



**Bio-
Hydraulic
Fluids**

AW 1000 & 2000
(ISO 32, 46, 68)

Bio-Hydraulic Fluids, AW 1000 & 2000, and BMW-Oracle Racing Bio-Syn Marine Hydraulic Fluid are Ultimately Biodegradable¹ vegetable oil-based formulas that replace mineral oil based hydraulic fluids. Bio-Hydraulic Fluids are formulated to perform in hydraulic systems that require Anti-Wear (AW), anti-rust, anti-oxidation, anti-foam, and demulsibility properties. They are highly inhibited against moisture and rusting in both fresh and sea water and pass both A and B Sequences of the ASTM D-665 Turbine Oil Rust Test. The super high viscosity base stocks increase the viscosity index past synthetic levels, thus conserving energy. Zinc-free additive systems have also been developed that are environmentally friendly and meet or exceed pump requirements.

Bio-Hydraulic Fluids are designed for use in mobile and stationary hydraulic vane, piston, and gear-type pumps and have shown to have exceptional anti-wear performance. Very little wear was encountered, 0 to 25mg (Pass), in accelerated biobased tests using Denison T-5D, Vickers 20VQ, 35VQ-25 (M-2950-S), and V-104C (ASTM D-2882) pump stand tests at pressures and temperatures ranging from 2000 to 3000 psi and from 150⁰ to 210⁰ F. The anti-wear performance exceeds the load stage 10 in the FZG (DIN 51354) requirements for US Steel 136, DIN51524, and GM (LS-2). They also meet the requirements for ashless GL-3 gear oils in reduction units and gear sets where they meet the viscosity ranges.

The super high viscosity index of the base stock naturally improves the thermal shear stability of the formula and increases load capacity, while extremely low volatility increases the flash and fire safety features. They are designed to provide seal conditioning for longer seal life and to reduce oil leakage from the system. Bio-Hydraulic Fluids should be used in hydraulic systems where low toxicity and biodegradability properties are required or advantageous. Base oils and additives in these products pass and exceed the acute toxicity (LC-50) criteria adopted by the US Fish and Wildlife Service and the US EPA. Bio-Hydraulic Fluids are environmentally responsible lubricants formulated from renewable, non-GMO agricultural plant resources. We believe Earth's environmental future rests in the use of renewable materials.

Test results on the following pages show that Bio-Hydraulic Fluids provide high performance in a wide variety of stationary and transportation equipment that operate in broad ranges of environmental conditions. In equipment operating outside, wear from poor cold temperature pumpability, surge loads, moisture, and dusty environments are more prominent. Bio-1000 and 2000 Hydraulic Fluids are formulated to improve performance in equipment that requires excellent anti-wear, hydrolytic stability, and cold temperature pumpability as low as -35⁰C. In addition the products may be used in machine tool hydraulic systems with the above Denison and Vickers pump requirements.

These products are based on a proprietary and patented anti-oxidant, anti-wear, and cold flow technology. Base stocks are non-GMO agricultural vegetable oils. This stabilized technology provides high performance in high and low temperature applications, reducing oil thickening and deposits.

¹ Ultimate Biodegradation (Pw1) within 28 days in ASTM D-5864 Aerobic Aquatic Biodegradation of Lubricants.

To Order

Fax to 831-728-1753 or call 800-491-9473 for Customer Service
Visit WiseSolutions.net or Email sales@wisesolutions.net

**Available Size
Container**

AW / ISO Grade
Quantity (min.)

5 gal. Pail	55 gal. Drum	330 gal. Tote



Performance Biolubricants and Colloidal Cleaners

Bio-1000 Hydraulic Fluids (ISO 32, 46, & 68)

