FUELS

By Tom Harrison

Good internal combustion engine performance is dependent on many things. Fuel, air, ignition and compression are but a few of the essential components needed to make an engine function. The focus of this article is fuel and how easy it is to take the quality of fuel for granted.

The importance of fuel quality was brought to light for us when we ran into a problem in our shop about 8 years ago with poor engine performance. We were experiencing poor combustion, lack of power, carboned-up cylinder heads and a whole host of small problems that we wrote off to poor design, poor manufacture, and too stringent pollution controls. We have come to learn that 99% of our problem was poor fuel.

The quality of both our gasoline and diesel fuels had deteriorated to the point that performance was being severely affected. It wasn't a matter of our supplier selling us poor quality fuels instead of a better grade fuel; they were selling us the best they had to offer. The large petroleum companies had been gradually reducing quality to the point where the only fuels available were of a poor quality, thus causing poor engine performance.

The problem was not one which came at us real suddenly, either. The decline in performance was very subtle over several years' time. With bulk-delivered fuels you tend to watch the price rather than the octane or cetane rating. If we put the fuel in a vehicle and it starts, we think that's good enough.

The most noticeable problems began with our switch from regular to unleaded fuels. At first the octane rating was adequate, as we noticed few problems. But in 1981, evidently the octane rating started to slip to the point that gasoline engine performance became very poor. We had a 1980 Chevrolet ¾ ton pick-up with a 350 automatic. Mileage never was good, but performance slowly went downhill. Engine knock or "pinging" was our first sign that either timing or fuels were the problem. I had the distributor rebuilt on a different curve to allow for poor fuels and emission controls but this only had a minimal effect on engine knock. Eventually I did some checking on octane ratings and realized that we had slipped to 85-87 octane fuels. We switched to premium unleaded gasoline at 91 octane and noticed a marked improvement in all our equipment. Cushmans and greensmowers all benefited from this better fuel.

In further researching our gasoline availability, we found that our supplier, Cenex Cooperatives, was now marketing two high octane gasolines. They have a premium lead-free which derives its higher octane from alcohol type sources and they offer a super unleaded of approximately the same octane derived from chemical additives. I assumed that alcohol or corn based sources would be the fuel to buy, so we stayed with the alcohol based fuels until I noticed that the marine industry had thrown up the red flag to the use of any fuels with alcohol. At first I thought their concern was for the high RPM light weight alloy cylinder heads. But after doing some checking, I found out that their concern was for the safety aspect of fuel leaking out of hardened and cracking fuel lines and getting into the bilges of boats, consequently causing a fire or explosion. The marine industry felt that alcohol caused rubber fuel line components to rapidly harden and become brittle. I have used alcohol based premium gasoline in my boats and after 24 months, I have had to replace all the fuel lines. The lines have become as hard as if they were 15 years old. I can't say that we have noticed any problems with our turf equipment, but we are looking each piece of equipment over carefully during our winter maintenance.

I wasn't sure whether to upgrade our fuel once more to super premium because I did not know whether the alcohol in our premium blend was a problem. So I called the OMC corporation in Waukegan, IL, Lawn-Boy in Tennessee, Cushman in Lincoln, NE, Briggs and Stratton in Milwaukee and Kohler in Kohler, WI. They all recommended not using any fuels with any alcohol content for only one reason and that was safety. Performance-wise, the alcohol based premiums were fine but the perceived problem of fuel line/system deterioration made them all recommend no alcohol in the fuels.

I then decided to call around and find out which oil companies are using alcohol in any of their fuels. That proved to be a tough task because no longer can you call the local Texaco, Shell, Citgo, Standard Oil jobbers. They have all pretty much gotten out of the local delivery market. Independents have taken over the local fuel deliveries. To find out what the independents were delivering was hard since some of them buy gas on the open market, thus being less than knowledgeable about their product. To the best of my knowledge, it appears that only the ag coops are offering premium fuels blended for higher octane with alcohol. All the other independents I talked to offered a premium gasoline with no alcohol additives. But they all indicated that it is a changing market. It pays to be constantly aware of what you are buying.

As I was finishing this article and tried to draw some conclusions regarding gasoline supplies and quality, the EPA, General Motors and the State of California announced a joint venture to research and promote the possible use of 100% alcohol/gasoline based fuels in southern California. The motives for the EPA and the State of California are to attain cleaner air. General Motors is cooperating because California has some terribly tough rules on vehicle emissions which do not apply to the rest of the country. GM probably feels that if a less polluting fuel can be introduced and accepted by the consumer, GM can sell the same cars in California that it sells to the rest of the country. Currently, many engine/trans-

mission options available to the rest of the nation are not available in California. All GM needs to do to make alcohol/gasohol work in their vehicles is use fuel system components that will withstand alcohol and then tune the vehicles accordingly.

Conclusions that can be made about fuels are as follows. Regular leaded gasoline as of January 1, 1988 is still legal for sale for about at least another year or so according to the EPA. When and if one chooses to switch to unleaded gasoline, the octane rating is minimal for good engine service. Premium type lead-free gasoline is worth the cost for long engine life. Whether to use premium fuel with alcohol additives or not is up to the individual user. Because I have noticed hardened fuel lines on my marine application, I will switch to premium fuel without alcohol until fuel line components are fully available that will better withstand alcohol. The concern as to whether unleaded fuel will destroy valves and valves seats in older equipment is determined by the use of the equipment. If you put a two bottom plow on your Ford 8N tractor and decide to plant soybeans amongst the *Poa annua* on the back forty, the valves on the Ford will not last. Hard, day long use of the older engines without the lead additives will eat up the valves. If the old 8N merely pulls a sprayer or a rough mower, it should have no problems. If you are really concerned about the engines, use lead-free fuels to save the valves. All newer engines including all our single cylinder engines have hardened valves and recommend lead-free fuels.

Another fuel problem that crept up on me was the quality of diesel fuel. I always thought that fuel oil and diesel fuel were two different fuels. I believed diesel fuel had additives for cleaner burning and higher cetane (heat value) ratings and fuel oil was the basic fuel for home heating with no additives. My assumptions were only partially correct. We have a Chevrolet Blazer with a 6.2 liter diesel engine. This is a good engine but its horsepower and torque values are not particularly high. If the timing is slightly off or if a poor or blended fuel is used, performance slips quite noticeably. Performance slowly began to deteriorate on this vehicle in the last year and I did not know what the problem could be. When we blended the diesel fuel 60/40 with #1 diesel for winter driving, performance got even worse. After doing some grousing and grumbling with our fuel supplier, they enlightened me to the fact that in their language diesel fuel and fuel oil are one and the same. There are no additives or cetane differences between the two. They do, however, offer a high grade diesel fuel with the trade name "fieldmaster diesel fuel". This has additives for control of solid pollutants and a much higher cetane rating. After about a month of using this fuel in the 6.2 liter engine the improved performance was tremendous. It was as noticeable as when I switched gasolines from regular lead-free to premium. My suppliers response to my obvious question of "why didn't you tell me about these better grades of fuels" was "we didn't think you needed anything better for lawn mowers".

Twenty years ago we could buy a good grade of regular gasoline that had a reasonable octane and was good for our engines. Premium fuel use on golf courses would have been unnecessary then. Today regular fuel has been cheapened to the point of almost being useless. Diesel fuels can vary in grades and quality also. What is important is that the buyer must beware. You must be aware of what the bulk truck is delivering and you must determine whether you think that better grades of fuels will help you in the care of your equipment.