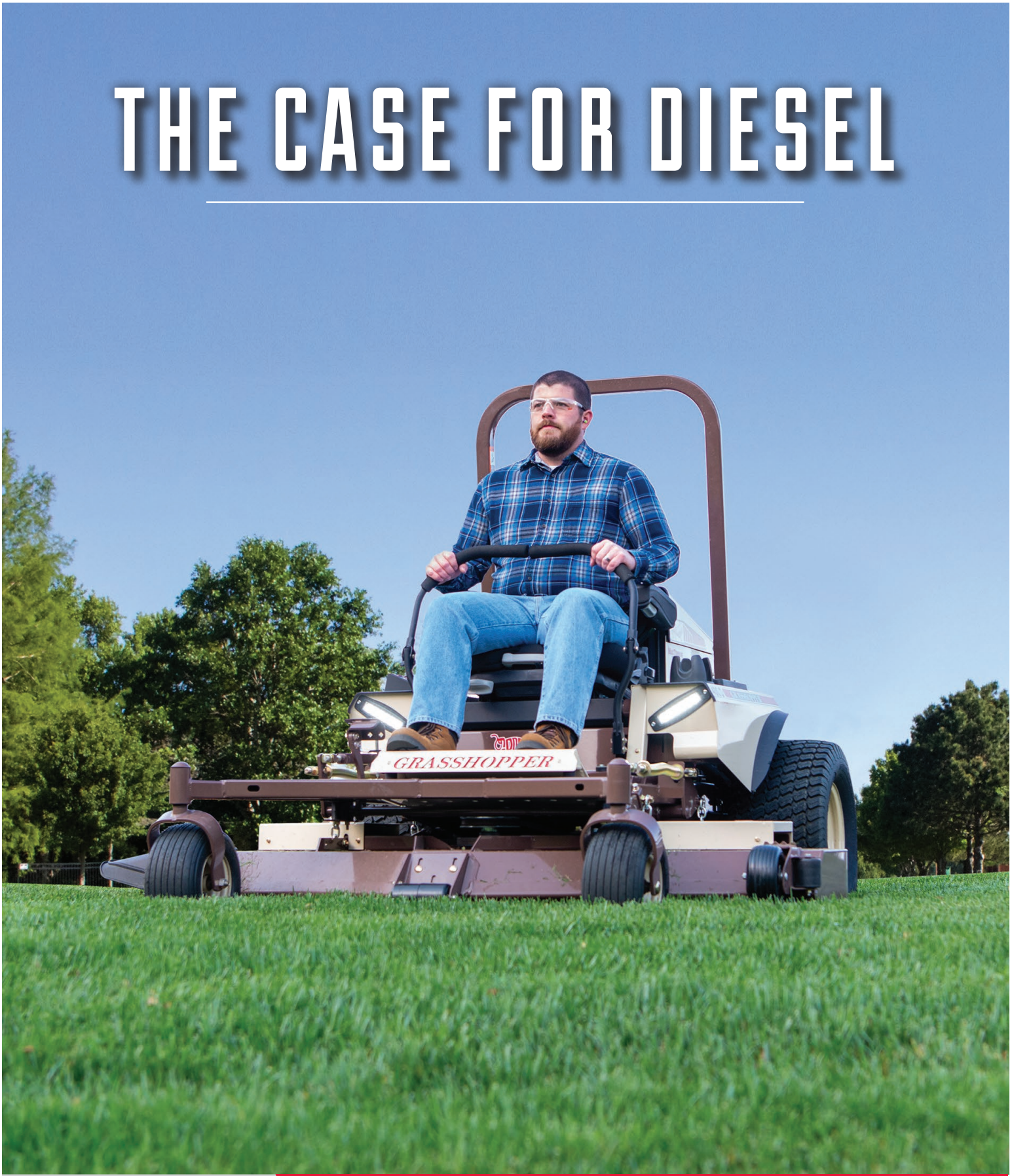
THE CASE FOR DIESEL



GRASSHOPPER®
Committed to the Cut.®

MAXTORQUE™ DIESEL MOWERS: DIESEL DONE RIGHT

INTRODUCTION

Today's business environment is changing rapidly. Maximizing productivity and controlling operating costs are critical to remaining profitable, but stricter emissions regulations are prompting landscape professionals to consider alternative fuels to balance equipment performance and compliance.

Certainly, the three most popular fuel choices – gasoline, diesel and liquefied petroleum gas (LPG) – merit close scrutiny to determine which provides the highest level of cost-effective performance in commercial landscape applications. Yet, of these options, Clean Diesel continues to compare more favorably, as the evidence in this paper will demonstrate.

