

Mixed Results



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Factor in fuels when maintaining equipment

When Coca-Cola changed its original formulation in 1985, consumers quickly gave the “new Coke” a thumbs-down, and the company scrambled to return to its time-tested recipe.

There’s a similar tinkering going on today with gasoline formulations. Unfortunately, the potential for harm is real. Ethanol, an alcohol fuel made from grain, mainly corn, has been making its way into gasoline slowly but steadily in recent years. The addition of the corn-based fuel in petroleum gasoline was driven initially by some environmentalists, the government and corn growers, and the issue has become something of a political battle, with some research showing that it takes more energy to produce ethanol than the fuel itself represents. Not to mention the impact it can have on food prices by reducing the amount of corn grown for consumption.



Different gas stations sell gasoline with different levels of ethanol mixed in. Some include very high levels of ethanol, such as E85, intended for specially designed automobile engines. Be sure to look carefully to see exactly what type of fuel you're buying for power equipment. If possible, search out gasoline with zero percent ethanol.

Photo courtesy of the U.S. EPA.

Leaving aside the political questions of whether ethanol makes sense in terms of carbon dioxide emissions, our food supply and national security, there is one absolute reality that cannot be debated: ethanol has serious potential to harm small engines, the kind of engines found in lawn mowers, chain saws, trimmers, etc. While there is an increasing number of automobiles designed to tolerate high levels of ethanol (GM's Flex Fuel engines can run up to E85, a gas mix that's 85 percent ethanol), small engines can be destroyed with just a fraction of that ratio of ethanol.

Even when ethanol was used in low levels, say 5 percent of gasoline, concerns were raised over its impact on engine performance and life. Then, the level of ethanol in many gas station mixes went up to 10 percent. Now, the EPA announced that it is considering allowing up to 15 percent ethanol in standard gasoline mixes.

The Outdoor Power Equipment Institute (www.opei.org), on behalf of its members, raised concerns clearly with the EPA, noting that the approval of such an increase would ignore “the impact on hundreds of millions of outdoor power equipment used by consumers, such as utility vehicles, lawn mowers, chain saws, snow throwers and other affected equipment, including boats, ATVs, motorcycles and snowmobiles.”

The OPEI pointed out that a move toward allowing up to 15 percent ethanol would require massive amounts of consumer education and greatly improved labeling at gas stations to help prevent damaging all types of power equipment. Even the EPA seemed to admit that more research was necessary before moving ahead.

While this issue continues to be sorted out, it’s important to note that even 10 percent ethanol in fuel mixes holds the potential to damage power equipment engines if proper precautions and maintenance practices are not followed. In fact, understanding the affect of ethanol in engines is perhaps the most important maintenance-related topic facing those in the green industry today.

Terry Green, technical manager with Dolmar, explains that, “Ethanol has a molecule of oxygen attached to the atom. So, the higher the percentage, the more air is in the fuel. When there’s air in the fuel, it means you’re making your equipment run leaner.” In that sense, it’s sort of like an unintended adjustment of the carburetor. “The margin for error is very, very small. If you buy some fuel that’s higher than 10 percent ethanol, or you’re running a low-grade oil in the mix or there isn’t enough oil in the mix, temperatures start to go up,” says Green. “It doesn’t matter if it’s two-stroke or four-stroke, if it gets hot, you will get a scoring effect on your pistons.”

While ethanol has been an issue in power equipment for years, it’s become more of a danger as equipment manufacturers are required to meet ever-stricter emissions standards, says Green. “The only way to do that is to make the engine run leaner and leaner. And, emissions certification tests are required to be conducted using zero percent ethanol fuel (the ‘dirtiest’ fuel from an emissions standpoint).”

So, manufacturers are required to set up the engines to perform with zero percent ethanol, and once they’re in use in the real world, higher levels of ethanol are inevitably used. Because of the oxygen present with ethanol, engines run hotter than they were intended to. “Heat is the biggest issue; you start getting hotter cylinder temperatures and, as the ring starts to expand, you get a ‘gaulding’ effect, where the piston starts to heat up and attach itself to the cylinder wall,” says Green.

Green says that older ethanol-containing fuels, such as gas left in a gas can during the off-season, is even worse. “You get phase separation, where you’ll get layers in the gas can and water forming. When you pour the water into the power equipment, it washes away the lubrication in the cylinder and causes the gaulding effect.”

