locations throughout North America, you're never far away from expert assistance and advice. In addition, John Deere service personnel are highly trained technicians who stay on top of changing engine technologies and service techniques.

\*John Deere 8335R with PowerShift at 75% of pull at maximum power, 15.45 hp-hr/gal. (Official Nebraska OECD Tractor Test 1990 – Summary 758) compared to John Deere 8320R with PowerShift at 75% of pull at maximum power, 15.11 hp-hr/gal. (Official Nebraska OECD Tractor Test 1963 – Summary 660).

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