



## High Lead in Used Oil From Piston Aircraft

It is common knowledge that lead is bad for people, wildlife, and the environment. Lead can cause permanent brain damage and is suspected to cause respiratory problems.

Lead was removed from automotive gasoline decades ago, but aircraft fuel (avgas) still contains this highly toxic substance. The use of avgas in piston engine aircraft contaminates the engine oil with lead, and the contaminated waste oil is considered a special waste. Unlike most regular crankcase oil, however, waste oil contaminated with lead cannot be burned in a waste oil furnace, due to the high lead content.

This fact sheet explains why lead is still used in avgas, and how to properly dispose of oil contaminated with lead.

### History of Lead in Fuel

In the 1920's, gasoline began to replace kerosene as a fuel for vehicles. This change was seen as a major advance at the time because kerosene droplets tended to "preignite" causing the piston to crack or "knock" against the cylinder head.

Engine knock rapidly wears away at the piston heads and valve seats, so fuels with antiknock qualities were sought. Lead alkyl was added to gasoline because of its lubricating and antiknock qualities. The lead gave longer engine life and was a better, more consistently burning fuel.

Eventually, new additives were formulated that increased the antiknock ("octane") ratings of gas without the use of lead, and leaded fuel was banned for use in vehicles. However, avgas is exempt from this ban because piston engine aircraft require such high octane levels, for several reasons:

- when the pistons perform at high pressures for long periods of time, they are exposed to considerable wear and pressure;
- aircraft safety depends on smooth engine performance, and requires a fuel that burns at a steady speed;
- higher octane fuels burn more cleanly, leaving less gum in the fuel pathways.

Although two-stroke diesel engines are available in a few models, leaded fuel is currently the only option available for most piston engine aircraft. Although fuel manufacturers have significantly reduced the amount of lead in avgas over the last decade, they have not yet been able to produce a non-leaded fuel that provides the same level of performance.

## Alternatives

Alternative fuels like ethanol, and additives such as ethyl tertiary butyl ether (ETBE) and methyl tertiary butyl ether (MTBE) are being researched as alternatives to leaded gas. The results are promising, but engines will have to be modified to burn new fuels. Also, certifying a new fuel or additive is a long and costly process, so avgas will be in use for some time. Phasing out lead is also difficult because the octane ratings for avgas and automotive gas are not determined under the same test conditions.

## Disposal

Until there are certified alternatives for lead in aviation fuel, lead will continue to contaminate oil in piston engine aircraft. However, to protect the environment and human health, it is illegal in the Yukon to burn used oil contaminated with lead.

One way to safely dispose of lead-contaminated used oil is to send it to refineries. After the oil is processed there, it is sent to asphalt plants or recycled into new motor oil and other oil-related products. Another option is to blend the contaminated oil with clean oil to reduce the lead concentration, and then burn it in a permitted used oil burner. This dilutes the contamination enough that burning it presents less of a hazard to human health and the environment.

A further option is to participate in the Department of Environment's annual Special Waste Collection. This annual event allows businesses and individuals to safely and legally get rid of their lead-contaminated oil and other special wastes. Please contact the Environmental Programs Branch for further details on the next special waste collection.

## Other Topics

Fact Sheets are also available on the following topics:

- Special Waste Regulations
- Used Oil
- Guide for Used Oil Burner Operators
- Transportation of Special Wastes
- Guideline on Waste Oil Blending

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**For more information on disposal options for lead-contaminated used oil, please contact:**

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