

Biolubricants: technical and market survey

SURVEY 3: January 2008

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66 -- PATENT: Process for producing a lubricating grease from a vegetable oil and grease obtained

Patent number: FR2873712

Publication date: 2006-02-03

Inventor: GRIGNOU HERVE; HOANG LE CHIEN; MOIGNER LYDIA

Applicant: CHRISTOL GREASE SOC PAR ACTION (FR)

Producing a lubricating grease comprises epoxidizing a vegetable oil, adding the epoxidized vegetable oil to a mineral, vegetable or synthetic oil, mixing and heating while adding a neutralizing base, and cooling the mixture when saponification is complete. - An INDEPENDENT CLAIM is also included for lubricating grease produced as above, with a dropping point of about 210 deg. C and a penetration of about 280 tenths of a millimeter.

67 -- PATENT: Metal working oil composition, method of metal working, and product of metal working

Patent number: WO2008001933

Publication date: 2008-01-03

Inventor: GOTO KOICHI (JP); TAKEDA KAZUYOSHI (JP); NIWA EIJI (JP)

Applicant: KYODO YUSHI (JP); GOTO KOICHI (JP); TAKEDA KAZUYOSHI (JP); NIWA EIJI (JP)

An oil composition for use in metal working with minimal quantity lubrication which comprises: a base oil selected from the group consisting of natural fats, derivatives thereof, and synthetic ester oils; a sorbitan fatty acid ester; and a phospholipid. Also provided are: a method of metal working which comprises using the oil composition; and a product of metal working with the oil composition. The oil composition is excellent in lubricity and rust prevention and is suitable for processing a metallic material such as a cast iron, steel, stainless steel, or non-ferrous metal (aluminum alloy or magnesium alloy) by metal working with minimal quantity lubrication.



68 -- PATENT: Compositions containing fatty acids and/or derivatives thereof and a low temperature stabilizer

Patent number: EP1866397

Publication date: 2007-12-19

Inventor: MULLER DRIES (NL); LOPES PEDRO (NL); BREWER MARK (NL); KELDERMAN ERIK (NL)

Applicant: ARIZONA CHEM (US)

The present invention relates to methods of improving the low temperature storage and performance properties of fatty acids and/or derivatives thereof, as well as compositions containing fatty acids and/or derivatives thereof having superior lower temperature storage and performance properties.

69 -- PATENT: Functionalized polymer composition for grease

Patent number: JP2007530732T

Publication date: 2007-11-01

Inventor: SIVIK MatthewR., DENIS Richard A. (US)

Applicant: The Lubrizol Corporation (US)

A grease composition containing: (a) the reaction product of: (i) a calcium containing overbased organic acid; and (ii) at least one acid producing compound or derivatives thereof selected from the group consisting of: (1) a non-polymeric hydrocarbyl substituted dicarbonyl derivative selected from the group consisting of an acid, an ester, a salt, an anhydride, ester-acid, acid-salt and mixtures thereof; (2) a copolymer derived from monomers containing (1) an olefin; and (2) an unsaturated dicarboxylic acid anhydride or derivatives thereof; and (3) an inorganic acid containing about 2 or more acidic hydrogens; and (b) an oil of lubricating viscosity, wherein the overbased calcium sulphionate contains colloiddally dispersed calcium carbonate is selected from the group consisting of calcite, vaterite and mixtures thereof. The invention further relates to the process to make the composition and its use in greases to increase water resistance.

70 -- PATENT: Gear fluids

Patent number: JP2007291357

Publication date: 2007-11-08

Inventor: Hewette Chip

Applicant: Afton Chemical corporation, Richmond (US)

A gear fluid composition for extreme pressure applications. The composition includes a base oil component and a friction modifier mixture. The mixture is provided by an alkyl phosphonic acid diester of the formula: wherein R 1 is a hydrocarbyl group containing from about 8 to about 24 carbon atoms, R 2 and R 3 are selected from a hydrocarbyl group containing from about 1 to about 8 carbon atoms, an alkyl phosphonic acid monoester of the formula wherein R 4 is a hydrocarbyl group containing from about 8 to about 24 carbon atoms, R 5 is hydrogen or hydrocarbyl group containing from about 1 to about 8 carbon atoms, and an amine salt of a partial ester of phosphoric acid represented by the formula wherein each of R 6 and R 8 is a hydrocarbyl group, and R 7 is hydrogen or a hydrocarbyl group, and wherein the ratio ranges from about 3 to about 5.5.

