# SEALING RINGS

Carbon Sealing Rings are used as the wear face of most mechanical seals for the sealing of fluids in all industries.

APPLICATIONS ARE :

- Process pumps
- Rotary steam joints
- Seals for agitators and autoclaves
- Chemical pumps
- Cold and warm water pumps
- Corrosive liquid pumps.

Carbon is well suited to be used as a sealing ring due to having the following properties.

- Very good chemical resistance
- Good thermal conductivity
- High wear resistance
- Good corrosion resistance
- Dry running properties
- Good frictional properties
- Outstanding resistance thermal shock
- Low thermal expansion

# DESIGN CONSIDERATIONS

Certain factors must be taken into consideration when deciding which combination of materials for seal ring and counterface is the most suitable for a particular application. These factors are the lubrication conditions obtainable at the interface, the pressure between seal ring and counterface.

### Full Fluid Film or Wet Lubrication

This condition is that which would be found in a pump with the seal fully immersed in the liquid being sealed and arranged so that there is a constant supply of cool liquid circulating around its rubbing faces and with a seal combination designed to give full fluid film lubrication at the interface.

### Boundary Lubrication

This is a condition in which the only cooling of the seal is achieved by splash from the liquid being sealed or in which the seal is fully immersed but the circulation of the liquid around it is restricted or the interface film is destroyed repeatedly by evaporation.

### Dry

This means that the seal is out of contact with the liquid and is completely surrounded by gas. This is the most arduous operating condition and should, if possible, be avoided because in certain circumstances very high rates of wear can be experienced. If the dew point of the surrounding gas is more than 0°C there is a good chance of success. There have been applications where the dew point was down to -15°C and the resulting wear rate was acceptable. With dew points below -15°C, the wear rate becomes excessive.

In those cases where "dry" conditions are encountered it is preferable to use a gland ring or labyrinth system.

# DUTY FACTORS

The operating conditions defined earlier as lubricating conditions are combined in the table below to give a "Duty Factor" which is the combination of operating conditions and PV factor. This table is used to select the grades recommended subsequently for the seal and counterface rings of a particular application.

| MAXIMUM PV FACTOR | LUBRICATION CONDITIONS | DUTY FACTOR |
|---|---|---|
| 7 ($kgf/cm^2$ X m/s units) or 2 X $10^4$ ($lbf/in^2$ X ft/min units)<br>Maximum pressure 3.5 $kgf/cm^2$ (50 $lbf/in^2$)<br>Maximum surface speed 2.5 m/s (500 ft/min) | Dry<br>Boundary<br>Wet | High<br>Medium<br>Low |
| 88($kgf/cm^2$ X m/s units) or 2.5 X $10^5$ ($lbf/in^2$ X ft/min units)<br>Maximum pressure 21 $kgf/cm^2$ (300 $lbf/in^2$)<br>Maximum surface speed 15 m/s (3000 ft/min) | Dry<br>Boundary<br>Wet | -<br>High<br>Medium |
| 350 ($kgf/cm^2$ X m/s units) or 1 X $10^6$ ($lbf/in^2$ X ft/min units)<br>Maximum pressure 35 $kgf/cm^2$ (500 $lbf/in^2$)<br>maximum surface speed 25 m/s (5000 ft/min) | Dry<br>Boundary<br>Wet | -<br>-<br>High |

# DUTY FACTORS

| LOW | MEDIUM | HIGH |
|---|---|---|
| CY2C<br>CY10C<br>MY3B | CY2C<br>CY10C<br>MY3B<br>MY3D<br>MY10D<br>MY3K<br>MY10K | MY3D<br>MY10D<br>MY3K<br>MY10K |

In some high duty applications, special designs of seal and counterface rings including cooling of the counterface may be necessary.
Note: Except organic solvent in all other chemical media, MY (Metal Impregnated) grades will be unsatisfactory.