

## Principle of Oil Seals

### Oil Seals

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One of the most frequently used types of seal is the Rotary Shaft Seal. This is generally used for sealing lubricating oil or grease in rotary shaft applications. In exceptional cases, it is also used to seal other fluids, gases and powdered or granular solids. For trouble-free operation and optimum service life of a seal, shafts must have a satisfactory surface finish, within recommended limits and have no machine lay. Both correct design and material choice are critical if bearings and gears are to be sealed to prevent the leakage of lubricating oils and greases and the ingress of penetrating dust and dirt.

### Sealing

A good lubricating oil forms a strong tenacious film on gears, bearings and shafts and is not easily removed from the pressure bearing surfaces of these. However, where the shaft extends away from the equipment, this oil film must be retained. In Oil Seals, the pressure or radial load exerted by the sealing lip must be sufficient to retain the oil film, whilst not so high that excessive friction losses or wear can occur. Good Oil Seal design is therefore a balance between optimum running properties of the material, lip design and integral garter spring.

### Working principle

During rotation of the shaft, a hydrodynamic film of lubricant is produced beneath the sealing lip, the thickness of which depends on shaft speed, oil temperature, oil viscosity and the pressure or radial load exerted by the sealing lip on the shaft. Due to capillary forces and the surface topography of the shaft, the fluid being sealed forms a meniscus under the sealing lip and is prevented from leaking. The fluid, the seal material, the film thickness, the sealing lip geometry and the surface topography of the shaft are governing factors in the realisation of these capillary forces. A used seal having a shiny wear flat with hardening and radial cracking is indicative that it had operated on a shaft which was too smooth and /or that the radial load exerted by the lip was too high. A used seal having a wide wear flat is indicative that it had operated on a shaft which was too rough, especially if there was no hardening or radial cracking and could also be associated with incorrect sealing lip geometry.