71 -- PATENT: Oil composition for metal working, method for metal working, and metal work

Patent number: JP2007269875

Publication date: 2007-10-18

Inventor and applicant: (JP)

An oil composition for metal working to be used in metal working with minimal quantity lubrication, which comprises both a base oil selected from the group consisting of natural oils and fats, derivatives thereof, and synthetic ester oils and a phospholipid; a method of metal working with the composition; and metal work. The oil composition is excellent in lubricity and suitable for working of metal materials such as cast iron, steel, and stainless steel with minimal quantity lubrication.



72 -- PATENT: Hydraulic oil composition with improved biodegradable properties

Patent number: DE60122400T

Publication date: 2007-11-08

Inventor: KONISHI TORU (JP); KIKUCHI YOSHINOBU (JP)

Applicant: NIPPON MITSUBISHI OIL CORP (JP)

An object is to provide a hydraulic oil composition which is excellent in oxidative stability, lubricating properties and biodegradability. A hydraulic oil composition comprising vegetable oil with a total degree of unsaturation of 0.3 or less as base oil, and comprising at least one antioxidant selected from the group consisting of a phenol antioxidant, an amine antioxidant and a zinc dithiophosphate antioxidant in an amount of 0.01 to 5 % by mass based on the total amount of the composition.

73 -- PATENT: Use of rapeseed oil in biolubricants

Patent number: AR056412

Publication date: 2007-10-10

Applicant: MONSANTO S A S (FR)

The present invention relates to the use of a rapeseed oil (extracted from at least one variety selected from the group consisting of CARACAS, CONTACT, CABRIOLET, CALIDA, SPIRAL, MSP05, MSP11 and MSP13) as base fluid in (bio-)lubricant. The present invention also relates to the use of alkylesters derived from rapeseed oil as base fluid in (bio-) lubricant.

74 -- PATENT: Biodegradable lubricating base oil, lubricating oil composition containing the same and the use thereof

Patent number: DE69636652T

Publication date: 2007-10-04

Inventors: INAYA SHUICHI; SAWADA HIROKI; KOBAYASHI YUICHIRO; HAGIHARA TOSHIYA (JP)

Applicant: KAO CORP (JP)

A biodegradable lubricating base oil obtained by carrying out an addition reaction of an alkylene oxide and a transesterification in a mixture of fats and oils, a polyhydric alcohol or an aliphatic carboxylic acid, and an alkylene oxide, the mixture containing 5 to 150 mol of the alkylene oxide to 1 mol of the fats and oils; a biodegradable lubricating base oil obtained by carrying out esterification of all or part of the hydroxyl group in the above fats and oils derivative using an aliphatic carboxylic acid or ester derivative thereof. Further, a biodegradable lubricating oil composition containing the biodegradable lubricating base oil and the use thereof are also described.

75 -- PATENT: Enviromentally Friendly Lubricants

Patent number: AU2002334650B

Publication date: 2007-09-20

Inventor: GUNSEL SELDA; CHIU I-CHING; LACEY PAUL

Applicant: SHELL INT RESEARCH

A biodegradable lubricant that is at least 60% biodegradable and has a gelation index of about 12 or less can be formulated using a transesterified triglyceride base oil together with a synthetic ester. A combination of an ester viscosity index improver and an olefin copolymer viscosity index improver also can be added. Further, the composition can be blended with mineral oils to lower the polarity in order to employ standard dispersant/inhibitor packages. Further, by mixing high and low viscosities of mineral oil in the formulation, it is possible to prepare a full range of SAE grade engine oils for gasoline-fueled and diesel-fueled engines.

76 -- PATENT: Improvements in or relating to the manufacture of lubricants

Patent number: ES135405

Publication date: 1934-11-01

Applicant: R S NAAMLOOZE VENNOOTSCHAP DE (NL)

Fatty oils are intensively polymerized by heating in presence of boron fluoride as catalyst. Temperatures below 200 DEG C. are suitable. The highly viscous products may be used as lubricants or for improving lubricating oils or greases. Raw or purified rapeseed oil, soya bean oil, and whale oil are specified fatty oils; they may be treated in presence of mineral oil or other medium. In an example, a purified rapeseed oil is maintained at 100 DEG C. for 33 hours; the product is purified by taking up with an equal volume of gasolene, shaking out twice with an equal volume of 50 per cent ethyl alcohol, and evaporating the gasolene. 6 lb. is added to 100 lb. of mineral lubricating oil, raising the viscosity index from 4,9 to 73,2.

