



Long Term Storage of Diesel

STORAGE LIFE

Under normal storage conditions diesel fuel can be expected to stay in a useable condition for:

- 12 months or longer at an ambient of 20°C.
- 6-12 months at an ambient temperature higher than 30°C.

As diesel gets older a fine sediment and gum forms in the diesel brought about by the reaction of diesel components with oxygen from the air. The fine sediment and gum will block fuel filters, leading to fuel starvation and the engine stopping. Frequent filter changes are then required to keep the engine going. The gums and sediments do not burn in the engine very well and can lead to carbon and soot deposits on injectors and other combustion surfaces.

The expected life of a diesel fuel is indicated by the oxidation stability test ASTM D2274. The test measures how much gum and sediment will be deposited after keeping the fuel at 95°C in the presence of oxygen for 16 hours. It roughly corresponds to one year storage at 25°C. A result of less than 20mg/L of sediment and gum after the test is considered acceptable for normal diesel.

ACCELERATED AGEING

The ageing process can be accelerated by the following conditions:-

- Contact with zinc, copper or metal alloys containing them. These metals will quickly react with diesel fuel to form unstable compounds.
- The presence of water. Water allows the growth of fungus and bacteria, these produce natural by-products such as organic acids which make the fuel unstable.
- Exposure to high temperatures.
- Exposure to dust and dirt which contain trace elements that can destabilise the fuel, such as copper and zinc.
- Fuel composition. Some components in diesel fuel naturally age quickly.

PROLONGING THE STORAGE LIFE

Prolonging the storage life is achieved by removing or controlling the conditions described in the previous section. Important measures to take are as follows:

- Ensure that the fuel is not in contact with any surfaces containing zinc or copper or compounds containing those metals (eg. brass). If those metals are present then a metal deactivator additive may help.
- Establish a regular fuel maintenance program to ensure that water and dirt is removed from storage tanks. This will also remove any chance for fungus to grow.
- Water should be drained from the storage tanks weekly. The frequency can be extended if the tank shows no tendency to collect water but should be done at least monthly.
- Tanks should be kept full to reduce the space for water to condense, maintaining tanks half full increases the water build up and promotes corrosion in the top half of the tank. Most water will come from condensation as the tank breathes, the rate at which water collects will depend on local climate and will be higher in hot humid coastal areas.
- Tanks should have a well defined low point where water will collect and can be drained. For example, cone down bottoms.
- Establish a system for filtering the contents of the main storage tank through a recirculating filter system. This can be made automatic and will reduce the potential for problems by removing sediment and gums. The filters should be checked and changed at regular intervals. When the filter change interval reaches a certain frequency then the fuel should be changed over.
- Tanks should be emptied and cleaned at least once every 10 years, or more frequently if there is a major contamination.
- Ensure that the fuel supplied conforms to a recognised specification, in Australia that would be AS3570, and ensure the fuel matches the winter cloud point for the area to avoid filter blocking by wax drop out in cold weather. .
- Always purchase fuel to replenish stocks in the winter season April - August. This will ensure that the fuel will not cause wax problems whatever season it is used.
- Obtain assurances from the supplier that all components are fully refined to promote stability.
- Establish a monitoring program whereby samples are taken at regular intervals to monitor the condition of the fuel. The samples can be examined at the site visually for evidence of haziness, sediment, darkening or sent to a laboratory for testing.
- Regularly turn the fuel over. If possible, plan the fuel usage so that it will all be used within 1-5 years and replaced with fresh fuel.

ADDITIVES TO IMPROVE STORAGE LIFE

The following additives can improve fuel storage life:

- Metal deactivators. These work by stopping copper, zinc and other reactive metals from reacting with the fuel.

- Fungicides/Biocides. These work by stopping fungus and bacteria from growing in the fuel and so prolong the life of the fuel. They are only effective on fungus and bacteria and will not stop other oxidation reactions from taking place. They are normally active at the water fuel interface where the fungus and bacteria grow. If fungus is present then a kill dose is required. Otherwise a maintenance dose is used to stop fungus growing. The disadvantages of biocides are:
 - handling and mixing is hazardous because they are poisons.
 - for a kill dose, killing the fungus can lead to a build up of dead matter which will block filters and also cause the fuel to oxidise.
 - ideally, the fungus should be killed and then the tank emptied and drained out.
 - maintenance doses are effective but no more so than regular water draining.
 - disposal of water bottoms requires special handling with due regard to the environment.
- Anti-Oxidants. These work by stopping the oxidation processes from taking place. They prevent the fuel oxidising and reduce the formation of sediment and gum.
- Fuel Stability Foam. Fuel Kleenik is a stability foam which is suspended in the diesel fuel in the tank. It has been developed and tested by Department of Defence and is claimed to keep the fuel stable for up to 10 years. The disadvantages are:
 - it does not work where fungus and water are present which is why it is suspended in the fuel.
 - its size is 2100mm x 200mm x 200mm so it has to be dropped in through a hatch.

After 15 years it has to be disposed of to landfill.

Fuel Kleenik is available from a company called FuelTreat ph 1800 034 442.

In underground storage low sulphur diesel fuel can be expected to last at least 5 years provided steps are taken to keep water and fungus out and potentially up to 10 years or more with regular inspection.

**For further information, please call the BP Lubricants and Fuel
Technical Helpline 1300 139 700 local call
or visit www.bp.com.au/fuelnews**