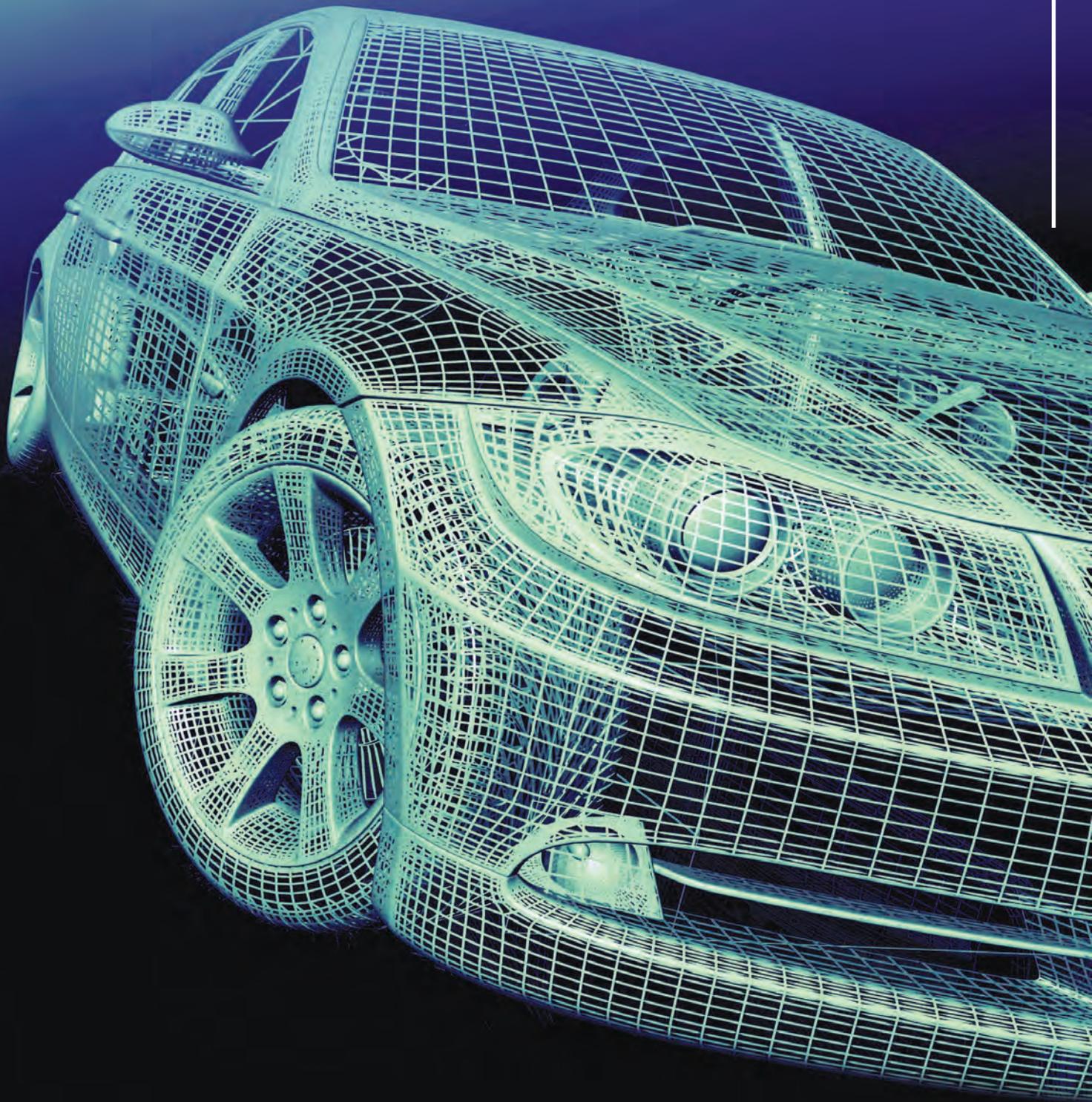


**How Whitford
high-performance coatings
solve key problems for
the automotive industry**



Whitford

Where good ideas come to the surface

Why Whitford?

Some companies develop products in the abstract — and then bend problems to fit the products. Whitford takes the opposite point of view. We believe that the way to a better product is to start with a specific problem, then create a product designed to solve it.

