



TECHNICAL BULLETIN

Seal Lubrication

Rubber Seals benefit from temporary or permanent lubrication for a variety of reasons. Dynamic sealing applications require some type of lubrication to prevent premature seal failure - often the media being sealed will provide the required lubrication. In compressed air applications, a lubricant may be added to the air to provide system wide lubrication. Additional lubrication may be desirable when:

- Lubrication is either insufficient or impossible due to the medium being sealed
- Operating environment prevents exhaust of lubricants from compressed air systems
- Reduced Friction and/or Breakaway pressure is desired
- Product assembly operations are difficult

Lubrication of seals can be achieved by adding a lubricant to the rubber compound before molding, or by treating the seal after molding. Seals that have a lubricant molded into them are considered to be Internally Lubricated.

Post molded lubrications fall into these categories:

- Temporary Coatings
- Semi-Permanent Coating
- Surface Modification
- Polymer Modification

Precision Associates offers the following lubrication options:

Temporary Coatings

Silicone Oil or Molybdenum Disulfide can be applied to the surface of molded rubber products. These options are low cost and work with most polymers. Temporary coatings are an excellent choice for aid in assembly. Moly's grimy nature may preclude it from some uses. Silicone Oil cannot be used on silicone compounds.

Semi-permanent Coating

A PTFE coating, approximately .0004 thick, may be applied to the surface of the rubber seal. This provides excellent lubrication for devices that do not cycle often, but must actuate when called upon. Heat activated fire sprinklers are a good example of this application. PTFE Coating is also a good choice where lubrication is required for device assembly when other external lubricants might contaminate the system. PTFE is compatible with most polymers, but will eventually wear off with continued use.

Surface Modification

The surface of most rubber seals can be permanently modified using a chlorination process. The result is a decrease in surface friction. Chlorination may also help seals to retain system lubricants. Chlorination does not work well with EPDM or Fluoroelastomers



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Z-APT™ advanced polymer treatment is a permanent modification of the rubber component's surface at a molecular level. Surface cross linking enhances the performance of the polymer without changing the bulk properties of the material. Unlike other lubricants that are susceptible to dissipation over time, **Z-APT™** enhancements remain intact if the surface is abraded. **Z-APT™** creates a substantial reduction in surface tack and coefficient of friction. Improved lubricity of the material enhances the performance and promotes longevity of treated seals. Almost all materials can be **Z-APT™** although some polymer types will see greater results than others.

Internal Lubricants

Internal lubricants are a good choice for applications requiring a longer-term solution. Internal lubricants can be divided into two classes; both are mixed into the rubber compound. When molded, the first type deposits some of the material on the seal surface. These lubricants act as bearing surfaces. Graphite, Molybdenum Disulfide (Moly) and Teflon® are included in this group. Teflon® is a good choice for FDA applications. The lubricants falling in the second group are proprietary organic semi-solids. These lubricants typically are not compatible with the rubber compound. Resultantly they will bleed or bloom to the seal surface over time. They are particularly good in continuously operated dry air applications as the sealing surface continues to be replenished with lubricant over a long period. Design engineers should be aware that as this lubricant bleeds out, seal volume will be reduced. As this usually amounts to no more than 2-3%, it is not usually a problem when designs accommodate this change.

The table below indicates the polymer/lubricant combinations currently in production. If your application requires a material choice not listed, Precision Associates can develop a compound especially for you.

Polymer	Durometer					
	40	50	60	70	80	90
NR	T		T			
NBR	MT	MTW	GMT	CGMTW	GMTW	GMTW
XNBR				GMTW	MW	GTW
HNBR			C	C	C	
CR		M	M	MT	M	T
FKM			T	GMT	GT	GMT
VMQ	T	T	T	MT	T	
FVMQ				T		
EPDM	T	T	T	GMTW	MTW	
EU/AU				M		M

Contact Precision Associates, Inc. for Compound Numbers and materials not listed

Lubricant Code

G = Graphite, M = Molybdenum Disulfide, T = Teflon®, W = Proprietary Organic Semi-solid, C= Combination of W and one of G, M or T

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