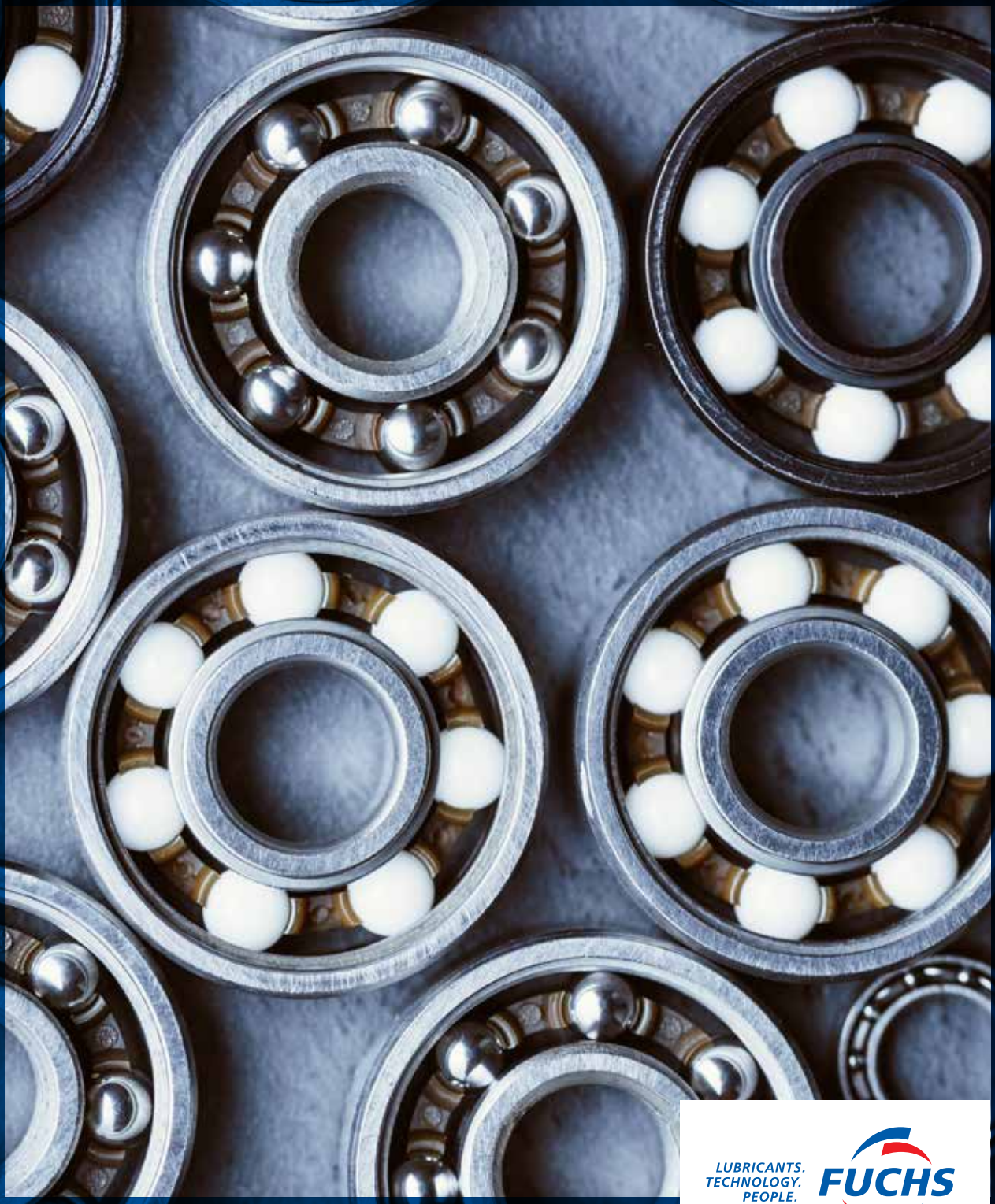
NYEBAR
Barrier Films to Prevent Oil Migration



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What is a Barrier Film?

A barrier film is a very thin coating that controls the “wettability” of a surface. Liquids will spread upon or “wet” any surface where surface energy is higher than the surface tension of the fluid. Because of the very high surface energies of metals, fluids would be expected to spread or creep on any truly clean metal surface. By modifying the surface of a metal or other solid, in advance, with a stable, durable film of low surface energy, it is possible to inhibit the migration or creep of fluids on that surface. An oil that is likely to migrate along a surface will stop and bead up like a drop of water on a freshly waxed car.

NYEBAR barrier films help inhibit oil creep to prevent oil migration and contamination. At room temperature, this stable fluorocarbon polymer has a surface energy well below the surface tension of most lubricating fluids. The NYEBAR polymer is supplied in a solution in a fast-evaporating fluorinated solvent. At room temperature, the film remaining after evaporation of the solvent will prevent creep of oils across the film surface. However, spreading can occur from gravitational or inertial forces when fluid quantity is large enough that it is forced across the barrier film or when rotational speeds are high enough that they sling the fluid over the film. NYEBAR barrier films can endure temperatures up to 200°C.