77 -- PATENT: Metal working fluid

Patent number: US2007191240

Publication date: 2007-08-16

Inventor: SUDA SATOSHI (JP)

The oil for metal working according to the invention is an oil for metal working comprising a triester of fatty acids and glycerin, wherein the content of oleic acid in the fatty acids is 40-98% by mass based on the total amount of the fatty acids. The oil for metal working of the invention can achieve a high level of machining performance without using a chlorine-based extreme pressure agent.

78 -- PATENT: Biodegradable oleic estolide ester base stocks and lubricants

Patent number: DE69835694T

Publication date: 2007-08-23

Inventor: ISBELL A (US); ABBOTT P (US); ASADAUSKAS SVAJUS (US); LOHR E (US)

Applicant: US AGRICULTURE (US); LAMBENT TECHNOLOGIES INC (US)

Esters of estolides derived from oleic acids are characterized by superior properties for use as lubricant base stocks. These estolides may also be used as lubricants without the need for fortifying additives normally required to improve the lubricating properties of base stocks.

79 -- PATENT: Oils with heterogenous chain lengths

Patent number: DE60031505T

Publication date: 2007-08-23

Inventor: KODALI DHARMA (US); NIVENS SCOTT (US)

Applicant: CARGILL INC (US)

Oils containing a triacylglycerol polyol ester and non-glycerol polyol ester are described, as well as methods of making such oils. Methods for improving lubrication properties of a vegetable oil also are described.

80 -- PATENT: Maleated vegetable oils and derivatives, as self-emulsifying lubricants in metalworking

Patent number: JP2007517965T

Publication date: 2007-07-05

Inventors: LANGE Richard M, BARTLEY Stuart L., OLLINGER Christinn G., HOGAN John Mickael

Applicant: The Lubrizol Corporation (US)

A succinated triglyceride oil derived from maleating triglyceride oil from a plant or land animal is described for use as an emulsifying agent for metalworking fluids. The metalworking fluid would comprise water; as an emulsifier this succinated triglyceride, optionally further reacted with water, Group IA and IIA metals, ammonium hydroxide, various amines, alkanolamines, alkoxyated



alkanolamines, and polyamines to form a modified emulsifier; and optionally an oil and other additives.

81 -- PATENT: Process for forming an emulsion using microchannel process technology

Patent number: JP2007516067T

Publication date: 2007-06-21

Inventor: QIU Dongming et al. (US)

Applicant: Velocys Inc. (US)

The disclosed invention relates to a process for making an emulsion. The process comprises: flowing a first liquid through a process microchannel, the process microchannel having a wall with an apertured section; flowing a second liquid through the apertured section into the process microchannel in contact with the first liquid, the first liquid forming a continuous phase, the second liquid forming a discontinuous phase dispersed in the continuous phase.

82 -- PATENT: Botanical engine lubricating oil

Patent number: CN1944604

Publication date: 2007-04-11

Inventor and applicant: WANG CHENGDONG (CN)

The botanical engine lubricating oil consists of vegetable oil, fifth fractional oil, sulfurized cotton seed oil, alkyl naphthalene and other four kinds of material. It is prepared through heating partial vegetable oil in a reactor, and adding the other materials through stirring until obtaining homogeneous solution. The botanical engine lubricating oil has unique recipe, and possesses the basic functions of mineral lubricant oil and no harm to soil.

83 -- PATENT: Poly(hydroxy thioether) vegetable oil derivatives useful as lubricant additives

Patent number: United States Patent 7279448

Publication date: 10/09/2007

Inventor: Erhan, Sevim Z., Adhvaryu, Atanu, Sharma, Brajendra K. (Peoria, IL, US)

Applicants: The United States of America, as represented by the Secretary of Agriculture (Washington, DC, US), The PENN State Research Foundation (University Park, PA, US)

<http://www.freepatentsonline.com/7279448.html>

This invention provides a novel class of chemically-modified vegetable oils prepared by reacting epoxidized triglyceride oils with thiols. The resultant poly(hydroxy thioether) derivatives have utility as antiwear/antifricition additives for industrial oils and automotive applications.

