

[Conclusion]

- Fluorinated grease is selected and used because of its advanced properties such as heat resistance, chemical resistance, and no effect on electrical contacts for which other lubricants' characteristics can't substitute.
- Fluorinated grease is mainly used in the closed system of specific machines and parts for a long time.
- Fluorinated grease is 10-1000 times more expensive than general-purpose grease. Even if refill or replacement is needed, it is unrealistic to replace and consume a large amount of this extremely expensive fluorinated grease for maintenance without any control of release to environment in factories. Therefore, the possibility of it being discarded/discharged at the stage of use is extremely low. Except for maintenance and repair in some cases, fluorinated grease is actually used without its refill and replacement during the long service life of machinery, equipment, and consumer products.
- Most of fluorinated grease remaining in closed system components may be treated under the WEEE/ELV regulation and be disposed through ATF (Approved Authorised Treatment Facility).

[Main purpose of fluorinated grease]

- Specific machines used under high temperature conditions.
- Specific machines under electrical contacts, bearings, sliding parts. (Silicone grease cannot be used because it gives it badly effect for electrical point or contact.)
- Specific machines that come into contact with chemicals, solvents, and fuels.
- Specific rubbers and plastics. (oil seals, packings etc.)

[Application examples with fluorinated grease]

- Contact parts of home appliances, high voltage circuit breakers, etc.
- Such as conveyor chains and rollers for drying and baking furnaces, film tenters, ovens, and packaging machines.
- Centrifugal separators, solvent washers, chemical plants, and others.
- Home appliances and housing equipment, pillow blocks, slide bearings, rolling bearings, ball screws, oil seals, packings, etc.
- Semiconductor manufacturing equipment, vacuum equipment, vacuum pumps, clean rooms.
- LBP (Laser Beam Printer), PPC (Plain Paper Copier), centrifuge, Chemical or solvent resistance valves.

[Price and cost]

- Fluorinated grease is 10-1000 times more expensive than general mineral oil grease.
- Therefore, fluorinated grease may be used in specific machines, not "open and disposable", but "closed and used" for a long time.
- In some cases, it is the same as the machine life and never refilled and replaced. At least it is not something that is consumed and replaced in large quantities like general-purpose grease.

Comparison chart: Base oil in lubricating grease

	Mineral oil	Di ester	Polyol ester	Synthetic hudrocarbon	Poly glycol	Phenyl ether	Silicone oil	PFPEs
Lubricity	Good	Excellent	Excellent	Good	Fair	Good	Poor	Good
Heat-resistant	Poor	Fair	Good	Good	Good	Excellent	Outstanding	Outstanding
Oxidation stability	Poor	Fair	Good	Good	Fair	Excellent	Outstanding	Outstanding
Low temperature performance	Fair	Outstanding	Excellent	Excellent	Good	Good	Outstanding	Good
Anti-rubber properties	Fair	Poor	Poor	Excellent	Outstanding	Good	Outstanding	Outstanding
Anti-plastic properties	Fair	Poor	Poor	Excellent	Poor	Excellent	Outstanding	Outstanding
note	Low-priced	Poor anti-rubber/plastic properties	Poor anti-rubber/plastic properties	incompatible with natural rubber and EPDM.			Poor lubricity and badly effect for electric point of contact.	The most high performace but very expensive.

PFPEs is "end point of lubricant technology"

Comparison chart: Thickener in lubricating grease

	Thickener type	Max. temperature	water resistance	Shear stability	note
Single metallic soap	Calcium soap (stearate)	70°C	Fair	Fair	old technology
	Calcium soap (hydroxy-stearate)	100°C	Good	Good	old technology
	Aluminium soap	80°C	Good	Poor	old technology
	Sodium soap	120°C	Poor	Fair	old technology
	Lithium soap (stearate)	130°C	Good	Good	most commonly used
	Lithium soap (hydroxy-stearate)	130°C	Good	Excellent	most commonly used
Composite metal soap	Calcium complex soap	150°C	Good	Good	improved product with excellent heat resistance
	Aluminium complex soap	150°C	Excellent	Excellent	improved product with excellent heat resistance
	Lithium complex soap	150°C	Good	Excellent	improved product with excellent heat resistance
Urea	Aromatic diurea	180°C	Good-Excellent	Good-Excellent	mainstream in Japan
	Aliphatic diurea	180°C	Good-Excellent	Good-Excellent	mainstream in Japan
	Alicyclic diurea	180°C	Good-Excellent	Good-Excellent	mainstream in Japan
	Tri urea	180°C	Good-Excellent	Good-Excellent	mainstream in Japan
	Tetra urea	180°C	Good-Excellent	Good-Excellent	mainstream in Japan
Organic	Sodium terephthalamate	180°C	Good	Good	used for long life
	PTFE	250°C	Outstanding	Outstanding	most stable. requires large quantities. expensive cost.
Inorganic	Bentonite	200°C	Fair	Good	has long been used for high temperature
	Silica gel	200°C	Poor	Poor	easy to rust