When The Grasshopper Company introduced the industry's first liquid-cooled diesel-powered zero-turn riding mower in 1983, it was with the firm belief that diesel provided superior power and performance compared to other fuel alternatives, particularly in comparison to previous experience with LPG. Today's Clean Diesel retains that power and performance while adding a substantial reduction in emissions that meet or, in most cases, exceed regulatory limits.

However, fuel type is only part of the equation. While the case for Clean Diesel as a fuel choice is compelling, it is equally important that the right combination of engine and mower design be used to maximize performance in commercial mowing applications.

Grasshopper MaxTorque™ diesel MidMount™ and FrontMount™ mowers are uniquely designed to take advantage of Clean Diesel's many benefits. We call it "Diesel Done Right," and we remain committed to harnessing the right balance of engine and mower to help you, as a turf care professional, meet your business and environmental goals.

A BRIEF OVERVIEW: GAS AND LPG VS. CLEAN DIESEL ENGINES

Gasoline, LPG and diesel engines all function based on the principle of internal combustion, but there is a distinctive difference. Gasoline and LPG engines use a spark-ignition system to ignite an air/fuel mixture, while a diesel engine uses the compression stroke to heat and compress air, then injects the fuel mixture into the hot environment, where it ignites spontaneously without the assistance of a spark.

This difference is important, as diesel engines must produce compression ratios as high as 25:1, compared to a typical compression ratio of 10:1 or 11:1 in its gasoline and LPG counterparts. This higher compression ratio not only allows the diesel engine to generate more power than comparable gasoline engines, but also requires that diesel engines be stronger, heavier and able to withstand greater internal stress than spark-ignition engines.

When comparing gasoline, LPG and diesel engines with similar displacements, the diesel engine will initially cost more because of its heavier construction; however, the better fuel economy, lower cost of maintenance and longer life cycle can far outweigh the initial acquisition cost.

SO WHICH FUEL IS SUPERIOR?

Comparing fuel types requires comparing several factors that impact mower performance, such as power, cost efficiency and convenience. In addition, side-by-side comparisons of emission rates must be included to make an informed decision. In taking a broader approach to evaluating each fuel, the overall advantages become clear, making it easier to determine which fuel type provides the most benefits.

POWER

The first measure of the viability of fuel choices for riding mowers is the energy output of each fuel, which directly reflects the amount of work a mower can do. Measured in British Thermal Units (BTUs), defined as the amount of heat (energy) required to raise the temperature of 1 pound of water by 1 degree Fahrenheit, we will use gasoline as the standard energy measurement against which we can measure diesel and LPG.

Gasoline delivers, on average, 114,100 BTUs per gallon. The quantity of any other fuel necessary to match gasoline's BTU content is referred to as a Gasoline Gallon Equivalent (GGE). Using GGE as a base, it takes 0.88 gallon of diesel and 1.35 gallons of LPG to match the energy found in one gallon of gasoline. (Fig. 1) Compared to gasoline, diesel uses less fuel while LPG burns more fuel to do the same amount of work!

Figure 1

GASOLINE GALLON EQUIVALENTS (GGE)

Fuel Type	Unit of Measure	BTUs/Unit	Gallon Equivalent (GGE)
Gasoline (regular)	Gallon	114,100	1.00 gallon
Diesel #2	Gallon	129,500	0.88 gallon
Propane (LPG)	Gallon	84,300	1.35 gallons

Source: https://www.treehugger.com/fuel-energy-comparisons-85636

» At 0.88 gallon, it is clear that less diesel is needed to deliver the GGE of gasoline. Conversely, more LPG is required to equal gasoline's BTUs. With regard to energy potential, aka "power," diesel is the clear winner.

COST EFFICIENCY

Fuel prices are volatile and can change drastically over time. Yet, we can still make cost comparisons for each fuel. Using the GGE data shown previously, cost comparisons to purchase equivalent BTUs of each fuel can be made by taking the highest BTU fuel – diesel – and adjusting the average national fuel prices for each fuel to match the energy found in a gallon of diesel. (Fig. 2)

Figure 2

ADJUSTED FUEL COST –ENERGY PER GALLON

Fuel Type	Unit of Measure	Price Per Unit	Energy Per Gallon BTUs)	Price Per 129,000 BTUs
Diesel #2*	Gallon	$5.22	129,500	$5.22
Gasoline (regular)*	Gallon	$3.91	114,100	$4.44
Propane (LPG)**	Gallon	$2.68	84,300	$4.12

Figure 3

ADJUSTED FUEL COST –GALLONS PER HOUR

Fuel Type	Unit of Measure	Price Per Unit	Average Gallon/Hour	Price Per 129,000 BTUs
Diesel #2	Gallon	$5.22	1.00	$2.74
Gasoline (regular)	Gallon	$3.91	1.65	$6.45
Propane (LPG)	Gallon	$2.68	1.80	$4.82

