

The Definitive Guide to **DEF**

powerblanket

— BRING THE HEAT™ —

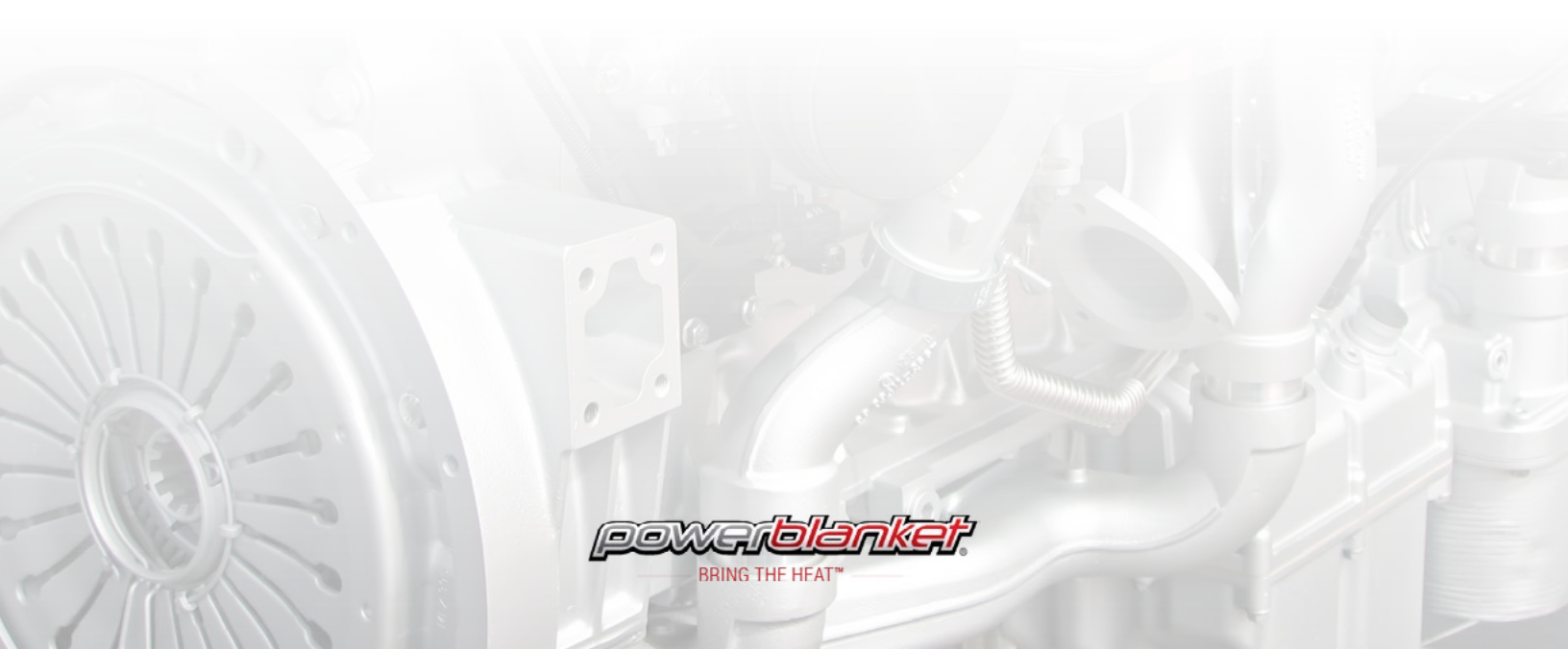
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Ever since the [Clean Air Act](#) went into effect in 1970, the United States Environmental Protection Agency (EPA) has taken the necessary steps to regulate exhaust emissions from various types of vehicles to reduce harmful air pollution.

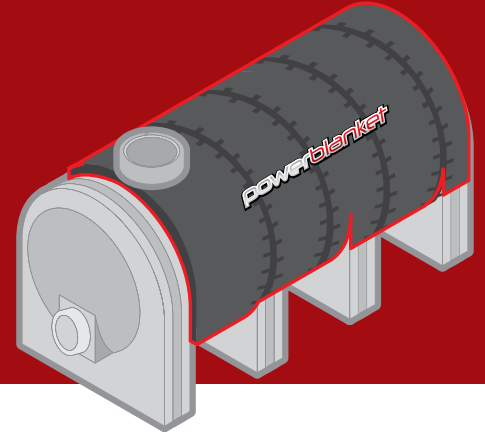
Diesel engines were not always regulated, even though they used to be a big source of hazardous air pollution. But in 1990, the EPA started the [National Clean Diesel Program](#), which set lower emission standards for diesel engines to continue helping reduce harmful pollutants getting into our air to better protect human health. In response to these new standards, engineers took it upon themselves to come up with a technology to make safer, more efficient exhaust treatment system for diesel engines. That technology is Selective Catalytic Reduction (SCR) that uses diesel exhaust fluid (DEF).