Applying NYEBAR

To prevent migration of lubricating oils, NYEBAR should not be applied in the area requiring lubrication, but rather as a dam or barrier around that area. NYEBAR can be applied to any clean metal, plastic or glass surface by:

1. Dipping the component in the solution
2. Spraying the solution on the part
3. Brushing Small Areas of a device

Air drying for five minutes permits evaporation of the carrier solvent, and a very thin, but fully effective film, will remain. Some customers have found that baking the applied film for 10 minutes at 90°C produces a more durable and abrasion resistant film and reduces the surface energy. The film does not cross-link like paint and is more akin to a thin layer of oil, even after baking out. For applications where low outgassing is a key property, baking the applied film for approximately 2 hours at 120°C is recommended to achieve optimum results.

Handling of treated parts should be minimized. NYEBAR should be applied to the shaft and housing surfaces that come into contact with the red highlighted surfaces, but NOT applied directly to the bearing surfaces itself, as shown in Figure 1. Application of NYEBAR directly onto the bearing could result in migration of NYEBAR to critical bearing internal surfaces that need to wet with lubricant during its service life.

Figure 1: Applying NYEBAR

Removing NYEBAR

Contamination of components with the barrier film would render them non-wettable by the lubricant, thus resulting in possible lack of lubrication and subsequent component failure. The NYEBAR films are readily dissolved by fluorinated solvents and to a lesser extent by chlorinated solvents. NYEBAR is relatively resistant to other commonly used solvents. However, prolonged immersion of the film should be avoided. An immersion of NYEBAR treated components in any effective solvents can dissolve the film and redeposit it in a vulnerable area. This can result in bearing failure. Mark all treated components to alert bearing users to the hazards of solvent immersion. It is very difficult to 100% completely remove the barrier film from a surface, so multiple rinse and wipe cycles are recommended, followed by surface wetting testing to make sure the surface is again wettable after cleaning.

Applications

NYEBAR barrier films are most commonly used whenever lubricant migration is a concern including:

Bearings & Actuators

For a pivot bearing, lubricants should be applied as a "doughnut" around the pivot. To prevent oil from spreading along a rotating shaft, a simple ring around the shaft should suffice. For ball bearings, the shaft and housing bearing seats and diameters that contact the corresponding bearing surfaces should be coated with barrier film, taking care that no barrier film will come in contact with surfaces that should be lubricated. It is generally suggested that one avoids applying NYEBAR directly to bearing parts. Shields, shims, shield retainers and retaining rings should also be coated, but extreme care should be taken so that no barrier film is permitted to contact bearing race lands, separators, balls or ball grooves. Like bearings, the barrier film is used to prevent actuator lubricant from contaminating adjacent components.

Optics

NYEBAR can be used near optical components where oil can compromise image quality. Since migration of oil onto an optical surface change the index of refraction it may severely compromise the performance of the optical system. NYEBAR was most notably used to protect the mast camera on both Mars Rovers.

Connectors & Potentiometers

Barrier films can be applied around the perimeter of conductors to prevent unwanted lubricant migration from the contact area. NYEBAR should not be applied to conductive surfaces that are intended to be lubricated. 0.2% concentrations of NYEBAR should only be applied to a conductive surface if it does not prevent critical lubricants from wetting the surface.

Release Agents

In situations where a thermal or other adhesive is applied to a heat sink, for example, NYEBAR can be used to limit the adhesion of the adhesive (for rework purposes) without adversely affecting the thermal conductivity of the adhesive. It should be noted of course that full adhesive strength would not be achieved and would need to be tested.

Fluidics

NYEBAR can be used to prevent surface migration of liquids on surfaces, citing examples such as spray heads, fluid dispensing nozzles and automated oiling applicators where the inhibition of surface migration is paramount to performance of the system.

FUCHS Lubricants

Innovative lubricants need experienced application engineers

Every lubricant change should be preceded by expert consultation on the application in question. Only then the best lubricant system can be selected. Experienced FUCHS engineers will be glad to advise on products for the application in question and also on our full range of lubricants.

FUCHS LUBRICANTS CO.
17050 Lathrop Avenue
Harvey, IL 60426
United States
Phone + 1 708-333-8900
E-mail inquiry@fuchs.com
www.fuchs.com/us

FUCHS LUBRICANTS CANADA LTD.
(Eastern Division)
405 Dobbie Drive
Cambridge, Ontario
N1R 5X9
Canada
Phone +1 519-622-2040
E-mail inquiriesCA@fuchs.com
www.fuchs.com/ca

FUCHS LUBRICANTS CANADA LTD.
(Western Division)
19829 99A Avenue
Langley, British Columbia
V1M 3G4
Canada
Phone +1 604-888-1552
E-mail inquiriesCA@fuchs.com
www.fuchs.com/ca

LUBRICANTES
FUCHS DE MÉXICO SA DE CV
Acceso C No. 101
Parque Industrial Jurica
76120 Querétaro, Qro.
Mexico
Phone + 52 (442) 2 38 91-00
E-mail info@fuchs.com.mx
www.fuchs.com/mx