Sources: * Source: As of 10/10/22: https://www.eia.gov/petroleum/gasdiesel/ ** Source: As of 10/03/22: https://www.eia.gov/petroleum/weekly/propane.php

While pump prices for gasoline and LPG may be lower than diesel, the consumption rates vary differently for the same displacement and horsepower mower engines. The gasoline engine burns on average 1.65 GPH, LPG 1.80 GPH and diesel only 1.0 GPH. (Fig. 3) So not only does a gasoline- or LPG-powered mower require more fuel to do the same work, it uses more fuel per hour than diesel. The results are more frequent fuel stops and reduced productivity. In a 1,000-hour mowing season, the gasoline mower will use 650 more gallons, and the LPG mower 800 more gallons than a diesel mower.

Don't be confused with fuel prices. While clean diesel costs more at the pump, when fuel prices are adjusted according to energy per gallon (Figure 2), or by gallons per hour (Figure 3), diesel is the clear winner. It is the most efficient fuel available today containing more usable energy compared to gasoline, for example, while delivering better fuel economy.[i]

[i] Pros and Cons of Diesel Engines, https://healthresearchfunding.org/pros-cons-diesel-engines

CONVENIENCE

When it comes to choosing a fuel option for a riding mower, consideration must be given to the operating issues, fuel availability and storage that impact their use.

Operators should bear in mind that utilizing gasoline for power equipment requires careful attention to ethanol content. According to most engine manufacturers, fuels containing more than 10 percent ethanol can damage or destroy outdoor power equipment, including lawn mowers. As such, they recommend regular gasoline, which typically contains about 10 percent ethanol.

Unfortunately, many consumers do not have a detailed understanding of the various grades of gasoline available. Multiple choices at the pump, such as E15, E20, E30 and E85, can be confusing for those refueling. Consumer surveys conducted by the Outdoor Power Equipment Institute (OPEI) indicated that less than 47 percent of Americans admitted to checking the fuel pump for warning labels or ethanol content in their gasoline. According to the president and CEO of the OPEI, efforts by the Federal Trade Commission didn't go far enough to educate consumers about ethanol blended gasoline.[ii]

In addition, because the lower percentage of ethanol tends to make regular gasoline slightly more expensive than more ethanol rich fuels, perceived cost savings can be misleading.

Gasoline and diesel fuels have a well-established infrastructure. As of 2022, National Petroleum News states that there are 145,000 retail outlets in the United States. That number is down from nearly 160,000 in 2010.[iii] At the same time, the percentage of those outlets offering diesel fuel has risen from 52.1 percent to 55 percent at the same time. The trend is that diesel fuel is increasingly integrated into the main pump islands instead of in some other part of the property.[iv] The latest U.S Department of Energy statistics for alternative fueling station counts by state reveal only 2,418 outlets offer LPG in the entire country in 2021.[v] Given that number, LPG availability represents only 1.7 percent of gasoline outlets, making diesel fuel 33 times more available than LPG. (Fig. 4)

Figure 4

RETAIL OUTLETS IN THE U.S. BY FUEL TYPE

Fuel Type	# of Outlets	% of Total
Gasoline (regular)	145,000	100%
Diesel #2	78,750	55%
Propane (LPG)	2,418	1.7%

LPG technology is most commonly found in fleet usage where fuel storage facilities can be installed and maintained to fuel the vehicles. These facilities are often not accessible to the average contract mower or homeowner, who must find refueling facilities or install their own. Unfortunately, the costs involved in installing such facilities start around $45,000 – $60,000 for a small, 1,000-gallon storage tank and single-hose dispenser according to a U.S. Department of Energy report.[vi] This cost along with obtaining the necessary employee certifications and permits virtually eliminates this option for most operators.

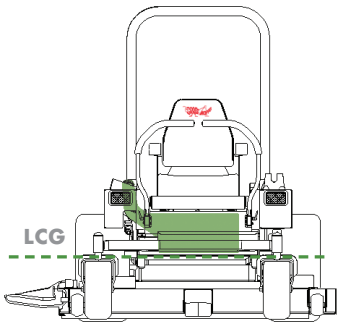
Yet, the drawbacks to LPG don't end there. While conversion from gasoline to LPG is relatively inexpensive and uncomplicated, carrying fuel onboard the mower has several disadvantages, as well. Fuel tanks for LPG require heavier construction than traditional gasoline or diesel tanks due to the need to store the gaseous fuel under pressure. This extra weight is often placed high on the power unit, raising the unit's overall center of gravity, which can change the mower's handling characteristics on uneven or rolling terrain. (Fig. 5) Plus, the additional weight of the tank reduces fuel economy, puts more load on the transmission, and requires more power from the engine, leaving less power to mow heavier grass.

