

Quick-Study for Product Design Engineers



Silicone Grease: Benefits, Risks & Urban Myths
A Case Study in Improving the Performance of Automotive Window Regulators

Silicone Grease: *Benefits, Risks, and Urban Myths*



Quick Overview

Silicone grease often has a bad rap in automotive manufacturing, despite its ability to outperform synthetic hydrocarbon greases.

This Quick-Study explores the benefits, risks, and myths around silicone grease as a lubricant for automotive window regulators — though the lessons learned here apply equally well to other automotive parts that may benefit from a silicone grease.



The Basics: *What is grease and how does it work?*



Oil
(up to 90%)

Thickener
(15 to 30%)

Additives
(5 to 10%)

Solid Lubricants
(5 to 10%)

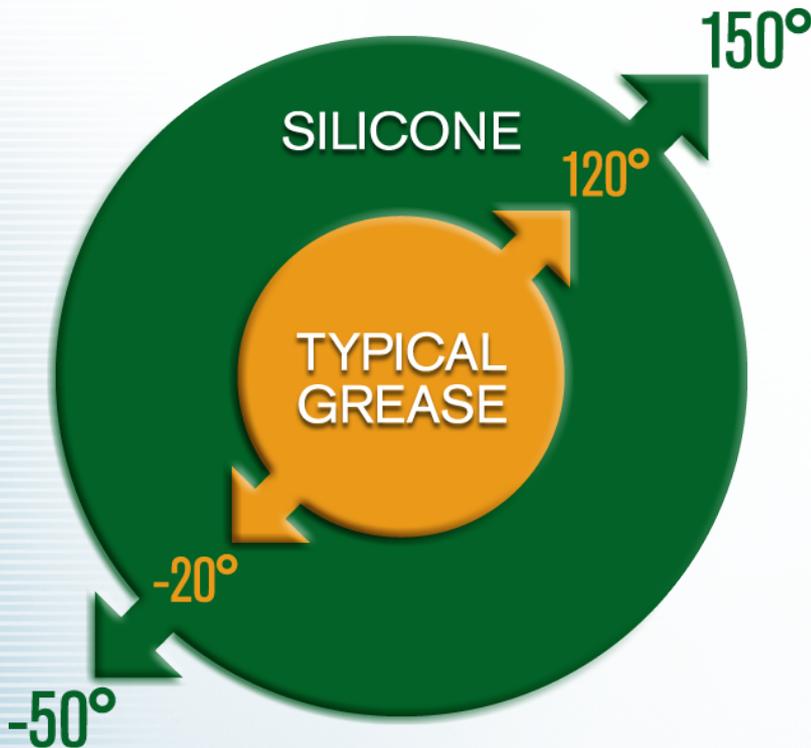
Oils lubricate. They form a protective film between two surfaces to prevent friction and wear.

Thickeners hold the oil in place, much like a sponge holds water. When mated parts move, the thickener is sheared and releases oil to form a lubricating film between moving parts. Thickeners reabsorb oil when motion stops.

Additives enhance critical performance qualities of a grease, such as low temperature torque, corrosion protection, and oxidation resistance.

Solid lubricants like PTFE, MoS₂, and graphite are load carrying additives that improve the lubricity of a grease, especially on start-up.

Silicone grease offers performance improvements over greases typically used to lubricate window regulators



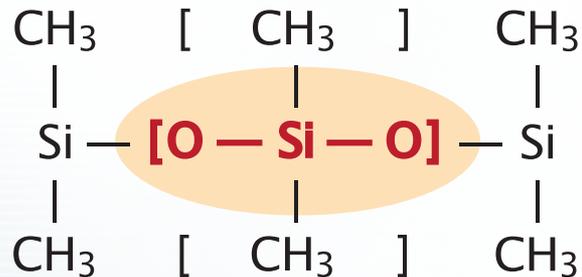
Benefits of Silicone

- Repels water.
- Significantly improves low and high-temperature performance without much physical change:
 - Si = -50°C to 150°C
 - PAO = -20°C to 120°C
- Offers excellent adhesion and long-term pliability.
- Retains chemical and physical properties over time for extended durability.
- Resists chemicals, salt, wind, UV, and IR radiation.
- Does not harden, dry out, or become brittle with age the way carbon-based materials do.