Whitford's global automotive team works closely with auto companies and their suppliers to solve the specific problems they face. The result has been a series of successful vehicle launches.

Whitford works to the ISO TS 16949 and ISO TS 14001 Enviro standards.

Auto-flex coatings

Whitford has developed two extensive lines of specialty coatings for rubber and other flexible substrates: Resilon® (water-borne) and Xylan® (solvent-borne). They are currently used on more than 100 platforms and over one million cars worldwide.

Anti-friction/corrosion coatings

For almost fifty years, Xylan has been specified by automotive companies and their tiers. In fact, Xylan was the first coating created to displace cadmium and zinc as a corrosion barrier on small fasteners. It was also the first coating to survive the rigors of internal diesel engines when applied to piston skirts and journal bearings.

Given the extensive range of water-and solvent-borne resins, coupled with leading solid lubricants such as PTFE, graphite and molybdenum disulphide, countless components and assemblies are coated with Xylan to provide lubrication, abrasion resistance, low friction, corrosion resistance and noise suppression.

From VW to Ford, from Honda to Hyundai and every car in between, Whitford's products are meeting the demanding needs and solving the problems of the global car brands.



Whitford coatings are protecting many different vehicles, including the Bentley Flying Spur.

Weatherstrip → Resilon

Resilon, Whitford's line of waterborne, single-component coatings, is based on PU/Si-hybrid technology to solve a variety of problems on flexible substrates in the automotive industry.

Resilon can easily be applied to EPDM, TPE, NBR, PVC, ABS and other temperature-sensitive substrates to help reduce friction, suppress noise, avoid sticking and protect against weathering.

Resilon is specified by many companies for automotive sealing systems such as trunk/boot and window surrounds, rubber door seals, etc.



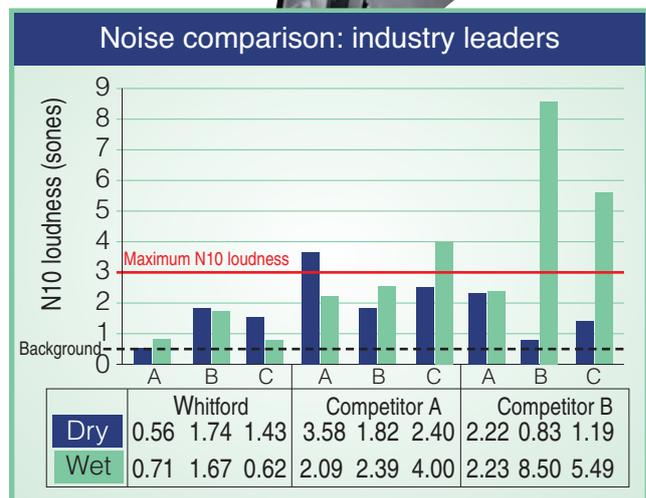
Resilon offers you:

- Low VOCs: It's waterborne and free of NMP.
- Improved itch and squeak suppression.
- Outstanding abrasion resistance.
- Superb haptic properties.
- Controlled friction: 0.1 to 1.0.
- Excellent resistance to the elements.
- Ideal for extrusion and corner mouldings.
- A variety of colours plus black.



Resilon provides UV protection, noise suppression, all-weather resistance.

| Resilon 2020 Performance | | |
|---------------------------------------|----------------------------------------|----------------------|
| Property | Specifications | Results |
| Itch & Squeak | Noise test GM9842P Rev.D | 0.2-1 sone |
| Friction | 0.3 (Toyota) 0.9 (Ford) 1.0 (GM) | Pass Pass Pass |
| Cleaner Resistance | GMN 10059 GM 9770P | Pass Pass |
| Weatherometer VW1303 PV3929 PV3930 | AE<3.0 | Pass |
| Crocking Dry | Ford - WSB-M2D49A2 300 cycles | Pass Rating 5 |
| Crocking Wet | Ford - WSB-M2D49A2 300 cycles | Pass Rating 5 |
| Abras. VW 50129 Jeans Test | 10,000 cycles | Pass |
| Cold Flexibility | DBL 5578.30 | Pass |
| 70°C/160°F Water Immersion 24 Hrs. | Whitford Test 153K | No adhesion loss |



Glass run → Resilon/Xylan

The requirements for glass runs and other profiles subject to significant abrasion on a constant basis are particularly demanding, and Whitford offers ideal solutions in both waterborne (Resilon) and solvent-borne (Xylan) systems.

