SEALING ELEMENT MATERIAL

Sealing Element (Rubber)

An oil seal normally consists of three basic components: Sealing Element, Metal Case, and Spring. The function of an oil seal is to prevent leakage along the shaft. This is mainly achieved by the sealing element. Materials normally used are Nitrile, Acrylic, Silicone, and Fluorinated Rubber.

Nitrile Rubber (NBR)

NBR is most commonly used material. It has good heat resistance properties, good resistance to oils, salt solutions, hydraulic oils, and gasoline. Operation temperatures are recommended from -40 to 120° C. It also functions well in dry environments, but only for intermittent periods. The disadvantage is poor chemical resistance.

Polyacrylate Rubber (PA)

Acrylic rubber has better heat resistance than Nitrile. It is recommended for high surface speed environments. The operation temperatures are recommended from -20° C to 150° C. It should not be used with water or in temperatures below -20° C.

Silicone Rubber (SI)

Silicone compounds operate effectively in a broad temperature range of -50 to 180° C. It is unsurpassed in its resistance to heat and low temperatures. The high lubricant absorbency of silicone minimizes friction and wear. It is usually used for crank shaft seals. Silicone has poor hydrolysis resistance. It should not be used in oxidized or hypoid oils.

Fluorinated Rubber (VI)

Fluorinated rubber is widely known under the DuPont trade name of Viton®. It has the best resistance to chemicals, and superior performance to high temperatures. Though Viton® provides so many good prospects, it has the highest cost.

SEALING ELEMENT MATERIAL PROPERTIES

MATERIAL PERFORMANCE

	NITRILE	PA	SILICONE	VITON
Temp. Range (°C)	-40 to 120	-20 to 150	-50 to 180	-30 to 200
Hardness (Shore)	70/80	70/80	75/85	70/80
Wear Resistance	O	Δ	X	Δ
Costs	Most economical	3rd costly	2nd costly	Highest

MATERIAL CHEMICAL RESISTANCE

	NITRILE	PA	SILICONE	VITON
Inorganic acids	Δ	Δ	Δ	Δ
Organic acids	XX	X	X	Δ
Alkali	X	O	O	O
Salt	O	O	O	O
Alcohol	XX	O	O	O
Esters	XX	XX	Δ	XX
Phenol	XX	XX	O	Δ
Ketones	XX	XX	Δ	X

O: Applicable
Δ: Applicable but must be observed
X: Applicable in a limited amount of time
XX: Not applicable

