

## Proposed Item for Biobased Designation

The following biobased product information has been collected to support item designation by USDA for the Federal Biobased Product Preferred Procurement Program (FB4P). This summary reflects data available as of September 15, 2005.

### **Title: Mobile Hydraulic Fluids**

**Description:** Mobile equipment hydraulic fluids represent that group of products formulated for use in construction and farm equipment such as tractors, end loaders, and backhoes. High operating temperatures and severity of operating environments typically limit the percentage of biobased content and require supplemental additives to increase performance. While these products have been tested to industry standards and should meet manufacturer's requirements, equipment warranties should be considered prior to use. In general these products have not been fully tested to the higher performance levels required for tactical equipment by the Department of Defense.

**Manufacturers Identified:** 13 manufacturers producing Mobile Hydraulic Fluids have been identified through internet searches, manufacturer's directories, trade associations, and company submissions.

**Industry Associations Investigated:** The following industry associations have been investigated for member companies producing Mobile Hydraulic Fluids:

- Biobased Manufacturers Association
- National Fluid Power Association
- Fluid Power Society
- Fluid Power Distributor's Association
- Association for Manufacturing Technology
- Material Handling Industry of America
- United Soybean Board
- Consolidated Fluid Power Institute
- U.S. Grains Council
- Independent Lubricant Manufacturers Association
- Society of Tribologists and Lubrication Engineers
- IEEE
- American Public Power Association

**Commercially Available Products Identified:** Of the manufacturers identified, 46 Mobile Hydraulic Fluids are commercially available on the market.

**Product Information Collected:** Specific product information including company contact, intended use, biobased content, and performance characteristics have been collected on 14 Mobile Hydraulic Fluids.

**Industry Performance Standards:** Product information submitted by biobased manufacturers indicate that have typically been tested to the following industry standards:

- American Petroleum Institute #API GL-4, generally equivalent to military specification MIL-L-2105 for manual transmissions and spiral bevel gears engaged in moderate service. API GL-4 rates a gear lubricant's performance
- American Society for Testing and Materials #D1298-99e2 Standard Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method
- American Society for Testing and Materials #D1500-04a Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)
- American Society for Testing and Materials #D2270-04 Standard Practice for Calculating Viscosity Index From Kinematic Viscosity at 40 and 100°C
- American Society for Testing and Materials #D2619-95(2002)e1 Standard Test Method for Hydrolytic Stability of Hydraulic Fluids (Beverage Bottle Method)
- American Society for Testing and Materials #D2770-01 Standard Specification for Ozone-Resisting Ethylene-Propylene Rubber Integral Insulation and Jacket for Wire and Cable
- American Society for Testing and Materials #D287-92(2000)e1 Standard Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)
- American Society for Testing and Materials #D2983-04a Standard Test Method for Low-Temperature Viscosity of Lubricants Measured by Brookfield Viscometer
- American Society for Testing and Materials #D445-04e2 Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
- American Society for Testing and Materials #D4684-02a Standard Test Method for Determination of Yield Stress and Apparent Viscosity of Engine Oils at Low Temperature
- American Society for Testing and Materials #D5864-00 Standard Test Method for Determining Aerobic Aquatic Biodegradation of Lubricants or Their Components
- American Society for Testing and Materials #D665-03 Standard Test Method for Rust-Preventing Characteristics of Inhibited Mineral Oil in the Presence of Water
- American Society for Testing and Materials #D892-03 Standard Test Method for Foaming Characteristics of Lubricating Oils
- American Society for Testing and Materials #D92-05a Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
- American Society for Testing and Materials #D97-05a Standard Test Method for Pour Point of Petroleum Products
- American Society for Testing and Materials #D974-04 Standard Test Method for Acid and Base Number by Color-Indicator Titration
- American Society for Testing and Materials #D30-18 Test Method for Specific Gravity and Absorption of Coarse Aggregates (Withdrawn 1934)
- Organization for Economic Cooperation and Development #OECD 301B Guideline for Testing of Chemicals, Ready Biodegradability: Modified Sturm Test
- Coordinating European Council #CEC L 33-A-93 Biodegradability of Two Stroke Outboard Engine Oil in Water
- Dept. of Army - Research Development & Engineering Command #QPL32073MIL-PRF-32073 Grade 4 Non-toxic, totally biodegradable Environmentally Friendly hydraulic fluid
- Environmental Protection Agency #EPA 560/6-82-003, number CG-2000, Aerobic Aquatic Biodegradation

**Samples Tested for Biobased Content:** 17 samples of Mobile Hydraulic Fluids have been submitted to independent laboratories for biobased content testing as specified by ASTM standard D6866-04.

