

Small Engines

Fuels for Gasoline Engines

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Gasohol is a mixture of gasoline and alcohol used as fuel in gasoline engines. In Tennessee, the most common form of alcohol used to make gasohol is ethanol. Ethanol is typically produced from corn and sugar cane. Federal law limits the amount of ethanol in gasoline to 10 percent of the total mixture. Most gasoline engines can use as much as 10 percent alcohol in the fuel without modifications to the existing fuel system. More than 10 percent alcohol requires significant adjustments to an engine to get proper combustion and performance. Federal law also requires fuel retailers to label gasoline pumps with the kind and amount of alcohol used to make gasohol.

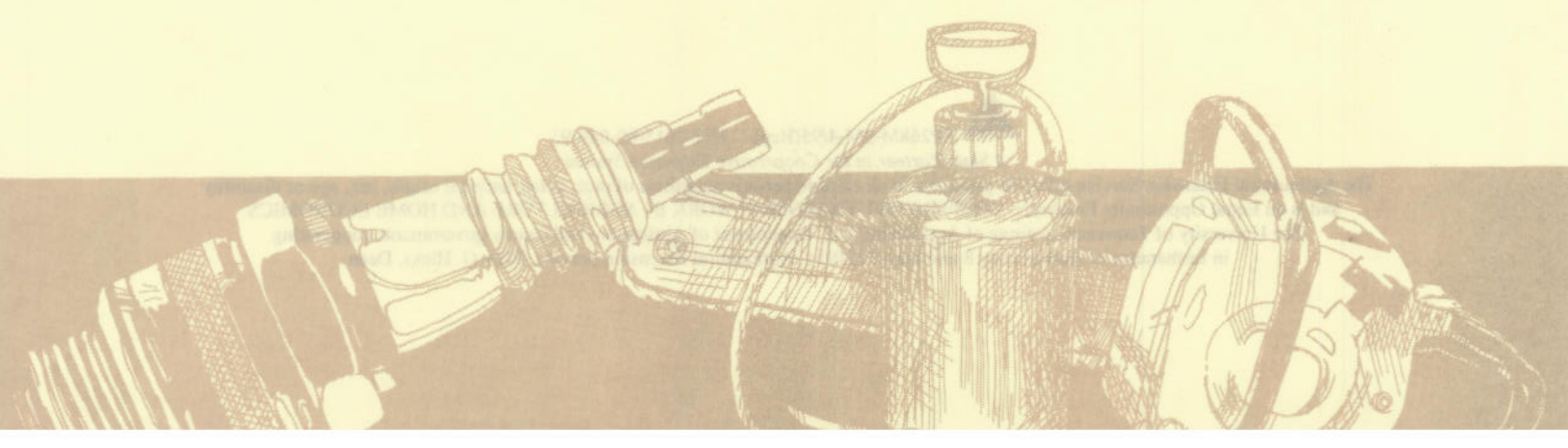
Alcohol is mixed with gasoline to make gasohol for two primary purposes. First, using alcohol saves gasoline. Every gallon of alcohol used saves a gallon of gasoline. Second, alcohol is an excellent octane improver. "Regular" grades of gasoline usually have an octane rating of 85 to 87. Ethanol has an octane rating of 105. By mixing alcohol and gasoline, the octane rating of the gasohol mixture can be easily raised to between 89 and 93.

The octane rating of a fuel is a measure of how well the fuel burns during the combustion process inside an engine. Higher octane level fuels tend to burn more smoothly and evenly in gasoline engines. Lower octane levels may cause an engine to "knock." Knock is caused by uneven combustion of fuel which results in severe engine vibrations that produce high-frequency sound waves that produce a sharp metallic noise. Besides producing an unpleasant sound, knock can be damaging to an engine and shorten engine life.

Ethanol is not the only form of alcohol that can be added to gasoline to make gasohol. Four other forms of alcohol can be used in varying amounts to make gasohol. Methanol is produced from coal, wood, natural gas or garbage. Normally called wood alcohol, it can be used up to a limit of 5 percent in the gasohol mixture. Methanol is poison to humans and animals and is very corrosive to fuel system components. Methanol has much less energy per gallon than gasoline and poses starting problems in cold weather. Methyl tertiary butyl ether (MTBE) is another form of alcohol used to make gasohol. It is manufactured by combining methanol and isobutylene. MTBE can be used up to levels of 11 percent by volume in gasoline. Fuels containing MTBE have reduced carbon monoxide emissions as compared to other gasohol forms. Tertiary butyl alcohol (TBA) is permitted at levels up to 15.7 percent in gasoline. TBA is used very little in fuels today. Oxinol is a mixture of TBA and methanol. Oxinol is permitted at levels up to 9.6 percent in gasoline. Oxinol is rarely used to make gasohol currently.

Ethanol and Engines

Ethanol is by far the most common form of alcohol used to make gasohol in Tennessee. Some of the advantages of using ethanol include:



- 1) Increased octane number
- 2) Renewable resource (made from corn and sugar cane)
- 3) Produces less carbon monoxide
- 4) Produces less carbon dioxide than gasoline per mile

Some of the disadvantages of ethanol as a fuel for gasoline engines include:

- 1) Less energy per gallon (Ethanol contains 76,000 BTU's per gallon, gasoline contains 115,000 BTU's per gallon)
- 2) Expensive to produce (about twice the cost of gasoline)
- 3) May promote smog formation as a gasoline additive
- 4) Slightly corrosive to some fuel system components
- 5) Attracted to water chemically, can pull moisture into vehicle fuel system.

Gasohol and Two-Cycle Engines

Gasohol usually works well in automobile engines and other four-cycle engines. Some problems have been attributed to gasohol when used in fuel injected engines. However, big problems arise when gasohol is used in two-cycle engines. Motor scooters, motor-cycles, snowmobiles and boats use two-cycle engines. Many two-cycle engines are also currently found on lawn and garden equipment. Many lawn mowers,

weed trimmers, chainsaws, power blowers and sprayers use two-cycle engines. These engines normally require an oil for lubrication to be mixed with the fuel. The oil mixed with the fuel is usually the only source of lubrication for these engines.

Gasohol poses three major types of problems with two-cycle engines:

1) Lubrication - Alcohol and oil do not mix well with lean mix two-cycle oils. Many engines currently use fuel/oil mix ratios of 100:1 or 200:1. Oils used for these mixtures contain large amounts of additives which tend to separate from the mixture when alcohol is present. This separation leaves the engine with little or no lubrication to prevent wear and tear.

2) Rubber and plastic parts deterioration - Alcohol attacks the plasticizers found in many fuel system components such as fuel lines, carburetors, seals, floats and diaphragms. Plasticizers are chemical compounds that keep plastic parts soft and pliable. New materials are replacing components with plasticizers to reduce problems associated with alcohol.

3) Water and corrosion - Alcohol attracts water. Alcohol will draw moisture from the air into a fuel system. Corrosion can be severe. Engines stored for short time periods (even one week) are more prone to damage from water. Complete replacement of carburetors and fuel pumps are sometimes necessary.



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