Typical Specifications

Performance Data	Method	ISO 32	ISO 46	ISO 68	Special Requirements
Specific Gravity @ 15.6°C	ASTM D-287	0.874	0.876	0.886	Report
API Gravity @ 15.6°C	ASTM D-287	30.4	30.0	28.2	Report
Viscosity @ 40°C	ASTM D-445	30.87	43.8	64.1	Note 1
Viscosity @ 100°C	ASTM D-445	6.9	9.67	12.5	Note 1
Viscosity @ -15°C, Brookfield	ASTM D-2983	not complete	1100 cP	-----	Note 1
Viscosity @ -25°C, Brookfield	ASTM D-2983	1,200 cP	3,000 cP	-----	Note 1
Viscosity @ -30°C MRV TP1	ASTM D-4684	4,500 cP	8,000 cP	-----	10W= <60,000
Viscosity @ -35°C MRV TP1	ASTM D-4684	7,500 cP	-----	-----	5W= <60,000
Viscosity Index	ASTM D-2270	184	216	198	90 (min)
Pour Point	ASTM D-97	-40°C	-36°C	-30°C	Note 1
Flash Point (COC)	ASTM D-92	236°C	243°C	251°C	198°C (min)
Fire Point (COC)	ASTM D-92	260°C	268°C	274°C	218°C (min)
Hydrolytic Stability, Copper Wt. Loss (mg) Copper Appearance Water Layer	ASTM D-2619	0.0139 1B 0	0.0208 1B 0.3	0.0208 1A 0.9	0.2 Report 4
Foam Sequence I, II, III (10 min)	ASTM D-892	0 Foam	0 Foam	0 Foam	0 Foam
Rust Prevention Distilled Water Syn. Sea Water	ASTM D-665	Pass Pass	Pass Pass	Pass Pass	Pass Pass
Copper Corrosion Strip 3hr@100°C	ASTM D-130	1B	1B	1B	DIN51524 2(Max)
Rotary Bomb Oxidation (minutes)	ASTM D-2272	250	250	250	USS 120 (min)
Oxidation Stability (Pressure Differential Scanning Calorimeter) min	ASTM D-5483 Modified	47.0 (165°C)	47.0 (165°C)	45.0 (165°C)	Note 2
Neutralization Number mg KOH/g	ASTM-D-974	< 0.4	< 0.4	< 0.4	1.5 (Max)
Swell of Synthetic NBR-1 Rubber, % (Avg.) Volume Change (%) Shore A Hardness Change (%)	DIN 53538, Part 1	6.0 -4	6.0 -4	6.0 -4	0 to 12 0 to -7
Filterability A-No Water (s) (Avg) B-2% Water (s) (Avg)	Denison TP 02100 HF-0 Requirement	113 187	268 271	335 449	600 (max) 2xA (max)
Demulsibility, ML Oil/Water/Emulsion	ASTM D-1401	40/ 40/ 0	40/ 40/ 0	39/ 40/ 1	40 (Max)
4-Ball Wear 1h, 167°F, 1200 RPM, 40 kg	ASTM D-4172	0.3 – 0.4	0.3 – 0.4	0.3 – 0.4	USS 127 0.5 (Max)
FZG Test	DIN 51354	12	12	12	US.Steel 10 (min)
Biodegradation Classification	ASTM-D-5864	Ultimate Pw1	Ultimate Pw1	Ultimate Pw1	Ultimate Pw1

Notes:

1. Viscosity Sufficient for Application
2. Not required



Performance Biolubricants and Colloidal Cleaners

Bio-2000 Hydraulic Fluids (ISO 32, 46, & 68)

Bio-2000 Hydraulic Fluids are designed to provide high performance in the high temperature/high pressure machine tool environment. In machine tool equipment, the hydraulic pump may work continuously in automatic machines. Machines may run 24 hours and 7 days a week non-stop. Close tolerances (0.00015 in. = 3 micron) and fine system filters (3 to 5 absolute filtration) for hydraulic/electric servo drive systems can work to elevate hydraulic system temperatures rapidly. It is also not unusual for hydraulic system components to be located close to very high temperature areas, i.e., on the side of a plastic mold injection gun. The very high oxidative stability of Bio-2000 Hydraulic Fluids meets these demands.

If oil samples are monitored and if the machine is running under clean conditions, fluid life can be increased with proper lubricant filtration and improved oxidation. Even though the US Steel requirement is a minimum of 125 minutes in the RBOT (oxidative stability) test, the hydraulic system's fluid life can be increased considerably when RBOT exceeds 400 minutes and a proper preventative maintenance sampling program is used. General Electric, GEK 32568A, requires an RBOT minimum of 450 minutes in turbine oil requirements. In WISE Solutions Bio-2000 Hydraulic Fluids, an RBOT of over 500 minutes has been met that increases fluid and equipment life.

TYPICAL SPECIFICATIONS	METHOD	ISO 32	ISO 46	ISO 68	Special Requirements
Specific Gravity @ 15.6°C	ASTM D-287	0.873	0.88	0.89	Report
API Gravity @ 15.6°C	ASTM D-287	30.6	29.3	27.5	Report
Viscosity @ 40°C	ASTM D-445	29.5	44.31	64.34	Note 1
Viscosity @ 100°C	ASTM D-445	6.54	9.50	12.2	Note 1
Viscosity Index	ASTM D-2270	186	206	191	90 (min)
Pour Point	ASTM D-97	-32°C	-30°C	-25°C	-12°C (max) 198°C
Flash Point (COC)	ASTM D-92	240°C	244°C	253°C	(min) 218°C (min)
Fire Point (COC)	ASTM D-92	265°C	272°C	275°C	
Hydrolytic Stability, Copper Wt. Loss (mg) Copper Appearance Water Layer	ASTM D-2619	0.0417 1A 0.2	0.0208 1B 0.3	0.0208 1B 0.9	0.2 Report 4
Foam Sequence I, II, III (10 min)	ASTM D-892	0 Foam	0 Foam	0 Foam	0 Foam
Rust Prevention Distilled Water Syn. Sea Water	ASTM D-665	Pass Pass	Pass Pass	Pass Pass	Pass Pass
Copper Corrosion Strip 3hr @ 100°C	ASTM D-130	1A	1A	1A	DIN 51524 2(max)
Rotary Bomb Oxidation, (minutes)	ASTM D-2272	613	600	600	USS 120 (min)
Oxidation Stability (Pressure Differential Scanning Calorimeter) min	ASTM D-5483 Modified	90 (165°C)	90 (165°C)	80 (165°C)	Note 2
Neutralization Number mg KOH/g	ASTM D-974	0.2	0.2	0.2	1.5 (max)
Swell of Synthetic NBR-I Rubber, % (Avg.) Volume Change (%) Shore A Hardness Change (%)	DIN 53538, Part 1	6.0 -4	6.0 -4	6.0 -4	0 to 12 0 to -7
Filterability A-No Water (s) (Avg) B-2% Water (s) (Avg)	Denison TP 02100 HF-0 Requirement	113 187	268 271	335 449	600 (max) 2xA (max)
Demulsibility, ML Oil/Water/Emulsion	ASTM D-1401	40/ 40/ 0	40/ 40/ 0	40/ 40/ 0	40 (max)
4-Ball Wear, 1h, 167°F, 1200 RPM, 40 kg FZG Test	ASTM D-4172 DIN 51354	0.4 - 0.5 11	0.4 - 0.5 11	0.4 - 0.5 11	USS 127 0.5 (max) US Steel 10 (min)
Biodegradation Classification	ASTM D-5864	Ultimate Pw1	Ultimate Pw1	Ultimate Pw1	Ultimate Pw1

