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The Aircraft Oil System is Being Developed

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ABSTRACT

The cause of the increase in temperature of the oil lubrication system of an aircraft's turbojet engine, which damages the engine and costs the government a lot of money, was researched. The main cause was discovered to be excessive heat from the frailer oil thermostat; therefore, I created and installed an experiential valve in the oil system, this functioned to reduce the temperature of the oil.

KEYWORDS

Temperature, oil lubrication, aircraft's, oil thermostat

INTRODUCTION

Airlines occupy great importance to most countries of the world at the present time in the civil and military field because of the large and fast services they provide in the transportation arena compared to other lines, as well as ensuring the national sovereignty of the country, but it may be reluctant to perform its duties due to its malfunctions, especially for plane due to the high oil temperature. For the engine, therefore , it is necessary to install a fixed valve for lubrication in the lubrication system of the aircraft, which work to regularly cool the engine oil and increases the efficiency of the engine. Thus we get rid of the defect of high engine oil temperature. Indeed, thanks to God, my experience was full with great success.

TEMPERATURE

is a numerical measure of hot and cold in a body that is in its own state of internal thermal equilibrium. Its measurement is by detection of heat radiation or particle velocity or kinetic energy, or by the bulk behavior of a thermometric material it may be calibrated in any of various temperature scale, Celsius, Fahrenheit, Kelvin, ect. the fundamental physical definition of temperature is provided by thermodynamic.[1]

FICTION

When you apply the brake, the friction linings make contact with the surface of the plane's revolving wheel. The pressure is determined by the influence of perpendicular forces created by the brake system on the surfaces, as well as whether the brake system is hydraulic or pneumatic .Friction are created by friction between the surfaces of the linings fitted on the plane and the surface of the wheels.

The coefficient of friction between the friction surfaces

Affect the value of the coefficient of friction between the surfaces on the amount of friction force needed to brake the plane, known as the coefficient of friction () as the ratio between the force required to move the surface to another surface (friction force) and the vertical force between the surfaces, and increases the frictional braking force [2]

$$\mu = \frac{F_r}{F_n} \tag{1}$$

μ =Coefficient of friction

F_r = Friction force

F_n = Vertical force

VISCOSITY

A fluid's viscosity is a measurement of its resistance to progressive deformation caused by shear or tensile stress.It corresponds to the colloquial concept of "thickness" liquids.Honey, for example, has a viscosity substantially higher than water.The friction between nearby particles in a fluid moving at different speeds causes viscosity.When a fluid is driven down a tube, it moves quicker towards the axis and extremely slowly near the walls; as a result, some stress (such as a pressure difference between the two ends of the tube) is created.

Viscosity in a dynamic (shear) state

Fluid shears luminary between two plates The fluid shears due to friction between the fluid and the moving boundary The force required for this action is proportional to the viscosity of the fluid.

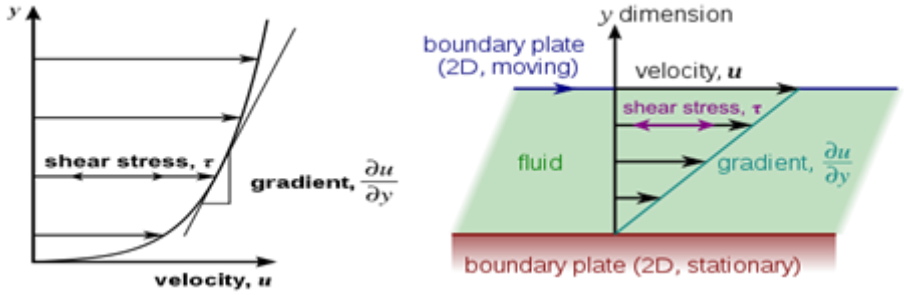


Figure 1. Fluid viscosity

The shear stress in a general parallel flow (such as that seen in a straight pipe) is proportional to the velocity gradient, as shown in figure (1) The resistance of a fluid to shearing flows, in which adjacent layers move parallel to each other at differing speeds, is expressed by its dynamic (shear) viscosity A Colette flow is an idealized condition in which a layer of fluid is caught between two horizontal plates, one immovable and the other moving horizontally at a constant pace (Because the plates are supposed to be quite large, what happens towards their edges is not taken into account The fluid particles will travel parabolic ally if the top plate's speed is low enough. As a result, it's necessary to keep the top plate moving at a constant speed.This force's magnitude is determined to be proportional to each plate's speed and area, but inversely proportional to their separation: y

$$F = \mu A \frac{u}{y}. \tag{2}$$

The viscosity (particularly, the dynamic viscosity) of the fluid is the proportionality factor in this expression. The rate u/y of shear deformation, also known as shear velocity, is the derivative of the fluid speed in the plane perpendicular to the plates .The viscous forces were described by Isaac Newton using the differential equation.

