

Material Changes to Seal OD Coatings

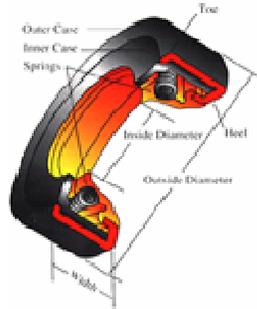
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A primary coating supplier to the seal industry is discontinuing a coating that has been used by many seal manufacturers for years. This article will review the reason for coating the OD of a seal; provide information on the existing coating material; provide cautions and test criteria for seal coatings; and describe the features of the newest seal OD coating material. In order to provide sealing on the OD(outside diameter) of a seal many seal manufacturers either make an all-rubber covered seal, or produce a metal cased seal with a coating on the OD or outside portion of the metal case.

The "Thin coatings of resin-based materials are sometimes placed on the outer diameter of a metal-cased radial lip seal(oil and grease seal, lip seals) to help fill imperfections in the housing bore, especially if the housing bore surface is rough".(1) Many rotary shaft seals, grease seals, or lip seals are rubber covered, so there is no requirement for seal designers or seal manufacturers to coat a rubber-covered seal. For years SKF Chicago Rawhide has been using a water-based acrylic polymer known as Bore-Tite® in the industry. This is a malleable sealant that helps to fill the small imperfections in the housings bore and can withstand temperatures of 400 degrees F. It is resistant to most oils, greases, gasoline, mild acids, mild alkalis, aliphatics, salts and glycols. Typical thickness on SKF seal ODs is 0.001" – 0.003". Dupont's Hypalon® which is a chlorosulfonated polyethylene material that most domestic and global manufacturers have been using as a coating for the OD of their metal-cased seals. The material characteristics of Hypalon are very similar to Bore-Tite with some variants providing a more rubber-like composition.

In order to reduce the cost of manufacturing metal-cased seals, several seal manufacturers have in the past provided painted seal coatings on the OD of the seal, however, this coating is really just standard paint and does not possess the material characteristics of Bore-Tite or Hypalon and, therefore, provides an inferior OD sealing capability with all of the inherent characteristics of Hypalon.. When placing an order for a metal-cased rotary shaft seal with a "painted O.D." requirement, be sure to ask your supplier what type of coating is being used on the OD. Ask for a material specification sheet on the coating material and that all specifications meet the requirements and characteristics of SAE Industry standards. According to SAE International, coatings shall have the following characteristics:

1. *Material shall dry to a tough, flexible and non-tacky film.*
2. *Thickness typically ranges from 0.005 to 0.076mm.*
3. *It shall not crack, flake or powder when scraped.*
4. *Coating shall adhere to seal case.*

5. *The sealer shall not show any evidence of peeling, blistering, softening, or dissolution when tested in medial to be sealed.*

There are several tests that the consumer can use to ensure that the coating used on the OD of metal-cased seals meets the adhesion requirements of the SAE standard. Some common adhesion test methods are as follows:

Knife Test - This simple test requires the use of a utility knife to pick at the coating. It establishes whether the adhesion of a coating to a substrate or to another coating (in multi-coat systems) is at a generally adequate level. Performance is based on both the degree of difficulty to remove the coating from the substrate, and the size of removed coating. The removal shall be somewhat difficult to remove and should not flake.

Tape Test - On metal substrates, a more formal version of the knife test is the tape test. Pressure sensitive tape is applied and removed over cuts made in the coating. There are two variants of this test: the X-cut tape test and the cross hatch tape test. Regardless of the variant of this test, no coating shall adhere to the tape.

Pull-Off test - A more quantitative test for adhesion is the pull-off test where a loading fixture, commonly called a dolly or stub, is affixed by an adhesive to a coating. By use of a portable pull-off adhesion tester, a load is increasingly applied to the surface until the dolly is pulled off. The force required to pull the dolly off, or the force the dolly withstood, yields the tensile strength in pounds per square inch (psi) or mega Pascals (MPa). Failure will occur along the weakest plane within the system comprised of the dolly, adhesive, coating system, and substrate, and will be exposed by the fracture surface.

Scrape Test - This test is typically performed in a laboratory and is limited to testing on smooth, flat panel surfaces. Adhesion is determined by pushing the coated panels beneath a rounded stylus or loop that is loaded in increasing amounts until the coating is removed from the substrate surface. A device called a balanced-beam scrape-adhesion tester is used.

To determine the compatibility of the O.D. sealing material, the seal is submerged in the specific fluid and observed for any evidence of peeling, blistering, or softening.

In April 2010 Dupont will no longer offer their Hypalon® coating, but has introduced Vamac®, which Dupont considers having better oil resistance, higher temperature durability, good low-temperature flexibility, excellent water resistance, and outstanding weather and ozone resistance than the Hypalon®. Dupont has stated that "this has been a difficult decision given DuPont's long history of supplying this line of products to the marketplace." For technical information on Vamac® please [click here](#) to be directed to the Dupont website.

The good news is that Dupont has come out with an improved material Vamac® that when used as a sealant or coating on the OD of a metal-cased seal will provide improvements over their existing material(Hypalon). The bad news is that consumers, Distributors, and OEMs need to be aware of the cost reduction initiatives of some seal manufacturers, as it relates to providing SAE or industry standard coatings for seal ODs.

1. (Shaft Seals for Dynamic Applications, p.392).
2. (SAE Fluid Sealing Handbook Radial Lip Seals 1996 Edition, p.85).