UCON Fluids & Lubricants

UCON Hydrolube HP-5046D

Introduction

UCON™ Hydrolube HP-5046D is a high-performance, water-glycol hydraulic fluid.

Features and Benefits

Fire Resistant – Recognized worldwide by FM Approvals as a FM Approved Industrial Fluid. Reduced fire hazards improve personnel safety in storage, handling, and use, which could lower insurance premiums.

High-Pressure Performance – UCON Hydrolube HP-5046D is a proven water-glycol fluid for use in high pressure systems.

All-Season Usage – With a viscosity index (VI) of 192 and a pour point of -63°C (-81°F), HP-5046D can be used year-round, where other fluids may require 2 or 3 viscosity grades to operate through different seasons.

Low Pump Wear – More reliable and longer service life means lower maintenance costs and less downtime.

Clean, Long-Lasting – When proper fluid and equipment maintenance procedures are followed, UCON Hydrolube HP-5046D remains clean, does not produce sludge, and lasts longer than conventional fluids.

Low Toxicity – Under OECD Guideline 420 for Acute Oral Toxicity Testing, HP-5046D is classified as a "compound which does not present a significant acute toxic risk if swallowed."

Water Solubility Means Easy Cleanup – UCON Hydrolube HP-5046D is 100 percent soluble in water, making equipment and shop cleanups easier than with conventional hydraulic fluids.

Readily Biodegradable – Formulated with 35-40 percent water and specially selected performance-enhancing additives, UCON Hydrolube HP-5046D is readily biodegradable, thus minimizing disposal problems and reducing plant maintenance costs.

Economical – UCON Hydrolube HP-5046D is a cost-effective alternative hydraulic fluid that in many instances is less expensive overall than other synthetic lubricants.

Typical Physical Properties[1]

Viscosity, cSt (SUS)	
at -18°C (0°F)	1300 (6000)
at 0°C (32°F)	340 (1600)
at 40°C (104°F)	46 (213)
at 65°C (149°F)	22 (102)
Viscosity Index	192
ISO Viscosity Grade	46
Specific Gravity at 20/20°C	1.089
Pressure -Viscosity Coefficient at 65°C, GPa-1	2.97
pH at 25°C	8.8-9.4
Reserve Alkalinity (ml 0.1N HCl/100 ml sample)	160-200
Water Content, weight %	34.0-38.0
Thermal Conductivity at 100°F (est.)	
(BTU/ft/hr/°F)	0.26
Coefficient of Thermal Expansion per °C (est.)	
at 20°C	0.00065
at 55°C	0.00067
Specific Heat (BTU/lb/°F) at 68°F (est.)	0.74
Density	
at 25°C, g/cc	1.084
at 40°C, g/cc	1.073
at 80°C, g/cc	1.045
at 15.56°C, lb/gal	9.10
at 20°C, lb/gal	9.08
Vapor Pressure at 100°F, psia	1.1
Flash Point, ASTM D 93 or ASTM D 92, (°C) (°F)	None
Pour Point, °C (°F)	-63 (-81)
Appearance	Red liquid-Slight Haze Permissible
Corrosion Resistance Properties	
Liquid Solution (copper, iron, steel, brass)	Excellent
Vapor Phase (steel, cast iron)	Excellent
NOTE: Not recommended for use with zinc, galvanized iron, or cadmium.	

1. The above data represent typical physical properties only and should not be construed as product specifications.

Performance Characteristics

High-Pressure Capabilities – The superior performance of UCON Hydrolube HP-5046D has been demonstrated by independent laboratory tests at 5000 psi, and in-service field trials and commercial applications at greater than 5000 psi (345 bars). Visual and quantitative measurements show little indication of wear of pump parts or motor components.

Excellent Fire Resistance – UCON Hydrolube HP-5046D extends the superior fire resistance characteristics of water-glycol fluids into the high-performance arena. Since a water-glycol fluid will not burn until the water has evaporated, there is much less fire hazard from a spill or leak onto a hot metal surface. In addition, there is considerably less flame and smoke associated with UCON Hydrolube HP-5046D than with other fire-resistant synthetic hydraulic fluids, such as polyol or phosphate esters. UCON Hydrolube HP-5046D is a FM Approved Industrial Fluid as tested against standard 6930 (January 2002).