In the case where fuel is left in a gas tank for an extended period of time,

Green says it's important to drain the old fuel out and put fresh fuel in. "We recommend not owning fuel for more than 30 days," he explains of Dolmar's guidance.

Bruce Tallman with Walker Mowers says that ethanol's tendency to attract water is often what causes the most problems in power equipment. Even if the piston and cylinder aren't damaged by excess heat, the water in the fuel system tends to corrode parts. "It attacks components throughout the fuel system, from the in-tank filters through fuel lines and carburetors and injectors," he explains. "It's not uncommon, for example, to see pick-up components in the tank corroding quickly." The corrosion also produces bits of debris that can plug up carburetor jets or injectors. "It's a good idea to inspect that whole system, wherever the fuel flows, and flush everything. Especially if old fuel has been sitting in there."

The alcohol also tends to break down and separate rubber gaskets and other such components, adds Tallman. "Honestly, it's just not a good fuel for small engines." Even if the engine isn't destroyed, he says ethanol hurts performance by preventing engines from running as smoothly as they should, or producing as much power as they could.

Tallmann says that engine manufacturers understand the damage ethanol can do, and are clear to mower companies that anything over 10 percent ethanol in the tank will void engine warranties. The problem is exacerbated because the process used by fuel suppliers to mix ethanol in isn't very precise. Various engine manufacturers offer ethanol test kits for end users, and Tallmann says he's heard reports of percentages as high as 20 percent ethanol in gasoline that should have 10 percent maximum.

"Pumps aren't always clearly marked, and the signs use words like 'may' or 'could' contain 'up to' a certain level of ethanol, so you're never really sure exactly what you're getting," says Green.

Green recommends avoiding ethanol whenever possible when purchasing fuel for power equipment. "We always recommend trying to find a gas station that advertises 'No Ethanol,'" he says. Fortunately, the Internet is now rife with discussion boards, lists and tips about which gas stations in a given area carry "real gasoline" with no ethanol.



Even if you perform all other maintenance by the book, the use of ethanol in small engines can destroy valuable lawn maintenance equipment.
Photo by Patrick White.

For those without local access to no-ethanol fuels, Trusouth Oil has come out with a premixed two-cycle fuel that contains ethanol-free gasoline and fully synthetic oil. The company offers two products: 50Fuel or 40Fuel, depending on what mix ratio a particular type of two-cycle equipment requires. Chris Creedon, vice president and general manager with Trusouth Oil, says that homeowners appreciate the convenience (no mixing required) of these products, while professional lawn care operators are most interested in the precision (the mix ratio isn't left to the best guess of employees out in the field) and, perhaps most importantly, the ethanol-free characteristics.

Creedon notes that 50Fuel and 40Fuel are made with high-octane gasoline (but without additives found in automobile gas, such as benzene), and boast a two-year shelf life. A specially designed cap helps make the 32-ounce containers safe for shipping and handling.

Green sees potential in this premixed product: "It might be more expensive, but you know for a fact that you're getting zero percent ethanol. So, if you leave it in an engine, there's no water that will corrode metal parts and no alcohol to eat up rubber parts. That type of fuel is much, much better for power equipment."

In part because of the presence of ethanol in most gasoline, Dolmar recommends using only fully synthetic two-cycle oils. "They have about a 25 or 30 degree [Celsius] higher window before they start to break down," Green explains. "And, there are different grades of synthetic. We recommend JASO FC or ISO EGD rating; that's the highest for an air-cooled engine. A 2.5-gallon jug of oil might cost you an extra dollar or two. It's crazy to try to save that money and risk ruining a \$1,000 piece of equipment."

Similarly, because of the presence of ethanol in fuel makes equipment run hotter, the margin for error in other maintenance procedures becomes even more exacting. For example, says Green, it's more important than ever to be sure to use the correct spark plug in small engines today. "It's one of the most common mistakes we see. If you put a spark plug with the wrong heat range into a high-rev engine that requires a high heat-range plug, you'll cause preignition and you can burn up a cylinder and piston the same way." Increasing cylinder temperatures is the last thing you want to do.