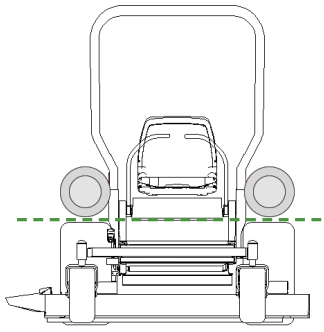
Figure 5

LOWER CENTER OF GRAVITY (LCG)

Grasshopper MaxTorque™ Diesel

Fuel tank under the seat lowers the center of gravity.





Competitors' LPG Models

LPG tanks placed higher on the powerunit raises the center of gravity.

[ii] http://www.turfmagazine.com/maintenance/new-ftc-ruling-ethanol-labeling-opei-issues-statement/
[iii] https://www.axios.com/2022/07/15/gas-stations-prices-closing
[iv] https://www.greencarreports.com/news/1094908_fewer-gas-stations-but-more-diesel-pumps-as-diesel-sales-rise
[v] https://afdc.energy.gov/stations/states
[vi] https://afdc.energy.gov/files/u/publication/propane_costs.pdf

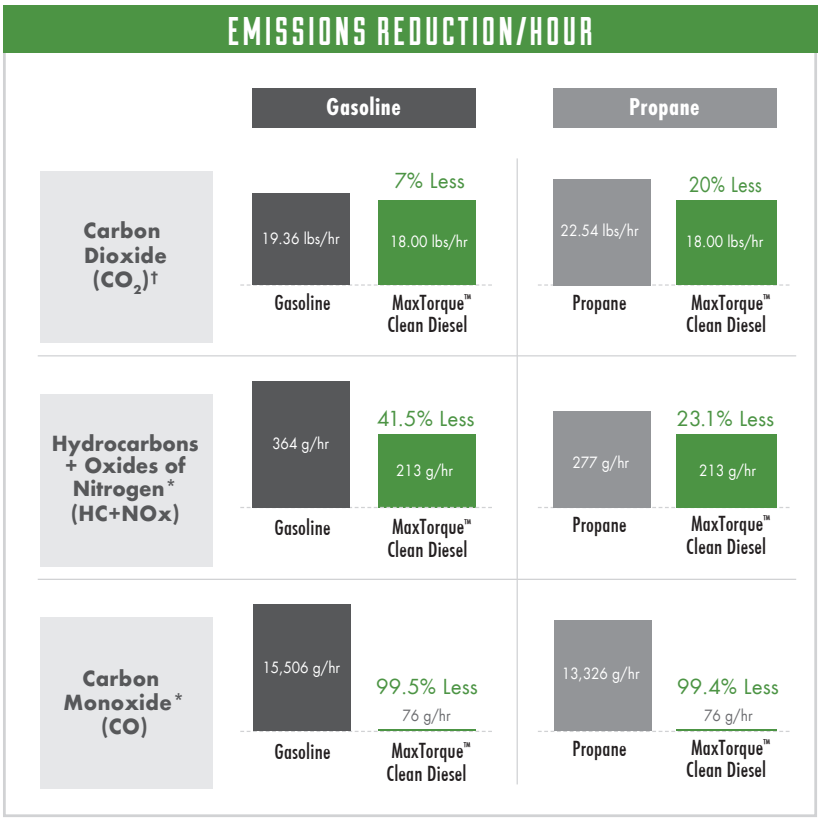
EMISSIONS

All internal combustion engines produce carbon dioxide (CO_2), carbon monoxide (CO), unburned hydrocarbons and oxides of nitrogen (NOx) emissions, as well as particulate matter. These all have an impact on air quality. In fact, hydrocarbon emissions during the summer months have prompted many local governments to declare ozone action days that prohibit mowing activities during the heat of the day when air quality is expected to be poor. As such, emissions become a greater issue, and one that can significantly impact operations and revenues.

The introduction of ultra-low-sulfur diesel in 2006 reduced sulfur content from 500 ppm to only 15 ppm for highway diesel, and the same sulfur content was introduced to off-road diesel by 2011. Overall, a fuel-efficient clean diesel engine is better for the environment than gasoline or propane engines.

While it is true that older diesel engines traditionally emitted significant amounts of particulate matter – or soot – into the air, Clean Diesel technology has eliminated 99 percent of black carbon diesel emissions since 2004. This is true for both highway vehicles and off-road vehicles such as lawnmowers.

Figure 6



† Climate Registry Default Emissions Factors, May 2021. Figures adjusted to GGE for each fuel type.
* CARB 2016 Engine Certifications.

In addition, the diesel engine consumes less fuel than a same-sized gasoline or LPG engine doing the same amount of work – further reducing the diesel engine's real impact on the environment.

