

Design and development of centrifuge Oil Cleaner

Vinit Jadhav, Anuj Chhetri, Akash Pawar ,Amit Thombare

Department of Mechanical Engineering, SVERI's College of Engineering,

Final Year Engineering Student

Guide: Prof. S.B. Fand

Relevance

Lubricating oil with use is deteriorated resulting in formation of sludge, lacquer and carbon. Further it is contaminated by various by products of combustion of fuel, viz water, acids, un-burnt fuel. In addition to these fine particles of dust and rust formed in engine are other impurities present in the oil. The oil after passage through the strainer and pump passes through the oil filter whose purpose is to remove any impurities which might damage the engine bearings.

NEED FOR PROJECT

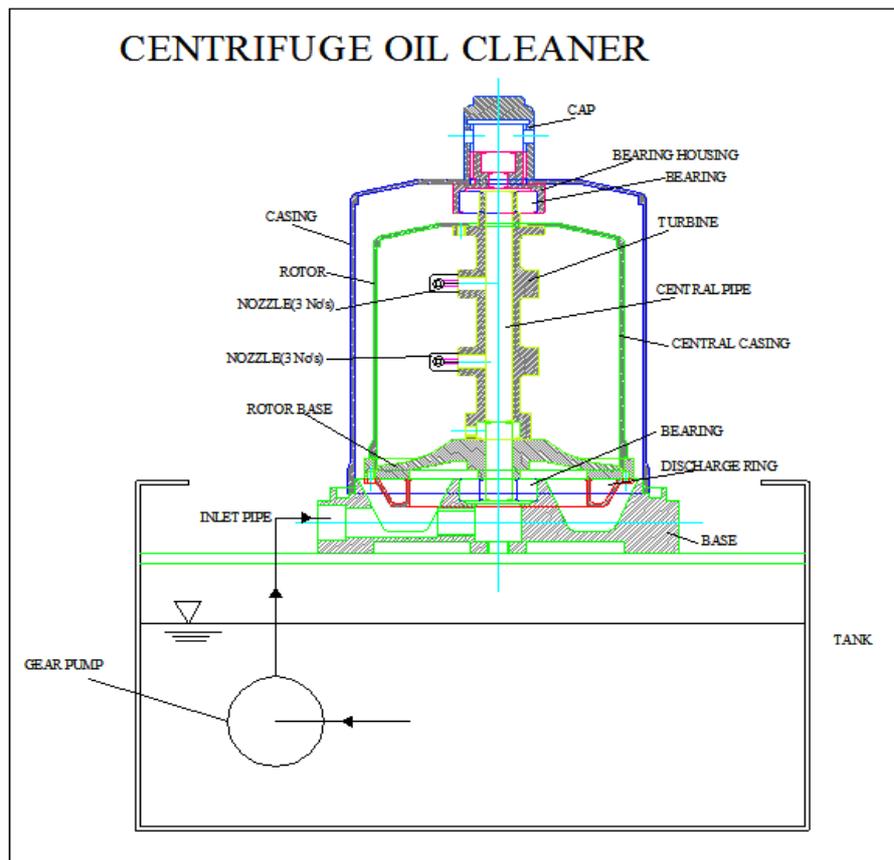
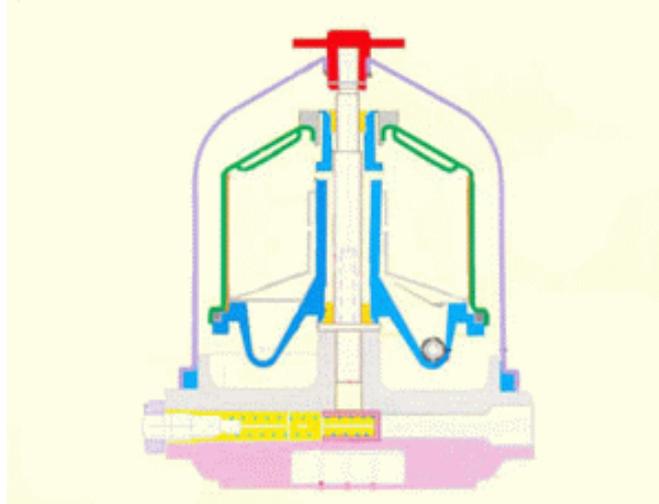
Lubricating oil with use is deteriorated resulting in formation of sludge, lacquer and carbon .Further it is contaminated by various by products of combustion of fuel, namely water, acids, un-burnt fuel. In addition to these fine particles of dust and rust formed in engine, other impurities are also present in the oil.

The oil after passage through the strainer and pump passes through the oil filter whose purpose is to remove any impurities which might damage the engine bearings.

CENTRIFUGE OIL CLEANER

In this the impure or dirty oil from the engine enters the hollow central spindle having holes around its periphery as shown in fig.