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What is DEF?



DEF isn't a fuel or a fuel additive, and it's also nonflammable, nontoxic and non-explosive. DEF is a synthetically made clear, non-hazardous liquid solution. It's made up of roughly one-third high-purity urea and two-thirds deionized water and weighs about 9 lbs. per gallon.

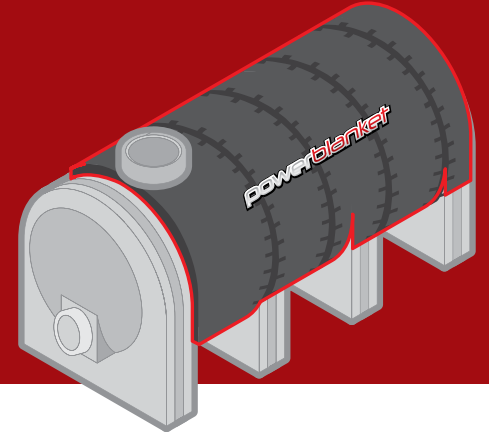
Benefits of Using DEF

Besides putting off harmless nitrogen and water into the Earth's air, DEF is known for being beneficial to the user, the vehicle and the environment in several other ways. The following are some of the other benefits of using DEF:

- Better fuel efficiency
- More optimized combustion
- Less wear on the engine
- Less maintenance
- Increased power
- Very reliable

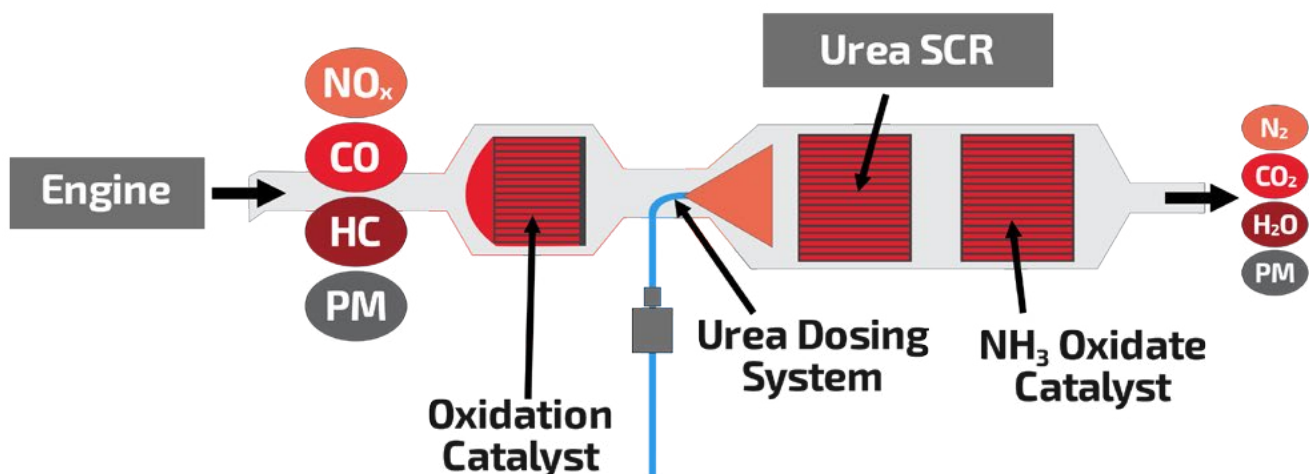
Another thing to note about DEF is that if you happen to get any on your hands or any other part of your skin, you can easily wash it off with soap and water without any harmful effects. But, DEF can stain your clothes, so if you spill it on your clothing be sure to immediately rinse that spot off with water.

Why SCR?



The SCR technology uses a catalytic reaction that breaks down any dangerous oxides of nitrogen (NO_x).

An SCR system's main parts include the SCR catalyst, injection unit, tank and dosing control unit. SCR is able to work by chemical reactions triggered by heat. These chemical reactions need a continuous feed of ammonia gas. In vehicles, SCR delivers that needed ammonia through DEF. Small amounts of DEF are injected into the exhaust stream by spraying and then the DEF vaporizes and decomposes to become ammonia and carbon dioxide. The ammonia is what works with the SCR catalyst to convert the harmful NO_x emissions diesel engines produce into harmless levels of nitrogen and water vapor.