The science behind the benefits

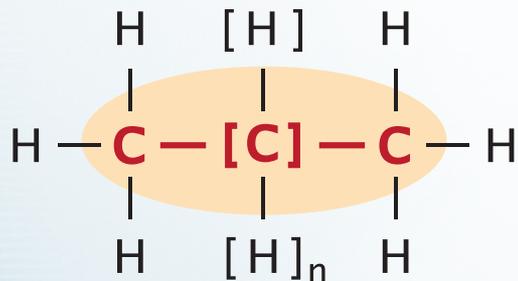
Silicone Fluid

(Polydimethylsiloxane)



Organic Fluid

(Hydrocarbon)



Si-O “molecular backbone” is significantly stronger than C-C links, which means:

- Significantly more resistant than standard hydrocarbon greases to temperature extremes, shear stresses, water, and chemicals.
- Excellent “oxidation stability” — so no sludge, especially at high temperatures, *which is common with hydrocarbon greases*.
- Shear stability up to 20x higher than hydrocarbons, providing longer life at higher speeds and heavier loads.

Silicones vs. Hydrocarbons: *Cost-benefit analysis*

PERFORMANCE
PRICE
SILICONES

HYDROCARBONS
PRICE
PERFORMANCE

Silicones may have a higher purchase price than hydrocarbons but...

- Less grease may be used per part.
- Superior reduction of noise and vibration at extreme temperatures.
- Easier to apply, cures more quickly, and enables automated production processes.
- Lasts longer than hydrocarbons, which means fewer failures and longer product life cycles.

...and they improve customer satisfaction and loyalty.

URBAN MYTHS

Silicones: Risk–benefit analysis

The risk of **silicone contamination** in automotive manufacturing plants has developed into an urban myth.

Before evaluating the “real risks,” let’s **explore the myth.**

Most myths are rooted in some facts



Fish Eyes

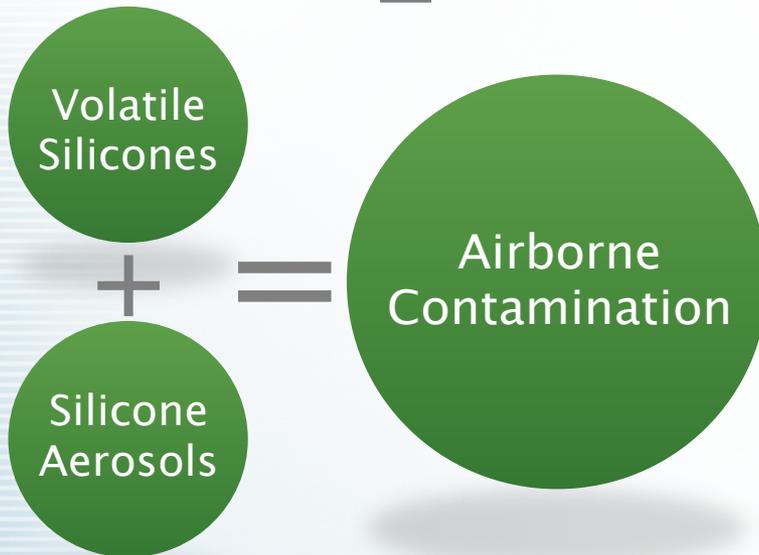
The auto industry discovered in the 1980's that silicone residue on unpainted metal caused "fish eyes," which meant costly corrective measures.

