

## Simple Stuff Getting the Lead Out



By Bob Vitrikas

Many (most?) of us are old enough to remember when unleaded fuel was introduced in the U.S. and what a heated discussion that caused. Was that a bad thing? Yes and no. Did it cause a major hit to engine performance? Not as much as you'd think. Did the automotive and petroleum industries adjust to the reality of unleaded fuel? Yes indeed they did!

Thomas Midgley Jr, inventor of leaded gasoline and the CFC refrigerant in the 1920s and, winner of numerous awards, has since been labelled a one-man environmental disaster, the man who killed the most people in history, and the most harmful inventor in history.

Back in the late 1800s and early 1900s the low octane rating of gasoline held back the ability of car manufacturers to build high compression engines, which in turn meant less powerful and less efficient engines that were prone to the dreaded engine knock. "Knock, knock, who's there?" Engine knock is caused by the gasoline/air mixture detonating before its time which results in the combustion explosion blowing back against the piston as it is rising in the cylinder causing a distressing knock in the engine. Severe engine knock has been known to burn holes in the pistons, burn valves and in general wreak havoc with your engine's internals. Oh dear me!

Not to worry, General Motors came to the rescue in the person of GM chemist Thomas Midgley Jr. who in 1921 discovered that adding ethanol to gasoline would raise the octane rating. Problem was you needed 10% ethanol in the gasoline to achieve the octane boost needed and ethanol was expensive. Hmmm.... Then Midgley discovered that tetraethyl lead (TEL) could substitute for ethanol, and it was cheap, and you only needed a small amount to do the trick. Hurray!! Well not so fast.... Turns out that lead is not a good thing when it comes to human beings. Just ask the last Roman emperor Romulus Augustus who presided over the demise of the Roman Empire which may have been partly due to lead poisoning as a result of lead lining of the water pipes in Roman cities. Poor Mr. Midgley suffered from migraine headaches while he was conducting his research on gasoline. We now know this was a result of his exposure to TEL. Once petroleum companies started producing leaded gasoline, worker deaths immediately started to occur in production plants. Not to worry, the petroleum companies assured us that TEL was "completely safe." The reality is far different.

Mr. Midgley's legacy was further tarnished in the late 1920s when he developed a refrigerant for use in air conditioning systems know as chlorofluorocarbon (CFC). You may know it as Freon 12 or R12. Leaded gasoline and CFC refrigerants have been banned due to their harmful impact on human health and the environment. It has been said that Midgley "had more adverse impact on the atmosphere than any other single organism in Earth's history." In 1940 he was struck down with polio and in 1944 he was found strangled in his bed by a device he designed to allow him to get out of bed unassisted. Privately his death was declared a suicide. Leaded gas and CFCs have now been banned worldwide.

Experience shows that lead poisoning can cause anemia, irreversible nerve damage and mental impairment, as well as increased levels of violence and criminality. Long term exposure can be lethal. Sadly children are particularly susceptible to learning and behavioral problems as a result of exposure to lead. Recent studies show that half of the U.S. population has been exposed to high concentrations of lead during early childhood. As a result Americans born during the 1940s onward have lower IQ scores. Children of the 1960s and 1970s when leaded gas use was at its peak, could have lost six to seven IQ points, having been exposed to eight times the current health limits for lead.

Starting in model year 1971, car manufacturers cut compression ratios to accommodate the phasing in of low lead fuels and avoid the dreaded engine knock and resulting warranty claims that would follow. In 1970 California passed a bill that mandated car manufacturers state the net vs gross horsepower ratings for their engines starting with the 1972 model year. The automakers wisely decided that simpler was better and switched overnight to the net rating for all states. So what's the difference? Gross horsepower rating is really an idealized and unrealistic way to measure horsepower. Engine output was measured running without air cleaner, restrictive exhaust system, cooling fan, alternator, power steering pump, A/C compressor etc. Net rating was real world with the engine installed in the car and with all the necessary components needed



to make it run properly.

Further, the Clean Air Act of 1970 required all cars after 1975 to be equipped with a catalytic converter and cut emissions by 90% in five years. Wow! All of these regulations came together to put the whammy on engine output and spelled the end for Detroit's performance wars, at least for a little while. The drop in engine power ratings was dramatic. Cadillac's 500 cu in V8 dropped from 400 hp in 1970 to 365 hp in 1971 as a result of compression ratios dropping but the worst was yet to come. When the gross to net horsepower measuring came into effect, the Caddy's figure



Cadillac Eldorado, the biggest loser.

dropped all the way down to 235 hp, a 165 hp drop! Yowie! But remember the big drop from 365 to 235 was the same engine just a different rating scheme. Whew!

