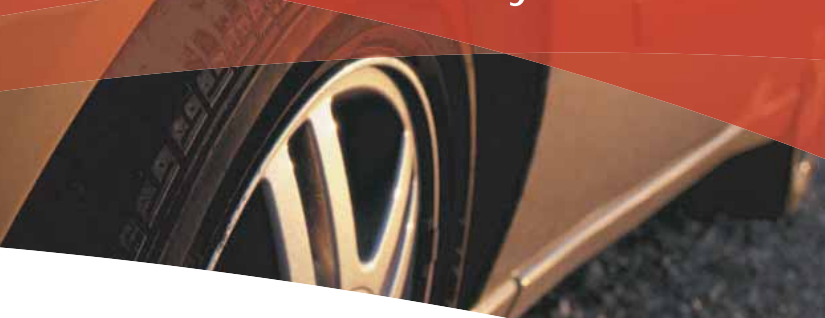


Silicones: Transportation

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Pioneering New Directions for a Mobile Society



As modern means of transport become faster, more reliable and more efficient, demands on materials become more exacting. Silicones meet these demands by delivering the strength, adhesion and durability needed in high-performance automobiles, ocean vessels, planes and spacecraft.

Their adaptability to meet precise or varying engineering challenges makes silicones suitable for situations requiring innovative approaches. Wherever things must be coated, sealed, fastened, weatherproofed and impregnated – silicones get the job done.

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Protect ●●●

Today, the transportation industry strives to improve safety, reduce pollution and maximize energy efficiency. Silicones have enabled successful implementation of compact systems such as engine compartments that minimize waste and maximize energy efficiency. Silicones also help maintain the structural integrity of a vehicle, helping to ensure all components are secure and resist corrosion from temperature fluctuations, moisture, salt and fuel.

Efficiency ●●●

Reduced production times and improved safety and maintenance are direct benefits of silicone applications. Silicones are easy to use in fabrication processes and are useful in many demanding manufacturing systems. Silicones allow for faster and more efficient assembly by reducing drying and curing time, while still allowing for precise fitting of joints.



Typical Applications

Airbags ●●●

The airbag is one of the most outstanding developments in the field of vehicle safety. Silicone coating ensures the fabric, which protects the driver and passengers, has controlled inflation/deflation and dependability and remains gas-tight and heat resistant during inflation.

Aviation and Aerospace ●●●

Silicones are fundamental to many of the components used in aviation and aerospace, which, by their nature, place extreme demands on materials. Because silicones can withstand astonishing stress and temperature extremes, they are used in a variety of aspects of aircraft and spacecraft assembly and maintenance. For example, adhesives and sealants are used to seal and protect the following from the elements: doors, windows, wings, fuel tanks, hydraulic switches, overhead bins, wing edges, leading gear electrical devices, vent ducts, engine gaskets, electrical wires and the black box.

Airflow Sensors ●●●

Airflow sensors control the fuel-air mixture, ensuring low-emission combustion. Heat dissipation is critical as vehicles trend toward greater miniaturization and packing density of hybrid components. Airflow sensors rely on silicones to provide high thermal conductivity, outstanding electrical insulation, good adhesion and elasticity.

Automotive Coatings ●●●

Silane-enhanced high-performance coatings help car finishes stand up to the harshest environments. Unique weathering properties and chemical and ultraviolet resistance prevent corrosion and ensure unflinching performance. Coatings tightly adhere to the siding, especially under wet conditions. Quality is not compromised by acid rain, sun, snow, salt or chemicals like gasoline and oil.

Automotive Windshields and Sunroofs ●●●

In virtually all new vehicles, silicone sealants hold windshields, sunroofs and windows in place with an airtight seal that stands up to extreme temperatures and harsh weather conditions, protecting people in the vehicle, even in the event of a collision.

Electronics ●●●

Silicones insulate and protect highly sensitive electronics and electrical connections – including circuits, wiring, communications systems and electrical plug-and-socket connections – against moisture and corrosion.



Foam Insulation ●●●

Silicone foams provide excellent insulation and safety benefits. The internal combustion process in engines generates heat, vibration and noise, which can place additional stress on materials and the passenger, who seeks a pleasurable ride. Used throughout the car interior, silicone foams provide good sound insulation, extreme heat resistance, flame retardancy and a reduction in the evolution of toxic combustion gases.

Silicones in Polyurethane Foam ●●●

Silicone surfactants help polyurethane foam provide cushioning, load bearing and protective shock absorption qualities to car seats, dashboards and automotive interiors.

Ignition ●●●

In a moving car, extreme engine temperatures place high demands on all ignition system parts. The combination of heat with road spray and road salt constitutes an extremely corrosive environment. Silicone sealants and adhesives ensure electronic components and parts such as the ignition cable, heater and cooler hoses and spark plug boots (critical to optimum ignition) can perform without being affected by temperature, moisture and other elements.

Radiators ●●●

The radiator must be absolutely leak-proof to function over long periods of time. Silicones' unique sealing properties are invaluable for the joints in the water tank, radiator tubes, radiator cover and openings. Silanes are added to the engine coolant to help with the anti-corrosion systems in the coolant.

Sealants ●●●

Self-lubricating silicone rubbers create strong, durable, airtight seals for virtually every part of the car. Silane-enhanced adhesives help attach everything from the rear-view mirror to the vinyl covering of the dashboard.

Tires

Silicone rubber is used in many tires to provide long wear life and superior traction.

Transmission

Silicones transmit power more uniformly. Modern viscous clutches with silicones increase power transmission in proportion with the torque. Long-term benefits include: long service life at high temperatures and shear rates, minimum loss of torque after long running times and near constant torque and viscosity.

Consumer Benefits

- Silicone adhesives and coatings extend the service life of cars, boats and planes. Exteriors are more resistant to rain, wind, salt, abrasion, ultraviolet radiation and chemicals such as gasoline. Joints last longer and overall maintenance and repair is less costly.
- Used to connect most parts of a car, silicones ensure components and systems remain intact, airtight and resistant to environmental stresses and pressures that could undermine performance.
- The interiors of most cars (as well as boats and planes) are assembled using silicone-enhanced adhesives that provide holding power comparable to welding or rivets, at a fraction of the cost in time, labor and materials. These adhesives can reduce weight – a crucial feature in aviation applications.
- Traffic lights and their under-road sensors are kept dry and operational thanks to sealants that contain silicones.
- Some silicone applications benefit industry and the general public by working to lower volatile organic compound (VOC) emissions.

Just a few of the car parts that benefit from silicones:

ABS control systems	Ignition cables
Air filters	Noise damping
Airflow sensors	Oil-sump seals
Airbags	Polyurethane foam in interior
Axle sleeves	Protective caps
Cables	Radiator seals
Clear coat	Radiator hoses
Carburetor flaps	Release agents for tire protection
Central-locking mechanisms	Seals
Cylinder head gaskets	Shaft seals
Damping media	Shock absorbers
Distributor caps	Spark plug boots
Door-lock shock absorbers	Sunroofs
Electronic components	Thermal insulation materials
Engine coolants	Tires
Engine gaskets	Torsion dampers
Exhaust systems	Turbo-charger hoses
Exhaust-pipe suspensions	Ventilation flaps
Foam insulation	Weather strips
Gaskets	Windscreen sealant
Headlamps	Windscreen wiper blades
Hydraulic bearings	