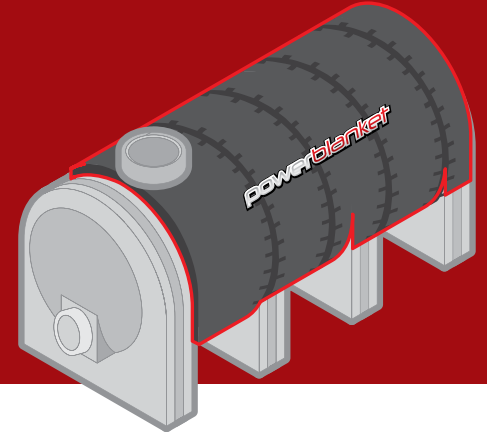


Most diesel pickups, trucks and SUVs that are a year model 2010 or newer have the SCR system. Several truck and engine manufacturers choose SCR as their leading technology choice because it allows them to meet the EPA's 2010 diesel emission standards for heavy-duty trucks.

SCR not only converts dangerous emissions into harmless ones, it also helps get rid of the strong diesel fuel smell and produces major fuel cost savings for the vehicle owner.



Handling DEF



When it comes to handling DEF, you need to know four things:

1. How to use it
2. How to care for it
3. How to protect it
4. Government regulations regarding it

We'll go over all you need to know to make sure you have and understand all the need-to-know details regarding how to properly handle DEF.

Using It

DEF is stored inside a tank on your vehicle. The nozzle pistol and filler cap of the DEF tank should both be clearly marked so you never forget or accidentally put DEF in the wrong tank or put diesel fuel in the DEF tank. Fortunately, most filling stations have different pump nozzle sizes, so a diesel pump nozzle will not fit inside a DEF tank. Once your DEF tank is filled and your vehicle is on and moving, the DEF is injected into your vehicle's exhaust stream through a SCR system, like we mentioned above.

Truck stops and retail locations throughout the United States are where you can purchase DEF at the pump or in jugs. There are also fleet suppliers who deliver DEF to your work facility in either jugs, drums, totes or in bulk. DiscoverDEF.com has a Retail DEF Search page and a Fleet Supply page that let you select your criteria to find a supplier with the type of DEF nearest you.

The cost of DEF depends on the location you buy from, the supply method and how much you purchase at once.

In terms of consumption, DEF consumption is measured by ratio of diesel fuel use. The typical DEF consumption rate is about 3 percent per diesel fuel gallon, meaning that your DEF tank is a lot less than your diesel fuel tank and you will use about 2.5 gallons for every 350 or so miles you drive.

Caring For It

Caring for DEF has a lot to do with storing it.

If you're not a pump purchaser and you have containers of DEF at home or work, you need to be sure the DEF is stored in a tightly sealed package inside a well-ventilated storage area. The storage temperature can be anywhere between 12 and 86 degrees Fahrenheit, but the ideal, recommended storage temperature is between 40 and 80 degrees Fahrenheit. When stored at the proper temperature, DEF's shelf life is two years. If you live somewhere that gets really cold at certain hours of the day or during certain times of the year, you need to find an effective storage and heating solution for DEF to keep it from being ruined.

Most publicly available DEF is a 32.5% concentration. At that concentration, DEF freezes at 12 degrees Fahrenheit. Though it may gel up at temperatures below 12°F, quality isn't affected by the freezing or thawing out after it freezes. Should your DEF freeze, warm the storage container it's inside until it thaws the DEF back into its normal liquid state.

You also want to keep DEF out of direct sunlight to keep it from overheating. If your DEF and its container do overheat, simply chill the container, which should be tightly sealed, by spraying it with cold water until it returns to the desired temperature range. Storing DEF above 77°F and in direct sunlight has been shown to reduce the shelf life from 2 years to less than 1 year.

When you need to internally clean or prime your DEF containers and equipment, use deionized water to wash them to remove the sediment or any built up deposits you see.

Protecting It

The following is a list of do's and don'ts with DEF.

- Don't let DEF get contaminated by coming in contact with foreign materials. DEF purity needs to be maintained, so it is important that you take caution to avoid contaminating your DEF fluid or your holding tank(s). Failure to do so could lead to costly repairs of your SCR system and increased pollution in the air.
- Never put diesel in your DEF tank.
- Don't mix DEF with other fuels, oil, tap water or other liquids.
- Keep all your DEF equipment clean and free from getting dirty or dusty.
- Only use DEF equipment dedicated to DEF to store or refill DEF.
- Store DEF between 12-86 degrees Fahrenheit to ensure optimal shelf life.



