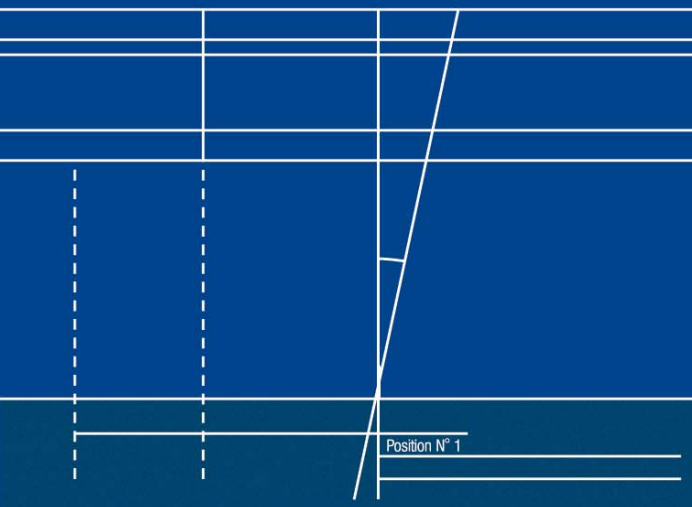
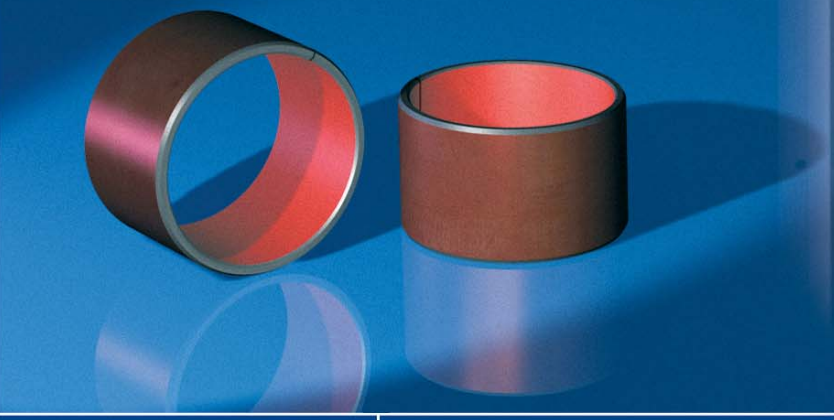
FEDERAL MOGUL



Product Information



GLYCODUR®
GLYCO® 298

Special bearings for shock absorbers

GLYCO

1 GLYCO® 298 - The material for use in shock absorbers

Shock absorbers are among the most critical and most heavily stressed parts of a car suspension system, as they affect vehicle safety, driving comfort and the durability of neighbouring components. In the suspension struts, especially the twin tube type, the wheel forces generate high transversal loads that impact on the upper piston rod guide and in extreme cases can cause seizure. Therefore, a bearing with the contrasting characteristics of low friction and high wear resistance is an essential requirement.

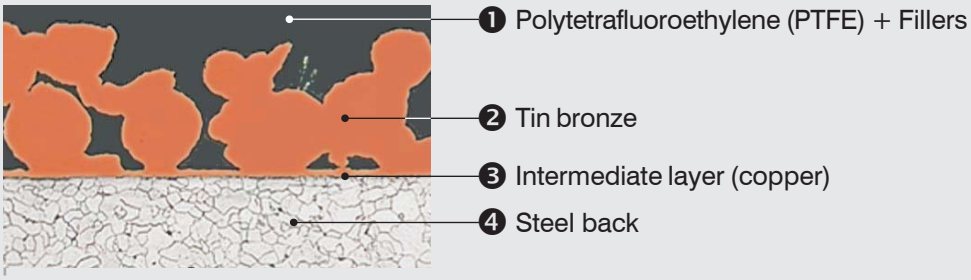


Figure 1.1 Photomicrograph

Bushings constructed as shown in Fig. 1.1 have proven very successful, as they combine the positive characteristics of sintered bronze with the universal antifriction properties of polytetrafluoroethylene. The extreme demands in the shock absorber necessitate additional optimization of the PTFE through the use of fillers.
For this purpose Federal-Mogul operates a computerized servohydraulic shock absorber test rig (Fig. 1.2), which can simulate virtually all stresses and therefore facilitates time-saving development under real world conditions.

In a move to achieve shorter development times and reduce testing effort, a short-time test program was developed with customers aimed at obtaining results that largely match the results from endurance testing.
The key criteria to be met by the guide bearing can therefore be investigated and the results integrated smoothly into practical applications.