$$\tau = \mu \frac{\partial u}{\partial y}, \tag{3}$$

where $\tau = F/A$ and $\partial u/\partial y$is the local shear velocity. This formula assumes that the flow is moving along parallel lines and the $y$axis, perpendicular to the flow, points in the direction of maximum shear velocity. This equation can be used where the velocity does not vary linearly with y, such as in fluid flowing through a pipe. Use of the Greek letter mu (μ) for the dynamic stress viscosity is common among mechanical and

chemical engineers, as well as physicists However, the Greek letter (η) is also used by chemists, and physicists viscosity kinematics

The kinematic viscosity is defined as the ratio of dynamic viscosity to fluid density .The Greek letter is commonly used to represent it (v).

$$\nu = \frac{\mu}{\rho} \tag{4}$$

When analyzing the Reynolds number, which indicates the ratio of inertial forces to viscous forces, this is a useful concept:

$$Re = \frac{\rho u L}{\mu} = \frac{u L}{\nu}\ , \tag{5}$$

Where L is a typical length scale in the system [3, 4, 5, 6]

ADVANTAGES OF A LUBRICATION SYSTEM THAT WORKS AUTOMATICALLY

Auto lubrication systems have a number of advantages over traditional manual lubrication methods:

1. Regardless of position or accessibility, all vital components are lubricated.
2. Lubrication takes place while the machine is running, ensuring that the lubrication is evenly dispersed throughout the bearing and enhancing the machine's availability.
3. Proper lubrication of crucial components assures the machinery's safe operation.
4. Less component wear equals longer component life, fewer breakdowns, less downtime, lower replacement costs, and lower maintenance expenses.
5. Lubricant amounts are measured, which guarantees no lubricant is wasted.
6. Safety - no climbing around machines or into areas that are inaccessible (gases, exhaust, confined spaces, etc)
7. Less friction means less energy use.
8. Increased overall productivity as a result of improved equipment availability and reduced downtime due to failures or routine maintenance.
9. The engine parts are lubricated under pressure feed in this arrangement.[8]

PRINCIPLE OPERATION OF THERMOSTAT

The thermostat is very temperature-sensitive, thermostat incorporating an expansion element be installed to regulate temperature when temperature of oil system few the thermostat allowed the oil to pass to reservoir directly as shown in up of figure (2), and when oil system have high temperature the thermostat allowed the oil to passes to heat exchanger to cool the oil then return to reservoir as shown in down of figure(2)