Cost-Effective – Outstanding antiwear performance has been demonstrated in both low- and high-pressure applications. The use of UCON Hydrolube HP-5046D provides cost savings, both initially and in make-up, for the best overall cost vs. performance. The fluid has been used as long as two years without changeout. Cost effectiveness also includes longer-lasting, better-performing hydraulic system components.

Environmental Safety – This diethylene glycol-water-based fluid requires no special handling and can be managed using standard waste treatment procedures. UCON Hydrolube HP-5046D does not contain any phenol. Any discharge should be reviewed with the local POTW before commencing operations.

Seal and Hose Compatibility – Historically, water-glycol fluids have exhibited excellent compatibility and service life with standard hydraulic seals and hose elastomers. UCON Hydrolube HP-5046D affords similar elastomer compatibility with commonly used materials, such as Viton, high-nitrile Buna N, EPDM, butyl, silicone, and halogenated elastomers (e.g., Aflas, Kalrez, etc.). Urethanes and Buna S (SBR) elastomers are not compatible with UCON Hydrolube HP-5046D.

Plastics Compatibility – Due to variations that can exist between plastics in the same generic family, it is important to test the compatibility of any plastic components (such as reservoir sight glass) exposed to the hydraulic fluid under end-use conditions.

Performance Test Results

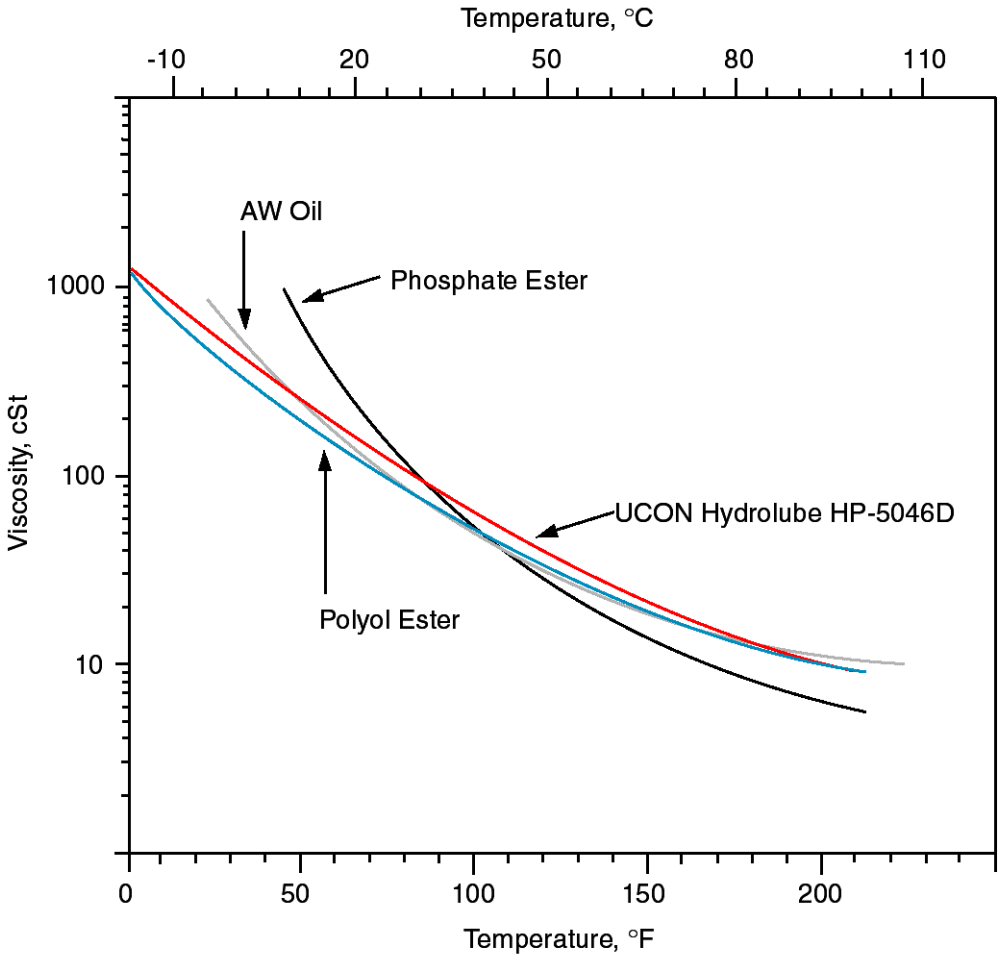
Viscosity Properties – Because of its relatively low pour point (-63°C) and high viscosity index (192), UCON Hydrolube HP-5046D can be used over a wide temperature range with only a minimal impact on the bulk fluid viscosity. The viscosity index and pour point of UCON Hydrolube HP-5046D is compared to typical ISO 46 grade mineral oil, phosphate ester, and polyol ester hydraulic fluids in Table 1.

