

Geometry of Valve spools and bores on the valve body - Effect on performance

The valve spool needs to be very precisely manufactured. While the tolerance on diameter is very close, the geometrical accuracies are equally important.

The spool in valves are designed to slide with least possible clearance. This clearance controls the leakage between the spool and bore in the spool body. The roundness and straightness of the spool beyond certain permissible valve create a camber or banana shape of the spool. The cylindricity error so caused reduces the clearance between the bore and spool and causes stickiness of the spool. To overcome this, the clearance needs to be increased which in turn increases the internal leakage over the spool and load holding ability gets reduced. If there is a taper from one end to other end of spool or bore, it causes an axial thrust on spool and makes the spool movement by hand difficult.

The cylindricity can be due to one of the following

Barrel shape, taper, straightness error, eccentricity between different bore segments, skewed axis etc. These kind of defects in the valve body bore for spool can be over come by honing the bore using a precision honing machine such as Kadia multi-pass honing machine.

