Proposed Item for Biobased Designation

The following biobased product information has been collected to support item designation by USDA for the BioPreferred Program. This summary reflects data available as of January 24, 2007.

Title: Gear Lubricants

Description: Products, such as greases or oils, that are designed to reduce friction when applied to a toothed machine part (such as a wheel or cylinder) that meshes with another toothed part to transmit motion or to change speed or direction.

Manufacturers Identified: 9 manufacturers producing Gear Lubricants 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 Gear Lubricants:

- Biobased Manufacturers Association
- United Soybean Board
- American Gear Manufacturers Association
- Independent Lubricants Manufacturers Association
- National Lubricating Grease Institute
- Society of Automotive Engineers
- Society of Manufacturing Engineers

Commercially Available Products Identified: Of the manufacturers identified, 24 Gear Lubricants 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 9 Gear Lubricants.

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-1 Designates the type of service characteristics of automotive spiral-bevel and worm gear axles as well as some manually operated transmissions operating under such mild conditions of low unit pressures and sliding velocities that straight mineral oil can be used satisfactorily. Oxidation and rust inhibitors, defoamers and pour depressants may be utilized to improve the characteristics of lubricants for this service. Frictional modifiers and extreme pressure agents shall not be utilized.
- American Petroleum Institute #API GL-2 Designates the type of service characteristics of automotive type worm gear axles operating under such conditions of load, temperature and sliding velocities that lubricants satisfactory for API GL-1 service will not suffice. (obsolete)
- American Petroleum Institute #API GL-3 Lubricant with light EP effect for transmissions and non-hypoid gear drives. Used by several vehicle manufacturers for first fill of transmissions.

- American Petroleum Institute #API GL-4 is 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. Designates the type of service characteristics of gears, particularly hypoid in passenger cars and other automotive equipment operated under high-speed: shock-load, low-torque, and low-speed: high-torque conditions.Environmental Protection Agency #EPA 560/6-82-003 Describes methods for performing testing of chemical substances under the Toxic Substances Control Act
- American Society for Testing and Materials #D1404/D1404M-99(2003) Standard Test Method for Estimation of Deleterious Particles in Lubricating Grease
- 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 #D2711-01a Standard Test Method for Demulsibility Characteristics of Lubricating Oils
- 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 #D5864-05 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
- International Organization for Standardization #ISO 150:2006 Specifies the requirements and the corresponding methods of test for raw, refined and boiled linseed oils for paints and varnishes.
- Environmental Protection Agency #560/6-82-003 Describes methods for performing testing of chemical substances under the Toxic Substances Control Act

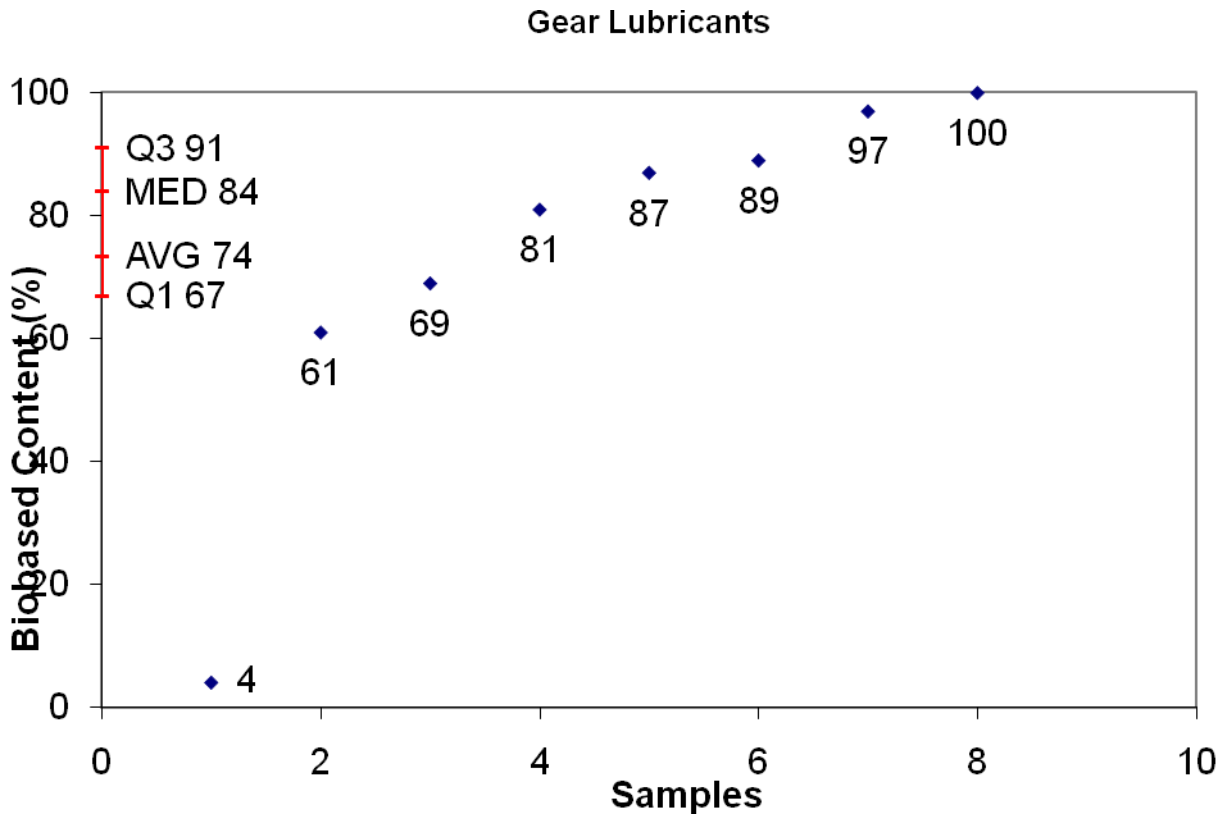
Samples Tested for Biobased Content: 8 samples of Gear Lubricants have been submitted to independent laboratories for biobased content testing as specified by ASTM standard D6866-04.