UCON Hydrolube HP-5046D has a comparable viscosity-temperature profile to typical competitive fluids, as shown in Figure 1.

Table 1 • Comparison of Viscosity Index and Pour Points of Hydraulic Fluids

Hydraulic Fluid	Pour Point, °C	Viscosity Index
Mineral Oil	-34	90-120
Phosphate Ester (Trialkyl)	<-70	90-145
Phosphate Ester (Triaryl)	-5 to -35	<0-35
Polyol Ester	-26	150-185
UCON Hydrolube HP-5046D	-63	192

Figure 1 • Viscosity vs. Temperature for Hydraulic Fluids



Pump Wear Performance – In a modified *ASTM D 2882 Test*, as the data in Table 2 indicate, UCON Hydrolube HP-5046D is significantly superior to conventional water-glycol and exhibits wear characteristics similar to those of phosphate/polyol esters and AW oil.

Table 2 • Comparitive ASTM D 2882 Pump Wear Test(1) Results

Fluid	Total Wear (mg)
Phosphate Ester	5
UCON Hydrolube HP-5046D	10
Polyol Ester	10
Antiwear Hydraulic Oil	24
Conventional Water-Glycol	65

1. Test Conditions:
   Tests were conducted over 100 hr at 2000 psi (13.8 MPa) and 1200 rpm using a vane pump equipped with a 30 L/min ring.
   Comprehensive cleaning procedures.
   Pass Criteria: ≤100 mg total wear

In the *Fuel Injection Shear Stability Test* (ASTM D 3945), UCON Hydrolube HP-5046D shows no viscosity loss at shear rates up to 10^6 sec-1.

High-Pressure Axial Piston Pump Test, UCON Hydrolube HP-5046D was also evaluated independently in a Sunstrand Series 22 axial piston pump using a modified Water Stability Test employed by Southwest Research Institute. As shown in Table 3, no significant flow degradation (0.8%) was observed over the full test duration. (A flow degradation of 10% constitutes failure.) Furthermore, test parts showed negligible wear after running 225 hours with HP-5046D (Figure 2).

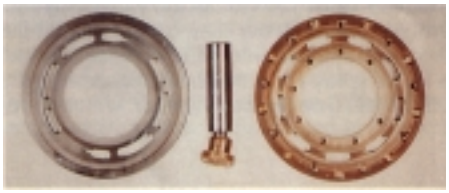
Table 3 • High Pressure Axial Piston Pump Test(1) Results

Time, hr	Flow Rate, gal/min (L/min)
1	24.9 (94.4)
75	24.9 (94.4)
125	24.9 (94.4)
225	24.7 (93.6)

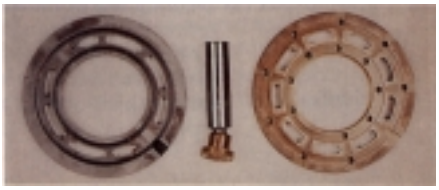
1. Test Conditions:
   - Sunstrand 22-2132 Variable Displacement Axial Piston Pump
   - Input Speed – 3100 rpm
   - Load Pressure – 5000 psi (345 bars)
   - Temperature, Reservoir – 120°F (49°C)
     Loop – 170°F (77°C)

   Pass Criteria: <10% flow rate decrease

Figure 2 • Sunstrand Series 22 Axial Piston Pump Parts After Running 225 hr with UCON Hydrolube HP-5046D



Side 1



Side 2

High-Pressure Hydrostatic Drive Test, UCON Hydrolube HP-5046D proved itself to be a very stable fluid with excellent lubrication properties under the high-pressure conditions of the following test.

