FUEL ECONOMY

CREATING
OPTIMAL PERFORMANCE

DEMAND IT ALL

DETROIT™
DEMAND PERFORMANCE™

WHAT GOES UP
DOESN'T ALWAYS COME DOWN.

You know what we're talking about. Rising fuel prices are constantly in the news, and if you're running one truck or a thousand, those prices are on your mind as well. It might seem out of your control, but there are some things you can do about it. Quite a few, actually. That's because as much as 70% of fuel economy is affected by factors that you can address and correct. So, no matter where you stand today in regard to your fuel economy, you can almost always find areas of improvement.

In fact, since fuel and fuel efficiency represent one of the highest operating costs that fleets and owner operators have, tracking fuel economy and taking action to optimize it is critical.

As the price of diesel continues to go up, making the most out of every mile becomes even more important for the health of your business.

BLUETEC® EMISSIONS TECHNOLOGY

WE KNOW A LITTLE SOMETHING ABOUT FUEL ECONOMY.

Detroit™ engines have long been recognized as the fuel economy leader in the trucking industry. As emission regulations became tougher with EPA 2004, EPA 2007 and EPA 2010, our engineers met these regulations while maintaining performance, reliability and most importantly, fuel economy standards. And with improvements to our powertrain components including the updated BlueTec® emissions technology, Detroit is ensuring its place in the market as the fuel economy leader. In fact, every new Detroit engine we build is 2013 OBD (OBD13) Certified and compliant with 2014 Greenhouse Gas (GHG14) regulations – all with the power and efficiency you demand.

But our commitment to fuel economy doesn't stop with engineering or manufacturing. It continues well past the initial sale to research and testing to help you operate more profitably and efficiently. Understanding the factors that affect fuel economy is critical in helping you achieve the best results.

GOOD SPEC
+ GOOD DRIVING
= GREAT FUEL ECONOMY

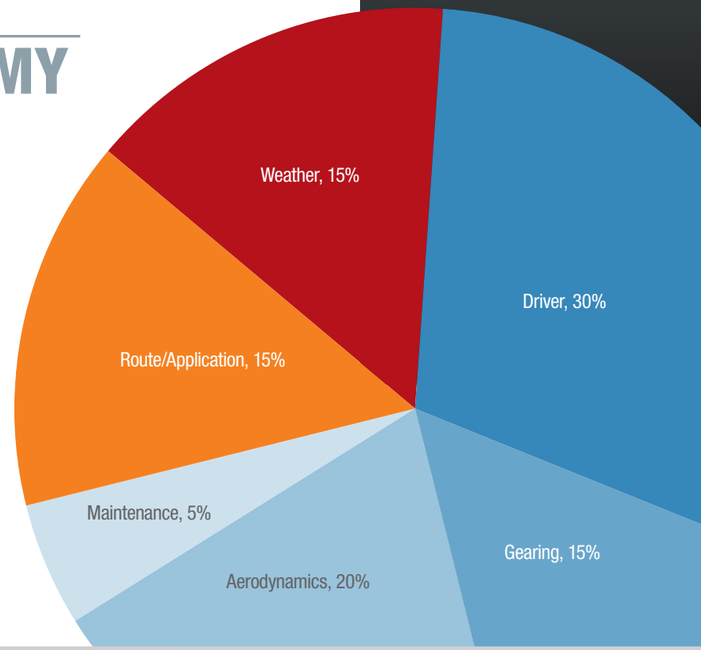
LEARN WHERE TO FIND EFFICIENCIES:

Controllable Factors
- Driver
- Gearing
- Aerodynamics
- Maintenance
- Powertrain Spec

Semi-Controllable Factors
- Route/Application
- Engine Break-In Effect

Uncontrollable Factors
- Weather
- Environment

FACTORS AFFECTING FUEL ECONOMY
- Controllable
- Semi-controllable
- Uncontrollable



GOOD DRIVERS ARE HARD TO FIND.