The same diesel engine model used for testing by CARB also powers Grasshopper MaxTorque™ diesel mowers. These mowers are easy on the environment, too, proving superior to equal-powered gasoline or LPG engines. Certification results from CARB indicate that LP-fueled engines emit drastically higher levels of oxides of nitrogen (NOx) and carbon monoxide (CO) than comparable clean diesel engines. (Fig. 6)

Powerful MaxTorque™ diesel engines can power through the toughest of jobs and are CARB- and Tier 4 Final emissions-compliant to minimize environmental impact. Liquid-cooled, 3-cylinder MaxTorque™ engines are also compatible with B5 diesel, which means that up to five percent of the diesel fuel mix can be from biodiesel – a non-petroleum, renewable resource.

In 2014 and 2015, the American Lung Association, in its annual State of the Air Report, identified Clean Diesel fleets as one of the main two contributors to helping the nation achieve cleaner air and meet national ambient air quality standards.

CLEAN DIESEL: THE CLEAR WINNER

When power, cost efficiency, convenience and emissions are considered, a pattern emerges. Clean Diesel provides more power, greater overall cost efficiency and convenience than gasoline or LPG. And, when emissions are factored into the equation, Clean Diesel becomes even more attractive as a means of maximizing performance and productivity while minimizing emissions.

DIESEL DONE RIGHT

Having established diesel as the most powerful and efficient fuel, it is important to note that diesel's benefits must be channeled correctly to provide the superior performance landscape professionals rely on in their day-to-day operations.

With more than 30 years of experience harnessing diesel power in True ZeroTurn™ equipment, "diesel done right" with Grasshopper provides exceptional advantages in fuel economy, performance and long service life.

Grasshopper incorporates only heavy-duty, compact diesel engines that are compliant with California Air Resources Board (CARB) and EPA Tier 4 Final emissions standards into the design of its MaxTorque™ diesel mowers. The result is a smooth, quiet-running, nimble workhorse that is light on turf and heavy on torque – allowing users to maintain a higher blade tip speed, even under the most demanding conditions.

So why is torque so important? To understand, it's best to start with a comparison of horsepower and torque.

IT'S ALL ABOUT TORQUE

Most people tend to compare engines by horsepower, a measurement defined as the amount of work that an engine produces. One horsepower is used to define the amount of work necessary to lift 33,000 pounds one foot in one minute. So, under ideal conditions, the horsepower of a gasoline and a diesel engine would be similar.

Yet equal horsepower does not necessarily mean equal power. Horsepower sells engines, but torque moves the mower. The rotational or twisting force around an axis is called torque. It is a measurement of how hard a motor can twist an output shaft at any given time. In other words, torque is the ability of the engine to do work and horsepower is the rate at which it can do work. The more torque your engine produces the more work your mower can do.

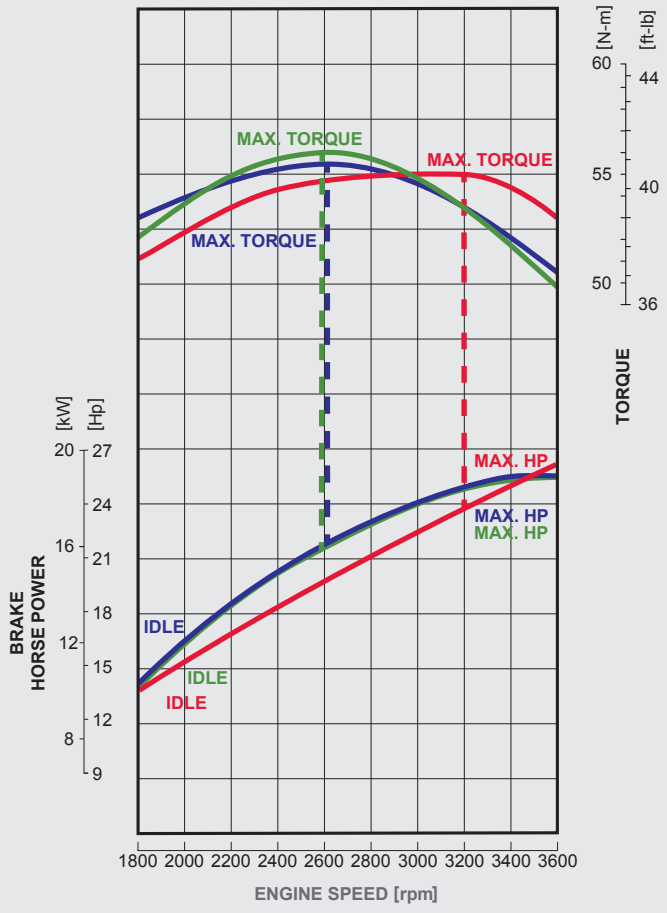
The chart (Fig. 7) below compares the performance curves of one diesel and two gasoline engines of comparable horsepower. The torque output of the diesel engine (green), at 2,600 RPM, is higher than the other engines in this comparison. Higher torque allows for greater horsepower at lower RPMs, enabling the diesel engine to do more work with lower fuel consumption, saving as much as 650 gallons of fuel over a 1,000-hour season.