Table 4 • High-Pressure Hydrostatic Drive Simulation

High-Pressure Hydro-Static Drive Simulation	Observations
• Sunstrand Series 20 Motor and Pump • Case Drain Flow: 5 GPM (19 L/min) • 600 sec Pressure Cycle: 1300 psi (90 bars) to 4500 psi (310 bars) • Duration: 500 hr (5 days/wk, 16 hr/day) • Operating Temperature Variation: +14°C (57°F) to 21°C (-6°F) • Pass Criteria: <5% flow rate decrease. Visual inspection of pump parts. Fluid integrity.	• The Sunstrand pump and motor performed well. Visual inspection before and after the test did not indicate unusual wear or stress. • No significant change in flow rate occurred during the test period. • Fluid exhibited excellent shear-stability. All chemical and physical properties of the fluid remained virtually unchanged. • Conclusions: UCON Hydrolube HP-5046D is a very stable fluid with excellent lubrication properties under high-pressure conditions.

Field Trials

The excellent high-pressure performance of UCON Hydrolube HP-5046D in test stands has been confirmed in various industry field trials and demonstrated in many commercial applications. Specific information relating to your potential application can be obtained from your Dow representative.

Case Histories

Customers have provided the following case histories of successful use of UCON Hydrolube HP-5046D:

- A leading agricultural equipment manufacturer reported twice the pump life using UCON Hydrolube HP-5046D in an Enerpac piston pump operated at 5000-7000 psi (345-483 bars).
- A major integrated steel company found that pump life doubled when they converted their Kress hot slag haulers with Tyrone gear pumps and Cessna piston pumps from a conventional water-glycol to UCON Hydrolube HP-5046D.
- UCON Hydrolube HP-5046D is a specified fluid for use in a Caterpillar hot slag hauler where the fluid has reduced pump wear by a factor of two in the Tyrone gear pump operated at an estimated loop temperature of 200°F (93°C) and 2500 psi (172 bars). Note: This is a rather extreme temperature and requires an effective heat exchanger in the reservoir to quickly cool the bulk fluid upon return to the normal running temperature. Systems should not be run at this loop temperature without effective cooling on return to the reservoir.
- A major steel industry service company has switched to UCON Hydrolube HP-5046D in hot-slag haulers where the fluid has doubled the pump life.
- A major Canadian steel company has doubled their pump life in Hydura compensated axial piston pumps running at 2800 psi (193 bars) and 1200 rpm. They cut pump consumption over a four-month period from eight units to four units with UCON Hydrolube HP-5046D.
- A northeastern lumber mill converted the Sunstrand hydrostatic drive in their log carriage system, operating at a peak pressure of 5000 psi (345 bars), to UCON Hydrolube HP-5046D from a conventional water-glycol. The result: trouble-free operation for over four years.

Product Stewardship

Dow encourages its customers and potential users to review their applications from the standpoint of human health and environmental aspects. To help ensure that Dow products are not used in ways for which they are not intended or tested, Dow personnel will assist customers in dealing with environmental and product safety considerations. Dow literature, including Material Safety Data Sheets, should be consulted prior to use.

For More Information

North America: toll-free 1-800-447-4369
fax 1-989-832-1465
Europe: toll-free +800 3 694 6367
call +32 3 450 2240
fax +32 3 450 2815
Pacific: call +852 2879 7260
fax +852 2827 5881
Other Areas: call 1-989-832-1560
fax 1-989-832-1465
http://www.ucon.com

Form No. 118-01348-904 AMS