

How to reduce friction with



FIELD-TESTED EXAMPLES OF HOW
XYLAN COATINGS SOLVE DIFFICULT ENGINEERING PROBLEMS

What is Xylan?

Xylan is the largest, most complete line of fluoropolymer coatings in the world. Xylan coatings have a broad range of properties which make them ideal for an infinite variety of applications.

Xylan coatings differ from traditional fluoropolymer coatings in one very important aspect: they are composite materials. Lubricants with the lowest-known coefficient of friction are combined with the newest high-temperature-resistant organic polymers. Together, they form "plastic alloys" with unique properties:

- Low coefficient of friction: as low as 0.02.
- Superb wear resistance: even under extreme pressure.
- Outstanding corrosion and chemical resistance: in most environments.
- Wide operating-temperature range: from -195°C to +285°C (-385°F to +545°F).
- Flexible curing schedule: ambient to 425°C (800°F).
- Wide colour range: to colour-code products.
- Pliability: Xylan coatings bend freely and repeatedly without breaking.
- Machinability: apply multiple coats of Xylan (most formulations) and mill.
- Excellent adhesion: to most metals, plastics, ceramics, wood, even to itself.

It's important to remember that Whitford can alter the properties of Xylan to suit the demands of the application in question — offering custom solutions to specific problems.



Xylan provides easy release under pressure for three-part collet and collar.

Xylan stops tapers from jamming.

CCL Systems makes equipment to prestress the steel strands which reinforce concrete structures.

One end of the strand is anchored and the other is grasped by a three-part tapered collet and collar, in the jaws of a very heavy-duty jack. Loads of up to 300kN (67,000 lbf) are applied until the concrete is set, forcing the tapered parts together.

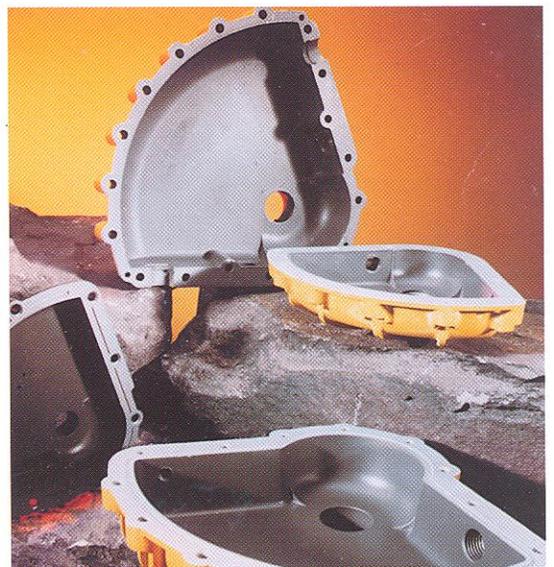
Freeing the collet after the tension has been removed, without permanently damaging the collet, was difficult.

CCL Systems found that coating the wedges with Xylan 1052 completely eliminated the jamming and ensured reusability.

Xylan combats sticking in rotary actuators.

Long periods of inactivity lead to problems of high static coefficient of friction in rotary actuators. Friction and wear between the close-fitting vane and the castings cause air leakage and inefficiency. Kinetrol solved this problem by coating the castings of their actuators with a layer of Xylan 1010 and gained several more benefits in the process.

The same Xylan coating improved the air seal and eliminated wear. It also stopped the corrosive effects of the air supply.



Xylan 1010 on the interior of quadrant castings adds four important benefits.

Xylan proves a winner on the track.

Reducing weight and minimising wear are two major objectives of car designers around the world — especially in auto racing. Yet, the lighter the material, the greater the tendency to wear.

Cosworth Engineering, internationally renowned designers of high-performance engines, has solved many design problems with Xylan coatings on engine components. For example:

- Aluminium cylinder liners save weight, but they suffer from scuffing. A collar of Xylan 2000 sprayed around the base of the cylinder liner totally eliminates the problem, even in the engine's hostile environment of heat, oil and friction.

- Cosworth replaced steel throttle plates with lighter aluminium, but running between aluminium guides soon caused scuffing. So Cosworth coated the throttle plate and the guides with Xylan, solving the scuffing problems and providing permanent dry lubrication, even in the presence of petrol vapour.