TOP TEN TIPS TO FUEL ECONOMY:

- Slow down
- Keep RPMs low
- Anticipate hills and traffic
- Reduce stops
- Avoid idling
- Minimize accessory loads
- Reduce trailer gap
- Use progressive shifting
- Stay in top gear
- Use cruise control

DON'T FORGET THE IDLE.

You can do all the right things on the road and still not see big efficiency gains if you ignore idling. At idle, the engine can burn from one half to over a full gallon every hour depending on idle speed. Not to mention increased wear and tear on the engines. So, if you're going to be there more than five minutes, shut it down. And since today's engines don't need idling time to warm up or cool down except in the most extreme conditions, once you build air pressure, it's time to go. Your bottom line will appreciate it.

USE THE CRUISE CONTROL.

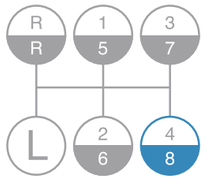
When it comes to maintaining speed and efficiency, nothing works better than cruise control. Even small variations in foot pressure on the accelerator pedal can have sizeable effects on efficiency, which is why cruise control can improve fuel economy as much as 6% over manual speed control.

To enhance the benefits of using cruise control, the DDEC system on Detroit engines also has a Soft Cruise setting, which reduces the overall fueling required to operate a vehicle in cruise control by delaying full-load torque requests until the vehicle has slowed to a speed slightly less than the set cruise speed. Using Soft Cruise can deliver up to an additional 1% on top of normal cruise control fuel savings.

KEEP THE REVS DOWN.

In the heart of every RPM speed band are what we like to call fuel economy sweet spots. By staying in this area, and using the engine's torque – instead of its horsepower – to do the work, you can easily boost fuel economy. In fact, taking your engine above 1500 RPM wastes fuel without providing any performance benefit, while every 100 RPM reduction in engine speed equals approximately a 2% gain in fuel efficiency.

So, be patient when you're pulling a long grade, and always ease into the throttle so you use just enough RPMs to get into the next gear. This is especially true with automated transmissions, where the more the throttle is applied, the higher the engine speed will climb before the transmission will upshift.



TOP GEAR. IT'S VERY EFFICIENT.

It seems like a given, but staying in top gear saves fuel. Because when using top gear, your engine operates at a lower RPM. That means there's less load on the engine, which results in less fuel being used. In other words, if your drivers can get over a hill without downshifting, they shouldn't downshift. That's why we design Detroit engines to pull strong down to 1000 RPM and provide the power to get you over that hill. It just makes financial sense.

ANTICIPATE THE ROAD AHEAD.

Steady momentum is good, and managing the road allows drivers to be easy on the brakes and the throttle. After all, every time you stop – or even slow down – it costs you. With a 70,000-pound load, accelerating from a complete stop burns at least one-quarter of a gallon of fuel. So try to make one stop for meals, refueling and breaks.

SO WE'LL ALL HAVE TO MAKE A FEW MORE.

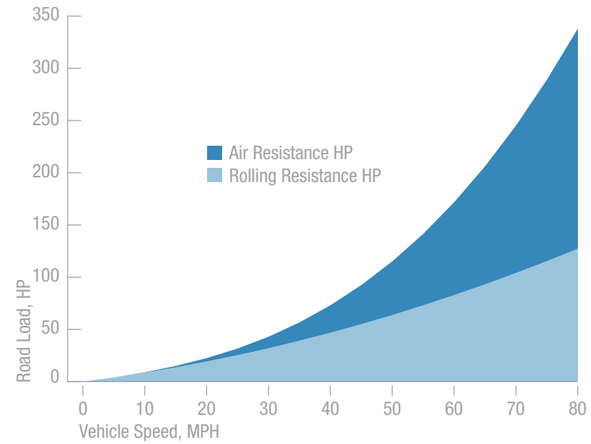
We all know how hard it is to find a good driver. But when it comes to maximizing fuel economy, there's nothing more important. After all, optimizing driver habits alone can improve fuel economy by up to 30 percent.

