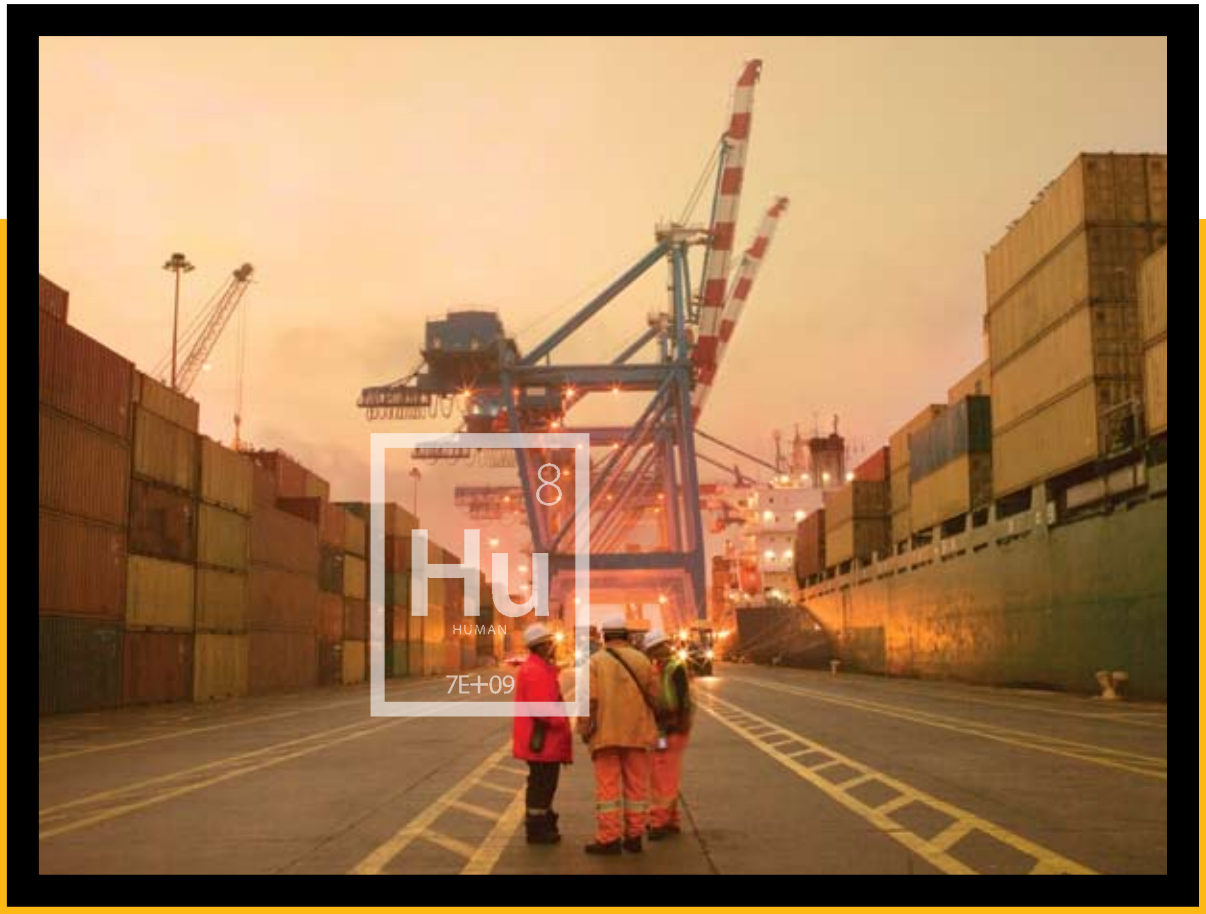



SYMBIO

## DOW™ SYMBIO Base Fluid

General Purpose Biodegradable Base Fluid

## DOW™ SYMBIO Bio-hydraulic Fluid

Industrial Bio-hydraulic Fluid for Stationary Equipment

# DOW™ SYMBIO Base Fluid
# DOW™ SYMBIO Bio-hydraulic Fluid

## Raising the bar in biodegradable lubricant performance

DOW™ SYMBIO Base Fluid and DOW™ SYMBIO Bio-hydraulic Fluid are the first offerings in an expanding line of next generation fluids from Dow. DOW™ SYMBIO Fluids are biodegradable general purpose products that provide excellent anti-wear performance. Using a patent pending formulation, these fluids are the first ever to combine the renewable and biodegradable characteristics of high oleic (HO) canola oil with the excellent deposit control (non-sludging), thermo-oxidative and hydrolytic stability characteristics of polyalkylene glycol (PAGs), while meeting and exceeding most environmental requirements.