Test

Figure 1.2
Shock absorber test rig

2.1 Friction

Low friction is one of the key demands of vehicle manufacturers, as friction directly affects the damping characteristics and hence driving comfort. A distinction is made between early-life friction and friction in service, i.e. after running-in. The measurement principle and the differences in the friction coefficient are shown in Figures 2.1.1 and 2.1.2.

With a special measuring setup the friction of the upper piston rod guide can be separately measured. This shows up the fine optimizations carried out on the examined materials and enables the effect of the counterface to be determined.

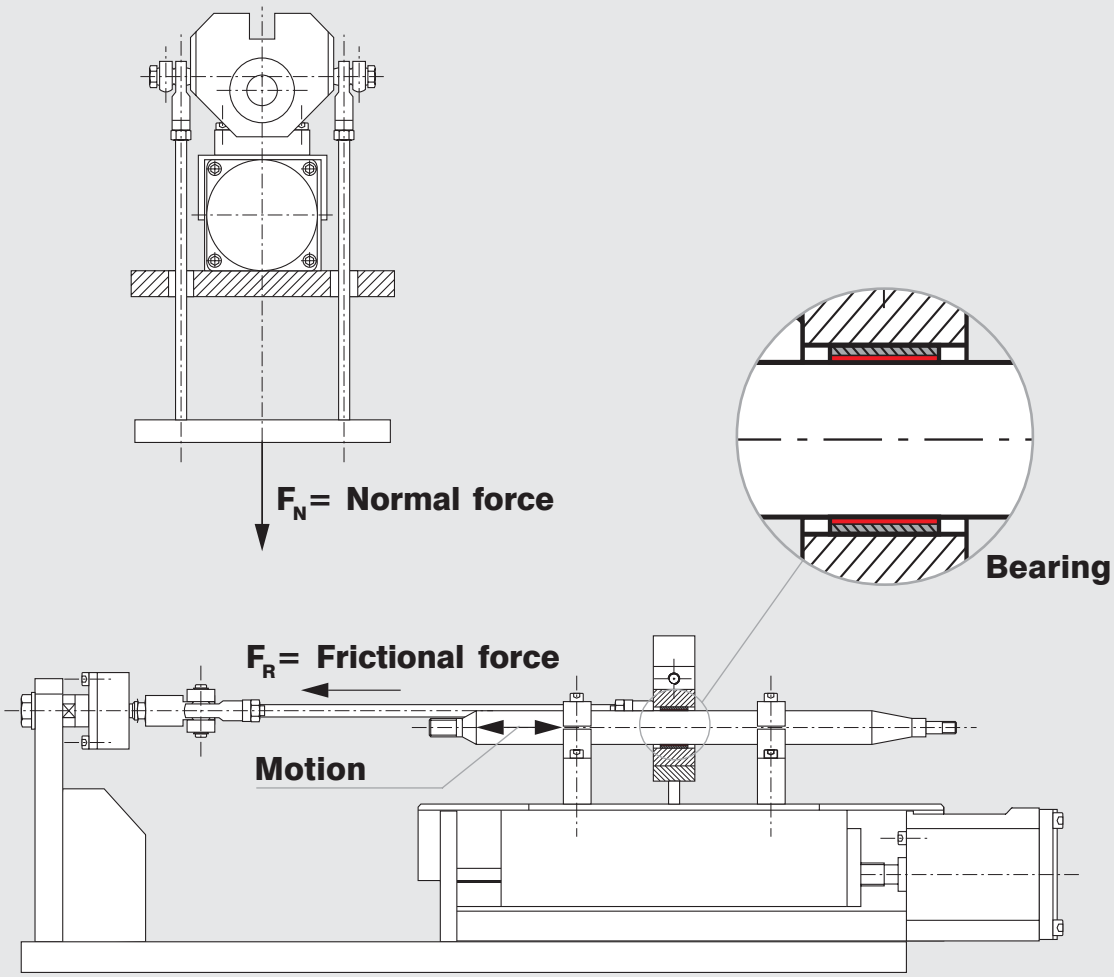
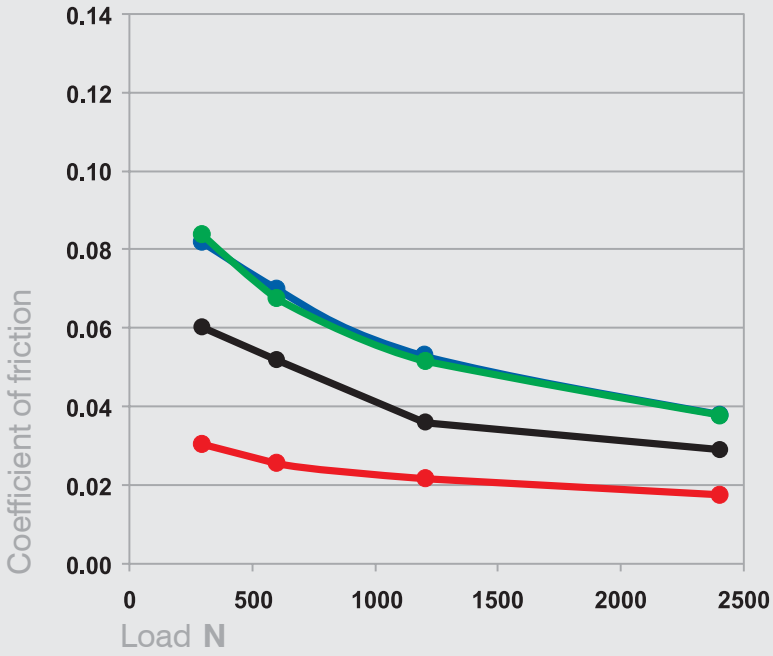
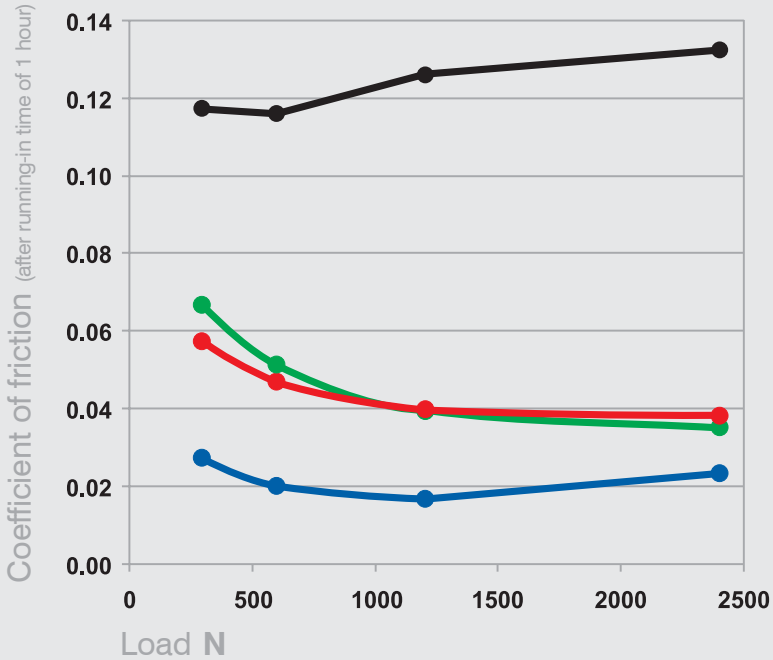