- Magnesium castings are lighter, but contact with harder materials (such as the sintered iron rotor in Cosworth's turbocharger scavenger pump) caused wear, rendering the castings unserviceable. A coating of Xylan 1010 completely solved the problem. Even after extensive racing trials, no appreciable wear was evident.

Having proved itself on the race track, Xylan is now enabling production car designers to cut weight and wear as they improve performance — all at a lower cost.



Xylan permits the use of lighter engine components by solving the problems of friction, scuffing and wear.



The two-part roller-bearing cage, coated with Xylan 1014, is in the foreground.

Xylan improves engine lubrication.

Danarm was experiencing unacceptable levels of connecting rod (big-end) bearing failure in their chainsaw engines.

Although they had designed a mechanically excellent bearing to withstand the arduous operational requirements (such as constant running 8 hours a day at 5000/8000 rpm and continual cycling from zero to full load), conventional 2-stroke lubrication was not adequate.

The solution was surprisingly simple. A thin coating of Xylan 1014 on the roller-bearing cage reduced both friction and scuffing. This reduced the demands on the fluid lubrication, and gave a massive improvement in reliability.

Xylan makes seat belts even safer.

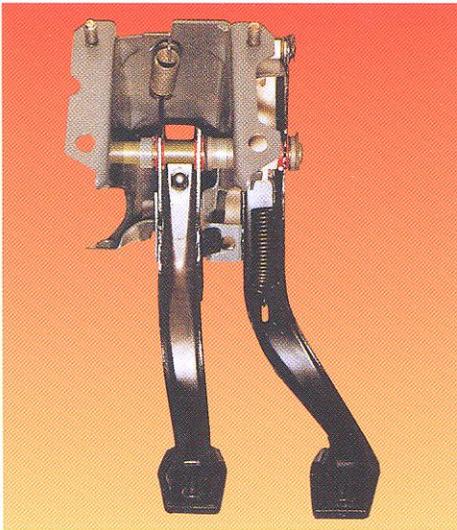
The versatility of Xylan 1010 is making a significant contribution to safety in automobiles.

Used in the seat-belt pillar bracket, a thin coating of Xylan ensures that the seat-belt webbing slides more easily, minimising friction and making the operation smoother.

If an accident happens, creating an exceptionally high and sudden load, Xylan eliminates the risk of the webbing being torn or cut at the moment of maximum tension.



Pressed steel B-pillar bracket coated with Xylan helps assure the safety of operation.



Xylan helps keep operation of brake and clutch pedal maintenance-free.

Xylan provides life-long lubrication for Ford and Rover.

Some bearing surfaces are inaccessible and therefore impossible to service. Two examples: the clutch and brake shaft bearings in Ford and Rover vehicles. The solution: a thin coating of Xylan 1010.

By coating the clutch and brake shafts with Xylan 1010, Ford achieved maintenance-free operation for twice as long as the life of the average clutch (800,000 operations).

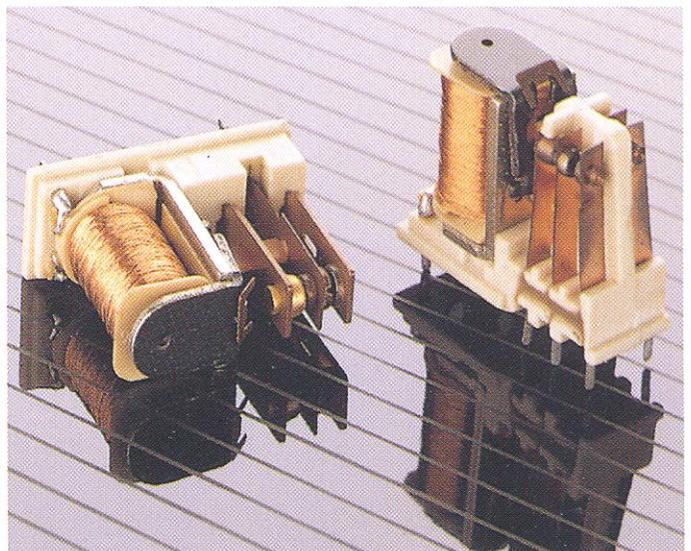
Xylan reduces friction, making operation smoother and easier, and completely eliminates the squeaks that develop when conventional lubricants dry out.

