

Leakage control in Hydraulic valves-effect of temperature.

The leakage in hydraulic valves depends on clearance between mating parts. In a Directional control valve, clearance between the spool and the bore(Ref fig. 1) is very critical for controlling the leakage, hence the ability to hold the load without any drift.

At lower operating temperature, say atmospheric temperature, the oil viscosity is at the nominal specified value, Eg., 68 CSt for servo 68 hydraulic oil. However, most of the hydraulic machineries work at 65 to 90 deg C temperature . Under this condition, based on viscosity index , the oil viscosity reduces sharply and the leakage of oil increases.

Hence, in spool valves, the working clearances will permit a higher leakage rate at higher temperature. To ensure that the oil leakage is well within permitted values even under extreme working conditions , the clearance are to be maintained accordingly. The effect of thermal expansion on size of mating parts and hence the clearance also needs to be taken into account.

In poppet type valves(Ref Fig. 2) the accuracy of seating with 100% circumferential line contact is essential to overcome the effect of temperature on leakage. If the line contact is partially reduced due to error in geometrical accuracy of poppet and poppet seat parts, when oil temperature increases, the leakage increases drastically.

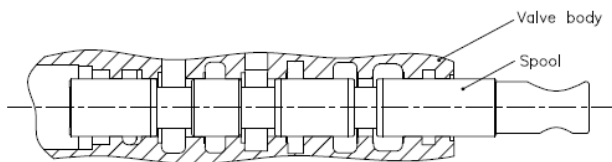


Fig.1: Spool in a valve body

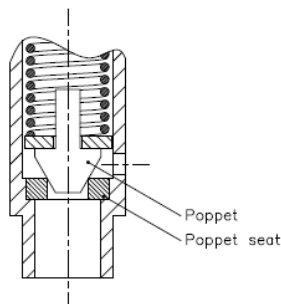


Fig.2: Poppet in a relief valve

Also, the seepage across seals in dynamic conditions such as rotary seal or sliding seal over a spool or plunger etc , has a tendency to increase at higher temperature.

However, when proper sealing material and seal configuration is used the effect of temperature can be overcome.