Hot Oil Flushing

Flushing is a process which is done to clear any contaminants present in the pipe and oil after installation. The sole purpose of this process is to avoid damage caused by contaminants/dirt's to the end using equipment. The pipes are cleaned by creating a turbulent flow in the system and passing them through filters until the desired cleanliness value is obtained. The cleanliness in the pipe is measured in terms of NAS/ISO/SAE Values.
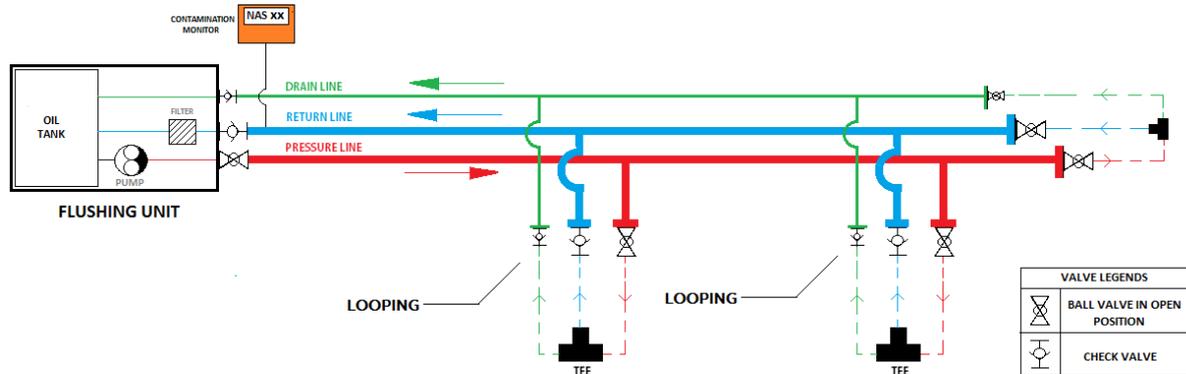
1.1 Process

Fig 1.0. Schematic Drawing of a Flushing Circuit

Flushing involves continuous recirculation of the working fluid in the system and purification at the flushing filter until the cleanliness value is obtained.

The main components in the flushing circuit are

a) Flushing Unit
b) Contamination Monitor
c) Flushing Filter
d) Looping Materials

The Flushing Unit (FU) is basically a Hydraulic Power Unit (HPU) with high flow rate. The FU will be the driving the flushing fluid throughout the circuit to get the lines flushed. The FU will be housing the flushing filter which is responsible to clean the circulating oil through every flushing cycle.

The contamination monitor measures the cleanliness of the oil and gives a reading called cleanliness values (CV). These values are either as per ISO 4406 or NAS 1683. The looping materials are normally hoses with various fittings like tee, elbows, and manifold depending on the requirement.

The above Fig 1.0 shows a typical flushing circuit. The fluid flows through the pressure line from the pump and branches from the tees through the tap-offs in the main header into the return and drain lines. The fluid flows back to the HPU through the return line and the drain line. In this process the fluid is filtered at the return line filter before it enters the tank and gets ready for the next cycle. The contamination monitor is connected to the return line just before the filter at the upstream side. The contamination of the oil is checked in the cleanliness monitor. If the CV is not as per requirement, the flushing cycle is continued until the CV is obtained. Once the CV is obtained, the flushing is continued for half an hour and the consistency of the CV is checked. If there is consistency in the reading, the flushing is complete.

1.2 Pre-requisites-

The main requirements for flushing are:

    A. Fluid Velocity of the Flushing Oil
    B. Viscosity/Temperature of the Flushing Oil

    a. **Fluid Velocity**
        Flushing of pipes will be more effective as the velocity of flow of the fluid in the pipeline is more. The minimum fluid velocity required for flushing is based on a fluid velocity corresponding to a Reynolds No. of 4000 and above in order to get turbulent flow. The velocity of the fluid can be found out from the formula:

        $V = Re * \gamma / D$

        Where,
        V= Fluid Velocity in m/s
        Re = Reynolds No= 4000 (The value can be more if more efficient and quick flush is required)
        γ = Kinematic viscosity of the flushing oil in m^2/s
        D = Internal Diameter of the pipe in m

        Based on the velocity obtained, the minimum flow rate required to flush the system is calculated as below:

        Q = A x V x 6000

        Where,
        Q = Flow Rate in lpm (litre per minute)
        A = Area of the Pipe Bore in m^2
        V= Velocity of the pipe in m/s

    b. **Viscosity/Temperature of the flushing Oil**

Viscosity and temperature of the flushing oil plays a pivotal role in deciding the flow rate required for flushing. An ideal flushing oil should have low viscosity and a high specific gravity. On the other hand viscosity should also not be too low either such that the liquid will not be able to carry loose particles which may fall down due to less gravity. Heating the oil to around 50 – 60 Deg Centigrade will help in loosening stubborn dirt or grease and hence drive them from the pipeline. It also decreases the viscosity which will in turn increase the fluid velocity.

Our team is well versed with flushing and have executed flushing projects in record time. We have the best flushing machines and cleanliness monitors to carry out this operation.