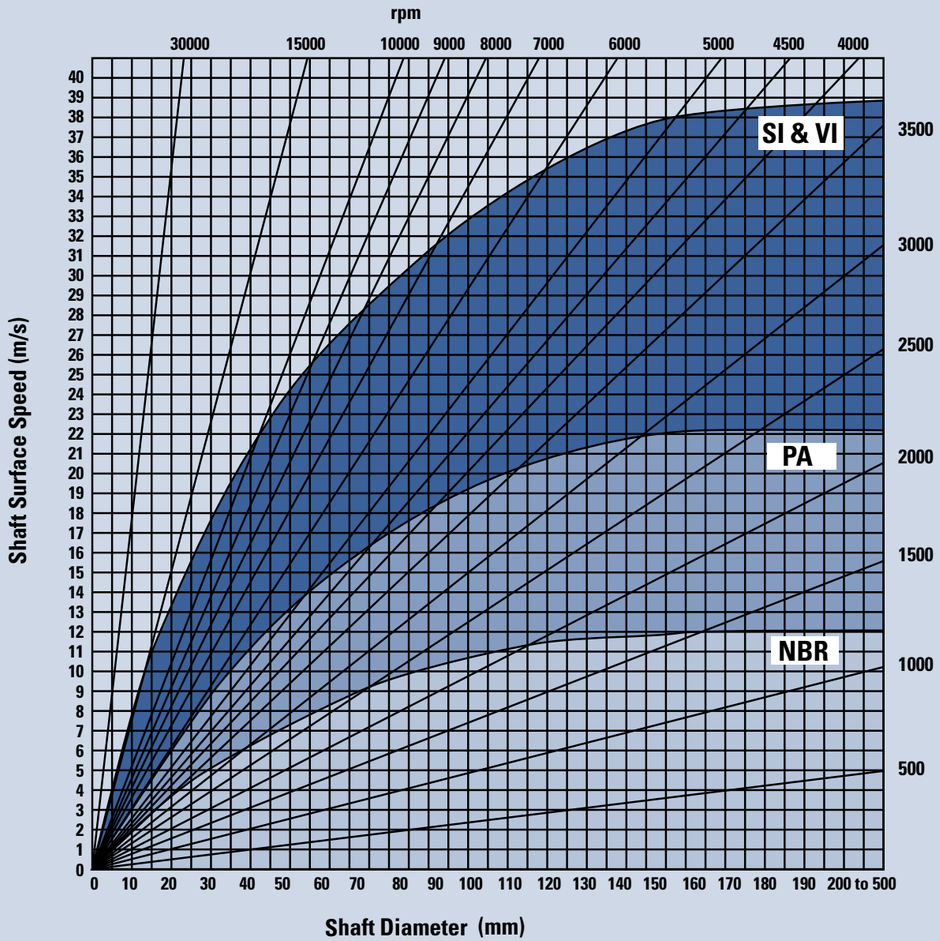
Lubrication

Oil seals are designed to operate with either oil or grease lubrication. Insufficient levels of lubrication cause excessive heat build up and reduce the life expectance of the seal lip and the shaft. When selecting a lubricant ensure that the lip material is compatible with the lubricant base materials. Before installation both the seal and shaft should be sufficiently lubricated.

SEALING ELEMENT MATERIAL PROPERTIES

RPM and Surface Speed

The following table shows the permissible surface speed and RPM's for various sealing element materials and shaft diameters.



FPM = shaft diameter in inches X RPM X .262
m/s = shaft diameter in millimeters X RPM X 0.0000523

TOLERANCE OF DMR SHAFT SEALS

Tolerance of DMR™ Shaft Seals

Seal O.D. Tolerance – Metric

Bore Diameter	Tolerance	
	Metal Cased Seal O.D.	Rubber Covered Seal O.D.
up to 50	+0.20 +0.10	+0.30 +0.15
50 to 80	+0.23 +0.13	+0.35 +0.20
80 to 120	+0.25 +0.15	+0.35 +0.20
120 to 180	+0.28 +0.18	+0.45 +0.25
180 to 300	+0.30 +0.20	+0.45 +0.25
300 to 500	+0.35 +0.23	+0.55 +0.30

Seal Width (mm)	Tolerance
up to 10	+/- 0.20
over 10	+/- 0.30

Seal Width (inch)	Tolerance
up to 1.000	+/- 0.015

Seal O.D. Tolerance – Inch

Bore Diameter	Press Fit Allowance		Tolerance	
	Metal Case	Rubber Covered Case	Metal Case	Rubber Covered Case
up to 1.000	+0.004	+0.006	+/- 0.002	+/- 0.003
1.001 to 2.000	+0.004	+0.007	+/- 0.002	+/- 0.003
2.001 to 3.000	+0.004	+0.008	+/- 0.002	+/- 0.003
3.001 to 4.000	+0.005	+0.010	+/- 0.002	+/- 0.004
4.001 to 6.000	+0.005	+0.010	+0.003 -0.002	+/- 0.004
6.001 to 8.000	+0.006	+0.010	+0.003 -0.002	+/- 0.004
8.001 to 10.000	+0.008	+0.010	+0.004 -0.002	+/- 0.004
10.001 to 20.000	+0.008	+0.010	+0.006 -0.002	+/- 0.004
20.001 to 40.000	+0.008	+0.010	+0.008 -0.002	+/- 0.004
40.001 to 60.000	+0.008	+0.010	+0.010 -0.002	+/- 0.004