Silicones got a bad rap in the automotive industry, *but not all silicones are created equal.*

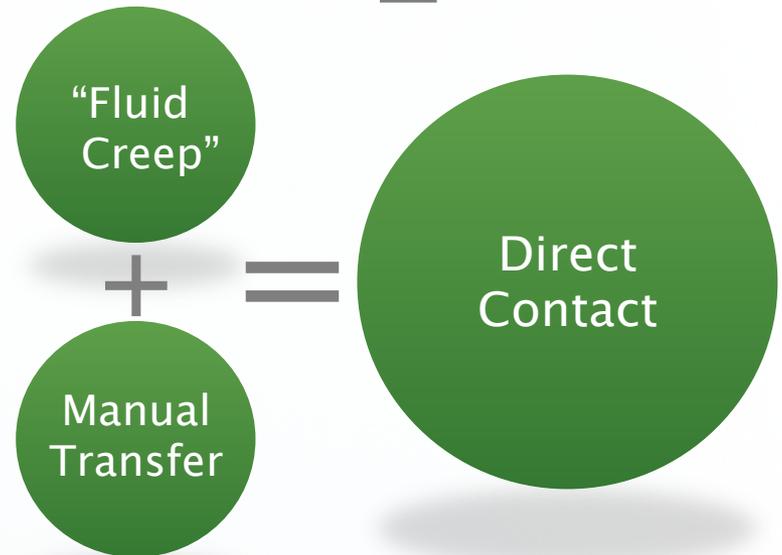


Exploring the myth: *Silicone contamination can happen in two ways*

1

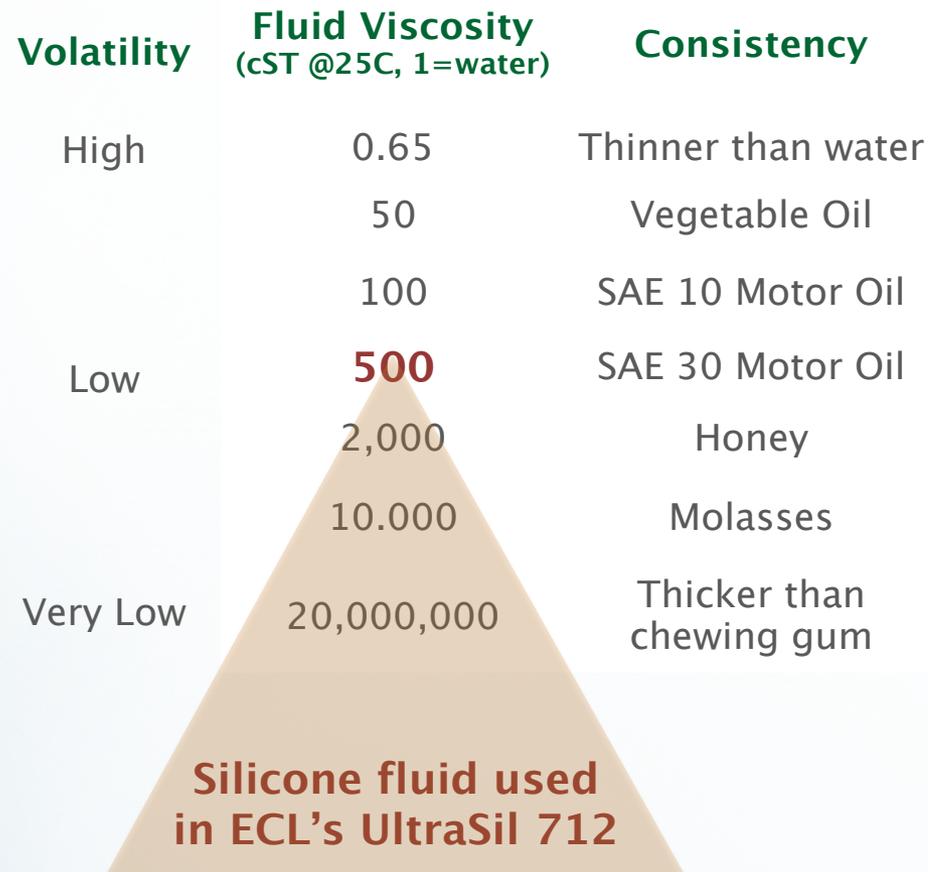


2



Volatile, airborne silicones were the culprits in paint shops

Volatility is related to the viscosity of the silicone fluid



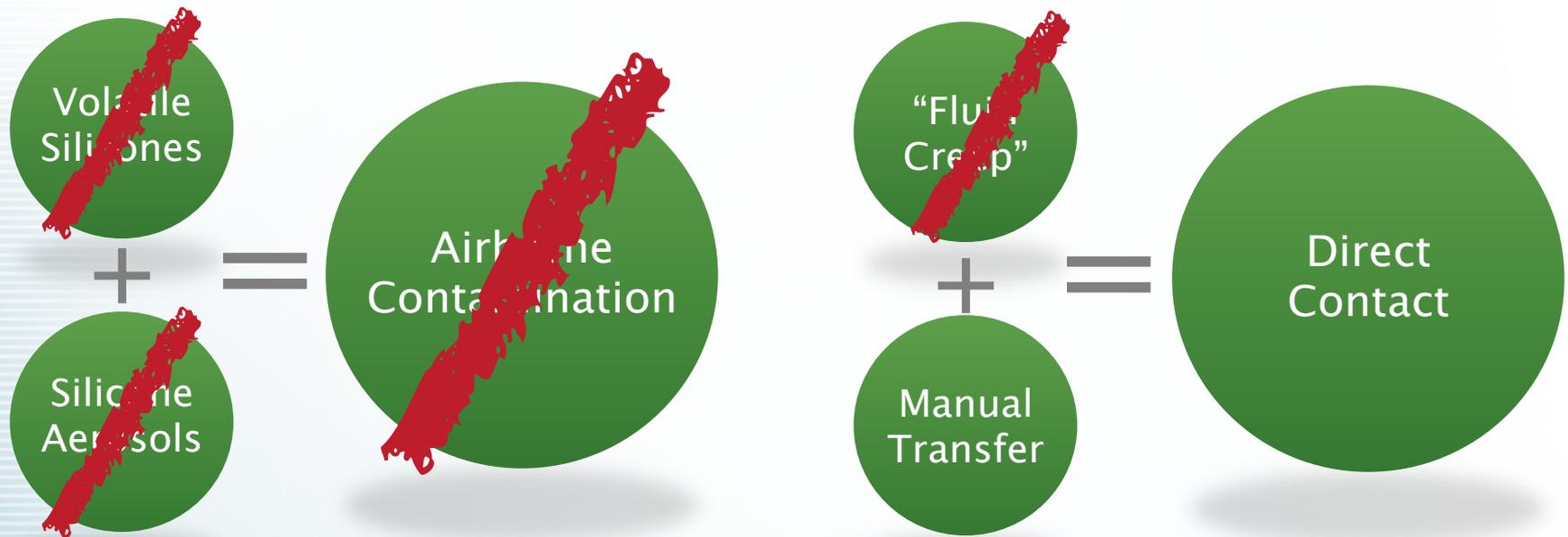
The risk of airborne contamination and “fluid creep” with UltraSil 712 is virtually zero



The Chemistry of UltraSil 712

- High-viscosity, low-volatility silicone fluid is “encased” in a lithium thickening agent (fortified with PTFE for improved lubricity).
- Evaporation after 24 hours at 100°C = 0.15%
- Oil Separation after 24 hours at 100°C = 1.4%

Assessing the “real risk” of contamination with UltraSil 712



Simple risk prevention



Think Safety

Rely on common sense

After handling silicone or *any* grease, your hands may be a source of “direct contact” contamination.

Wash hands thoroughly when leaving the area where silicone is used.

Optional: Disposable gloves.

If accidents happen...



- Use solvents designed to clean silicone grease (not the ones you use to clean up hydrocarbon greases.)
- Dampen clean, dry cloth with solvent.
- Use several cleaning strokes. Always start from the “non-contaminated” side of the surface. Clean surface edge last.



A note on solvents to clean silicone greases



DOW CORNING



Several recognized chemical companies offer a variety of commercially available solvents specially formulated to clean surfaces contaminated by silicone grease.

Dow Corning's OS2 is a good example. DuPont also offers cleaners that can be used to clean silicone greases, particularly the 3900-series products. Note that some low-viscosity silicone oils can be used to clean silicone grease, usually followed by cleaning with soap water to remove any residue. Follow manufacturers' use instructions.

Your ECL rep can help you determine which solvent best suits your needs.
customerservice@ecllube.com



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