Notes:

1. Viscosity Sufficient for Application
2. Not required



Bio-Hydraulic Fluid ISO 46 Tested at DOD, Ft. Belvoir, VA
Technical Report # 13640 "L" March 1995, TARDEC-TACOM (US Army)

TYPICAL SPECIFICATIONS	METHOD	WISE Bio-Hydraulic Fluid (ISO-46)	Reference Mineral Oil (Mil-H 46001)	Special Requirements
Specific Gravity @ 15.6°C	ASTM D-287	0.91	0.87	Report
Viscosity @ 40°C	ASTM D-445	*ISO-46 47.5	ISO-32 31.43	Note 1
Viscosity @ 100°C	ASTM D-445	9.58	5.29	Note 1
Viscosity @ -15°C, Brookfield	ASTM D-2983	1100 cP	1544	Note 1
Viscosity @ -25°C, Brookfield	ASTM D-2983	3000 cP	Not Complete	Note 1
Viscosity @ -30°C MRV TP1	ASTM D-4684	15,000 cP	Not Complete	10W= 60,000(max)
Viscosity Index	ASTM D-2270	194	99	90 (min)
Pour Point	ASTM D-97	-36°C	-39°C	-12°C (max)
Flash Point (COC)	ASTM D-92	278°C	212°C	198°C (min)
Fire Point (COC)	ASTM D-92	335°C	234°C	218°C (min)
Hydrolytic Stability, Copper Wt. Loss (mg) Copper Appearance Water Layer	ASTM D-2619	0.01 1B 0.17	Not Complete Not Complete Not Complete	0.2 Report 4
Foam Sequence I, II, III (10 min)	ASTM D-892	0 Foam	(Fail)	0 Foam
Rust Prevention Distilled Water Syn. Sea Water	ASTM D-665	Pass Pass	Pass Pass	Pass Pass
Cincinnati Machine Thermal Stability Procedure A % Vis Change Neutralization Number mg KOH/g Precipitate or sludge, mg/100ml Steel Rod Visual Condition Deposit, mg Metal Removed, mg/200 ml Copper Rod Visual Condition Deposit, mg		4.38 0.15 15.65 slight tarnish 1.5 Nil 2c 7.4	7.45 (Fail) 0.49 8.75 medium tarnish Nil Nil 4B 5.6	+5 max 0.75 25 (max) Report 3.5 (max) 1.0 (max) 5 10 (max)
Accelerated Storage Stability (@ 100° C One Month) Viscosity Changes, % @ 40°C ASTM D445 Acid Number Changes, mg PDSC, Induction Time Changes, %	Army Method	0.83 0.1 0	1.43 0.03 -25.58	Note 2 Note 2 Note 2
Copper Corrosion Strip 3 Days @ 100°C Galvanic Corrosion	ASTM D-130 FED-STD 7915, #5322	1B Pass	1A Pass	Note 2 Note 2
Corrosiveness and Oxidation Stability @ 100°C Humidity Cabinet, Hrs. to Fail	ASTM D-4636 ASTM-D-1748	Pass 230	Pass 48	Note 2 Note 2
Oxidation Stability (Pressure Differential Scanning Calorimeter) min	ASTM D-5483 Modified	13.34 (180°C)	24.2 (180°C)	Note 2
Evaporation Loss, % (100°C, 1 hr) Neutralization Number mg KOH/g	(Thermogravimetric Analysis) ASTM D-664	0.78 1.35	0.75 0.58	Note 2 1.5 (max)
Swell of Synthetic NBR-L Rubber, %	FED-STD 791, #3603	10.35	7.78	Report
Demulsibility, ML Oil/Water/Emulsion	ASTM D-1401	40/ 40/ 0	40/ 40/ 0	40 (max)
4-Ball Wear, 1h, 167°F, 1200 RPM, 40 kg	ASTM D-4172	0.40	0.43	USS 127 0.5 (max)
Biodegradation Classification	ASTM D-5864 (Ultimate)	Yes	No	Report

Notes:

1. Viscosity Sufficient for Application
2. Not required