Mowing wet or heavy grass places a higher torque load on the engine. When the load exceeds the engine's present torque output, the governor opens the throttle, burning more fuel to maintain the same RPM. Because the diesel engine produces higher torque at lower RPMs, it will maintain optimum blade tip speed without consuming additional fuel. This enables it to deliver a clean, quality cut at faster ground speeds thereby increasing operating productivity and controlling operating costs.

Because a diesel engine produces more energy in comparison to gasoline and propane ones, a greater deal of torque is realized while consumption of fuel is less.[vii] The benefits from this higher torque include greater performance resulting in higher productivity and improved fuel efficiency.

Figure 7

COMPARATIVE ENGINE PERFORMANCE CURVES



>> TORQUE VS. HORSEPOWER: A COMPARISON

When comparing the 25.0 hp Kawasaki FD750D and 24.5 hp FD791D DFI gasoline engines and the 24.8 hp Kubota D902-E4B diesel engine, it becomes evident that, even though maximum horsepower is relatively equivalent, torque can vary greatly.

KUBOTA 24.8 HP LIQUID COOLED D902-E4B DIESEL ENGINE

KAWASAKI 25.0 HP AIR COOLED FD750D GASOLINE ENGINE

KAWASAKI 24.5 HP LIQUID COOLED FD791D DFI GASOLINE ENGINE

KUBOTA D902-E4B TESTED UNDER J1995 SAE STANDARD
KAWASAKI FD750D TESTED UNDER J1995 SAE STANDARD
KAWASAKI FD791D DFI TESTED UNDER J1995 SAE STANDARD

ENGINE PERFORMANCE DATA SOURCES:

Kubota D902-E4B:
http://kubotaengine.com/assets/documents/Brochures-Engines%20Tier%204/2016%20June/SUPERMINI/d902_e4b.pdf

Kawasaki FD750D 25.0HP:
http://www.kawasakienginesusa.com/engines/fd/fd750d

Kawasaki FD791D DFI 24.5HP:
https://www.kawasakienginesusa.com/engines/fd/fd791d-dfi

[vii] Diesel Engines: Pros & Cons, by Allison Smith, 02/05/2020, https://www.cjponyparts.com/resources/diesel-engine-pros-and-cons

MAXTORQUE™ DIESEL MOWERS

Despite Clean Diesel's many benefits, not all diesel designs are created equal. While many manufacturers see diesel and gasoline engines as interchangeable and utilize the same chassis and drive train configuration for both, Grasshopper MaxTorque™ diesel mowers are uniquely designed to channel diesel's additional power more efficiently to the cutting deck.

Yet, when it comes to efficiency, the engine is only part of the equation. Grasshopper designs each mower to isolate the engine and drive train from the operator platform and chassis to create a low-vibration power unit that provides a comfortable ride and more precise control at faster mowing speeds.

This delicate balance of power, performance, comfort and precision control is uncommon among other diesel mowers. Many manufacturers incorporate aluminum block diesel designs into mowing products, which don't hold up as well to the engine's internal pressure and force. Others pack too much weight and bulk into the engine cavity, which reduces fuel economy, maneuverability and performance.

By channeling the power of diesel into a power unit specifically designed to maximize its benefits, Grasshopper MaxTorque™ diesel mowers deliver powerful performance that increases productivity and reduces fuel consumption while minimizing operating costs.

MORE POWER TO FINISH FASTER

In mowing conditions that require plenty of power, such as wet or tall grass, pastures or roadsides, MaxTorque™ diesel mowers take full advantage of diesel's exemplary power to complete jobs up to 50 percent faster than like-powered gasoline or propane models.

This additional power allows those in commercial mowing to get more work done in less time, powering through the toughest of jobs at faster speeds while minimizing fuel use and maintenance. As a result, they can be more productive, add more customers without additional equipment or personnel, and enjoy increased profitability.

GREATER SAVINGS ON FUEL

With an expertly engineered, diesel-powered machine such as a Grasshopper MaxTorque™ diesel mower, powerful performance is only the beginning.

Controlled mowing tests found that Grasshopper MaxTorque™ diesel mowers use only half the amount of fuel as equal-powered gasoline models. What's more, feedback from customers using Grasshopper diesel mowers in real-life mowing conditions verify these controlled findings.