DOW™ SYMBIO Base Fluid can be used to formulate hydraulic fluids or other industrial products such as metalworking fluids, chain oils, biodegradable greases, etc. DOW™ SYMBIO Bio-hydraulic Fluid is a general purpose bio-hydraulic fluid formulated for stationary industrial hydraulic systems.

DOW™ SYMBIO Fluids provide better thermo-oxidative stability than leading canola-based fluids as well as synthetic ester/vegetable oil fluids, reducing maintenance requirements and the potential for unplanned downtime.

Unlike conventional mineral and vegetable oils, DOW™ SYMBIO Fluids are non-sludging and non-varnishing, which contributes to more trouble-free operation and extended equipment life. DOW™ SYMBIO Fluids are compatible with hydrocarbon oils, simplifying fluid conversion.

**Product Description**

DOW™ SYMBIO Fluids include DOW™ SYMBIO Base Fluid, which has a high renewable content and is suitable for formulating general purpose hydraulic fluids, metalworking fluids, chain oils and other products. Also included is DOW™ SYMBIO Bio-hydraulic Fluid, which combines the base fluid with a proprietary Dow additive package in a ready-to-use product. DOW™ SYMBIO Bio-hydraulic Fluid is a fully formulated ISO VG-46 bio-hydraulic fluid designed for use in equipment operating under mild conditions with reservoir temperatures ranging from -10°C to 70°C and operating pressures of up to 5,000 psi.

Applications for DOW™ SYMBIO Bio-hydraulic Fluid include stationary marine equipment such as offshore (above water), harbor, and ship lock equipment. The fluid may also be used in equipment used in the entertainment industry such as large fountains, amusement park hydraulics, and other stationary industrial hydraulic systems.

The renewable content and biodegradation properties of DOW™ SYMBIO Fluids can help users meet strict environmental regulations while ensuring that critical industrial equipment is protected against wear. They can also contribute to an enhanced overall public image for the user.


Typical physical properties of the products are detailed in Tables 1 and 2. Environmental properties are described in Table 3.

## Features and Benefits

**Non Sludging or Varnishing –** Laboratory tests have shown that DOW™ SYMBIO Bio-hydraulic Fluid does not exhibit the sludge forming tendencies of vegetable oil-based bio-lubricants and hydrocarbon oils as shown in Figure A. This can allow DOW™ SYMBIO Bio-hydraulic Fluid, and products based on DOW™ SYMBIO Base Fluid, to last longer, reduce system cleaning requirements, and minimize servo-valve sticking in hydraulic equipment. Because DOW™ SYMBIO Fluids are compatible with mineral oil, they are more forgiving if fluid cross-contamination should occur.

**Low Wear –** The excellent anti-wear performance of DOW™ SYMBIO Bio-hydraulic Fluid is shown in Table 4, which details results of Vickers V-104C pump testing showing total weight loss of the Conestoga cam and vanes of 1.9 mg and viscosity reduction of 2.1 percent. DOW™ SYMBIO Bio-hydraulic Fluid exhibited wear well below the < 5 mg of total wear and < 5 percent viscosity reduction that are considered benchmarks for excellent results in this test. Four ball wear test results also show the low wear performance of the fluid (Table 2).

**Higher Thermo-Oxidative Stability –** DOW™ SYMBIO Bio-hydraulic Fluid and fluids formulated using DOW™ SYMBIO Base Fluid are more thermo-oxidatively stable than competitive fluids based on canola oil or blends of synthetic ester/vegetable oils.

Figure B shows the exceptional oxidative stability of DOW™ SYMBIO Bio-hydraulic Fluid compared to three competitive fluids formulated from other feedstock materials in an accelerated oxidation test. These results indicate that DOW™ SYMBIO Bio-hydraulic Fluid can deliver longer fluid life than competitive formulations.

