

Guide to Selecting UCON™ Fluids and Lubricants

Including Properties,
Applications & Features

DOW®



High Performance Polyalkylene Glycol Base Stocks and Formulated

The broad line of UCON™ fluids and lubricants includes a wide range of base stocks and formulated products that differ significantly from petroleum, animal, and vegetable oils. These polyalkylene glycol (PAG)-based synthetic products can be varied and controlled in formulation and used to a degree not possible with natural oils or lubricants. They are used in applications from hydraulic fluids to quenchants, and from machinery, gear and bearing lubricants, to compressor lubricants.

The versatility of UCON™ fluids and lubricants results from unique physical and performance properties. For example...

- **Viscosity** – UCON™ fluids and lubricants are commercially available in a series of viscosities ranging from 12 to more than 65,000 centistokes at 40°C. They show less change with temperature than petroleum oils, and high viscosity indices give them wider operating ranges. Viscosities of UCON™ products are virtually unaffected by high rates of shear.
- **Low Pour Point** – UCON™ products have low, stable pour points, and do not require pour point depressants.
- **Lubricity** – UCON™ lubricants have outstanding overall load-carrying capacity, film strength, and anti-wear properties.
- **Cleanliness** – UCON™ fluids and lubricants are refined to eliminate organic impurities. When they decompose, soluble by-products are formed rather than sludge, varnish, gums or tars.
- **Stability** – UCON™ fluids and lubricants are oxidatively stable, which contributes to long service life. Even under high temperature conditions, the fluids retain the qualities of efficient hydraulic fluids, lubricants, and heat transfer media.
- **Flash Points** – UCON™ fluids and lubricants generally have higher flash points than petroleum oils of the same standard viscosities. This provides a greater margin of safety and permits higher temperature service.
- **Miscibility** – UCON™ fluids are available as water-soluble or oil-soluble products.
- **Solvency** – UCON™ fluids clean valves, orifices and other surfaces as they operate.
- **Gas Solubility** – UCON™ fluids retain their viscosity better in contact with gases, such as methane, nitrogen, ethylene, propane, hydrogen, etc., providing thicker lubricant films and better lubrication than similarly exposed petroleum oils and polyalphaolefins.
- **Noncorrosive to Metals** – UCON™ fluids and lubricants are noncorrosive to iron, steel, brass, bronze, and aluminum under normal operating conditions. Inhibitors can be incorporated to control corrosion, even in the presence of water.
- **Elastomer Compatibility** – UCON™ fluids are compatible with common elastomers.
- **FDA Status** – UCON™ fluids and lubricants have numerous clearances under FDA Food Additive Regulations.





How to Choose the Proper UCON™ Fluid or Lubricant

Selection of the proper UCON™ fluid or lubricant can be based primarily on viscosity, pour point, cloud point, water or gas solubility, lubricating properties, oxidation stability, or a combination of these and other physical, chemical, or performance properties. The following are considerations when selecting UCON™ fluids or lubricants.

Viscosity – Viscosity is the key property in the selection of any lubricant. Due to their higher viscosity index, when selecting or comparing UCON™ fluids to replace a petroleum product, the viscosity comparison should be made at the operating temperature, rather than at SAE or ISO standard temperature grades.

Operating Temperature – If prolonged operation above 40°C is expected, choose UCON™ lubricants containing antioxidants or stabilizers.

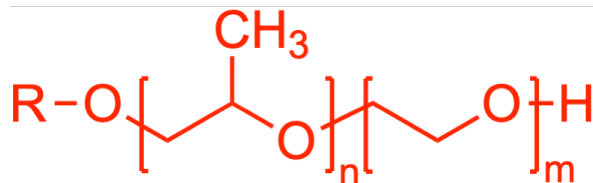
Solubility – Choose the UCON™ fluid or lubricant with the right solubility properties. LB fluids are water insoluble, which makes them useful for mechanical lubrication. 75-H and 50-HB fluids are water soluble, which makes them useful as process fluids or as lubricants where contact with the end-product is possible and ease of washability is essential. Also take note of the unique gas solubilities of UCON™ products.

Additives – The performance of UCON™ formulated products is enhanced through the use of additives, including extreme pressure modifiers, corrosion inhibitors, dyes, and other additives for special requirements.



UCON™ Base Stocks

UCON™ base stocks are polyalkylene glycols (PAGs), which are polymers of ethylene oxide and propylene oxide described with the generalized formula:



LB Fluids are alcohol-started base stocks of all oxypropylene groups ($m=0$) with one terminal hydroxyl group. They are water insoluble and available in a variety of molecular weights and viscosities.

50-HB Fluids are alcohol-started base stocks containing equal amounts, by weight, of oxyethylene and oxypropylene groups with a single terminal hydroxyl group. They are water soluble at ambient temperature and are available in a variety of molecular weights and viscosities.