Biobased Content Data: Results from biobased content testing of Gear Lubricants indicate a range of content percentages from 4% minimum to 100% 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 2 Gear Lubricants have been submitted to NIST for BEES analysis.

BEES Analysis: The life-cycle costs of the submitted Gear Lubricants range from $63.08 minimum to $87.50 maximum per usage unit. The environmental scores range from 0.1856 minimum to 0.3405 maximum. A detailed summary of the BEES results is included as Appendix B.

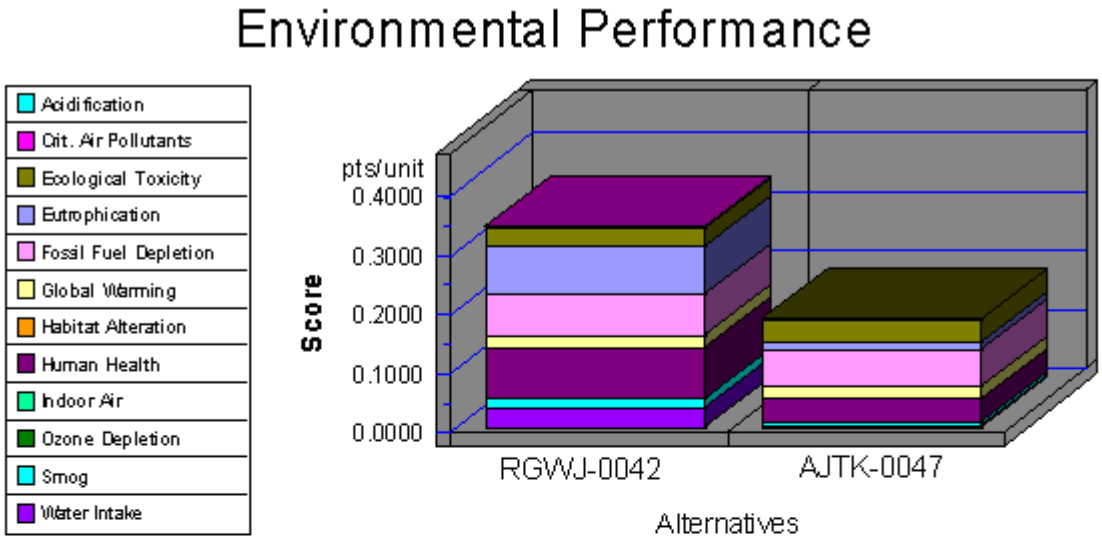
Appendix A - Biobased Content Data



	Companies Identified	Products Identified	C14	BEES
1	J7A3	J7A3-0003	4	
2	RGWJ	RGWJ-0041	61	
3	RGWJ	RGWJ-0042	69	yes
4	AJTK	AJTK-0047	81	yes
5	RGWJ	RGWJ-0040	87	
6	N1H5	N1H5-0011	89	
7	RDO8	RDO8-0068	97	
8	RDO8	RDO8-0097	100	

