

STUDY ON DIESEL

Diesel or Diesel fuel is a specific fractional distillate of fuel oil (mostly petroleum) that is used as fuel in adiesel engine invented by German engineer Rudolf Diesel[[1]]. The term typically refers to fuel that has been processed from petroleum.

Other diesels

However, alternatives such as biodiesel or biomass to liquid (BTL) or gas to liquid (GTL) diesel that are not derived from petroleum are also being developed.

Petroleum diesel

Diesel is produced from petroleum, and is sometimes called petrodiesel (or, less seriously, dinodiesel) when there is a need to distinguish it from diesel obtained from other sources. As a hydrocarbon[[2]] mixture, it is obtained in the fractional distillation of crude oil between 250 °C and 350 °C at atmospheric pressure. Petro Diesel is considered to be a fuel oil and is about 18% denser than gasoline.

Algae, microbes and water

There has been a lot of discussion and misinformation about algae [[3]] in diesel fuel. Algae is a plant[[4]], and it requires sunlight to live and grow. As there is no sunlight in a closed fuel tank, no algae can survive there. However, some microbes[[5]] can survive there. They can feed on the diesel fuel.

These microbes form a slimy colony that lives at the fuel/water interface. They grow quite rapidly in warmer temperatures. They can even grow in cold weather when fuel tank heaters are installed. Parts of the colony can break off and clog the fuel lines and fuel filters.

It is possible to either kill this growth with poison[[6]], or eliminate the water, a necessary component of microbial life. There are a number of poisons on the market, which must be handled very carefully. If a poison is used, it must be added every time a tank is refilled.

Regardless of the approach there is still a risk of filter clogging. When microbes die their residue may still be in the tank. Once a microbe colony grows there will be a persistent problem.

Chemical composition

Petroleum derived diesel is composed of about 75% saturated hydrocarbons[[7]] (primarily paraffins[[8]] including n, iso, and Cycloalkane[[9]], and 25% aromatic hydrocarbons[[10]] (including naphthalenes [[11]]and alkylbenzenes)[[12]].[13] The average chemical formula for common diesel fuel is C₁₂H₂₆, ranging from approx. C₁₀H₂₂ to C₁₅H₃₂.

Properties

The density of diesel is about about 850 grams per liter whereas gasoline has a density of about 720 g/l, or about 18% less. When burnt diesel typically releases about 40.9 megajoules (MJ) per liter, whereas gasoline releases 34.8 MJ/l also about 18% less. Diesel is generally simpler to refine than gasoline and often costs less (although price fluctuations often mean that the inverse is true).

Diesel fuel, however, often contains higher quantities of sulfur. In Europe, emission standards and preferential taxation have both forced oil refineries to dramatically reduce the level of sulfur in diesel fuels. In contrast, the United States has long had "dirtier" diesel, although more stringent emission standards have been adopted with the transition to ultra-low sulfur diesel (ULSD) occurring in 2006 (see also diesel exhaust). U.S. diesel fuel typically also has a lower cetane number (a measure of ignition quality) than European diesel, resulting in worse cold weather performance and some increase in emissions.

Diesel contains approximately 18% more energy per unit of volume than gasoline, which, along with the greater efficiency of diesel engines, contributes to fuel economy (distance traveled per volume of fuel consumed).

Environmental aspects

High levels of sulfur in diesel are harmful for the environment. It prevents the use of catalytic diesel particulate filters to control diesel particulate emissions, as well as more advanced technologies, such as nitrogen oxide (NOx) adsorbers (still under development), to reduce emissions. However, lowering sulfur also reduces the lubricity of the fuel, meaning that additives must be put into the fuel to help lubricate engines. Biodiesel is an effective lubricant.

Synthetic diesel

Wood, straw, corn, garbage, and sewage-sludge may be dried and gasified. After purification the so called Fischer Tropsch[[14]] process is used to produce synthetic diesel. [15] Other attempts use enzymatic processes and are also economic in case of high oil prices. Synthetic diesel may also be produced out of natural gas in the GTL process or out of coal in the CTL process. Such synthetic diesel has 30% less particulate emissions than conventional diesel (US- California) [16].

Biodiesel

Main article: Biodiesel

Biodiesel[[17]] can be obtained from vegetable oil[[18]] and animal fats (bio-lipids[[19]], using transesterification[[20]]). Biodiesel is a non-fossil fuel alternative to petrodiesel. It can also be mixed with petrodiesel in any amount in modern engines, though when first using it , the solvent properties of the fuel tend to dissolve accumulated deposits and can clog fuel filters. Biodiesel has a lower gel point than

petrodiesel, but is comparable to diesel #2. This can be overcome by using a biodiesel/petrodiesel blend, or by installing a fuel heater, but this is only necessary during the colder months. There have been reports that a diesel-biodiesel mix results in lower emissions than either can achieve alone. A small percentage of biodiesel can be used as an additive in low-sulfur formulations of diesel to increase the lubricity lost when the sulfur is removed.

Chemically, most biodiesel consists of alkyl[[21]] (usually methyl[[22]]) esters [[23]] instead of the alkanes and aromatic hydrocarbons of petroleum derived diesel. However, biodiesel has combustion properties very similar to petrodiesel, including combustion energy and cetane[[24]] ratings. Paraffin biodiesel also exists. Due to the purity of the source, it has a higher quality than petrodiesel.

Uses

Diesel fuel is very similar to heating oil which is used in central heating. In Europe, the United States and Canada, taxes on diesel fuel are higher than on heating oil due to the fuel tax, and in those areas, heating oil is marked with fuel dyes and trace chemicals to prevent and detect tax fraud. Similarly, "untaxed" diesel is available in the United States, which is available for use primarily in agricultural applications such as for tractor fuel. This untaxed diesel is also dyed red for identification purposes, and should a person be found to be using this untaxed diesel fuel for a typically taxed purpose (such as "over-the-road", or driving use), the user can be fined \$10,000 USD on the spot. Also, in the United Kingdom it is known as red diesel, and is also used by agricultural vehicles. Diesel fuel, or Marked Gas Oil is dyed green in the Republic of Ireland. The term DERV(short for "diesel engined road vehicle") is also used in the UK as a synonym for diesel fuel. In India, taxes on diesel fuel are lower than on gasoline as majority of the transportation, that transports grains and other essential commodities across the country, runs on diesel.

Diesel is used in diesel engines, a type of internal combustion engine. Rudolf Diesel[[25]] originally designed the diesel engine to use coal dust as a fuel, but oil proved more effective. Diesel engines are used in cars, trucks, motorcycles, boats and locomotives.

Other uses

Bad quality (high sulfur[[26]]) diesel fuel has been used as a palladium[[27]] extraction agent for the liquid-liquid extraction[[28]] of this metal from nitric acid mixtures. This has been proposed as a means of separating the fission product[[29]] palladium from PUREX[[30]] raffinate[[31]] which comes from used nuclear fuel. In this solvent extraction system the hydrocarbons [[32]] of the diesel act as the diluent[[33]] while the dialkyl[[34]] sulfides[[35]] act as the extractant. This extraction operates by a solvation [[36]] mechanism. So far neither a pilot plant or full scale plant has been constructed to recover palladium, rhodium[[37]] or ruthenium[[38]] from nuclear wastes created by the use of nuclear fuel.

Source : <http://engineering.wikia.com/wiki/Diesel>