These products give flexible window seals many benefits, including high abrasion resistance, low consistent-friction values and low operational-noise qualities, all major advantages over traditional flock technologies.

They provide improved window speed as well as superior freeze-release under the coldest of circumstances.



Resilon and Xylan offer you:

- Low friction (0.1 to 0.5).
- Superior abrasion resistance.
- Choice of waterborne or solvent-borne technology.
- Very low noise (below 3 sones).
- Choice of smooth or particulated grades.
- Excellent weathering.
- Available in low-cure-temperature grades.
- An ideal flock replacement.

Glass-run seals provide maximum satisfaction over extended time when coated with Resilon or Xylan.



The Bugatti Veyron, the world's most expensive production car, specifies Resilon.

| Resilon 2120/21 Performance | | |
|-----------------------------|----------------------------------------|--------------------|
| Property | Specifications | Results |
| Abrasion Resistance | Toyota/GM 3 kg Load 10,000 cycles | Pass |
| | Suzuki Muddy Water 3 kg 5,000 cycles | Pass |
| | VW 50129 Jeans Test 10,000 cycles | 50,000 cycles Pass |
| Friction | FIAT ≤ 0.2 | Pass |
| | Toyota 0.3 | Pass |
| | GM | Pass |
| Crock | GM14170 Wet, Dry, Solvent | Pass |
| Itch & Squeak | GM9842B Rev D | 1.0 Sones Pass |
| Weathering | GMW 14650 3,000 hrs $\text{OE} \leq 3$ | Pass |
| | SAE J2527 2500KJ $\text{OE} \leq 3$ | Pass |
| Water Immersion | Whitford Test 153K 80°C/175°F, 96 hrs | Excellent adhesion |

Special applications → Resilon/Xylan

Whitford's extensive range of water- and solvent-borne coatings has been tailored to meet the precise performance demands of numerous rubber, plastic and fabric components within a typical car. These include o-rings, gaskets, trim panels, buttons and moulding.

In addition to providing leading top-coat technology, Whitford has advanced water- and solvent-borne primer technology to assure outstanding adhesion promotion on the most challenging of substrates.



Resilon and Xylan offer you:

- Controlled friction.
- Low noise surface-to-surface contact.
- Excellent chemical and abrasion resistance.
- Soft haptic and colours.
- Assembly aids and flock coating.
- Low-temperature cure.
- Leading primer technology.



Whitford coatings are ideal for all forms of rubber, plastic and fabric used in today's automobiles.

Steering systems → Xylan

Steering systems turn to Xylan for a variety of important functions, not the least of which is the collapsible steering column in which the energy-dissipation management must be flawless on the first day the car is driven and every day thereafter.