To make sure their performance is as good as it can be, take the time to educate drivers on the role reduced highway speeds, shorter idle times and proper gear selection play in improved fuel economy. Or see the top ten tips at left and show them all the ways you can operate more profitably.

SLOW AND STEADY WINS THE PROFITABILITY RACE.

The greater the speed, the greater the aerodynamic forces exerted on a vehicle. This means your engine works harder and uses more fuel. It's also important to consider that fuel consumption increases exponentially as speed increases. For instance, a truck traveling 70 MPH uses much more than twice the fuel as a truck operating at 35 MPH. The chart at right demonstrates the relationship between speed and fuel consumption. For example, throttling back only 5 MPH can result in a fuel savings of up to 10%.

To help this, some fleets will program engines to limit the top speed of the vehicle. Additionally, modern engines have several electronic engine parameters that can be programmed to help lower vehicle top speed. This can help the driver develop new driving habits, which ultimately result in better fuel economy.



EFFECT OF LOWER SPEEDS ON FUEL ECONOMY

Average Speed	w/ Excellent Aero	w/ Poor Aero
1 mph slower	1% – 1.5%	2% – 3%
5 mph slower	5% – 8%	10% – 15%

A GREAT ENGINE
IS ONLY PART OF GOOD EFFICIENCY.

Advances in powertrain engineering have led to engines that run quieter, cleaner and more efficiently than any that have come before. Best of all, they're doing it without a loss in power over earlier models. Though selecting a new engine is a great first step, to maximize efficiency you need to look at your entire powertrain and how it's spec'ed for the job you do.

GEARING BEST PRACTICES

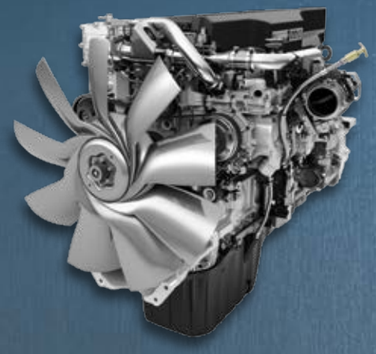
Improvements in fuel economy can be achieved at the expense of performance. Similarly, improvements in performance can be achieved at the expense of fuel economy. Fleets usually favor better fuel economy while owner operators prefer better performance. The best practice, however, is to gear for balanced performance and achieve the greatest fuel economy while retaining the power to get the job done. Your Detroit representative can help you choose the right gearing and the right RPM for your application.

PLAN UP FRONT FOR PERFORMANCE DOWN THE ROAD.

Developing a good spec is the first step in building any new truck. Be sure to gear vehicles correctly and choose an engine rating that's best for your job at hand. An under-powered truck works harder than it has to, and an over-powered truck produces power it doesn't need. Either way, extra fuel is burned.

Also, ensure that your transmission and axle ratios are optimized for your application. If you're going to be hauling heavy loads up inclines for short distances, your needs are going to be quite different than those of a long haul tractor. Load factors should also be a primary consideration when spec'ing to determine the best power ratings and ratios. For help with correctly spec'ing your truck, contact your local Detroit™ dealer, distributor or representative.

MEET A TRIO OF HIGH PERFORMERS.



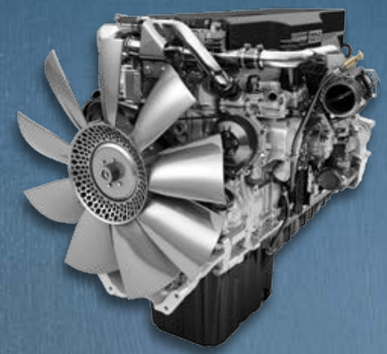
DETROIT DD13

STATS

12.8L 350-470HP 1250-1650lb-ft

Designed specifically for LTL, vocational or regional trucking needs, driving the Detroit™ DD13® engine means you no longer have to choose between great fuel economy, serviceability and performance.

The DD13 provides the longest service intervals in its class, along with easier serviceability, all in a fuel-efficient design that offers a B-50 life of one million miles and improved fuel economy by integrating groundbreaking technologies, such as the Amplified Common Rail System™ (ACRS™) and an advanced cooling system.