Figure 2.1.1 Friction gauge

Frictional behaviour in early life



Frictional behaviour in service



Test conditions	
Running-in time	1 Hour
Load	2400 N
Surface velocity	0.04 ms^{-1}
Bearing dimensions	
- Inside diameter d	22 mm
- Outside diameter D	25 mm
- Length B	15 mm

- GLYCO® 92
- GLYCO® 198
- GLYCO® 298
- Competition

2.2 Wear

Wear of the piston rod guide bearing affects shock absorber durability. An excessive increase in bearing clearance causes leakiness and weakens the damping characteristics, and in extreme cases it can lead to seizure. Proper functioning is additionally impaired by wear debris in the oil.

Consequently, the bearing material must be sufficiently wear resistant to attain the design service life. Diagram 2.2.1 shows that GLYCO® 298 is superior to all hitherto known materials.

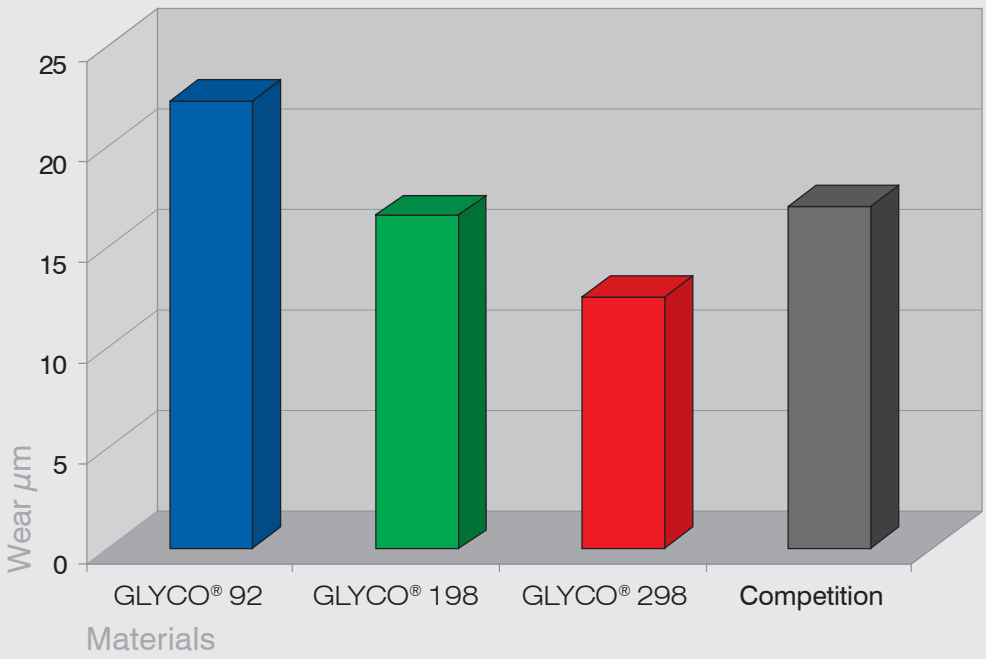


Diagram 2.2.1 Wear

Bearing material

2.3 Material delamination

With system pressures changing at a high frequency and reaching 200 bar, high oil flow velocities are generated. Allied to this, rapid changes in loading direction occur, with cavitation-like stressing. Such operating conditions place the toughest demands on the material. Often, a failure begins with an orange-peel effect, which progressively develops into a delamination of the final layer. The failure is evaluated visually.

For this purpose Federal-Mogul has produced a rating guide with scores of 1 = bad to 11 = very good.

Figure 2.3.1 shows the rubbing surfaces of different materials after testing. With 10 points, GLYCO® 298 emerged from the test with the best rating.

Material delaminations in the test

Test conditions:
Surface velocity V_{max} = 2.6 m/s

Specific radial load p = 6 MPa
System temperature = 100 °C

Heavy delamination (Standard material)

Incipient delamination (Standard material)

GLYCO® 298 after the test run

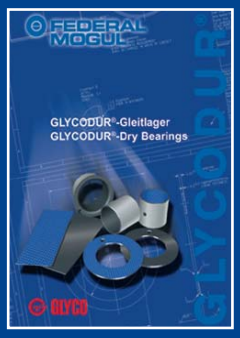
Figure 2.3.1
Rubbing surfaces after the test run

Summary

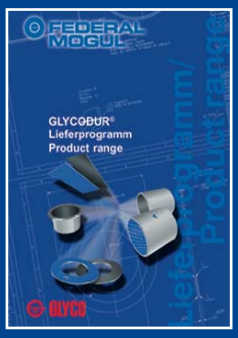
3.1 Summary

GLYCO® 298 was developed specifically for the challenges of shock absorbers. Extensive investigations on the test rig demonstrate the superiority of this material in terms of the key criteria of friction, wear and delamination.

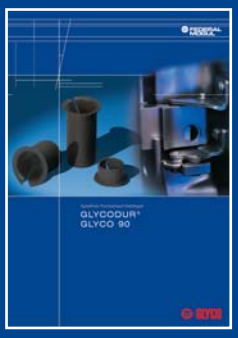
The environmentally clean manufacturing process and the exclusion of ecologically harmful fillers from the composition of the material are innovative steps in applicational terms.



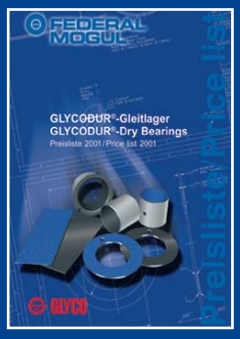
GLYCODUR®
Bearings Catalogue



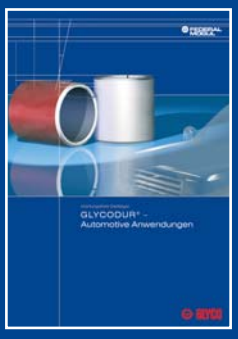
GLYCODUR®
Product Range



GLYCODUR®
GLYCO® 90



GLYCODUR®
Price List



Automotive
Applications

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