84 -- LEGISLATION: Ranking without valuing in the face of major uncertainty— The case of the promotion of biodegradable lubricants

Stefan Mann

Agroscope FAT, Ta'' nikon, CH-8356 Ettenhausen, Switzerland

Journal of Environmental Management 85 (2007) 198–203 Received 24 October 2005; received in revised form 11 September 2006; accepted 19 September 2006 [Available online on www.sciencedirect.com](http://www.sciencedirect.com)

Major benefit uncertainties prevent monetary quantification of some environmental amenities.

Replacing mineral lubricants with biodegradable substitutes is shown to be a case in point. However, it is possible to rank the social benefits of substituting mineral lubricants with regard to different applications and environments. As the private costs and benefits of substitution are mainly constant, only a policy that prioritizes full substitution in the applications with the greatest benefits can be efficient. It is shown that regulations requiring substitution in certain fields are likely to fulfil this criterion, while subsidies for production, processing, market introduction and research usually fail to meet the efficiency criterion.



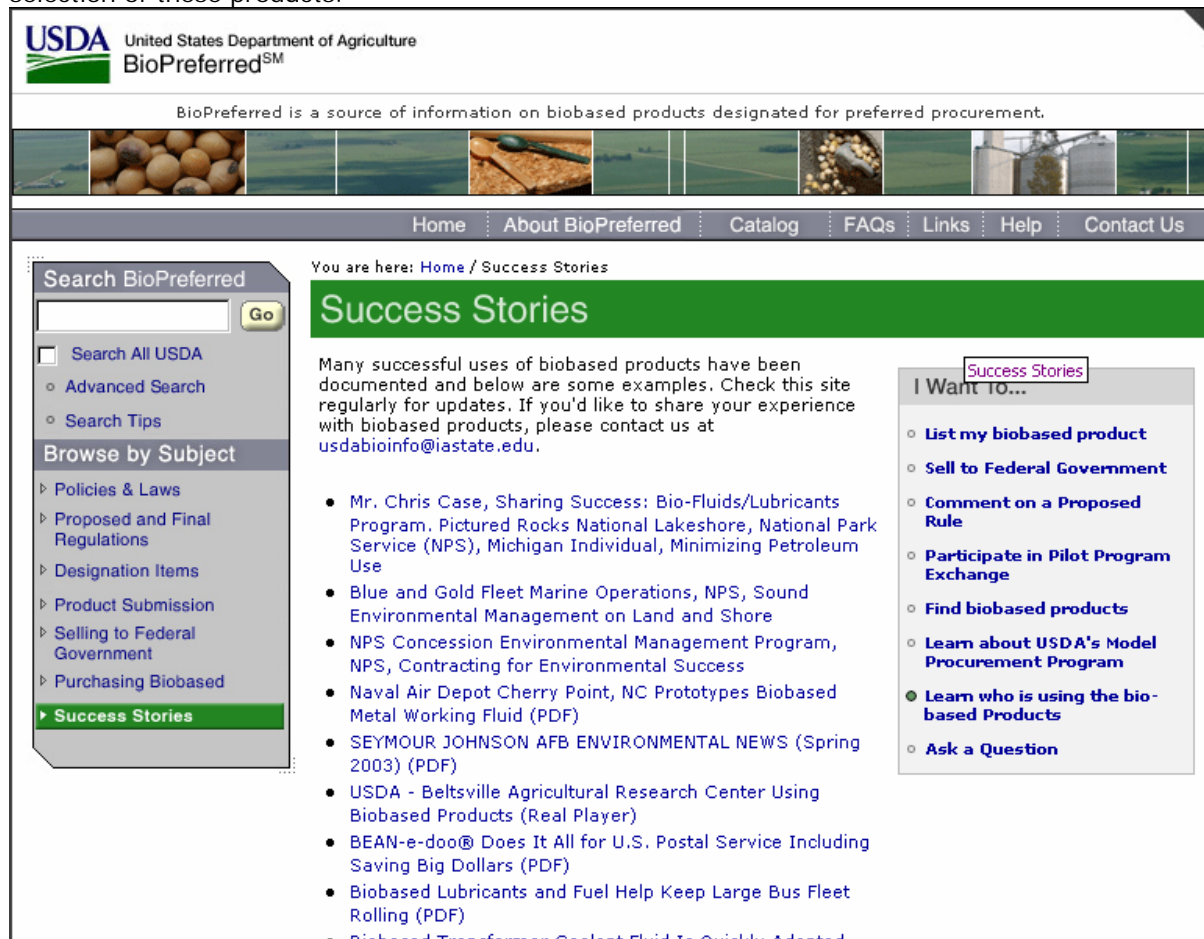
85 -- LEGISLATION: BioPreferred Program in the USA

<http://www.biopreferred.gov/aboutus.aspx>

The Farm Security and Rural Investment Act (FSRIA) of 2002 included two provisions that helped launch BioPreferred. The provisions included: 1) a mandate to the U.S. Department of Agriculture to develop and implement a comprehensive program for designating biobased products and 2) a directive to all federal agencies to increase their purchase and use of "preferred" products.