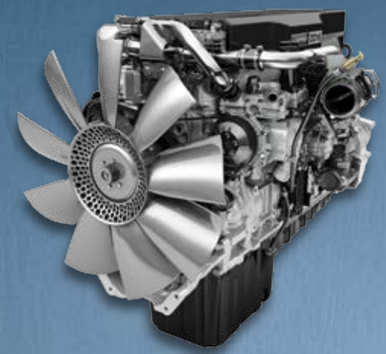
DETROIT DD15 TC

STATS

14.8L 455-505HP 1550-1750lb-ft

We designed the Detroit™ DD15® TC engine from the block up with integrated features like an Exhaust Gas Recirculation (EGR) system and BlueTec® emissions technology to make it one of the most fuel-efficient engines available today. It offers the perfect blend of horsepower and torque, making it perfect for long haul applications. In fact, the innovative design of the DD15 TC delivers 90% of peak torque in just 1.5 seconds, so you burn less fuel even fully loaded.

The DD15 TC also delivers fuel economy with extended service intervals and a B-50 life of 1.2 million miles. The bottom line: all your performance and business demands are met.



DETROIT DD16

STATS

15.6L 475-600HP 1850-2050lb-ft

The biggest, toughest and most powerful engine we've ever created, the Detroit™ DD16® engine drives like the heavy-duty diesel you've always wanted. A vocational workhorse made for extreme loads, the DD16 has the power to deliver, with an amazing torque curve that pulls down to 1000 RPM, letting you hang in top gear longer.

It offers a B-50 life of 1.2 million miles, and with advances like our exclusive Amplified Common Rail System (ACRS) and BlueTec emissions technology, the DD16 produces a combination of power and efficiency that until now has been unheard of.

THE ENGINE BREAK-IN EFFECT

As you know, many engines – not to mention transmissions and axles – require a break-in period of about 25,000 miles. Making fuel economy comparisons prior to the end of this break-in period won't give you accurate information on your efficiency.

Also, putting vehicles into service in colder months will show the poorest cumulative MPG characteristics as a result of seasonal and "break-in" impacts. If your engine requires break-in, continual evaluations after the proper break-in period will result in the best guide to your efficiency performance.

SMART ENGINES KNOW
WHAT IT TAKES TO BE EFFICIENT.

When you have a Detroit engine under the hood, you get more than just an engine. Our DDEC® electronics system monitors and manages all engine functions for peak performance and efficiency. We've been building electronically controlled engines since 1985, so we know a thing or two about making them perform their best.

With DDEC, there are several options and features available to fleet managers that will help their drivers improve fuel economy. These features will better control engine idling, shifting techniques and after-treatment management. If you need help to correctly set these engine features, contact your local Detroit dealer, distributor or representative.

PROGRESSIVE SHIFTING

Keeping engine speeds low improves fuel economy. This is also true when accelerating through the gears. This technique is called progressive shifting. All drivers should practice progressive shifting, but with DDEC, fleet management can ensure they do.

We created the DDEC Progressive Shifting feature to limit the vehicle's rate of acceleration above the set engine RPM to encourage the driver to upshift into the next gear. And once the vehicle speed has reached the high range, the set engine RPM limit will prevent the driver from making any early downshifts, maximizing the use of top gear.

AUTO-ELEVATE

The Diesel Particulate Filter (DPF) is an integral component of the BlueTec aftertreatment system. That's why we've put measures in place that will protect the DPF for those customers who need to idle for extended periods. With the Auto-Elevate feature enabled, the DDEC monitors the amount of unburned fuel collecting in the DPF and automatically increases engine speed to safely remove it. The result is increased efficiency and maximum system uptime.

For all fleets not using Power Take-Offs, we recommend enabling the Auto-Elevate feature and educating drivers on its operation.