Even though fuel prices rise and fall, saving 650 gallons over the course of 1,000 hours, which represents approximately one mowing season, can mean a significant savings in fuel costs over gasoline or other fuels.

In the course of 1,000 hours, operators can save 650 gallons or more of fuel using diesel-powered Grasshopper mowers versus competitive gasoline mowers of similar power. These fuel savings are even greater when compared to propane.

> "We save roughly 1.25 gallons of fuel per hour per machine with diesel, which translates to more than $13,000 in fuel savings every year."
>
> CHRIS SHIPP, Owner
> *Shipp Shape Lawn Service*
> *Sylvester, GA*

> "We run all diesel engines, and we can run all day long without refueling. There are times I don't even bother fueling it up in the morning, because I know I can run two days on one tank."
>
> MIKE STEWART, JR.
> *President, Stewcare, Inc.*
> *Delaware, OH*

FUEL SAVINGS EXAMPLE

Based on diesel fuel prices at $2.74 per gallon as of February 1, 2021, diesel savings can be significant over the course of a 1,000-hour mowing season, saving 650 gallons or $1,237 over gasoline and 800 gallons or $1,238 over LPG. Combining purchase price and fuel usage, MaxTorque™ diesel models can result in over $1,200 in savings over gasoline or propane in the first three years, leading to long-term savings resulting from better fuel economy. (Fig. 8)

Because diesel engines produce more torque, however, an increase in productivity can lead to handling more jobs in the same amount of time. (See Additional Revenue Potential on Page 11.)

Check out our Fuel Expense & Emissions Calculator at: http://www.grasshoppermower.com/fuel-calculator/ for a real time example of the potential fuel savings in your area by switching to diesel power.

Figure 8

THREE-YEAR TRUE COST OF OWNERSHIP/OPERATION

Fuel Type	Gasoline	Propane	Diesel
Brand	Any	Any	Grasshopper
HP/Cutting Width	25-27 HP/61"	25-27 HP/61"	25 HP/61"
Purchase Price	$9,700.00	$9,700.00	$12,200.00
Total Purchase Price*	$9,700.00	$11,200.00	$12,200.00
Fuel Consumption (Gallons/Hr)	1.65	1.80	1.00
Fuel Cost Per Gallon**	$2.41	$2.21	$2.74
Fuel Cost Per Hour	$3.98	$3.98	$2.74
Fuel Cost Per Month	$331.38	$331.50	$228.33
Fuel Cost Per Year	$3,976.50	$3,978.00	$2,740.00
Three Year Cost of Operation			
Year 1: Purchase Price + Fuel	$13,677.00	$13,678.00	$14,940.00
Year 2: Year 1 + Fuel	$17,653.00	$17,656.00	$17,680.00
Year 3: Year 2 + Fuel	$21,630.00	$21,634.00	$20,420.00
Three-Year Savings (versus LPG)	$4.50	–	$1,214.00
Three-Year Savings (versus others)	$1,209.50	$1,214.00	–

* Figures used in this chart are based on mowers equipped with 61-inch decks mowing under normal conditions with an annual usage of 1,000 hours. The purchase price of the propane model includes the additional cost of a conversion kit.
** Average national fuel prices as of 02/01/21 as referenced on page 4.

OVERALL PERFORMANCE

Grasshopper True ZeroTurn™ mowers have earned a reputation for delivering outstanding performance, superior operator comfort and a better quality cut wherever they mow. Our MaxTorque™ diesel mowers are no exception, harnessing all the benefits of diesel power while maintaining the smooth ride, intuitive control and unparalleled cut quality for which Grasshoppers are famous – all while delivering faster mowing speeds that enhance productivity.

Yet the true measure of any mower is the return on investment it provides to its owner. When considering the true cost of ownership of a Grasshopper MaxTorque™ diesel mower, its advantages become even clearer.

TRUE COST OF OWNERSHIP

Successful contractors and fleet managers must take into consideration long-term revenues and costs versus short-term "bargains" that result in higher operating costs and lower productivity. Understanding the long-term savings a mower can deliver throughout its life cycle is also critical in making an informed decision.

Grasshopper MaxTorque™ diesel mowers deliver savings in five primary areas:

- Fuel savings
- Additional revenue potential
- Engine life expectancy
- Maintenance and labor savings
- Trade-in value

ADDITIONAL REVENUE POTENTIAL

Savings and revenue result from faster job completion times and more billable hours. Grasshopper MaxTorque™ diesel models can complete tough mowing jobs faster – up to 50% faster in some cases – adding up to 250 additional billable hours in a normal mowing season compared to a propane-powered mower.

Every diesel mower you operate could generate an additioanl $10,000 of income per year based on an average of $40/hr x 250 hours a year.