75-H Fluids are diol-started base stocks containing 75 weight percent oxyethylene and 25 weight percent oxypropylene groups with two terminal hydroxyl groups. They are water soluble at temperatures below 75°C and are available in a variety of molecular weights and viscosities. better lubrication than similarly exposed petroleum oils and polyalphaolefins.

Applications for UCON™ Fluids and Lubricants



Functional Fluids

Hydrolubes (Fire-Resistant Hydraulic Fluids)

UCON™ hydrolubes were developed to meet the demand for relatively low-cost, fire-resistant hydraulic fluids. They are balanced formulations of a glycol-water base, thickened with a water-soluble UCON™ lubricant. They contain additives to improve lubrication properties and provide resistance to both liquid- and vapor-phase corrosion. UCON™ hydrolubes have been tested to the Standard 6930 Flammability Classification of Industrial Fluids and approved by FM Approvals as “FM Approved” products.

Hydraulic Fluids

UCON™ hydraulic fluids provide the lubricity and performance required of industrial hydraulic fluids that must operate over a wide temperature range. Excellent low-temperature properties permit outdoor use year-round. They are resistant to oxidation and thermal degradation as well as to sludge or varnish formation. UCON™ hydraulic fluids have high viscosity indices and their viscosities are unaffected by high rates of shear.

Coating Fluids

UCON™ LB Series base fluids can be compounded with selected rust and oxidation inhibitors to serve as lubricating and protective coatings for hydraulic brake parts and similar equipment prior to and during assembly. They are compatible with DOT 3 brake fluids, but not silicone-based fluids. UCON™ coating fluids have no adverse effect on braking system elastomers and provide lubrication during assembly of braking parts.

Metalworking Fluids

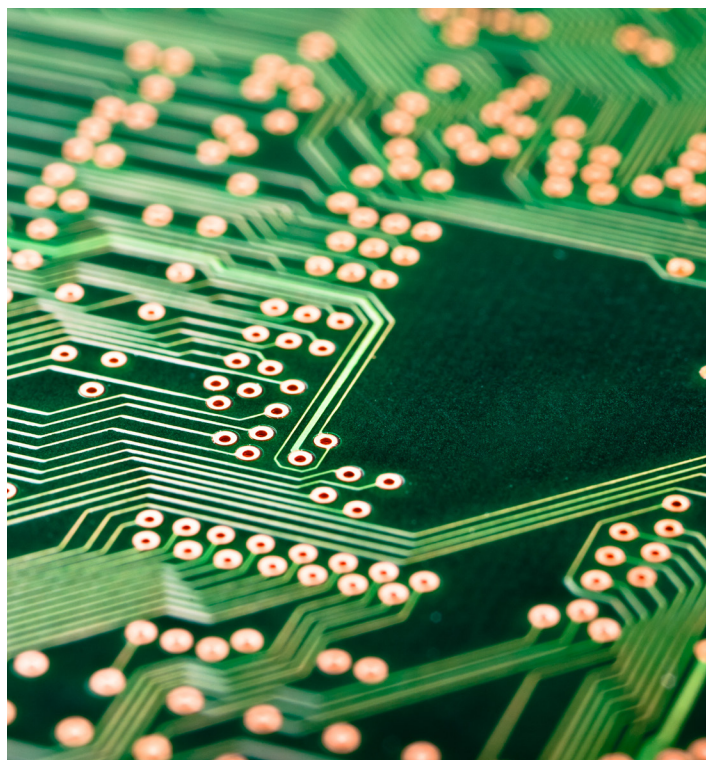
UCON™ metalworking fluids are used as lubricity bases for formulating water-soluble cutting and grinding fluids and in forming operations, such as drawing, stamping, and rolling. They can be used alone or in combination with extreme-pressure additives. UCON™ metalworking fluids exhibit inverse solubility – they become less soluble in water as the temperature of the solution increases. In contact with a hot tool or workpiece, the polyalkylene glycol comes out of the solution and coats the metal surfaces with a concentrated lubricant film, providing greater lubricity and heat removal.

Heat Transfer Fluids

UCON™ fluids offer better heat transfer characteristics than petroleum oils of comparable viscosity. They offer excellent thermal and oxidation stability and are widely used in open, vented heat transfer systems. UCON™ fluids feature high flash and fire points and, when used properly, have minimal tendency to sludge, carbonize, and foul heat transfer surfaces. They have higher thermal conductivity than petroleum oils and contain no PCBs.

Process Fluids

UCON™ fluids are uniquely suited for use in the heat treating or processing of plastics, elastomers, thread, or fabricated parts where compatibility of the fluid with the processed part is important. UCON™ process fluids transfer heat rapidly and uniformly and can be used in open baths up to 204°C. Because they are water soluble, only a water rinse is required to remove residual fluid from parts or other processed material.





Lubricants

Compressor Lubricants

UCON™ LB Series and 50-HB Series base stocks are used extensively in the formulation of compressor lubricants. A complete line of formulated UCON™ compressor lubricants is also available. Centrifugal, reciprocating, rotary-screw, sliding vane, and other types of compressors have been lubricated with UCON™ lubricants in a variety of applications, including helium, nitrogen, hydrogen, carbon dioxide, natural gas, ethylene, stack gases, landfill gas, and fluorocarbon refrigerant. They offer excellent lubricity, high temperature stability, resistance to sludge and varnish formation, good additive response, and adaptable solubilities.

