

Tech topic

Jet engine oil system: part 1

Overview

Key insight

Jet oils are required to operate at extreme temperatures between

-40°C and
>250°C.

Introduction

International air regulations require that each engine is equipped with a self-contained oil system capable of providing continuous oil flow under all conditions. The recirculatory oil system stores, carries, cools and distributes oil for lubricating and cooling every bearing, gear, spline, carbon seal and certain accessories.

Oil flow

Delivered by a single positive displacement pump from a tank attached to the engine, deaerated, filtered fresh oil flow is supplied to components through piping and/or internal flow passages. Supply pump delivery pressure can be regulated or unregulated, depending on the engine builder's practice.

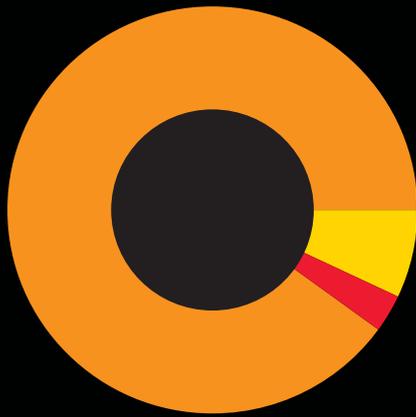
An antisiphon system prevents tank draining due to the siphoning effect created upon engine shutdown through the supply network when the tank is located above a supply nozzle. A pressure relief valve protects the supply pump and circuit against abnormal output pressure during cold starts.

Flow distribution is metered through oil nozzles, protected in some applications by last chance filters. Flow rate to components is based on lubrication and cooling requirements in a particular area.

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Functions of jet oil



90%

Transfer heat

5-10%

Reduce friction

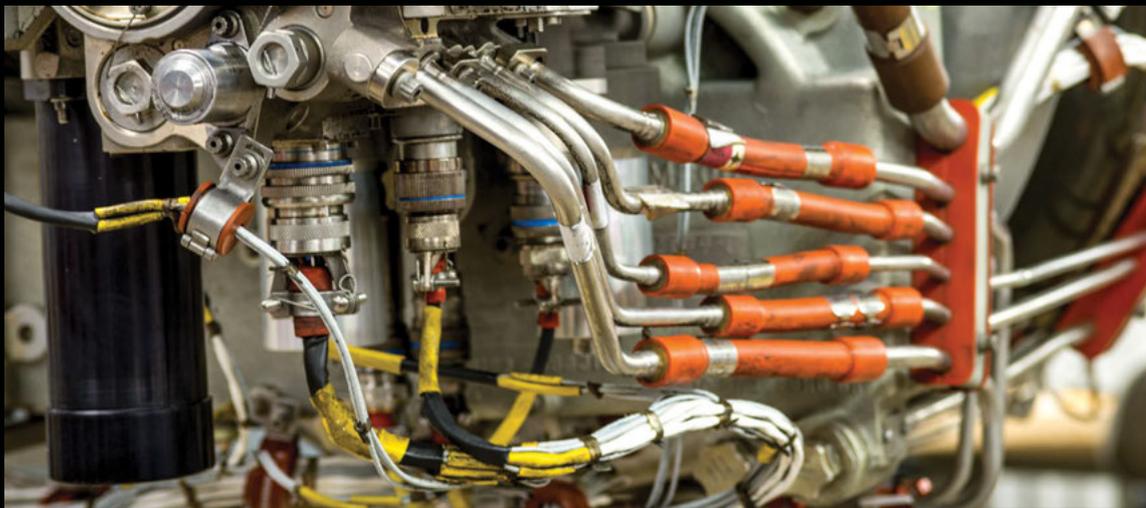
2-3%

Seal, filter contaminants, corrosion protection

Monitoring system

A monitoring system provides information to the cockpit engine health by measuring oil parameters such as oil supply pressure and temperature and filter ΔP . Cockpit indication of abnormality goes on in case of failure. In advanced onboard computerized systems, additional parameters are recorded and analyzed in real time or after landing, such as filter ΔP , scavenge temperatures, oil quantity in the tank and quantity of debris released by the sumps.