Automakers made a dramatic recovery and today you can dial up your friendly Dodge dealer and order an 807 hp fire breathing monster. Or if you prefer the strong silent type, how about an electric Lucid Air Sapphire rated at 1,234 hp and zero emissions! Performance? How about 0-60 mph in 1.89 seconds, 0-100 mph in 3.84 seconds and the quarter mile in 8.95 seconds. Top speed is a heady 205 mph. Range on a charge

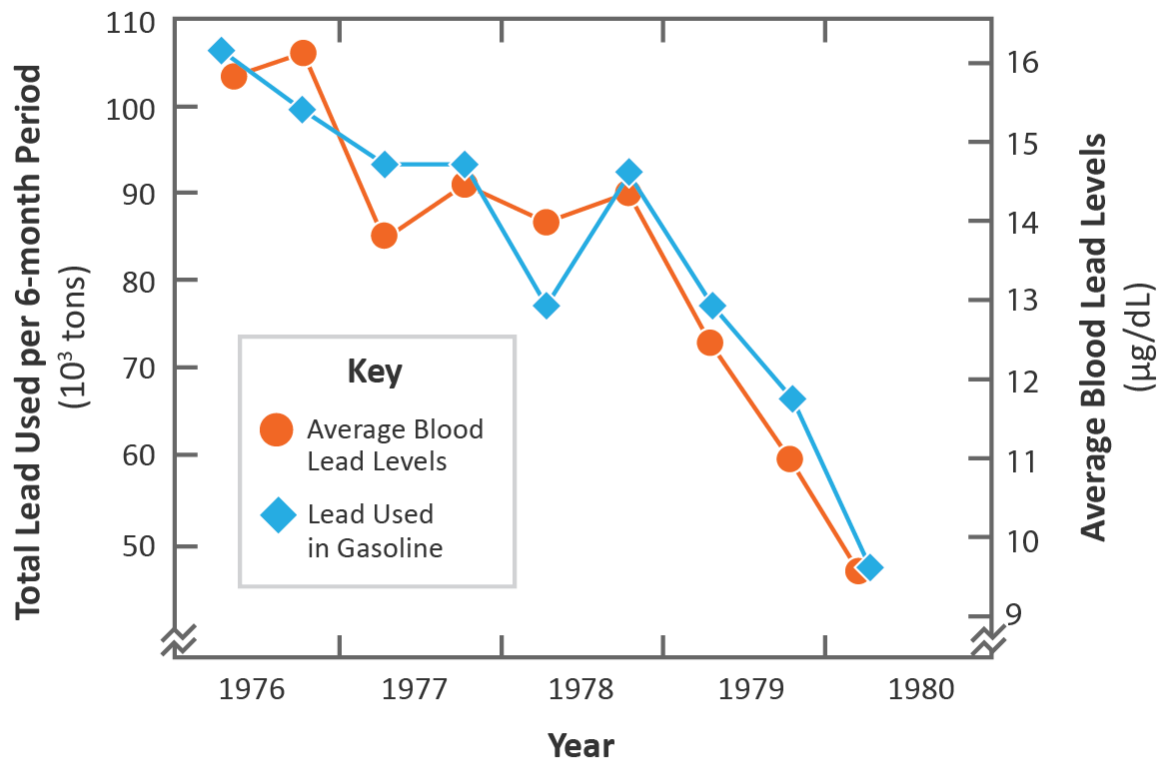


is an impressive 427 miles. Talk about electrifying performance!

In 1974 the feds banned the use of lead in paint and enacted a partial ban of lead in gas in 1985 and in 1996 passed the Clean Air Act which banned leaded gasoline in vehicles. However airplanes, race cars, farm equipment and marine engines can still burn leaded fuel. Airplanes contribute 70% of the lead emissions in our atmosphere. Oh lordy! Not to worry, the Federal Aviation Administration will transition to unleaded fuel in airplanes by the end of 2030.

The Lucid Air Sapphire, the face of environmentally friendly performance today!

## Lead Content in Gasoline and Average Blood Lead Levels



*EPA standards led to parallel decreases in lead content of gasoline and blood lead level of the average American.*

So what has this gained us besides higher gas prices? Quite a bit actually. A 2002 study found that lead levels in U.S. children had dropped by 80 percent from 1976 to 1999 resulting in higher IQs and greater economic productivity. Yea!

Today we add ethanol to our gasoline to raise the octane rating and provide income for corn farmers in the midwest. In 2005 Congress passed the Renewable Fuel Standard that required refiners to add 10% or more ethanol to their motor fuel. It is possible to raise the octane rating in gasoline without ethanol but that involves a more expensive refining process. You can still buy unleaded ethanol free gasoline for your older cars at select stations. Why go to the bother? Turns out ethanol is harmful to old car fuel system parts such as fuel tanks, fuel pumps and carburetors (remember those?). Makes you want to go out and buy an electric car. Simpler is better?