IDLE SHUTDOWN

As we discussed earlier, unnecessary idling wastes fuel and money. It also results in excessive engine wear, additional pollution and can pose a health risk to drivers.

All DDEC engines have an option to automatically shut down after a specified period of idle time. Several shutdown modes and overrides can be selected based on your specific needs.

AMBIENT AIR TEMPERATURE OVERRIDE

This DDEC option allows the shutdown override to be disabled based on the ambient air temperature. By setting upper and lower temperature limits, your fleet manager can control when the driver may override the idle shutdown, allowing continuous idle to maintain comfort in periods of extreme temperatures.

OPTIMIZED IDLE

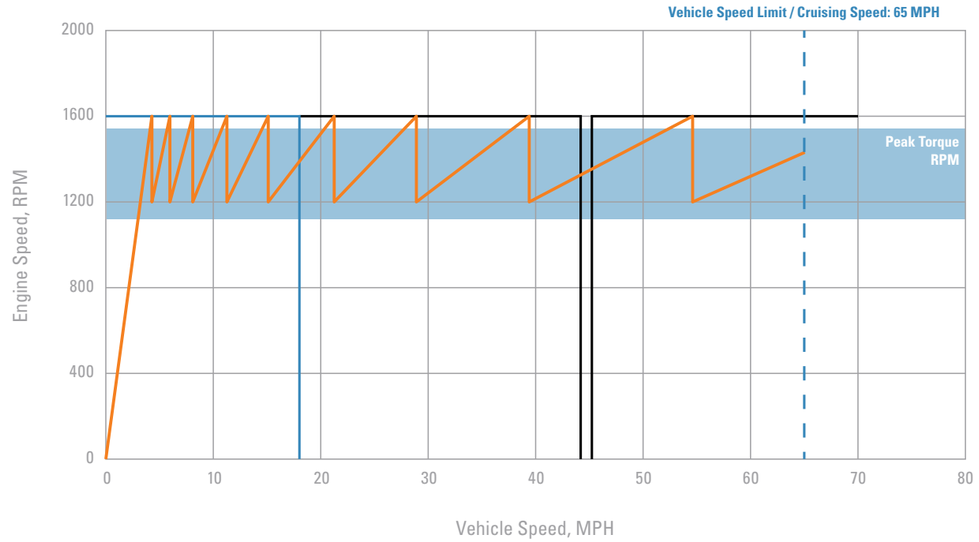
The DDEC Optimized Idle feature reduces engine idle time by running the engine only when required. Optimized Idle automatically stops and restarts the engine to accomplish the following:

- Keep the engine oil temperature between factory set limits 60 – 104°F (16 – 40°C)
- Keep the battery charged >12.2 V (12 V system)
- Keep the cab/sleeper of an on-highway truck at the desired temperature (using the optional thermostat)

Other benefits include overall reduction in exhaust emissions and noise, and improved starter and engine life by starting a warm engine and eliminating starting aids.

Idle Time and Reduction in Fuel Economy
Zero Idle Time vs. 10% = 2-3% (with Air Conditioning On @ 1,000 RPM)
Zero Idle Time vs. 25% = 3-6% (with Air Conditioning On @ 1,000 RPM)
Zero Idle Time vs. 50% = 7-10% (with Air Conditioning On @ 1,000 RPM)
Zero Idle Time vs. 10% = 2-3% (with Engine Only @ 700 RPM)
Zero Idle Time vs. 25% = 3-6% (with Engine Only @ 700 RPM)
Zero Idle Time vs. 50% = 7-10% (with Engine Only @ 700 RPM)

PROGRESSIVE SHIFT SCHEDULE



EVERY GOOD RELATIONSHIP NEEDS A LITTLE GIVE AND TAKE.

Knowing all the demands placed on today's drivers, it's good to give a little something back to get the best performance. DDEC-controlled engines can help with several features designed to reward drivers with extra road speed for fuel-efficient behavior.