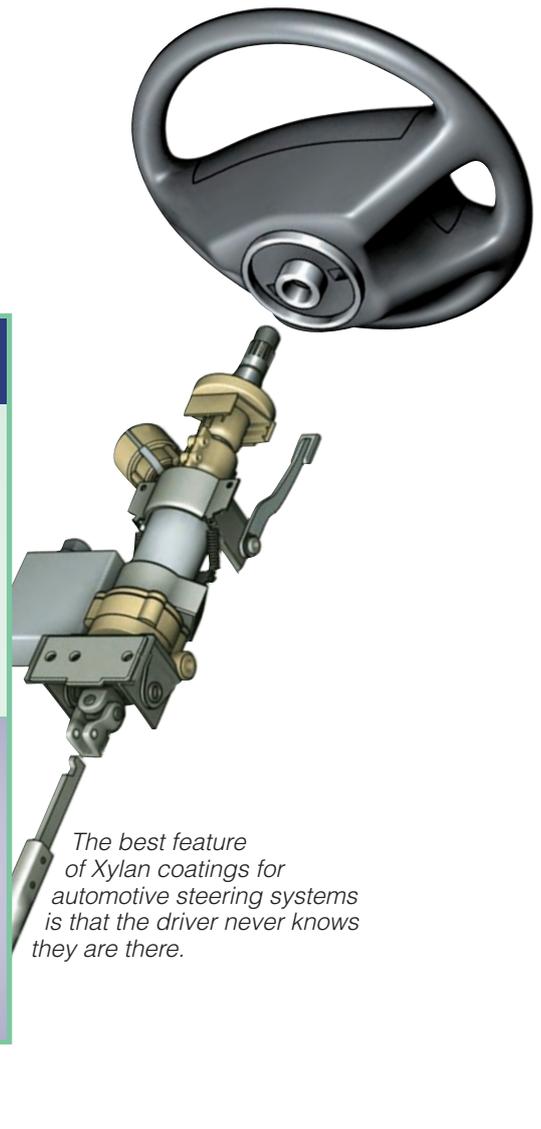
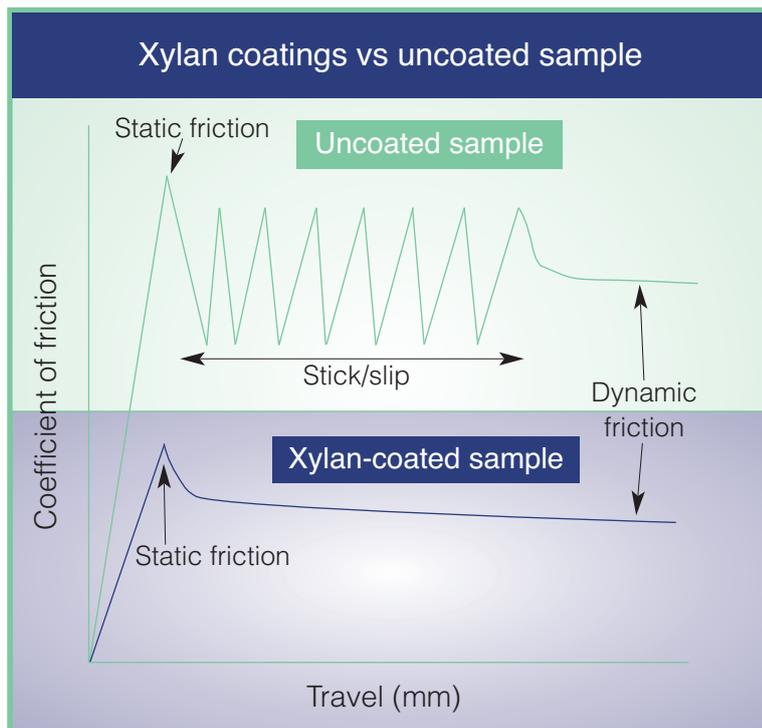
Different Xylan coatings solve different problems by providing dry-film lubrication, uniform CoF, stick/slip prevention, excellent resistance to corrosion and chemicals, reliable freeze-release, etc.

Xylan coatings are specified for crash tubes, mounting brackets/plates, cam plates, capsules, shafts, column-locking mechanisms, etc.



Xylan offers you:

- Minimization of moments of inertia.
- Smooth, safe operation.
- Consistent performance for the life of the vehicle.
- Minimization of stick/slip.
- Outstanding resistance to wear.
- Worry-free freeze-release.



The best feature of Xylan coatings for automotive steering systems is that the driver never knows they are there.

Fasteners → Xylan

Xylan coatings and automotive fasteners have been a winning combination for more than 25 years.

Xylan has become the wear-resistant, anti-friction coating that more and more manufacturers have turned to for consistent, fail-safe reliability.

Xylan coatings are also used extensively, from clips to washers, from fixings to rivets, in automotive platforms everywhere.



Xylan offers you:

- Extremely precise torque tension.
- Outstanding rust/corrosion resistance.
- Excellent adhesion and resistance to wear, abrasion, chipping.
- No production of dust.
- User-friendly, easy application.
- Water- or solvent-borne options.
- Rich black and colours.

| Xylan 5200 Series | | |
|-------------------------------|-----------------|-----------------------|
| Coefficient of friction range | OEM | Specification covered |
| 0.12 - 0.18 | Ford | WZ 100 |
| 0.08 - 0.16 | VW | VW 01129 |
| 0.11 - 0.17 | Ford | WZ 101 |
| 0.08 - 0.14 | VW | TL 246 |
| | GM | GME 0255 |
| | GM | GM 6046M |
| | Chrysler | PS 7001 |
| | BMW | GS 90010 |
| | Honda | D02008-5 |
| | Renault | 01-71-002/--Q |
| 0.12 - 0.18 | Peugeot/Citroen | B152230 |



Fasteners coated with Xylan have been doing their job for more than 25 years on automotive platforms around the world — in every different type of climate.