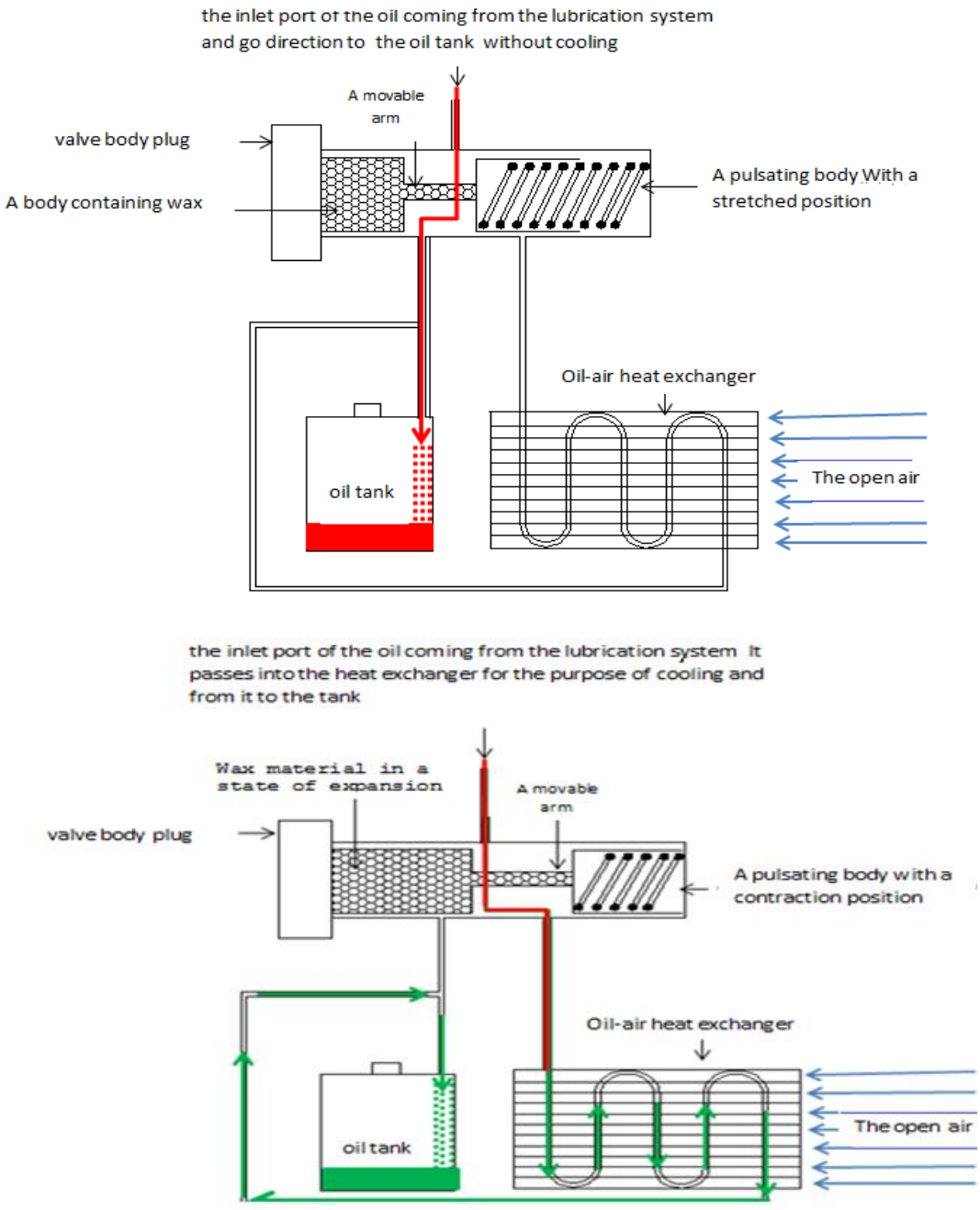
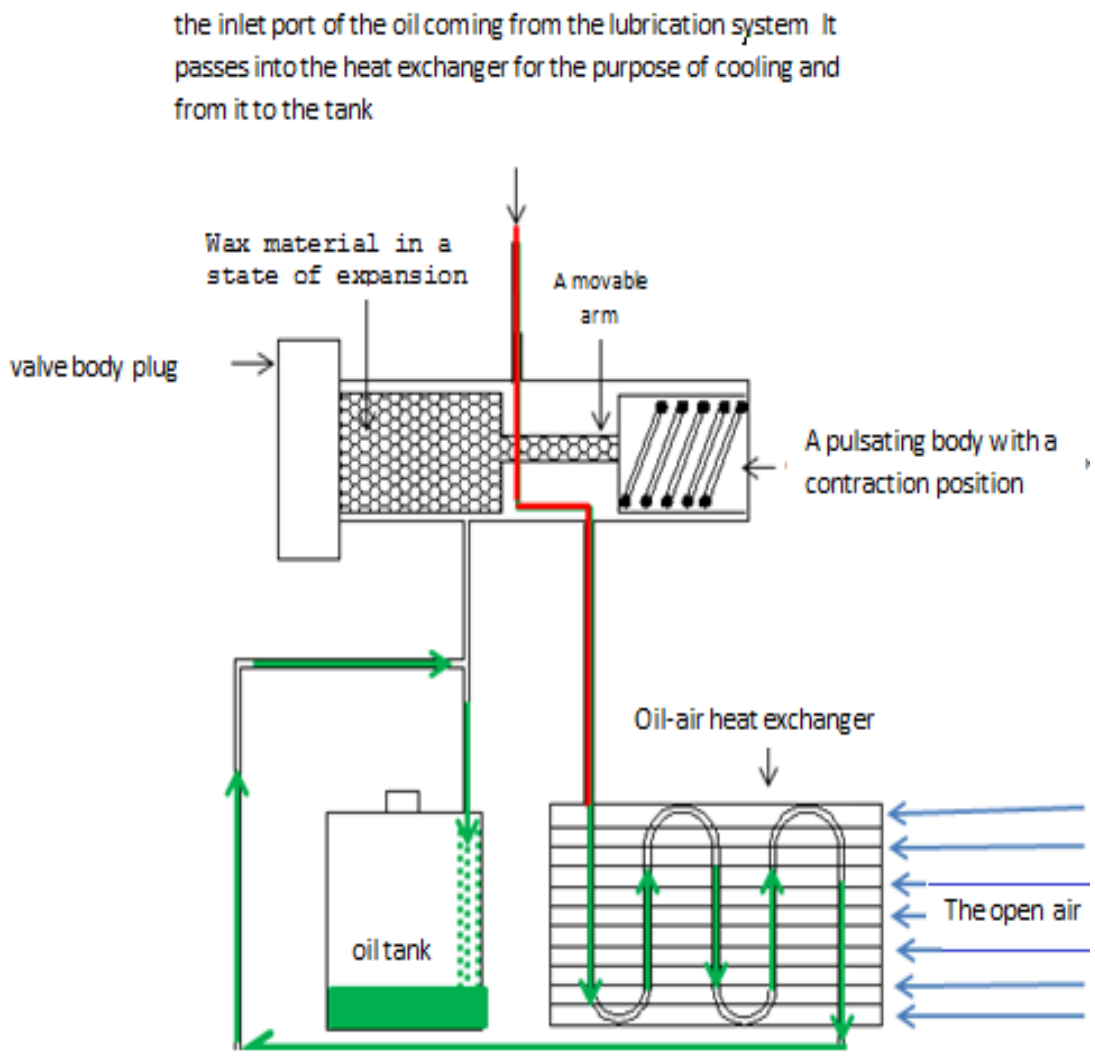