Mill and Calendar Lubricants

Large-scale mills and calendars used by the rubber, textile, paper, and plastics industries require lubricants for large-diameter journal or sleeve bearings, anti-friction bearings, and several types of gearing. While petroleum lubricants are often suitable for moderate temperature operation, at elevated temperatures (calendar roll temperatures above 177°C), these fluids can form carbonaceous residues, contributing to lubricating problems and increased maintenance. UCON™ calendar lubricants are formulated for high temperature service, and are supplied in several viscosity grades to offer greater flexibility in high temperature equipment than petroleum products.

Solder Assist Fluids

Water-soluble UCON™ fluids are well-suited as base fluids for many applications in the electronics industry, including solder assist fluids. Excellent thermal and oxidative stability make them ideal for formulations used in printed circuit board manufacturing and assembly. Inhibited fluids provide high temperature stability, high flash and fire points, and low foaming tendencies.

Quenchants

UCON™ quenchants are a series of nonflammable, aqueous solutions containing special polymers and corrosion inhibitors for quenching both ferrous and nonferrous metals. They can replace water, oil, or brine solutions and are the preferred quenching media for both low- and high-hardenability, plain carbon, and alloy steels. UCON™ quenchants provide much wider flexibility in quench severity than water or oil, thus reducing cracking, distortion, and residual stress in quenched parts. Use of UCON™ quenchants is permitted by most major industrial and military specifications. UCON™ Quenchant A is classified as a Type I quenchant (AMS 3025B) for aluminum heat treating in the aerospace industry. UCON™ quenchants have been tested to the Standard 6930 Flammability Classification of Industrial Fluids and approved by FM Approvals as “FM Approved” products. Fluids as industrial-grade UCON™ALL lubricants. With extreme-pressure performance similar to extreme-pressure sulfur- and phosphorous-containing gear lubricants, UCON™ food-grade lubricants pass twelve load stages of the FZG spur gear test.





Lubricants Cont.

Machinery, Gear & Bearing Lubricants

Dow offers two formulated lubricants for gear lubrication: UCON™ALL™ lubricants and UCON™ food-grade lubricants. UCON™ALL lubricants are fully formulated, extreme-pressure lubricants for enclosed industrial gears. They are formulated to provide excellent lubrication, thermal and oxidative stability, and extended service life, while eliminating many of the problems associated with petroleum gear lubricants. With viscosity indices generally exceeding 170, these lubricants provide excellent viscosity-temperature properties; which eliminates the need for seasonal changeover due to climatic temperature changes. UCON™ALL lubricants are available in a broad viscosity range for many industrial gear applications, including helical, herringbone, bevel, spiral bevel, spur, and worm gear designs.

Food-Grade Lubricants

UCON™ food-grade lubricants are fully formulated, extreme-pressure lubricants developed for industrial machinery where incidental food contact from lubricants may occur. All of the components of these lubricants are identified in FDA Regulation 21 CFR 178.3570 and/or 21 CFR 178.3910. UCON™ food-grade lubricants offer improved performance over food-grade white oils and non-food-grade-rated petroleum oils by providing excellent lubricity, increased oxidative and thermal stability, high viscosity indices and low pour points. They provide the same energy savings and temperature reductions as industrial-grade UCON™ALL lubricants. With extreme-pressure performance similar to extreme-pressure sulfur- and phosphorous-containing gear lubricants, UCON™ food-grade lubricants pass twelve load stages of the FZG spur gear test.

High-Temperature Lubricants

UCON™ lubricants offer unique properties that provide key advantages in industrial lubrication at high temperatures. At elevated temperatures, most lubricating oils tend to decompose or oxidize into sludges and carbonaceous residues, resulting in high wear rates and inefficient operation. UCON™ lubricants generally do not form deposits, sludges, or varnishes at high temperatures. Total or clean burn-off can be achieved without sludge and residue formation. UCON™ lubricants are ideal liquid carriers for solid lubricants, such as graphite or molybdenum disulfide, used in high-temperature applications. This combination is highly desirable in kiln-car bearings, on oven chains and drives, and to lubricate gears on hot glass machinery.

Special Uses

Special uses for UCON™ fluids and lubricants include, chemical intermediates, ink and dye solvents, plasticizers and solvents, foam control agents, cosmetic fluids and emollients, and demulsifiers. Contact Dow to learn more about these and other applications.

Supporting Services

The Dow sales and technical team for UCON™ fluids and lubricants stands ready to support you with product selection, formulation, and application assistance; product physical properties and performance data; regulatory information; handling and storage information; as well as Material Safety Data Sheets and other product safety information.

To learn more, contact Dow at the number for your area, listed on the back of this brochure. Or visit us online at www.UCON.com



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