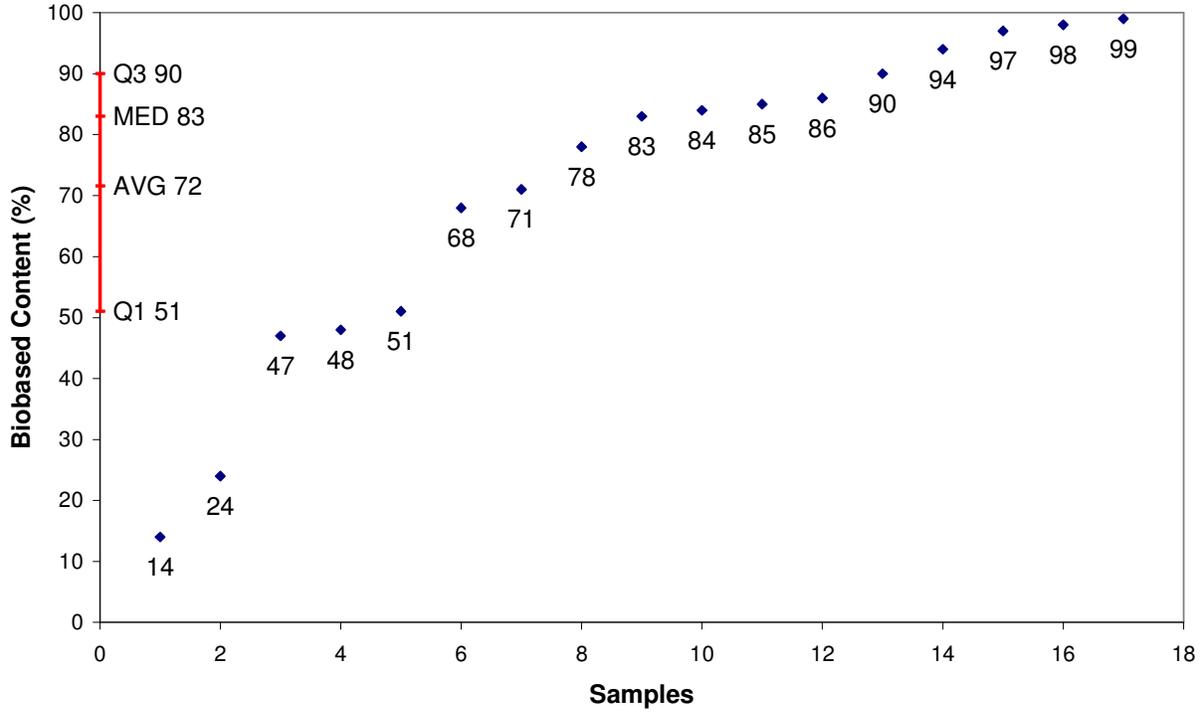
**Biobased Content Data:** Results from biobased content testing of Mobile Hydraulic Fluids indicate a range of content percentages from 14% minimum to 99% maximum biobased content as defined by ASTM D 6866-04. A detailed distribution of biobased content levels is included as Appendix A.

**Products Submitted for BEES Analysis:** Life-cycle cost and environmental effect data for 3 Mobile Hydraulic Fluids have been submitted to NIST for BEES analysis.

**BEES Analysis:** The life-cycle costs of the submitted Mobile Hydraulic Fluids range from \$470.25 minimum to \$768.61 maximum per usage unit. The environmental scores range from 2.5324 minimum to 3.3770 maximum. A detailed summary of the BEES results is included as Appendix B.