There are some additives on the market, including Star-Tron Enzyme Fuel Treatment and Seafoam, designed to help stop the phase separation of fuel and break down the excess water that develops in gasoline containing ethanol. "That's a big plus," says Green.

While ethanol isn't a concern for those using diesel mowers, there are fuel-related considerations when it comes to that type of equipment. "Landscapers and lawn care providers are turning to clean diesel as a way to reduce fuel consumption and reduce emissions while holding the line on costs and increasing productivity," says Ray Garvey, equipment specialist with Grasshopper Mowers. This environment mindset often leads users to inquire about the use of biodiesel in their units.

"Biodiesel technology is rapidly developing," says Garvey. "It comes from a variety of sources, and there is heated debate concerning the impact on the overall carbon cycle in biodiesel production. When engine manufacturers are satisfied with the consistency and quality of biodiesel, there will likely be higher allowable thresholds allowed in the fuel tank."

For now, he recommends always checking the owner's manual for guidance on allowable biodiesel content. Grasshopper's MaxTorque line of diesel mowers, for example, can be used with up to 5 percent (B5) biodiesel fuels. "What is recommended for warranty will nearly always correlate to the best engine performance," says Garvey, who points out that even a 5 percent reduction in fossil fuel use can really add up.

In addition to selecting the correct type of diesel fuel, users of this type of equipment need to follow a few other maintenance practices, as well. Garvey says, "In the spring, operators want to start with fresh fuel, fresh oil and clean air and fuel filters. Use the engine oil specified in the engine manual, and use OEM air filters to ensure a tight, proper fit. Note that C engine oils [compression ignition] are recommended for diesel engines while S engine oils [spark ignition] are recommended for gasoline engines. Again, the recommendations in the engine owner's manual are critical."

Garvey points out that many regular maintenance items on diesel engines are simplified in comparison to gasoline units. For example, he says, "There is no carburetor and there are no spark plugs or plug wires to upkeep." Whether a mower is gasoline or diesel, Garvey says that if the unit is equipped with a radiator, it's critical to check coolant levels and quality. "Consider replacing the coolant if it is over a year old, and ensure the radiator fins are not damaged and are clear of any obstructing debris," he advises.

Putting the right fuel in the tank and taking care of your equipment will give you the best return on your investment, and can make you more profitable in the season ahead by keeping you out on the job and rather than in the garage.

Spring Maintenance

With spring nearly upon us, lawn care professionals are working diligently to ensure their mowers are in proper working order for the season ahead. We asked a mower maintenance expert for his recommended check-list of maintenance items to check-off now, before the grass starts growing. Justin Skidmore of Mobile Sales and Service (www.mobilelawnmower.com), says that when commercial customers bring in mowers to the Berkley Heights, N.J., shop, the staff begins by doing the following:

- Checking every nut and bolt on the machine. "There's a lot of vibration that occurs when a mower is running, and a lot of wear items," says Skidmore.
 - Draining old fuel and cleaning the fuel tank and system.
 - Checking the bearings and belts.
 - Changing the oil. "That's one of the most important things we do before the season, and one of the most important things a customer needs to keep doing throughout the season," Skidmore explains.
 - Changing the air filters. "That's definitely something to do in the spring," says Skidmore. The air filter should also be checked according to engine manufacturer recommendations throughout the season.
 - Sharpening the blades. "We try to follow the manufacturer's original angle," says Skidmore.
 - Greasing where needed. "On older machines, there are often a lot of grease points. On newer mowers, they've eliminated a lot of them," he explains. Even on newer mowers, though, idler points and wheel bearings commonly need to be greased. In all cases, Skidmore advises lawn care pros to always check their mowers' operating manuals for further maintenance requirements.
- Finally, while many LCOs may be comfortable taking on the above-mentioned maintenance items themselves, there are times when it helps to have an expert look over the mower. For example, says Skidmore, "On older machines with a lot of hours, we start with a leak-down test that gives us an idea of the valves, rings and cylinder bores. If the engine is pretty worn out, now is the time to consider replacing it to avoid downtime later. It also can keep you from spending money for spring prep maintenance work on an engine that only lasts a few weeks into the season."

Patrick White is a freelance writer and editor who has covered every aspect of the green industry in the past 13 years. He is based in Middlesex, Vt., and is always on the lookout for unusual stories.