Appendix B - BEES Analysis Results

Functional Unit: 5 gallons

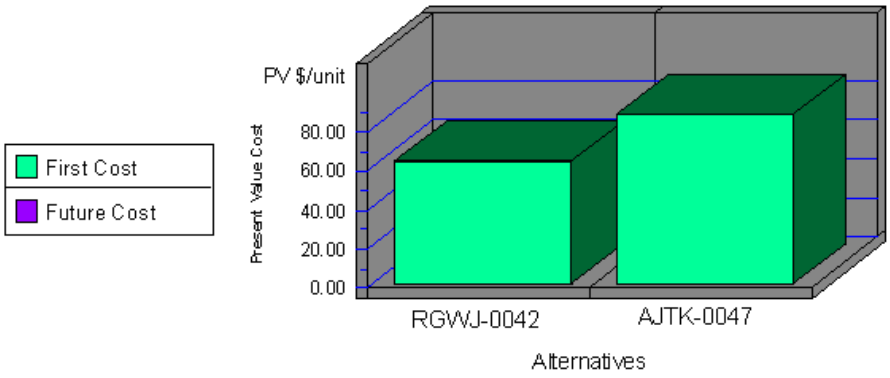


Note: Lower values are better.

Category	RGWJ-0042	AJTK-0047
Acidification–5%	0.0000	0.0000
Crit. Air Pollutants--6%	0.0009	0.0009
Ecolog. Toxicity–11%	0.0326	0.0387
Eutrophication--5%	0.0802	0.0122
Fossil Fuel Depl.--5%	0.0679	0.0641
Global Warming–16%	0.0224	0.0214
Habitat Alteration–16%	0.0000	0.0000
Human Health–11%	0.0867	0.0383
Indoor Air–11%	0.0000	0.0000
Ozone Depletion--5%	0.0000	0.0000
Smog--6%	0.0164	0.0064
Water Intake--3%	0.0334	0.0036
Sum	0.3405	0.1856

Appendix B (continued)

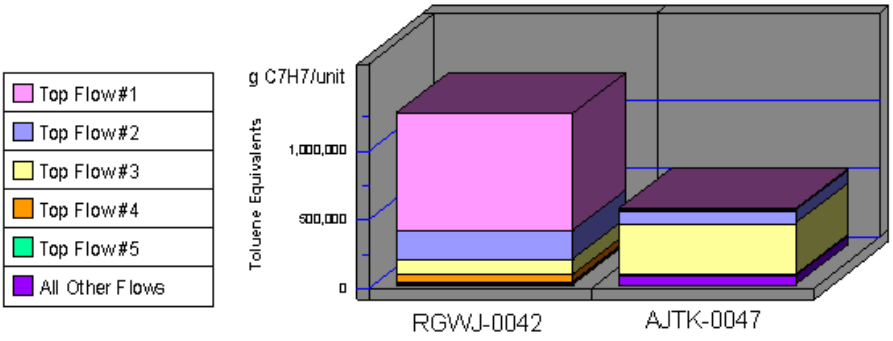
Economic Performance



Category	RGWJ-0042	AJTK-0047
First Cost	63.08	87.50
Future Cost-- 3.9%	0.00	0.00
Sum	63.08	87.50

*No significant/quantifiable durability differences were identified among competing alternatives. Therefore, future costs were not calculated.

Human Health by Sorted Flows*



Note: Lower valuesare better

Category	RGWJ-0042	AJTK-0047
Cancer--(a) Dioxins (unspecifie	850,097.09	10,070.97
Cancer--(w) Arsenic (As3+, As5+	211,688.49	88,117.48
Cancer--(w) Phenol (C6H5OH)	116,261.00	379,251.40
Noncancer--(a) Dioxins (unspeci	50,758.00	601.32
Cancer--(a) Arsenic (As)	5,728.80	9,792.82
All Others	17,086.00	64,920.27
Sum	1,251,619.37	552,754.26

*Sorted by five topmost flows for worst-scoring product