



**EPA Tier 4 Final:**  
Cleaner Equipment,  
Cleaner Air

# T4F Understanding the Impact of Tier 4 Final

Tier 4 Final (T4F) is the U.S. Environmental Protection Agency's (EPA's) latest step in a series of increasingly strict emissions standards for diesel engines. It has resulted in diesel engines that not only operate more cleanly, but also produce power more efficiently. This brochure will help you understand the T4F regulations and how they affect Miller® diesel engine-driven welder/generators.

## A commitment to a cleaner world

Miller is proud to be part of this historic achievement in improved air quality and equipment performance. As the world becomes more environmentally conscious to care for future generations, Miller has redesigned its diesel engine-driven welder/generator product line to reduce emissions and maximize power output. The result is a full product lineup of exceptionally clean and powerful diesel engine-driven welder/generators.

## New engines, new equipment

Over the years, various emissions regulations have affected engines of all types and sizes. T4F regulations apply to diesel engines up to 75 horsepower. To comply with the regulations, engine manufacturers have modified their engines at virtually every level, from intake systems to injection systems and combustion chambers to exhaust handling. These new engines power a select group of Miller welder/generators in our Big Blue® product line.

## Get the right equipment for the job

It's important to have the right equipment for the job. Having a solid understanding of the jobs on which a new Miller diesel engine-driven welder/generator will be used can help you select the right machine. Demanding tasks such as welding thick metals and gouging with large-diameter carbons may require amperage that only a higher-horsepower machine can provide. Jobs requiring less amperage often can be handled by machines having less than 25 horsepower, which are not subject to the same T4F regulations. This brochure can help you decide which Miller diesel engine-driven welder/generator best matches your jobsite needs.



## T4F Helping Us All Breathe Easier

The EPA's T4F emissions standards are helping to significantly reduce the amount of airborne pollutants produced by diesel engines of all sizes. These pollutants – which include carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), non-methane hydrocarbons (NMHC) and particulate matter (PM, or “soot”) – contribute to poor air quality and potential health problems.

Thanks to the gradual strengthening of emissions standards from Tier 1 (T1) through T4F, the EPA estimates that NO<sub>x</sub> pollutants – a major component of smog – were reduced by about a million tons in 2010 alone. That reduction is the equivalent of removing 35 million cars from the roads. *By the year 2030, the EPA estimates that the cleaner air brought about by T4F regulations will have saved 12,000 lives, plus prevented 8,900 hospitalizations and 1 million lost workdays.*

(Source: <http://www.epa.gov/oecaagct/xfuel.html>)

## A Tiered Approach

### The history of Tier 1 – Tier 4 Final

Many of the engine design strategies used to meet EPA regulations were first developed and tested in on-road diesel engines, such as those that power semi-trailer trucks. On-road diesel engines were the first to be regulated by the EPA, beginning in 1987. The following information summarizes the Tier 1 – Tier 4 Final regulations of off-road diesel engines, such as those that power Miller® diesel engine-driven welder/generators.

### Tier 1

In 1998 and 1999, Tier 1 (T1) regulations impacted diesel engines between 25 and 75 horsepower. T1 regulations restricted the combined output of NO<sub>x</sub> and NMHC, as well as CO and PM emissions.

### Tier 2

Tier 2 (T2) regulations were implemented in 2004. They required even lower NO<sub>x</sub> emissions, plus reductions in NMHC and PM. Required PM reductions were as much as 25 percent for some engines.

### Tier 3/Tier 4 Interim

Tier 3 (T3)/Tier 4 Interim (T4i) standards became active in 2008 and focused on reducing NO<sub>x</sub> emissions by roughly another 37 percent in engines between 50 and 100 horsepower.

### Tier 4 Final

T4F regulations for off-road diesel engines in the 25 to 75 horsepower range are now in place and have reduced PM, CO, and NMHC emissions by 85 percent or more when compared to T4i-compliant engines. Diesel engines with less than 25 horsepower, while not subject to the same T4F regulations as engines having 25 horsepower or more, are still compliant with applicable EPA regulations, producing fewer exhaust emissions and improved output.

# T4F Inside a Miller® T4F-Compliant Diesel Engine-Driven Welder/Generator

Many innovative strategies were used to make diesel engines T4F-compliant. Fewer exhaust emissions are only one benefit; T4F systems also can produce power more efficiently, so the engine's displacement can be reduced, increasing fuel economy without sacrificing power output.

Some of the most significant T4F compliance strategies used in the diesel engines that power Miller welder/generators are shown and explained here.

## High-pressure common rail (HPCR) fuel injection system

This advanced design applies extreme pressure (up to 34,000 psi) to diesel fuel, storing the pressurized fuel in a "common rail" — one that's shared by all of the engine's fuel injectors. When this pressurized fuel exits an injector, it vaporizes into an extremely fine mist that burns more completely.