The dirty oil comes out of these holes and fills the rotor casing after which it passes through these jets, the reaction of which gives the motion to the rotor casing in the opposite direction so that it starts rotating .The oil impinges on the outer stationary casing under impinges on the outer rotating .The oil impinges on the outer stationary casing under heavy pressures , where the impurities are retained and clean oil falls below from where it is taken out .The filter walls have to be cleaned at intervals of about 7000 km.



CONSTRUCTION

The construction of the centrifuge oil cleaner consists of the following parts

(h) BODY(BASE FLANGE)

Body or the base flange is a steel construction that supports the entire filter until. It has provision for clamping the filter unit into tank. Body is provided with an opening in the form of oil inlet connection in which is screwed a hose nipple. Provisions are made for the drain of the cleaned oil in the form of six holes evenly spaced on either side of the center line.

Centrally in the body carries the central pipe that carries oil at high pressure to the rotor turbine .The body also carries a ball bearing 6004zz on which the rotor base is fitted.

Another important part of the body is the upper clamping ring that is used to hold the cover or casing of the oil cleaner by means of hose clip.

CENTRAL PIPE

Central pipe is a hollow steel tube that carries the high pressure oil from the body to the rotor turbine. Two holes are drilled spaced on the circumference of the central pipe at the inlet to the turbine .The central pipe is sealed at the upper end by means of a plug.

(i) ROTOR BASE

Rotor base is the lower part of the turbine unit that rotates along with the turbine. It is housed in the body by means of the ball bearing 6004zz. This rotor base carries the turbine at its upper end where as a groove is provided to house the rotor casing. Holes are provided on the rotor base to drain the oil coming out of the turbine nozzles to the discharge ring fitted at its lower end.

(j) ROTOR TURBINE

Rotor turbine is an inward flow radial out reaction turbine. It consists of a rotor turbine body, and two sets of nozzles (4 each) along the length and each set of nozzles has the four nozzles equally spaced at 90⁰ phase difference.

Body of the rotor turbine is constructed from structural grade low density aluminum for light weight. The body received ball bearing 6004zz as bearing elements at the upper end. Central eight M8 tapped holes are provided on the circumference equally spaced. These holes receive eight nozzles.

Nozzles are two part construction that consists of a pipe element screwed into the rotor turbine body where as the nozzle element is element is fitted on to it at 120⁰ to the pipe element axis.

(k) ROTOR CASING

Rotor casing is a steel construction hollow container fitted on to the rotor base at the lower end where as at the top it is fitted to the turbine by three M4 bolts. The rotor casing is removable for cleaning purpose.

(l) CASING

(m) Casing or cover is the super structure that covers the rotor and other parts. It is fitted on the body at the upper ring portion and is clamped in position by means of a hose clip.

F- UPPER BEARING HOUSING

Upper bearing housing carries the ball bearing 6004zz that houses the turbine; it is threaded at the upper end to receive the cap which locks the entire assembly.

G- TANK

Tank is the reservoir of oil and also acts as the frame for mounting the oil cleaner.

WORKING

- The centrifuge oil cleaner assembly consists of its body and a rotor inside.
- The body houses the rotor and also facilitates the clear mounting on the oil tank. The body as inlet oil connection and drained facility of cleaned oil to the tank.
- High pressure oil enters the body through oil inlet connection moves to the rotor turbine through the central pipe. The rotor turbine receives this oil at its central hollow portion and it is equally distributed to the nozzles on its periphery.
- The nozzles convert the oil pressure energy into drive force of rotors rotation this oil kinetic energy and more over the dirt matter by virtue of its mass will have high momentum. This high momentum mass when strikes the walls of the rotor it will stick to it where as the clean oil will fall down and more on to the lower rotor part.
- This oil will be sprayed again by the discharge ring nozzle there by achieving on cooling effect.
 - Dirt mass will gradually build up on the wall of the rotor. The design of the rotor facilitates easy periodic removal of the collected dirt.

BENIFITS OF CENTRIFUGE OIL CLEANER.

1. Removes harmful abrasive, metallic and dirt particles.
2. Reduces wear rate of moving engine components.
3. Extends time between major overhauls by another 50 %, reduces expenditure on over hauls.
4. Eliminates parts breakage due to wear scratches from large dirt particles.
5. Finer oil cleaning eliminates clogging of oil passages.
6. Oil cleaner also acts like a cooler which lowers the oil temperature this will cause more cooling of piston rings, gudgeon pin thereby eliminating chances of engine seizure.
7. Arrests additives depletion, thus retaining the oils lubrication properties for longer time.
8. Keeps engine operation fuel efficient and oil efficient.
9. It arrests the thickening of oil and wear of piston rinks.
10. Quality of oil remains consistent over time.