MAINTENANCE & LABOR SAVINGS

Diesel models require less maintenance, since they have no spark plugs or spark plug wires to replace, and because they use less fuel there is less time spent at the pump. Calculate the savings from the operator spending only half as much time filling the fuel tank – up to 90 fewer trips to the gas station each year (based on tank size).

ENGINE LIFE EXPECTANCY

The long service life of liquid-cooled diesel models versus air-cooled gas models results in greater return on investment. It's not uncommon for liquid-cooled, 3-cylinder MaxTorque™ diesel engines to provide twice the service life of an air-cooled, V-Twin engine. If the air-cooled model has to be replaced twice as often, factor in the cost of purchasing two air-cooled engines for each Grasshopper diesel model.

grasshopperdiesel.com

TRADE-IN VALUE

Beyond the cost of ownership, a Grasshopper MaxTorque™ diesel mower is a solid long-term investment that lays the foundation for future equipment purchases. Another significant advantage of MaxTorque™ diesel models lies in their trade-in value. (Fig. 9) Commercial operators traditionally cycle out air-cooled machines at two- to three-year intervals, while the equipment still retains nominal value for less demanding applications. Air-cooled riders that have been modified from gas power to run on LPG, have virtually no aftermarket value. MaxTorque™ diesel models, on the other hand, can double or triple the useful life cycle, allowing the owner to reap greater rewards at trade-in time or continue reaping return on investment by keeping the unit in service for more years.

Figure 9

THREE-YEAR TRADE-IN VALUE

	Gasoline	LPG	Diesel
Replacement Cost	$9,700	$9,700	$12,200
Trade-In Value	$1,960	$1,130	$5,000
Percent of Purchase Price	20%	11%	41%
Replacement Cost (out of pocket)	$7,740	$8,570	$7,200

Note: Prices estimated. Not a guarantee of trade-in value. Prices not adjusted for inflation. Assumes regular OEM-specified equipment maintenance, with no damage and in good operating condition. Trade-in value of used LPG model reflects extremely soft resale demand and questionable engine life expectancy. Diesel models traded in after three years can provide more years of useful service versus gasoline and LPG models.

OVERALL RETURN ON INVESTMENT

Choosing clean MaxTorque™ diesel power as an alternative fuel to LP can save over $1,200 in cost of operation and can boost revenue up to $23,403 over three years. When trade-in value is included at the end of three years, the overall return on investment from a Grasshopper MaxTorque™ diesel mower can total over 200 percent. (Fig. 10)

Figure 10

THREE-YEAR RETURN-ON-INVESTMENT (ROI)

	Gasoline	LPG	Diesel
Additional Revenue Potential	–	–	$23,403
Operating Savings	–	–	$1,214
Trade-In Value	$1,960	$1,130	$5,000
3-Year ROI	$1,960	$1,130	$29,617

Example: actual results may vary.

Once a transition is made to Grasshopper MaxTorque™ diesel mowers, it makes little financial and environmental sense to use anything else. Reduced fuel costs, and the long service life – combined with increased productivity and superior resale value – keep replacement costs minimal compared to other alternatives.

Clearly, the cost of ownership and operation versus the cost of acquisition is to the advantage of a Grasshopper MaxTorque™ diesel mower when the scope of the contracts and job sites require hard-working, efficient zero-turn mowers and grounds maintenance systems.

CONCLUSION

Considering the information discussed in this paper, a Grasshopper liquid-cooled, diesel-powered mower will provide better fuel economy, higher performance and more longevity than air-cooled gasoline- and LPG-powered models. Diesel power also saves money because the engine lasts longer and is easier to maintain throughout its service life.

Furthermore, diesel's greater torque differential allows mowing operators to achieve greater operating efficiency than gasoline- or LPG-powered mowers. This greater efficiency translates into time savings by being able to mow more efficiently at faster mowing speeds thereby finishing jobs quicker. For commercial operators, these savings equate to reduced labor and operating costs and directly impact the bottom line by providing the opportunity for increased revenue potential.

Yet, not all diesel mowers are designed to make optimal use of diesel's powerful benefits. Certainly, a low-emission, expertly engineered diesel engine is half the equation. However, riding comfort, quality of cut and superb handling characteristics are cornerstones of a quality commercial mower that should never be compromised. That's why careful selection of equipment is critical in making the most of diesel's benefits.

Grasshopper MaxTorque™ diesel mowers are designed to unleash the power of diesel, offering superior performance and fuel economy, enhanced productivity and reduced emissions in one package. Grasshopper diesel is "diesel done right," harnessing diesel's strengths as an alternative fuel in a way that provides more cost-effective and powerful performance in virtually any application.

grasshopperdiesel.com

Committed to the Cut.®

Proud Partner

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