

Further enhances the lubricity and low-foaming properties of water-soluble lubricants, allowing for more advanced metalworking

SANYO
PRODUCT
TOPICS

Machine tool lubricants are essential in the machining of metal products. Among them, water-soluble machine tool oils are superior in terms of processability and environmental friendliness, and further improvements in performance is required. In this issue, we introduce a synthetic base material for water-soluble machine tool oil that enables advanced metalworking with our proprietary technology.

Machine tool lubricant that reduces friction in metalworking applications

Various metal products, such as automobiles, machinery, and construction materials, undergo some type of metal processing, such as cutting, pressing, and rolling. The friction generated by these processes causes heat generation and damage, which can lead to product defects. Therefore, in most cases, machine tool lubricants are used to reduce friction during metalworking. By reducing heat generation and damage to friction surfaces, it is possible not only to reduce product failure rates, but also to extend tool life. There are two kinds of machine tool lubricants: "water-insoluble," which are used without dilution, and "water-soluble," which are used after dilution with water.


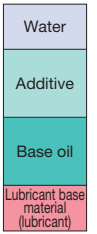
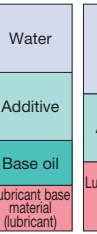

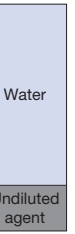
In general, water-insoluble machine tool oils are composed primarily of mineral oil and have excellent lubricity because they can dissolve various additives, such as extreme pressure agents, that reduce friction. Their disadvantages are the possibility of ignition, adverse effects to workers from mist generated during operation, and staining the machine tools and floors. On the other hand, water-soluble machine tool oil uses water and has excellent cooling properties. Since it is easy to clean and advantageous for post-processing such as coating, the demand for water-soluble oil has increased from the viewpoint of improving the working environment and reducing environmental impact. However, their lubricity is inferior to that of water-insoluble machine tool oil and has the disadvantages of metal rust and the need to take measures against corrosion of diluted water. Therefore, currently each lubricant is used selectively in areas where its characteristics can be well-performed.

Water-soluble machine tool oil required to improve its performance with the evolution of metalworking

The main component of a water-soluble machine tool oil is a synthetic water-soluble base material. This base material largely determines the basic performance such as lubricity and water solubility. Water-soluble machine tool oil can be broadly classified into three types: emulsion type, soluble type and solution type.

The emulsion type improves lubricity by dispersing oil components such as mineral oil and various additives in water with a surfactant. However, because it contains mineral oil, it has the disadvantage that it becomes milky white when mixed with water, making it difficult to see the processing point, and because it uses a surfactant, it tends to foam during processing. The solution type, which is transparent even when diluted with water, is characterized by the fact that the processing points are visible and leave little residue during cleaning, and since it does not use mineral oil, it is also environmentally friendly and healthy for workers. However, since the various additives commonly used in water-insoluble machine tool oils are not soluble, the lubricity is inferior. The performance of the soluble type is intermediate. Despite its advantages and disadvantages, water-soluble machine tool oil with excellent cooling properties is suitable for high-speed machining, and with the development of metalworking, there has been a demand for products that can be used for precision machining and hard-to-machine materials.

■ Overview of different types and compositions of machine tool oils

Water-insoluble	Water soluble			
	Use undiluted	Emulsion type	Soluble type	Solution type
				

UTILIOL GA-15P achieving both high lubricity and low foaming

Sanyo Chemical has been developing the synthetic base materials for water-soluble machine tool oils since the 1960s and has cultivated its technology in this field. Utilizing this technology, UTILIOL GA-15P was launched in 2021.