EPA Regulations

As noted at the beginning of this eBook, the EPA sets and monitors [diesel fuel standards](#) and regulations regarding the use of DEF.

There are standards for highway and offroad diesel fuel vehicles, as well as locomotive and marine diesel fuel vehicles.

Since 2001, there have been several diesel fuel related statutes. The most recent is the Tier 3 Vehicle Emission and Fuel Standards Program [2015 Amendments Direct Final Rule](#), published on February 19, 2015, which set new diesel fuel restrictions of which you should be aware.

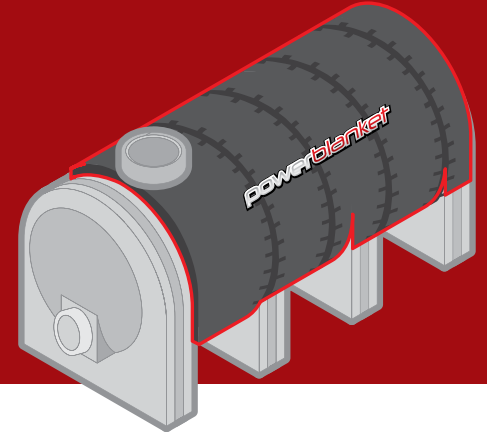
Tier 3 Vehicle Emission and Fuel Standards Program “is part of a comprehensive approach to reducing the impacts of motor vehicles on air quality and public health. ... The vehicle standards will reduce both tailpipe and evaporative emissions from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles.”

In addition, the EPA set [standards for diesel fluid systems](#). These final rules regarding SCR maintenance were published on August 8, 2014, and state that minimum fluid refill intervals are:

- 4,000 miles for all light-duty vehicles and trucks that use an SCR system
- at least as far as the vehicle’s fuel capacity lasts, be that in miles or hours, for heavy-duty engines.

If you ever are curious or concerned with EPA standards and regulations you are required to follow, visit the [EPA website](#) or [contact them](#).

Challenges with DEF



Long term storage, bulk storage, and fueling

Many fleets and transportation companies store DEF for their trucks inside mobile IBC 330g and 275g totes, outside in their fuel islands - where, in cold climates, the DEF is prone to freezing. For smaller fleets and many in the Agriculture industry, DEF might be stored in 55g drums. DEF is even more prone to freezing in this smaller quantity, even inside a shed or barn.

Some larger fleets store DEF in larger containers, even 3,000-10,000g holding tanks. This is great because they save money by buying in bulk and having fewer service calls from their providers. However, these tanks often freeze as well.

Frozen DEF

One of the biggest headaches people in really frigid locations frequently encounter is when DEF freezes inside the truck tank. Truck manufacturers have solved this problem while the trucks are operational by running the coolant system through the DEF tank. Unfortunately, in very cold situations, DEF can freeze solid overnight. When this happens, the truck sensor thinks the truck is out of DEF and drivers risk the truck going into “limp” mode. If this happens it can lead to a tow bill, a shop bill and perhaps more costly, a delayed shipment. Stories abound of truckers stranded until they were able to thaw the DEF inside the tank and get the truck running. It might take an hour or two of idling to melt the frozen DEF popsicle inside the tank.

Powerblanket has created a solution. We have several heated and insulated covers that can be plugged in overnight to prevent this from happening and save late shipment penalties, headaches in the shop and the lost time that may result from frozen DEF.

Conclusion

Whether your everyday vehicle or your work vehicle uses DEF, you need to know how to properly use it, care for it and meet EPA regulations.

At Powerblanket, we understand the purpose and need for diesel exhaust fluid to keep our air quality as safe and pollutant-free as possible. And in order for DEF to work how it is supposed to, it needs to be properly stored at the right temperatures. So, if you live in a cold-climate area, our [DEF tote heaters](#) and custom-on vehicle heaters are the ideal solution to keeping your DEF fluid and functional, saving you money, time and energy in the process.

CONTACT US

Sources:

<http://www.discoverdef.com/def-overview/faq/#mixdiesel>

<http://us.air1.info/en/all-about-def/what-is-def/>

<http://www.yara.us/nox-reduction/def-for-vehicles/diesel-exhaust-fluid-for-commercial-vehicles/diesel-exhaust-fluid-handling-and-storage-guide/>

<http://www2.epa.gov/diesel-fuel-standards>