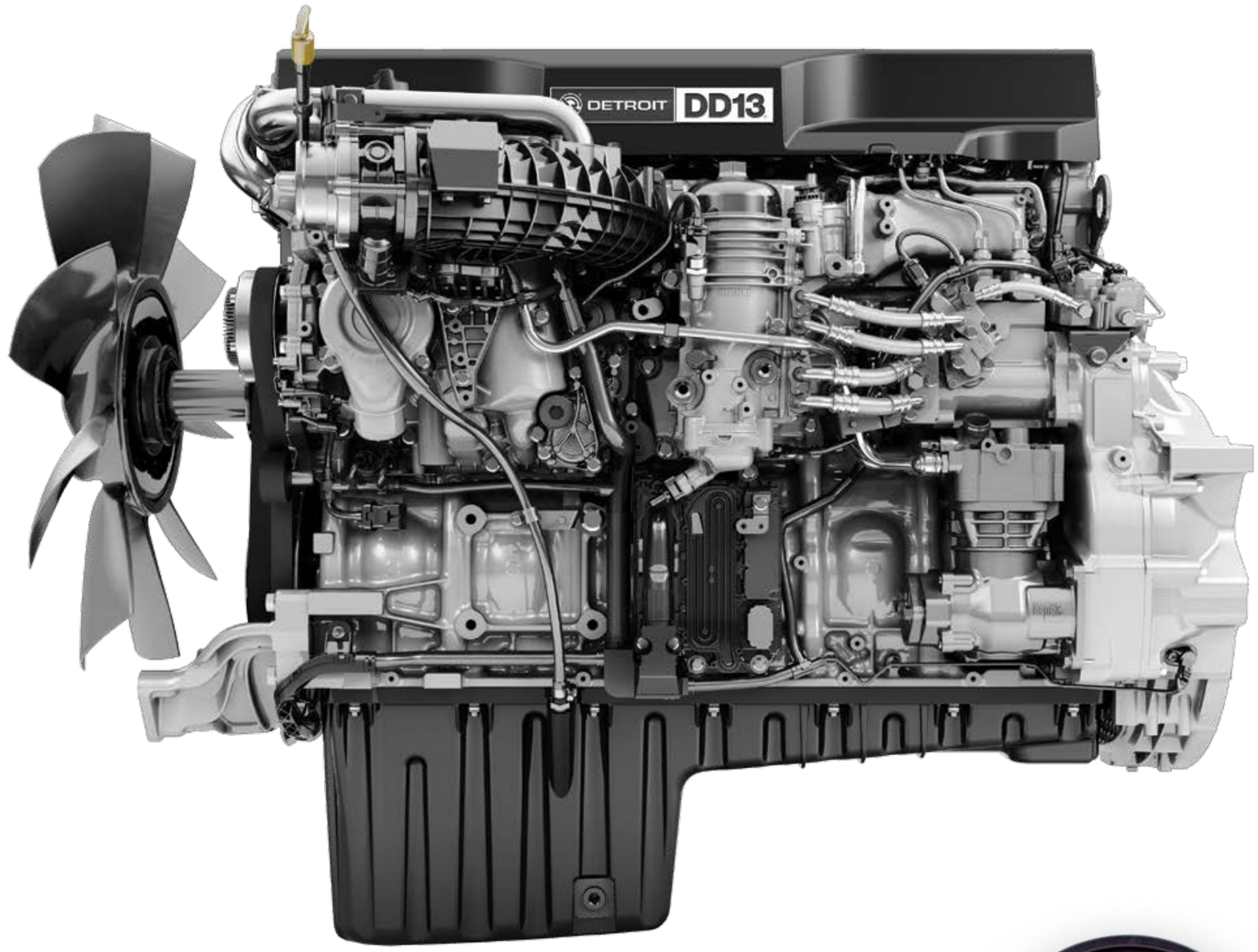
These features can be used alone or in combination to design a driver's rewards program that is right for them. Just remember that when you give back some speed to the driver, you'll also be giving back some fuel economy gains.