**Excellent Shear Stability –** Results of pump tests show the shear stability of DOW™ SYMBIO Bio-hydraulic Fluid is excellent.

**Biodegradable –** DOW™ SYMBIO Fluids offer high biodegradability, which can reduce clean up costs in the event of spills or leaks.

**Component and Fluid Compatibility –** DOW™ SYMBIO Fluids are compatible with metals and common seal materials found in hydraulic systems. The fluids are also compatible with hydrocarbon-based fluids, for easier fluid conversion.

**Table 1 – Typical Properties, DOW™ SYMBIO Base Fluid***

| Physical Properties | Method | Result |
|---|---|---|
| Appearance | Visual | Clear, pale yellow |
| Kinematic viscosity @ 40°C, cSt | ASTM D7042 | 41 |
| Kinematic viscosity @ 100°C, cSt | ASTM D7042 | 9 |
| Viscosity index | ASTM D2270 | 202 |
| Pour point, °C | ASTM D97 | -26 |
| Flash point, COC, °C | ASTM D92 | 295 |
| Flash point, PMCC, °C | ASTM D93 | 220 |
| Density @ 20°C, g/ml | ASTM D7042 | 0.94 |

*Typical properties, not to be construed as specifications

**Table 2 – Typical Properties, DOW™ SYMBIO Bio-hydraulic Fluid***

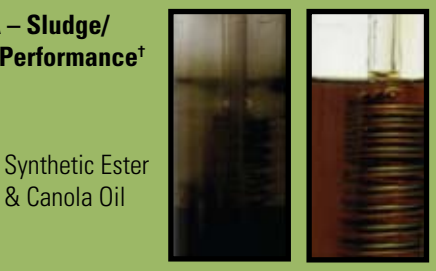
| Physical Properties | Method | Result |
|---|---|---|
| Kinematic viscosity @ 40°C, cSt | ASTM D7042 | 46 |
| Kinematic viscosity @ 100°C, cSt | ASTM D7042 | 10 |
| Viscosity index | ASTM D2270 | 195 |
| Pour point, °C | ASTM D97 | -30 |
| Flash point, COC, °C | ASTM D92 | 296 |
| Flash point, PMCC, °C | ASTM D93 | 220 |
| Foam sequence I, ml/ml | ASTM D892 | 50/0 |
| Foam sequence II, ml/ml | ASTM D892 | 30/0 |
| Foam sequence III, ml/ml | ASTM D892 | 50/0 |
| Copper corrosion, 6 hrs. @ 100°C | ISO-2160 | 1A |
| Copper corrosion, 24 hrs. @ 100°C | ISO-2160 | 1A |
| Ferrous corrosion, 24 hrs. | ASTM D665A | Pass |
| Ferrous corrosion, 24 hrs. | ASTM D665B | Pass |
| Four ball wear, 40 Kg, 1200 rpm, 1 hr @ 75°C, mm | ASTM D4172 | 0.4 |
| Air release properties @ 50°C, mins | ASTM D3472 | 8.5 |

*Typical properties, not to be construed as specifications

**Table 3 – Environmental Properties**

| | |
|---|---|
| OECD Ready Biodegradability<br>Test method 301 B, 28 days, requirement: >60% | Pass |

**Figure A – Sludge/ Varnish Performance†**




†Sludge formation is monitored using an internal method by heating the fluids to 120°C for three weeks using the equipment and procedure defined in ASTM D2893. The fluid was observed for evidence of darkening and sludging by visual inspection periodically.