**Benefits:** Optimizes engine performance with fewer emissions, and greater fuel efficiency.

## Electronic engine controls

These controls precisely regulate the timing and delivery of fuel and adjust the air/fuel ratio to maintain optimal performance under all conditions, including environmental variables such as temperature and altitude.

**Benefits:** Maximizes engine power; minimizes fuel consumption and emissions. Optimizes engine performance throughout a broad range of temperatures and altitudes, giving you more operational flexibility.



## Cooled exhaust gas recirculation (CEGR) system

The pollutant NOx is formed when oxygen and nitrogen in the air react at high temperatures, like those found in an engine's cylinders. The CEGR system captures a small amount of the engine's exhaust, cools it to a lower temperature and diverts it back into the engine's cylinders. This makes fewer oxygen and nitrogen molecules available to chemically create NOx. An electronically controlled switching valve optimizes the CEGR system's operation, ensuring maximum engine performance at all times. This optimized performance has the added benefit of higher power density, which increases both engine torque and fuel efficiency.

**Benefits:** Fewer NOx emissions, improved engine power, greater fuel efficiency.

## Diesel oxidation catalyst (DOC)

The DOC is similar to a catalytic converter found in gasoline-powered automobiles. As diesel engine exhaust passes through the DOC, it reacts with the catalytic material inside. The chemical reaction transforms much of the exhaust into harmless water vapor and carbon dioxide.

**Benefits:** Fewer exhaust emissions; requires no maintenance.

Selecting the right size of welder/generator helps maximize your resource efficiency and reduce your emissions footprint. A careful assessment of your welder/generator's job requirements will help you select equipment with the right output capability – whether it's a machine with 25 horsepower or more that's affected by the new T4F regulations, or an emissions-compliant machine with less than 25 horsepower.

### Models with 25 Horsepower or More

#### Big Blue® 800 Duo Pro and Big Blue® 800 Duo Air Pak™



Our powerful diesel welder/generators offer robust output for welding and power generation and are ideal for dual-operator applications. A premium arc makes it easier to produce high-quality welds in critical applications. Increase productivity and space on your truck, trailer or jobsite with the ability to serve two weld operators at once and run a wide range of tools with the 20 kW generator. The Big Blue 800 Duo Air Pak adds an Ingersoll Rand rotary screw-type air compressor for gouging and operating a full range of pneumatic tools, supplying up to 60 cfm of air at 100 psi with a 100% duty cycle.

- **Better welds on thicker material**, thanks to an improved weld control that increases arc quality and optimizes welding output: up to 800 amps for a single weld operator or 400 amps for each of two weld operators.
- **Takes on big gouging jobs** with 1/2-inch carbons, or two separate 1/4-inch carbons at once in dual-operator mode.
- **Multiprocess capabilities**, including TIG, MIG, FCAW, Stick and CAC-A.
- **Long-life engine** runs at a low 1,800 rpm, which contributes to its reliability and service expectation of 10,000 hours or more of operation.

#### Big Blue® 600 Pro and Big Blue® 600 Air Pak™



The most reliable, versatile machines available to keep your worksite equipment fully functional and make you more productive throughout the day. Tackles tough jobs that require high-output for welding, gouging and auxiliary power. The Big Blue 600 Air Pak adds an Ingersoll Rand rotary screw-type air compressor for gouging and operating pneumatic tools, supplying up to up to 60 cfm of air at 100 psi with a 100% duty cycle.

- **Capable of gouging** with 3/8-inch carbons using the 600 Pro and with 1/2-inch carbons using the 600 Air Pak.
- **Multiprocess capabilities**, including TIG, MIG, FCAW, Stick and CAC-A.
- **Long-life engine** runs at a low 1,800 rpm, which contributes to its reliability and service expectation of 10,000 hours or more of operation.

#### Big Blue® 500 Pro



This welder/generator is both flexible and capable, putting out up to 500 amps of welding power or up to 20 kW of generator power. Ideal for jobs with heavy use requirements, such as structural steel erection.

- **Handles gouging jobs** with 3/8-inch carbons.
- **Multiprocess capabilities**, including TIG, MIG, FCAW, Stick and CAC-A.
- **Long-life engine** runs at a low 1,800 rpm, which contributes to its reliability and service expectation of 10,000 hours or more of operation.

### Models with Less than 25 Horsepower

While not subject to the same T4F regulations as equipment powered by diesel engines having 25 horsepower or more, the welder/generators below are compliant with applicable EPA regulations, producing fewer exhaust emissions and improved output for a wide variety of job requirements.

#### Big Blue® 450 Duo CST™ The power of two Miller® CST 280 welders in a single machine that's a generator, too.



Ideally suited for construction work, such as process piping. Enjoy the productivity and cost advantage of giving two weld operators a full range of TIG and Stick welding operations from one fuel-efficient machine.