Pistons → Xylan

Whitford has been providing anti-friction coating solutions for pistons in both automotive engines and air conditioning units for years.

Xylan coatings have been tailored to combine the characteristics of the best engineering polymer binders with bonded lubricants to achieve unrivaled anti-friction protection for the life of the vehicle.

Whitford's practice of close partnership with our customers to create unique formulations that achieve maximum performance for different application methods has been of particular benefit.



Xylan offers you:

- Very low friction under load.
- Excellent temperature stability.
- Outstanding resistance to chemicals such as automotive fluids.
- Superb dry-film lubrication.
- Performance that lasts the life of the vehicle.
- Smooth, uniform operation.

| Xylan on pistons | | |
|----------------------|-------------|-------------------|
| Property | Typical | Method |
| CoF static | 0.11 - 0.14 | ASTM D4518-85 |
| CoF dynamic | 0.06 - 0.10 | Stanhope Seta Rig |
| Abrasion resistance* | 22 - 23 | ASTM D-3363 |
| Hardness (pencil) | >8H | |
| Wear depth** | 2.1 - 2.5 | Stanhope Seta Rig |

* Litres of sand/25 μ
 ** μ /100 hours (X).0001xPxV
 NOTE: Dynamic coefficient of friction and wear depth were determined by using a modified Stanhope Seta Thrust Washer test rig with coated pieces running against an annular thrust washer of EN31 steel hardened and tempered to 850 V.P.N. and with a surface finish of 12 micro-inches.



Pistons coated with Xylan perform for the life of the vehicle.



Xylan withstands all the many chemicals used in automotive fluids.

Special applications → Xylan

Xylan high-performance coatings are the ideal solutions for typical automotive problems such as friction, freeze-release and noise.

Whitford's variety of anti-friction coatings with hydrophobic properties offer noise-reducing solutions in numerous applications, from locks to solenoids, latches to bearings.

Whitford's ability to adjust formulae to improve performance has been key to our being specified by many manufacturers.



Xylan offers you:

- Dry-film lubrication.
- Controlled friction.
- High wear resistance.
- High load-bearing capabilities.
- Conductive or insulating properties.
- Low surface energy.
- Colour identification.
- Superb corrosion and chemical resistance.

Coatings of Xylan are performing a variety of useful functions on many different parts in automobiles, such as brake calipers.



Whether it's a special colour for coding or making sure locks don't seize in the freezing winter weather, Xylan is the solution to the problem.

Solutions → Whitford

The average car has about 10,000 moving components. These, of course, are often evolving, which means that the coatings some of them require must evolve, too.

That is what we think we do best.

If we don't have the right coating to solve your problem, we'll develop one that will.

As we said in the early days, "We are not in the business of selling coatings. We are in the business of solving problems for our customers. Coatings and related technology are only the means by which we solve the problems."

What problems can we solve for you?



Whitford offers you:

- Years of experience in solving problems for the auto industry, including friction, wear, corrosion, chemical attack, noise suppression, weathering, freeze-release.
- The most extensive portfolio of water- and solvent-borne coatings available.
- Offices and factories in the major markets of the world.
- Unequaled investment in research and development.



No matter what platform you have under wraps, Whitford coatings can help solve whatever problems your engineers may face.

Whitford → Worldwide



Whitford Brazil, São Paulo



Whitford China, Jiangmen City



Whitford Italy, Brescia



Whitford Singapore, Tuas Basin Close



Whitford UK, Runcorn



Whitford United States, Pennsylvania

Whitford has 11 factories in eight major markets, sales offices in 11 other countries and sales agents in 25 more. We have more than

500 employees speaking some 30 different languages and dialects. We manufacture the largest, most complete line of fluoropolymer coatings in the world.



Whatever your automotive coating problem, Whitford probably has the right product to solve it. If not, we'll work with you to develop the coating that will.

How to contact Whitford

Whitford manufactures and maintains sales offices in many countries of the world. For more information, please contact your Whitford representative or the nearest Whitford office (see our website: whitfordww.com) or sales@whitfordww.com.

Whitford

Where good ideas come to the surface

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