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PROPERTIES AND SPECIFICATIONS OF LUBRICANTS

Due to the absence of reciprocating motion and the presence of ball and roller bearings (antifriction bearings), the turbine engine uses a :

- less viscous lubricant.

Gas turbine engine oil must have a :

- high viscosity for good load carrying ability

but must also be of:

- sufficiently low viscosity to provide good flowability.

It must also be of:

- low volatility to prevent loss by evaporation at the high altitudes

In addition, the oil should not:

- foam

should be:

- essentially nondestructive to natural or synthetic rubber seals in the lubricating system.

The many requirements for lubricating oils are met in:

- the synthetic oils developed specifically for turbine engines.

Synthetic oil has two principal advantages over petroleum oil It has a :

- lower tendency to deposit lacquer
- and coke

type II turbine oil

Oil grades used in some turbine engines normally contain :

- thermal and oxidation preventives
- load carrying additives,
- substances that lower the pour point in addition to synthetic chemical base materials

Most turbine oils meet this type II specification and are made with the following characteristics:

1, Vapor phase deposits; carbon deposits formed from oil mist and vapor contact with hot engine surfaces.

2, Load carrying ability; provides for heavy loads on the bearing systems of turbine engines.

3, Cleanliness; minimum formation of sludge deposits during severe operation.

4, Bulk stability: resistance to physical or chemical change resulting from oxidation. Permits long periods of serve operation without significant increase in viscosity or total acidity, the main indicators of oxidation

5, Compatibility; most turbine oil is compatible with other oils that meet the same military specification. But, most engine manufacturers do not recommend the indiscriminate mixing of approved oil brands and this is not a generally accepted practice.

6, Seal Wear; essential for the life of engines with carbon seals that lubricant properties prevent wear of the carbon at the carbon seal face.

My statement (my own explanation):

1. Vapor Deposits: Prevents carbon buildup on hot engine surfaces.
2. Load Support: Handles heavy loads on bearings.
3. Cleanliness: Minimizes sludge during harsh use.
4. Stability: Resists oxidation, maintaining viscosity and acidity.
5. Compatibility: Mixable with similar oils but avoid indiscriminate blending.
6. Seal Protection: Prevents wear on carbon seals.

SPECTROMETRIC OIL ANALYSIS PROGRAMS

A Spectrometric Oil Analysis Program allows an :

- oil sample to be analyzed and searched for the presence of minute metallic elements

As the engine operates over time:

- the oil picks up very small particles that stay suspended in the oil.

Oil analysis programs :

- identify and measure these particles in parts per million (PPM) by weight.

An increase in PPM of certain materials can be a sign of:

- component wear or impending failure of the engine

PROPERTIES AND SPECIFICATIONS OF TURBINE ENGINE FUELS

Aircraft with turbine engines use a type of fuel different from that of reciprocating aircraft engines

Commonly known as:

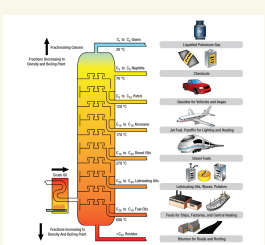
- jet fuel, turbine engine fuel is designed for use in turbine engines
- should never be mixed with aviation gasoline
- Should not be introduced into the fuel system of a reciprocating aircraft engine fuel system

The characteristics of turbine engine fuels are significantly different from those of :

- AVGAS

Turbine engine fuels are :

- hydrocarbon compounds of higher viscosity with much lower volatility
- higher boiling points than gasoline



Turbine engine fuels sustain a:

- continuous flame inside the engine.

They typically have a:

- higher sulfur content than gasoline,
- various inhibitors are commonly added them.

Inhibitors Used to control:

- 1, corrosion 2, oxidation 3, ice 4, microbial and bacterial growth

FUEL VOLATILITY

The choice of turbine engine fuel reflects consideration of conflicting factors

While it is desirable to use a fuel that is
- low in volatility to resist vapor lock and evaporation while in the aircraft's fuel tanks

Turbine engines must start
- readily

and be able to :
- restart while in flight

Fuel with high volatility makes this
- easier.