- **A capable performer**, ready to handle TIG welding of pipe or plate and Stick welding up to 3/16 inch. Delivers up to 280 amps for a single weld operator, 225 amps for each of two weld operators, or 12 kW of generator power.
- **Less noise, lower emissions and fewer machines at your jobsite.**
- **Long-life engine** runs at a low 1,800 rpm, which contributes to its reliability and service expectation of 10,000 hours or more of operation.

#### Big Blue® 400 PipePro® Get both the power output and advanced arc control technology you need for transmission pipeline work. This welder/generator delivers rugged and reliable performance in harsh conditions and improved arc performance to produce consistent, quality welds.



- **Ideal for the most demanding pipeline jobs.** Handles TIG, MIG, FCAW and Stick processes and is optimized to meet high-strength steel requirements.
- **Solid output**, with either 400 amps of weld power or 10 kW of generator power.
- **Long-life engine** runs at a low 1,800 rpm, which contributes to its reliability and service expectation of 10,000 hours or more of operation.

#### Big Blue® 400 Pro You'll enjoy the flexibility of being able to work on multiple job types with multiple processes with the versatile, powerful performance of the Big Blue 400 Pro welder/generator.



- **More power to help you do more.** With up to 400 amps of output or 10 kW of generator power, the Big Blue 400 Pro can handle most jobs with ease, including gouging with up to 1/4-inch carbons.
- **Multiprocess capabilities**, including TIG, MIG, FCAW, Stick and CAC-A.
- **Long-life engine** runs at a low 1,800 rpm, which contributes to its reliability and service expectation of 10,000 hours or more of operation.

#### Trailblazer® 325 Diesel Get big welding and generating power in a small package. The Trailblazer 325 Diesel is designed to give you strong performance and take up less room, making it perfect for applications where space is at a premium.



- **Serious power from a smaller machine.** Capable of delivering up to 325 amps of output for all applications, and 10.5 kW of generator power.
- **Unbeatable arc performance, multiprocess flexibility** and independent generator and welding outputs make this welder/generator perfect for construction, fabrication and maintenance/repair operations.
- **Strong welder/generator performance and low fuel consumption.** Engine idles at 1,800 rpm and varies speed up to 3,600 rpm depending on the power you need.

#### Bobcat™ 250 Diesel Solid performance with the most popular welder/generator in the industry. The rugged Bobcat 250 Diesel is great for Stick and Flux-Cored welding.



- **Goes anywhere, does what you need** with versatile AC and DC TIG plus MIG, FCAW and Stick capabilities that provide quality welds on all types of metals.
- **Real-world power to get the job done** with up to 250 amps of welding output or 9.5 kW of generator power, the Bobcat 250 Diesel is perfect for most maintenance, repair and construction operations.
- **Strong welding/generator performance and low fuel consumption.** High-speed engine idles at 2,400 rpm and operates at 3,600 rpm for the performance you need.

# T4F Q&A

## Q. What is Tier 4 Final?

A. Tier 4 Final (T4F) is a significant reduction in the EPA's allowable levels of exhaust emissions from diesel (not gasoline) engines. To meet T4F regulations, new diesel engines above 25 hp require significant modifications, including the installation of exhaust after-treatment devices. The result is fewer pollutants emitted by those engines and a cleaner environment.

## Q. Which Miller® diesel engine-driven welder/generators are being affected by T4F?

A. Miller diesel engine-driven welder/generators most affected by T4F include the Big Blue® 400 Pro, Big Blue 400 PipePro®, Big Blue 450 Duo CST™, Big Blue 500 Pro, Big Blue 600 Pro, Big Blue 600 Air Pak™, Big Blue 800 Duo Pro and Big Blue 800 Duo Air Pak.

## Q. Are other countries adopting T4F standards?

A. Each country has its own emissions rules, but only the U.S. and Canada are adopting T4F standards at this time.

## Q. How long has Miller known about these EPA regulations, and what has Miller done to prepare for them?

A. The EPA's first set of emission regulations affecting diesel engines in the horsepower ranges used by Miller had an effective date of January 1, 1998. Since then, increasingly stringent emissions regulations have been implemented. T2 became effective in 2004 and was followed by T3/T4i in 2008. In each case, both Miller and the engine manufacturers made the modifications necessary to ensure full compliance.

Miller has been preparing for the T4F changes, not only by ensuring full compliance of diesel engine-driven welder/generators, but also by increasing the output capabilities of welder/generators. By improving the full line of Miller diesel-powered products, we strive to make more options available to our customers and minimize the impact that the T4F regulations may have on them.

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## Count on Miller to answer your Tier 4 Final questions

This brochure answers many common questions about the Tier 4 Final emissions regulations. If you need additional information, your Miller distributor or Miller district manager will be happy to help; you can also visit our website.

**MillerWelds.com/Tier4**

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