Xylan extends relay life more than sixfold.

The German relay manufacturers, Bach and Co., wanted to extend the operating life of their relays, which were suffering from wear-out due to scuffing. So they conducted tests of many different forms of lubrication for the knife-edge bearing in the relay.

In spite of the use of conventional lubricants, scuffing still led to failure of the relays at around 1.5 million operating cycles. When they tested a thin coating of Xylan 1010 on the knife-edge bearing surfaces, wear life was extended to over 10 million cycles.

As an additional benefit, the Xylan coating lowered friction to the point where the operating voltage reduced from 20v to 15v, saving power, too.



The electromagnetic coil pulls down the top of the "L"-shaped armature. The opposite end operates the contacts. The knife-edge bearing is in the angle of the "L".



The Rover uses Xylan on glass-run channels for smooth, noise-free operation of windows.

Xylan smoothes window operation for Rover.

Rover specifies Xylan 1631 (as many auto manufacturers do) for use on rubber glass-run channels through which windows are raised and lowered.

Xylan reduces the coefficient of friction by more than 80 percent, so the glass slides easily, even when the temperature falls well below freezing.

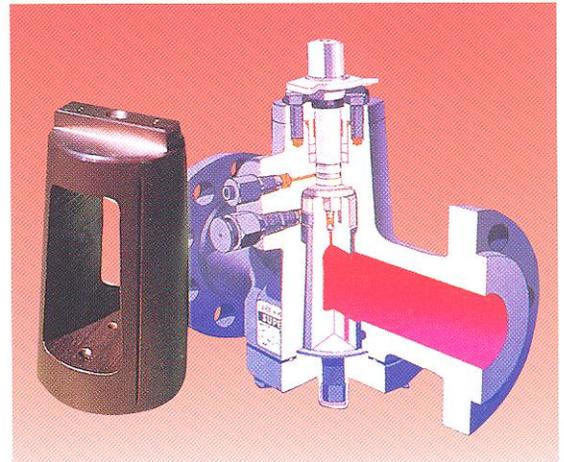
Xylan brings additional benefits to the automotive industry. Because Xylan lowers friction so dramatically, it eliminates noises associated with micromovement against the glass. And the outstanding release of Xylan means that window glass won't stick to the rubber channels when wet snow and sleet freeze.

Xylan lubricates in the most hostile of conditions.

Pipeline valves have to work over extreme temperature ranges — from -45°C to $+200^{\circ}\text{C}$ (-50°F to $+390^{\circ}\text{F}$). Internal pressures rise to 255 bar (3,200 psi). And the fluids carried, such as sour gas and oil, hydrogen sulphide, salt water, and carbon dioxide, are highly corrosive.

Serck Audco has found that a thin coating of Xylan 1014, even in these hostile conditions, reduces friction, cuts operating torque on their plug valves (by as much as 15% on phosphor-bronze valves and 25% on nickel-coated versions) and withstands the corrosive elements.

They've cut their costs, too, because the lower operating torque allows them to use less expensive materials in the valve actuators.



The Xylan coating on this valve plug, which sits tightly in a tapered housing, reduces friction significantly.



Xylan coatings come in many colours for easy colour-coding.

Xylan prevents nuts from freezing.

Xylan 1070 coatings on large nuts and stud bolts significantly reduce the amount of make-up torque lost to friction, removing much of the uncertainty from predicting clamp loads.

At the same time, Xylan eliminates the problems of galling, which occur with metals such as stainless steel.

Xylan resists corrosion in and above sea water, and in chemical environments. This prevents nuts from freezing, and significantly reduces break-out torque.



Complex small components are easily coated with Xylan for low friction, release, corrosion resistance.

Xylan coatings protect small components.

There are many formulations of Xylan for bulk application to small components. Xylan 5000 series coatings can be applied by dip-spin, tumble or conventional spray methods.

Liquid in form, their properties ensure that complex shapes are coated accurately and completely. And, because they are available in a wide range of colours, no separate colour finish is needed — saving time and cost.

A major application area is in the automotive industry, where Xylan coatings on small fasteners give corrosion resistance and ensure correct tensioning from the applied assembly torque.