My statement;
Turbine engine fuel needs to balance two factors:
- Low Volatility: Prevents vapor lock and reduces evaporation in the fuel tanks.
- High Volatility: Ensures easy engine starting and restarting, especially in cold conditions.

The fuel must provide reliable performance in both scenarios.

TURBINE FUEL TYPES

Three basic turbine engine fuel types :
1, Jet A: most common turbine engine fuel available in the continental United States

2, Jet A-1 : is the most popular globally

3, Jet B : Its volatility and vapor pressure : reflect this and fall between Jet A and AVGAS
Jet B : primarily available in Alaska and Canada

FUEL IDENTIFICATION

The use of dyes in fuel helps:

- aviators monitor fuel type

AVGAS for reciprocating engines is:

- dyed various colors for use in different parts of the world.
- the liquid is colored (green, red, blue)

Jet fuel is :

- not dyed

All grades of jet fuel are:

- colorless

or

- straw colored.

Decals and markings using the same colors as the AVGAS colors :

- are used

Delivery trucks and hoses are:

- marked as are aircraft tank fuel caps and fill areas

Jet fuel fill hose nozzles are:

- sized too large to fit into an AVGAS tank fill opening

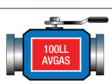
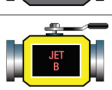
Fuel Type and Grade	Color of Fuel	Equipment Control Color	Pipe Banding and Marking	Refueler Decal
AVGAS 82UL	Purple			
AVGAS 100	Green			
AVGAS 100LL	Blue			
JET A	Colorless or Straw			
JET A-1	Colorless or Straw			
JET B	Colorless or Straw			

Figure 9-2. Color coded labeling and markings used on fueling equipment.

FUEL PURITY

The use of filters in the various stages of transfer and storage of jet fuel:

- removes most foreign sediment from the fuel

The purity of aviation fuel is compromised most often by:

- water

However, water is not removed by:

- the aircraft's filters and strainers as easily as solid particles

Air in the tank vapor space above the liquid fuel contains:

- water vapor.

Temperature fluctuations cause the water vapor to :

- condense on the inner surface of the tanks and settle into the liquid fuel.

Proper procedure for minimizing water entering aircraft fuel is to:

- fill the aircraft fuel tanks immediately after each flight

If water is entrained or dissolved in the fuel:

- it cannot be removed by draining the sump(s) before flight

there may be enough water for

- icing to be a concern.

As the aircraft climbs and fuel is drawn out of the tanks:

- the fuel supply cools

If cool enough:

- ice crystals form rather than liquid

These can clog:

- filters and disrupt fuel flow to the engines.

Both AVGAS and jet fuel have:

- this type of water impurity issue leading to icing that must be monitored and treated.

FUEL ADDITIVES

Fuel Additives are :

- chemicals added to aviation fuel to improve performance and prevent issues:

1, ANTI-ICE ADDITIVES

such as :

- Prist®

added usually during :

- refueling

They dissolve in free water as it comes out of the fuel and

- lower its freezing point.

2, ANTI-MICROBIAL ADDITIVES

microorganisms form a bio film that can clog :

- filters
- corrode tank coatings
- degrade the fuel.

SAFETY PRECAUTIONS

Information on established limits on exposure to turbine oil can generally be found in the

- material safety data sheets (MSDS).

Prolonged breathing of hydrocarbon vapor concentrations in excess of the prescribed limits may result in

- lightheadedness,
- dizziness,
- nausea

Prolonged or repeated contact of turbine oil with the skin can cause

- irritation and dermatitis

In case of skin contact,:

- wash the skin thoroughly with soap and warm water.

Promptly remove oil soaked clothing and

- wash.

If turbine oil contacts the eyes:

- flush the eyes with fresh water until the irritation subsides

Protective clothing, gloves, and eye protection :

- should be used when handling turbine oil