FUEL ECONOMY INCENTIVE

The Fuel Economy Incentive (FEI) feature allows fleet managers to establish fuel economy targets, and rewards drivers who exceed the goal with incremental increases in maximum road speed. The more the driver exceeds the target, the more road speed he can earn, up to the chosen maximum MPH.

COMMON DRIVER REWARDS

The Common Driver Rewards (CDR) feature is similar to the FEI, but uses cruise control usage and/or top gear time as the performance targets for incremental increases in maximum road speed.



PASSMART

The PasSmart feature gives fleet managers the ability to provide drivers the additional road speed they need to pass other vehicles while still maintaining a fuel-efficient, safe road speed limit. The additional road speed is only available for a limited amount of time and it's up to the driver to use it effectively.

THE HIGH COST OF SPEED

Nothing has a larger effect on your operational cost than speed. Every 5 MPH costs you about 0.5 MPG – and speeding, rapid acceleration and braking can lower your fuel economy by as much as 33% at highway speeds and 5% around town.

With 150,000 miles driven, reducing speed 10 MPH can save 2,857 gallons a year. At $4.00 a gallon, that's a savings of $11,428.

THE UNSURPASSED STYLE OF MAXIMUM EFFICIENCY.

Roof Cap and Extenders, 1%
Trailer Bull Nose, 3-10%
Aerodynamic Mirrors, 1%
Match Cab and Trailer Height and Width, 10%
Remove Sun Visor, 1%
Trailer Gap, 4%
Driver Training, 10%
Underhood Air Cleaner, 1-2%
Angled or Rounded Trailer Corners, 2%
Remove Bug Deflector, 1%
Cab Side Extenders, 3%
Remove Auxiliary Mirrors, 1%
Engine Lubricants, 1%
Fifth Wheel Height, 2%
Aero Wraparound Bumper, 2%
Axle Lube, 1%
Tire Alignment and Inflation, 2%
Fuel Efficient Tires and Wheels, 5%

Savings are measured individually and are not cumulative. Actual percentages may vary due to external factors and methods of measurement.

As your vehicle moves down the road, gravity and wind resistance work in opposition. This is known as drag. While you can't do much about gravity, you can make sure your truck is aerodynamically optimized to reduce drag and increase fuel economy.

It's important to note that aerodynamic drag grows exponentially with increased vehicle speed. And while aerodynamics is a factor in every application, it has a greater effect on long-haul applications where trucks are traveling at higher speeds over a longer period of time. That's why the reduction of aerodynamic drag for on-highway vehicles is even more important, as it greatly decreases the energy output required of the engine, resulting in improved fuel economy.

MIRRORS

Choosing aerodynamically styled mirrors can offer a significant reduction in resistance compared to more traditional mirrors.

AIR CLEANERS

While external air cleaners look great as a chrome accessory, they don't do much for aerodynamics. Underhood air cleaners offer no wind resistance and generally save time when they need replacement.

CAPS AND EXTENDERS

There are multiple roof cap and side extender options available to direct air above and around your trailer for reduced drag and improved fuel economy, no matter what type of load you haul.

TRAILERS

By reducing trailer gap and matching the trailer to the cab height and width, you minimize the areas where wind can cause drag. The results can be very profitable.

A WELL-MAINTAINED TRUCK IS A WELL-PERFORMING TRUCK.

Maintenance is critical to the long-term performance of your investment. But what many don't realize is this maintenance is also important to the fuel economy performance of your vehicles. Most maintenance pays for itself just in the money saved through better efficiency because by properly maintaining your equipment, you can improve fuel economy and reduce costs. Here you'll find a few of the most important maintenance services you'll need to stay on top of to optimize efficiency.

AIR CONDITIONING COMPRESSOR OPERATION AND FAN-ON TIME

About 50% of total fan-on time can be attributed to the air conditioning compressor. The more time you operate your vehicle with the fan on and the air conditioning compressor running, the more power you'll need from the engine, and the less power the engine has to move the load. This means that the engine has to work harder to move the load, consuming more fuel in the process.

