

GRADES OF FUEL –

For gasoline engines in most parts of the country, there are three grades of fuel. The least expensive is unleaded regular, guaranteed to be 87 octane (really “pump octane”, “PON”). Most cars use this fuel.

Mid-grade has 89 octane, and is useful for cars that “ping” or “knock” on regular. This pinging is more likely in hot weather and under heavy load, in older, well-worn cars.

Premium has 91 (usually) to 93 (rare) octane, and is specified for a few higher-dollar cars with higher compression ratios that confer more efficiency and power. These cars will not run without ping or knock on either mid-grade or regular. Ping or knock will eventually do engine damage, sometimes very quickly. Use the right fuel!

Octane rating is conferred to a finished gasoline by an anti-knock additive. In years past, the additives were tetra-ethyl or tetra-methyl lead. Now they are either MTBE (a very poisonous ether) or ethanol (non-poisonous ethyl alcohol). The more additive, the higher the octane rating, and the less likely the engine will ping or knock, but the fuel is also more expensive. (The more ether or ethanol, the cleaner it burns, though.)

Buy only the grade that stops ping, anything else is wasted money! Higher octane rating is not more energy or power, it is only more knock resistance. In point of fact, the higher additive content of mid grade and premium actually reduces fuel energy slightly!

“Flex-Fuel” engines can also use an alternative fuel designated “E-85”; non-flex engines cannot, without serious modifications. E-85 is a blend of 85% by volume dry ethanol with 15% unleaded regular gasoline. Flex fuel engines will also run just fine on all blends from straight E-85 to straight gasoline.

Actually, non-flex engines will run just fine with a little E-85 in their otherwise-gasoline fuel, although the manufacturers do not want you to know this. The maximum tolerable E-85 in an unmodified non-flex engine is no more than 2 gallons E-85 to every 3 gallons gasoline. Go higher in alcohol content, and it won’t run right, and may not even start.

From about 22% actual ethanol in the mix (about 26% E-85) on up, the mixed octane is higher than premium gasoline (even if 93 octane), while the E-85 component is usually cheaper than regular gasoline! An E-30 blend could replace all three grades of gasoline at every station in America, plus all the “boutique” fuels in all the EPA “non-attainment” areas, with one single fuel of better quality. No one would have to spend a dime: all the same tanks and pumps would serve, and no modifications to the cars are necessary at all.

For passenger-car diesel engines, there are only two grades generally available: Number 2 (the standard), and Number 1 (a thinner, runnier grade useful for very cold winter conditions). Most stations around the country only offer Number 2.

Biodiesel is beginning to be available in some parts of the country. This is a product chemically refined from vegetable oils, waste cooking greases, or animal fat wastes. It is a drop-in replacement for petroleum diesel: no modifications required. Its only drawback is a tendency to gel-up (freeze) at about 29 F. However, blends of biodiesel with petroleum diesel will go much, much colder.

Vegetable oil itself is actually a diesel fuel, but requires serious modifications to the car: a separate tank with an in-tank heater, and a means to switch tanks. The car must always be running on petroleum diesel when shut down, as it generally will not start on the vegetable oil next time.

COOLANTS –

There are two liquid coolant types out there, and they may not be mixed. You must stay with what you have, unless you can do a very thorough engine cooling system flush! Most folks cannot.

One type is “green” coolant with a silicate additive package, the other is “red” coolant incorporating “organic acid technology” as the additive package. Both use the same ethylene glycol / propylene glycol base material, it is the wildly-different additives that make them so different. The “green” stuff can actually range from green to yellow in color. The “red” stuff actually ranges from red to orange.

Green coolant additive packages generally last 2-3 years. The coolant needs to be changed every 2-3 years as a result. If you do not change the coolant, your cooling system will corrode and spring leaks. This technology has more than 5 decades of experience behind it.

Red coolant additive packages last longer, at 5+ years, but you still need to change your coolant at no more than the interval specified in your owner’s manual. This is a new technology, with only a handful of years’ experience behind it. Do not neglect changes.

Both types come as concentrates in gallon containers. These concentrates must be diluted with an appropriate amount of water before you add them to your system. For most of the “Lower-48” and Hawaii, a 50-50 mix is fine. In the snow belt and Alaska, use 60-40 antifreeze concentrate-water. Do not exceed 63-37, or the freezing point actually comes back up!

TRANSMISSION FLUIDS –

The most common are light hydraulic oils, with special additive packages for the wet clutches inside automatic transmissions. They are petroleum base, and typically dyed red. The names are Mercon or Dexron, with a suffix Roman numeral, such as “Mercon II” or “Dexron III”. Buy the name and Roman numeral your owner’s manual specifies.

POWER STEERING FLUIDS –

These can be either automatic transmission fluids or “power steering fluids”, which are really only light petroleum hydraulic fluids. Only the additive packages differ: power steering fluids lack the wet-clutch additives (and the red dye) of the automatic transmission fluids. See your owner’s manual for which to use, and don’t mix them.

BRAKE FLUIDS –

These are all designated by the letters “DOT” and a number, such as “DOT-3”. The higher the number, the hotter the brake parts can get before your brake fluid starts to boil, causing brake “fade” (a failure to brake). They range from DOT-1 and DOT-2 (no longer available), through DOT-3 (the most common), DOT-4 (a little better), to DOT-5A and DOT-5 (the very best). You can always replace a lower number with a higher, except not DOT-5.

All of these but DOT-5 are glycol-based hydraulic fluids. These glycols are somewhat corrosive and will damage most paints, but otherwise have the right properties to be brake fluids. Glycol brake fluid ought to be changed every 3 years or so, because it will absorb atmospheric moisture through the reservoir cap vent, and that moisture will cause corrosion damage. Sufficient corrosion damage can cause the brakes to fail.

DOT-5 is different: it is based on a silicone oil, instead of a glycol blend. Silicone oil is incompatible with glycol, so these materials absolutely may not be mixed, because some sort of brake failure will likely occur! The silicone DOT-5 is very expensive, and very hard to find. However, it does not absorb water, and never needs changing.

DOT-5 silicone is compatible with glycol brake system seal materials (or any others!). Thus a glycol system can be refitted with silicone, but only if the system is thoroughly flushed and cleaned. It is a good retro-fit for antiques, restored or otherwise.

CLUTCH FLUIDS –

Some cars with manual transmissions have hydraulically operated clutches. Many of these have a “clutch fluid reservoir”, for others, it is combined with another system. If separate, the “clutch fluid” could be a power steering fluid, an automatic transmission fluid, or even a brake fluid. Consult your owner’s manual to find out which, and use that correct fluid exclusively. Don’t mix them.