**Figure B – Oxidation Performance Comparison Modified ASTM D2893 Blown Air Oxidation test @ 95°C**

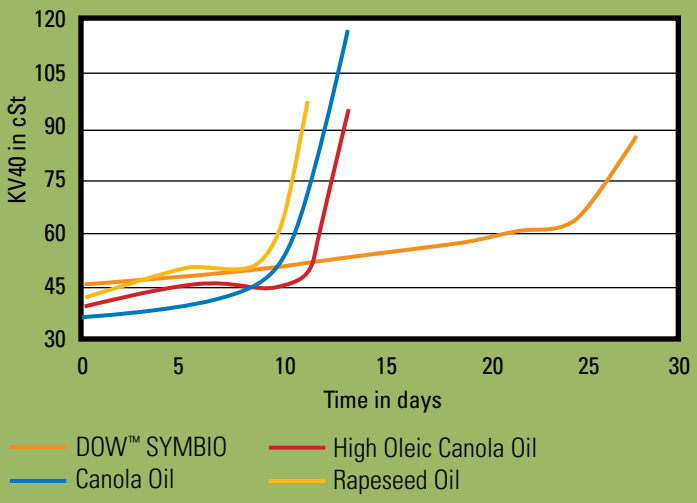



**Table 4 – Wear Performance, Vickers V-104C, ASTM D7043**

| | Total Weight Loss of Rings and Vanes. mg | Viscosity (KV40) Change after Test, % |
|---|---|---|
| DOW™ SYMBIO Bio-hydraulic Fluid | 1.9 | 2.1 |
| Competitive Formulated Canola Oil | 4.4 | 1.6 |
| Blend of Synthetic Ester and HO Canola Oil | 0.8 | 0.7 |
| Formulated Rapeseed Oil | 9.1 | 2.7 |
| Synthetic Fluid Based on HO Sunflower Oil | 19 | 20.8 |
| Synthetic Polyol Ester | 3.4 | 14.3 |

**Regulatory and Disposal**
Requirements for reporting accidental fluid spills and discharges may vary from country to country, state to state, or from city to city. It is important that you contact the appropriate authorities in your local area to clearly understand any reporting or other requirements.

Consult local sewage treatment plant authorities for regulations prior to disposing of any product. For guidance in the U.S., contact your local Water Board, regional office of the Environmental Protection Agency, or the appropriate regulatory authority. In other nations, contact the appropriate regulatory authority in your area.

**Product Safety**
When considering the use of any Dow products in a particular application, review the current Material Safety Data Sheet (MSDS) and ensure that the use you intend can be accomplished safely. For MSDS and other product safety information, contact Dow at the number for your area, listed on the back of this brochure. Before handling any other products mentioned in the text of this brochure, obtain the available product safety information and take necessary steps to ensure safe use.

No chemical should be used as or in a food, drug, medical device, cosmetic; or in a product or process in which it may contact a food, drug, medical device, or cosmetic; until the user has determined the suitability and legality of the use. Since government regulations and use conditions are subject to change, it is the user's responsibility to determine that this information is appropriate and suitable under current, applicable laws and regulations.

Dow requests that the customer read, understand, and comply with the information contained in this publication and the current MSDS. The customer should furnish the information in this publication to its employees, contractors, and customers, or any other users of the product(s), and request that they do the same.

**Emergency Service**
Dow maintains a 24-hour emergency service for its products. The American Chemistry Council (CHEMTREC) and Transport Canada (CANUTEC) also maintain 24-hour emergency service:

| Location | Dow Products | All Chemical Products (In Case of Emergency) |
|---|---|---|
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| Canada | 519-339-3711 (collect) | Phone CANUTEC: 613-996-6666 (collect) |
| Europe, Middle East, North and Central Africa | 49 41 469 12333 | |
| Latin America, Asia-Pacific, South Africa, Any Other Location Worldwide | Phone United States: 989-636-4400 | |

At sea, radio U.S. Coast Guard, which can directly contact Dow…800-DOW CHEM or CHEMTREC…800-424-9300

**DO NOT WAIT. Phone if in doubt. You will be referred to a specialist for advice.**

**To Learn More…**
Contact an authorized Dow formulator or distributor to purchase hydraulic fluid based on the technology of DOW™ SYMBIO Fluids. For the name of a formulator or distributor near you, contact Dow:

U.S., Canada, Mexico Phone: 1-800-447-4369 Fax: 989-832-1465
Latin America: Phone: +55 11-5188-9222 Fax: +55-11-5188-9749
Europe: Phone Toll Free: +800-3-694-6367* Phone: (+32) 3-450-2240 Fax: +32 3-450-2815
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