LUBRICANTS

Maintaining lubricants is extremely important for the functionality and efficiency of an engine. And using synthetic lubricants takes this functionality and efficiency to another level. That's because synthetic lubricants are specifically manufactured for superior temperature stability and improved viscosity at low temperatures, reducing pumping and spin power losses. Which, you guessed it, improves fuel economy.

OTHER MAINTENANCE REQUIREMENTS

Be sure to check your manufacturer guidelines for general maintenance recommendations. The following is a partial list of other important items to look out for during your maintenance procedure:

- Air Leaks
- Fluid Leaks
- EGR Leaks
- Brake Wear
- Belt Condition
- Coolant Filter Life
- Coolant Level
- Fuel Filter Life
- Oil Filter Life
- Oil Level
- Overhead Adjustment

TIRE INFLATION AND WEAR

Driving with improperly inflated tires increases rolling resistance and has a significant impact on fuel economy. Every 10psi of under-inflation reduces fuel economy by approximately 1%. Check manufacturer guidelines for tire inflation recommendations to ensure that tires are properly inflated.

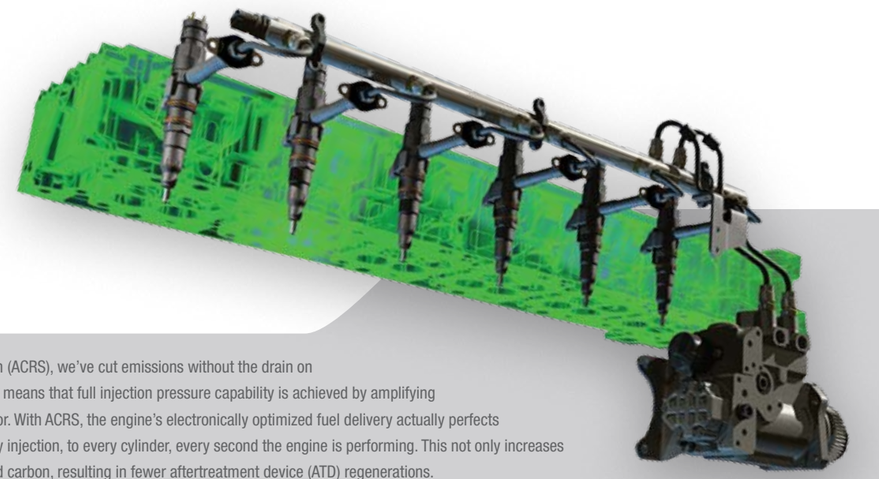
It's also important that your tire type is matched to your application. Remember that aggressive treads reduce your miles per gallon average, and low-profile tires reduce rolling resistance and demand for power from the engine. Additionally, worn tires can have a positive impact on fuel economy. Though be sure to check that tires are not significantly worn, as they could pose dangers for both your drivers and highway travelers in general.

Percentage of Tire Wear	Increase in Fuel Economy
30%	2%
50%	6%
80%	6.6%

AXLE ALIGNMENT

Axle alignment is key to optimizing fuel economy. And this holds true whether considering single or tandem axles, steer axles or trailer axles. The importance of axle alignment is not only reflected in miles per gallon, but also in tire wear. For instance, even a one-quarter-degree misalignment of the front axle, versus a properly aligned axle, will cause a condition known as tire scrub, a lateral force that pushes the tires sideways. Not only does this lead to safety concerns, it also has a negative impact on fuel economy and general vehicle operation. So be sure to monitor axle alignment and adjust when necessary to maximize the fuel economy and safety of your vehicle.

ACRS™



With the Detroit Amplified Common Rail System (ACRS), we've cut emissions without the drain on fuel mileage or power. The "amplified" in ACRS means that full injection pressure capability is achieved by amplifying engine fuel rail pressure internally in the injector. With ACRS, the engine's electronically optimized fuel delivery actually perfects the pressure, the timing and the spray for every injection, to every cylinder, every second the engine is performing. This not only increases efficiency, it also reduces deposits like soot and carbon, resulting in fewer aftertreatment device (ATD) regenerations.

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