Figure 2. Principle operation of origin thermostat

PRINCIPLE OPERATION OF DEVELOPMENT THERMOSTAT

As shown in figure (3) the development thermostat which I design and adding to oil system, the thermostat always allowed to oil to passes to heat exchanger for all time to reduce the temperature of the oil.



TESTING AND CONCLUSIONS

I selected two aircrafts type Tucano 27 which it caused frequent high temperature of oil system (Tucano 27 is aircraft Brazilian-made dual seat used for many purposes and the main purpose is to train students in the colleges of the Air Force and rehabilitation Aviation). I installed my new thermostat on one of the aircraft and made sure that both aircrafts fly in same time in day and night and under the same weather conditions and during 50 hours of flying of follow up, the test concluded that there are a difference between aircraft equipped with new thermostat and non-equipped, as shown in the following table(1).

Table 1. Different between Tucano aircraft equipped and non-equipped the new thermostat

N	**Tocano aircraft equipped with new thrmostat**	**Tocano aircraft non-equipped new thrmostat**
1	during 10 houres flying the temperature and pressure of oil system its normal	during 10 houres flying the temperature and pressure of oil system its normal
2	Through 19 houres flying the temperature and pressure of oil system its normal	Through 19 houres flying, we had increase the temperature of oil. investigate the cause, it was failure of the thermostat, it was replaced with new thermostat
3	Through 32 houres flying the temperature and pressure of oil system its normal	Through 32 houres flying, we had reduce of oil pressure. investigate the cause, it was failure of the viscosity of oil, it was replaced with new oil

4	Through 43 houres flying the temperature and pressure of oil system its normal	through 43 houres flying the High-temperature oil. investigate the cause, it was failure because of changing the color of oil, it was replaced with new oil
5	after 50 hours flying, during the maintenance process and conduct periodic inspections of the aircraft and we found a bad viscosity, we changing the oil with new oil	after 50 hours flying, during the maintenance process and conduct periodic inspections of the aircraft and we found a bad viscosity with a few impurities, we changing the oil with new oil

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