



NORDON CYLINDERS

The following presentation has been compiled for Nordon Cylinders in order to provide reasons to support the use of D Glide bushing and wear strip materials. This presentation is to be used as an internal training tool only. Modern Engineering is available to provide any relevant information that Nordon Cylinders end-users may require.

Introduction to the D Glide Product:

D Glide is a specialised bushing and wear strip material developed and manufactured in the Netherlands. Initially developed for use in the offshore oil industry, D Glide performed so well that uses became apparent in many main stream industries, including hydraulics. In fact, D Glide is now used by some of the world's largest hydraulic companies, including Eaton Cylinders and Parker Hannifin.

All D Glide materials consist of three major ingredients:

1. Industrial woven mesh (Terylene)
2. A thermosetting resin (both low and high temperature grades)
3. Special lubricating additives such as PTFE, graphite or molybdenum disulphide

It is the combination of these three core ingredients that has provided the opportunity to utilise a material that has a very high load carrying capacity, is self lubricating with a low co-efficient of friction and able to withstand temperatures up to 250°C. D Glide is capable of withstanding most chemicals and heavy contamination.

D Glide in the hydraulics industry:

- **D Glide in cylinder ends:**

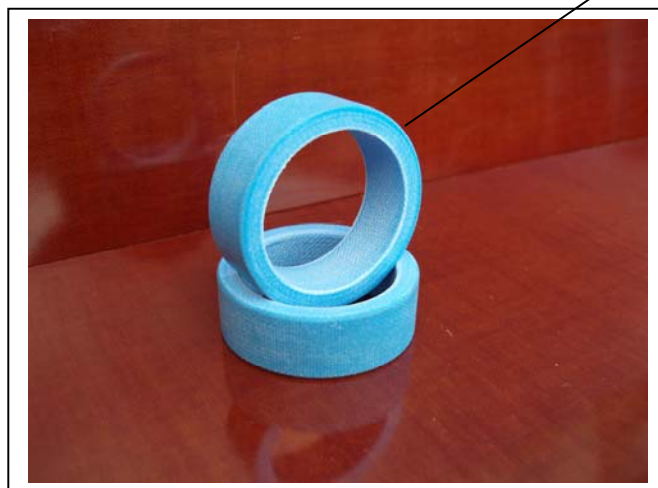
Pivot points for hydraulic cylinders can experience some of the worst environments for mechanical products. With contamination issues, lubricant starvation and high shock loads, pivot points can be the first components to show substantial wear within the boundaries of the hydraulic circuit. Traditionally the pivot bush and pin have steel-on-steel contact with grease lubrication. Grease functions by ensuring that the two metal components are kept away from each other by using a lubrication wedge. Problems occur when the grease cannot create enough of this wedge to get between the pin and the bush. In fast rotating applications this isn't a problem as the speed of the pin or shaft is fast enough for the wedge to be created. However in slow moving applications this wedge is much more difficult to create. Either the grease needs to be retained within the load zone or special extra tacky greases are required. Once steel-on-steel contact has occurred the failure of the pin and bush assembly accelerates.

Steel-on-steel contact can cause the following failure issues:

- Cold metal welding
- Fretting
- Corrosion
- Wear caused by vibration
- Worn pins from contamination
- Metal fatigue
- Edge stresses on the bushing (Misalignment)
- Cracked and damaged bushes

As D Glide is a full composite material with self lubricating properties, most failures that occur with steel on steel contact do not exist with D Glide. D Glide also has an element of elasticity (e-modulus ~ 1% of steel) which is able to withstand any high shock loads and edge stresses without permanent deformation.

We believe that D Glide is the perfect material for applications where customers require a maintenance-free bushing material that is capable of withstanding high loads including shock loads and misalignment, while being resistant to contamination and chemicals.



A typical set of D Glide bushings and where they would be located

- **D Glide spherical and non-spherical bushes**



D Glide spherical bushes



D Glide non-spherical bushes

There are two types of D Glide spherical bushes available. One is the more traditional type with a “ball and socket”. The other is the D Glide non-spherical bush which consists of a thick cross section of solid D Glide.

- **D Glide spherical bushes:**

D Glide spherical bushes have some distinct advantages over the more traditional commercially available spherical bushes. D Glide spherical bushes are:

- Totally maintenance free
- Able to withstand high shock loads
- Resistant to chemicals
- Of higher load carrying capacity than commercially made spherical bushes
- Able to be submersed in both sea and fresh water
- Resistant to seizure on pivot points

- **D Glide non-spherical bushes:**

Many spherical bushes are used within the hydraulics industry even though misalignment in many cases is less than one degree. However one degree of misalignment with hydraulic cylinders can cause oil leaks and premature wear. D Glide non-spherical bushes are able to absorb up to one degree of misalignment due to the elasticity of the material.

D Glide non-spherical bushes are manufactured to the same dimensions as the traditional spherical bushes, however they are much more economical and have less moving parts. D Glide non-spherical bushes have the advantage of being able to withstand very heavily contaminated areas and are able to operate continuously in some of the most aggressive environments in industry.



- **D Glide neck bushes:**

Commercially available neck bushes have few disadvantages when it comes to hydraulic cylinders. Generally, they aren't subjected to high loads and they are in an ideal environment with sufficient lubrication and very little contamination. D Glide's distinct advantage is that it is able to be custom made to any size and length, ensuring that the neck bush fits the application. In turn, this may enable a design change for other manufactured parts, thereby allowing a cost saving.

D Glide fitting options:

D Glide bushes can be pressed, frozen or glued into position depending on the size and application.

- To press fit D Glide, calculations concerning wall thickness, tolerances, loads and running clearances need to be performed. It is recommended that you contact Modern Engineering for installation parameters.
- D Glide can be cryogenically frozen to aid fitting in larger bush sizes (over 250mm). If this is required please contact Modern Engineering.
- Gluing D Glide into position is a straight-forward and simple process. Modern Engineering recommends the use of the following glues:

Araldite K106 (Same as Selleys Super Strength Araldite)

General-purpose glue, easy to work with, remains slightly flexible but not truly (sea) water resistant, average chemical resistance.

Araldite K138

Better chemical resistance than K106 and seawater resistant. A little more difficult to work with as the viscosity of the glue is thicker. Works best when glue temperature is between 20 and 30°C.

Loctite 406

Instant super glue. Good bond strength. Has no flexibility and very little time to work with before it cures. Recommended for small bonding applications.

Conclusion:

It is understandable that some end-users may be hesitant about the uses of an engineered plastic. Despite this, we believe that products, such as D Glide, are the future of many industrial design problems. By working together and sharing product knowledge, we believe that your customers will quickly realise that D Glide is capable of out-performing most traditional components for use in hydraulic applications. If established, a partnership between Nordon Cylinders and Modern Engineering, will deliver positive solutions and results for both you and your customers.