## Appendix A - Biobased Content Data

### Mobile Hydraulic Fluids

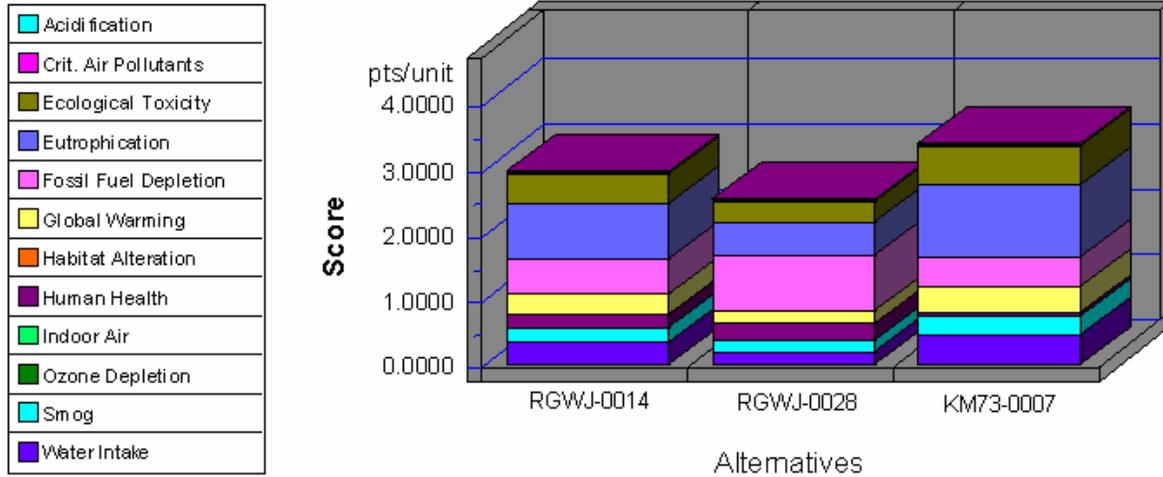


	Manufacturers Identified	Products Identified	C14	BEES
1	J7QA	J7QA-0001	14	
2	J7A3	J7A3-0025	24	
3	JY3G	JY3G-0048	47	
4	JY3G	JY3G-0006	48	
5	D6S7	D6S7-0015	51	
6	J7A3	J7A3-0006	68	
7	RGWJ	RGWJ-0014	71	
8	AT1L	AT1L-0003	78	
9	D6S7	D6S7-0008	83	
10	AT1L	AT1L-0002	84	
11	D6S7	D6S7-0002	85	
12	D6S7	D6S7-0005	86	
13	D6S7	D6S7-0004	90	
14	D6S7	D6S7-0003	94	
15	D6S7	D6S7-0007	97	
16	C41O	C41O-0001	98	
17	KM73	KM73-0005	99	
18	RGWJ	RGWJ-0028		yes
19	RGWJ	RGWJ-0014		yes
20	KM73	KM73-0007		yes