Scavenged oil flow



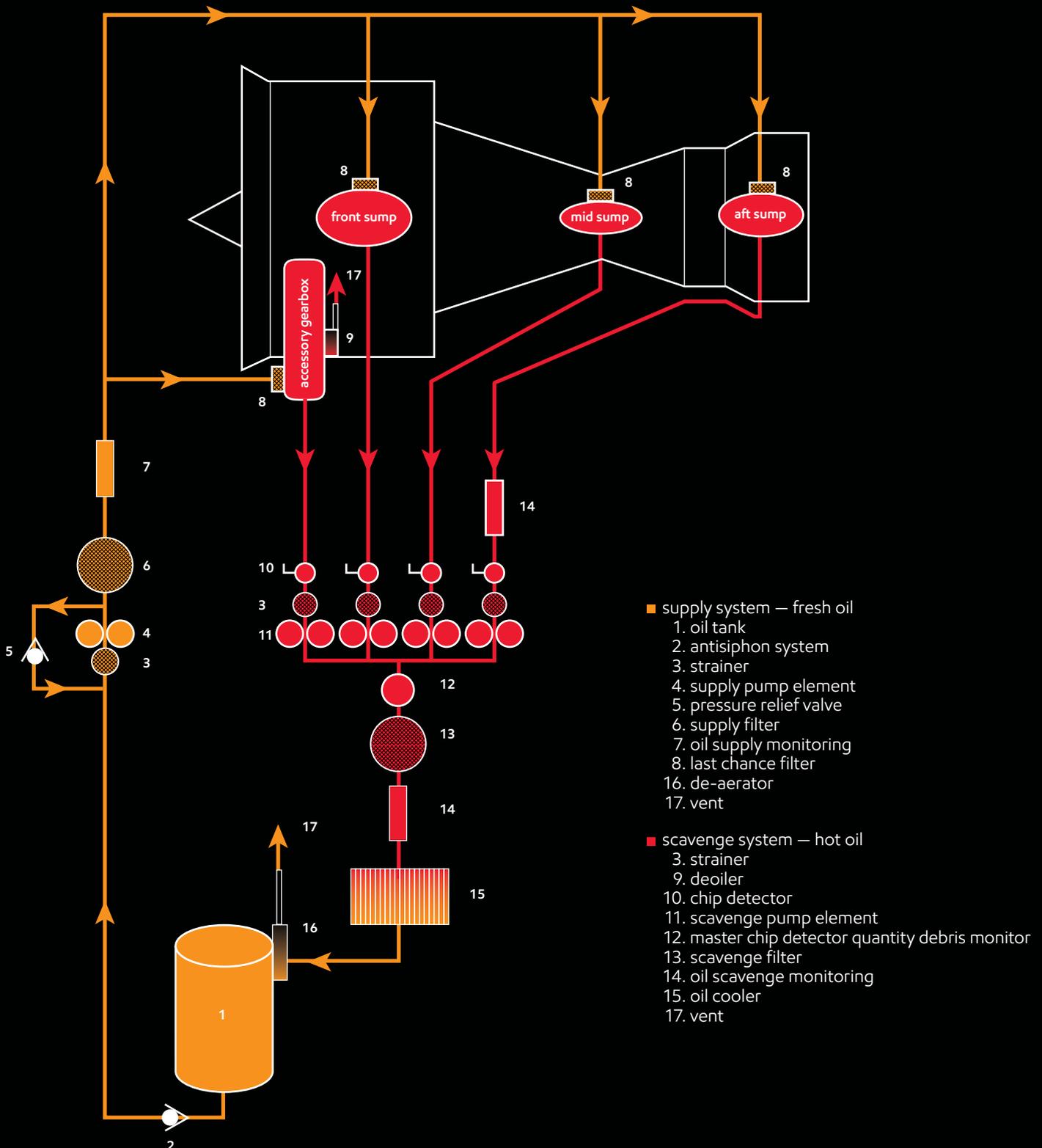
After lubricating and cooling the components in the bearing sumps (or compartments), the oil flows to the bottom of sumps, carrying heat, air bubbles, wear particles and debris. Oil is scavenged by a dedicated positive-displacement pump element through a separate circuit.

Scavenged oil flow is slightly lower than the supply flow due to normal oil consumption through the de-oiler, oil seals and oil leaks. Scavenge pump elements are designed to have excess capacity to keep sumps drained, without scavenge interruption in every flight condition. A large amount of air is carried by the scavenge oil and removed through a de-aerator when entering the tank. Each pump element is generally protected by a wire mesh screen against foreign objects, with the fine filtration done by cartridge type filters on the supply line and sometimes another on the scavenge line.

Pressure and scavenge pump elements are generally stacked in the same housing installed on the accessory gearbox and driven by the core engine. Chip detectors, strainers and filters for monitoring are often on the lubrication unit. Oil cooling is achieved by heat transfer from the scavenged oil to the burn-off fuel, and to fan or ram air as is required. Coolers can be on the scavenge side and/or the supply side.

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Typical jet engine oil system



For more information

Please contact your ExxonMobil aviation sales representative.