UTILIOL GA-15P is a solution-type polyalkylene glycol (PAG) synthetic base material for machine oils that can be used for a wide range of metal types and processing methods that have been difficult to process even with water-insoluble machine tool oils and emulsions. It is also used in the machining of light metals such as aluminum with high

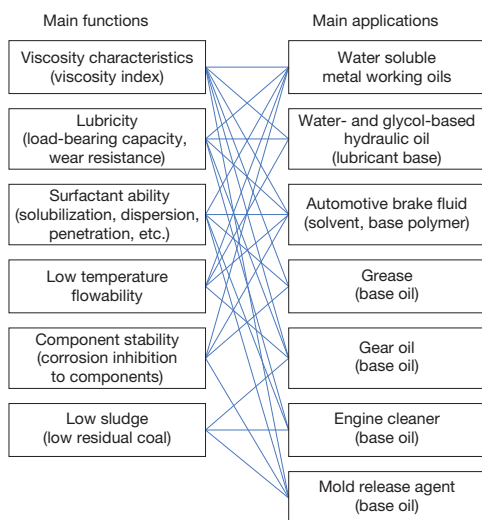
ductility, which has been difficult to machine with conventional water-soluble machine tool oils. PAG, the main component of PAG, is one of a group of AOA products made from lipophilic propylene oxide and hydrophilic ethylene oxide. Sanyo Chemical has been accumulating AOA technology since 1960 and has produced a variety of products. Using this proprietary AOA technology, Sanyo Chemical has been able to achieve both high lubricity and low foaming, which have been trade-offs for water-soluble machine tool oil. Other advantages of PAG include its high cloud point and transparency when diluted with water, which allows it to be processed at relatively high temperatures, and its low flammability, which makes it easy to store and handle as it is not classified as a hazardous

material under the Fire Protection Law in Japan. In addition to its excellent lubricity, PAG can also be used as an additive to metalworking oils because it can impart emulsifying, solubilizing, and permeation functions as surfactant properties. Because of these properties, PAG is used in a wide range of lubricating oil applications outside of metalworking.

Products with the potential to expand into many areas

In this way, the UTILIOL GA-15P is a highly complete product that can be used to process light metals such as aluminum, which has been difficult in the past, and also contributes to reducing environmental impact and improving the working environment. UTILIOL GA-15P contributes to SDGs goals such as Goal 9 "Industry, innovation and infrastructure," promote inclusive and sustainable industrialization' and Goal 12 'Responsible consumption and production'.". In addition, because PAGs can be given various functions, they are expected to be applied in other areas besides metalworking oil, such as hydraulic fluids for hydraulic machines. From an environmental and safety perspective, UTILIOL GA-15P has the potential to expand into many fields as an alternative to oil-based products. Sanyo Chemical will continue to contribute to society by expanding its applications beyond metalworking.

Examples of PAG functions and applications



Property of UTILIOL GA-15P and our conventional PAG-based lubricant base material

Property [unit]	UTILIOL GA-15P	Our conventional PAG-based lubricant base material		
		NEWPOL GEP-2800	NEWPOL PE-61	BLEMBER LUB-90
Kinematic viscosity (40°C) [mm ² /s]	263	198	144	461
Flash point [°C]	255	240	210	230
Japanese Fire Service Law* ¹	Designated flammables (flammable liquids)	Hazardous material under the Japanese Fire Services Act (petroleum No. 4, class 4)	Hazardous material under the Japanese Fire Services Act (petroleum No. 4, class 4)	Hazardous material under the Japanese Fire Services Act (petroleum No. 4, class 4)
Appearance (20°C)* ²	Clear liquid	Clear liquid	Clear liquid	Turbid liquid
Cloud point* ² [°C]	52	>75	26	18

*¹ Japanese Fire Service Law: Class 4: Inflammable liquids, of which Class 4 petroleum have a flash point of 200°C or more but less than 250°C. Designated flammables and flammable liquids have a flash point of 250°C or higher.

*² Appearance (20°C) and cloud point of cutting fluid model (each lubricant base material: 0.50 wt%, medium-chain fatty acid amine salts: 2.40 wt%, ion-exchange water: 97.10 wt%)

Please contact our company sales representative when handling our company products.

Also be sure to read the "Safety Data Sheet" (SDS) in advance.

It is the responsibility of the user to determine the suitability and safety in the intended use.