## Appendix B - BEES Analysis Results

Units: 1 55-gallon drum of fluid

### Environmental Performance

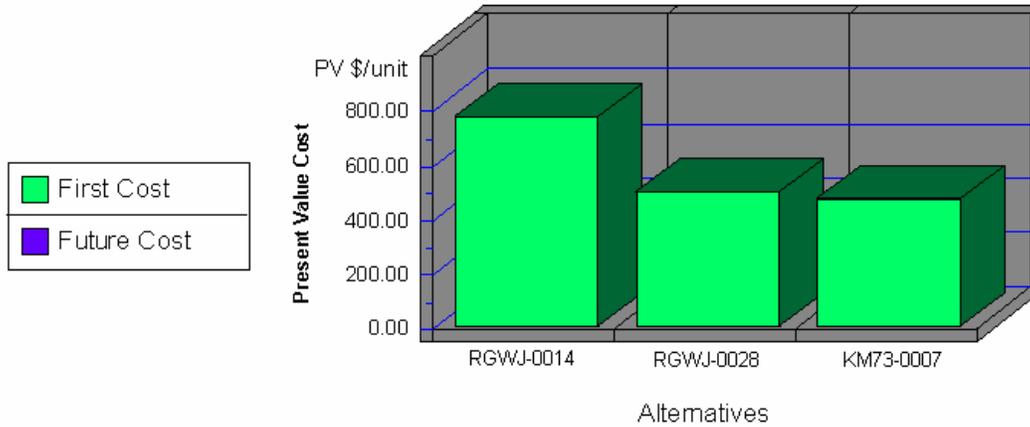


**Note: Lower values are better**

Category	RGWJ-0014	RGWJ-0028	KM73-0007
Acidification-5%	0.0002	0.0001	0.0003
Crit. Air Pollutants-6%	0.0110	0.0089	0.0136
Ecolog. Toxicity-11%	0.4583	0.3206	0.5838
Eutrophication-5%	0.8665	0.5217	1.1158
Fossil Fuel Depl.-5%	0.5456	0.8459	0.4681
Global Warming-16%	0.2982	0.2082	0.3794
Habitat Alteration-16%	0.0000	0.0000	0.0000
Human Health-11%	0.1981	0.2574	0.0675
Indoor Air-11%	0.0000	0.0000	0.0000
Ozone Depletion-5%	0.0000	0.0000	0.0000
Smog-6%	0.2271	0.1598	0.2908
Water Intake-3%	0.3549	0.2098	0.4577
<b>Sum</b>	<b>2.9599</b>	<b>2.5324</b>	<b>3.3770</b>

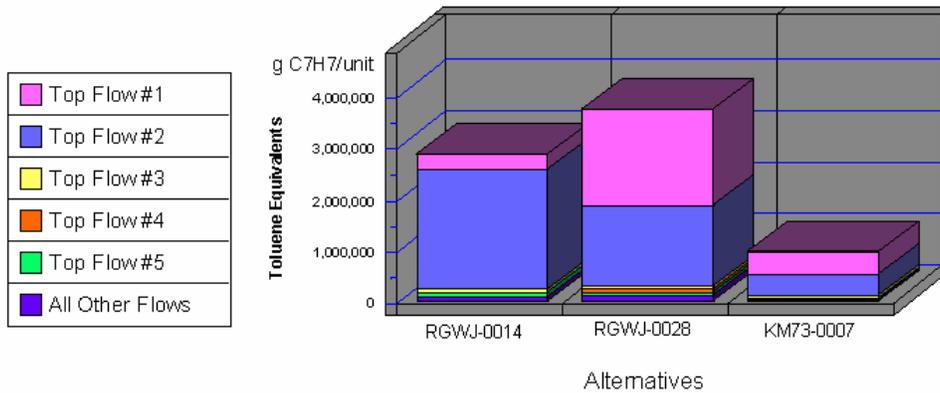
## Appendix B (continued)

### Economic Performance



Category	RGWJ-0014	RGWJ-0028	KM73-0007
First Cost	768.61	497.14	470.25
Future Cost- 3.9%	0.00	0.00	0.00
<b>Sum</b>	<b>768.61</b>	<b>497.14</b>	<b>470.25</b>

### Human Health by Sorted Flows\*



**Note: Lower values are better**

Category	RGWJ-0014	RGWJ-0028	KM73-0007
Cancer-(w) Arsenic (As3+, As5+)	296,277.83	1,855,286.07	449,622.90
Cancer-(w) Phenol (C6H5OH)	2,319,607.40	1,552,284.80	383,661.30
Cancer-(a) Dioxins (unspecifie	49,072.05	75,398.25	58,970.70
Noncancer-(w) Barium (Ba++)	9,160.26	56,557.64	13,809.78
Cancer-(a) Arsenic (As)	90,793.42	45,396.71	26,853.31
All Others	94,123.03	130,672.77	41,844.89
<b>Sum</b>	<b>2,859,033.98</b>	<b>3,715,596.25</b>	<b>974,762.88</b>

\*Sorted by five topmost flows for worst-scoring product