As defined by FSRIA, "biobased products" are products determined by the U.S. Secretary of Agriculture to be commercial or industrial goods (other than food or feed) composed in whole or in significant part of biological products, forestry materials, or renewable domestic agricultural materials, including plant, animal, or marine materials. Made from renewable plant and animal sources, biobased products are generally safer for the environment than their petroleum-based counterparts. They are usually biodegradable or recyclable.

Federal agencies are required by FSRIA to purchase biobased products over their petroleum-based counterparts, as long as the biobased materials are reasonably available, reasonably priced, and comparable in performance. As the single largest consumer in the United States, purchasing roughly \$400 billion annually in goods and service, the federal government's asked to use biobased resources. To aid federal agencies in their selection of these products, this website will collect voluntary manufacturing and product information from makers and vendors of biobased materials, including lab results of bio content and other key information to aid federal agencies in their selection of these products.



The screenshot shows the USDA BioPreferred website. At the top, it says "USDA United States Department of Agriculture BioPreferredSM". Below that, a banner reads "BioPreferred is a source of information on biobased products designated for preferred procurement." The navigation menu includes Home, About BioPreferred, Catalog, FAQs, Links, Help, and Contact Us. The main content area is titled "Success Stories" and contains the following text:

You are here: [Home](#) / [Success Stories](#)

Success Stories

Many successful uses of biobased products have been documented and below are some examples. Check this site regularly for updates. If you'd like to share your experience with biobased products, please contact us at usdabioinfo@iastate.edu.

- Mr. Chris Case, Sharing Success: Bio-Fluids/Lubricants Program. Pictured Rocks National Lakeshore, National Park Service (NPS), Michigan Individual, Minimizing Petroleum Use
- Blue and Gold Fleet Marine Operations, NPS, Sound Environmental Management on Land and Shore
- NPS Concession Environmental Management Program, NPS, Contracting for Environmental Success
- Naval Air Depot Cherry Point, NC Prototypes Biobased Metal Working Fluid (PDF)
- SEYMOUR JOHNSON AFB ENVIRONMENTAL NEWS (Spring 2003) (PDF)
- USDA - Beltsville Agricultural Research Center Using Biobased Products (Real Player)
- BEAN-e-doo® Does It All for U.S. Postal Service Including Saving Big Dollars (PDF)
- Biobased Lubricants and Fuel Help Keep Large Bus Fleet Rolling (PDF)
- Biobased Transformer Coolant Fluid Is Quickly Adopted

On the right side of the page, there is a sidebar titled "I Want To..." with a "Success Stories" link. The sidebar contains the following options:

- List my biobased product
- Sell to Federal Government
- Comment on a Proposed Rule
- Participate in Pilot Program Exchange
- Find biobased products
- Learn about USDA's Model Procurement Program
- Learn who is using the bio-based Products
- Ask a Question



The USDA has selected and prioritized items for designation as "preferred" biobased products. The USDA, other government agencies, private industry groups, and independent manufacturers have evaluated these items against program criteria established collaboratively. Each product within a category was evaluated against its non-biobased counterpart for cost effectiveness, accessibility, and performance. To prioritize efforts under BioPreferred the USDA is using a ranked list of current biobased products. This list here below show as example the lubricant related categories.

2-Cycle Engine Oils	Greases (Rail Track)	Multi-Purpose Lubricants
Air Tool Lubricants	Greases (Truck)	Penetrating Lubricants
Chain and Cable Lubricants	Hydraulic Fluids (Mobile Equipment)	Rock Drill Oil
Concrete and Asphalt Release Fluids	Hydraulic Fluids (Stationary Equipment)	Slide Way Lubricants
Engine Crankcase Oil	Machine Oils	Soybean Oil
Forming Lubricants	Metal Foundry Mold Release	Surfactants and Emulsifiers
Gear Lubricants	Metalworking Fluids	Total-Loss Lubricants
Greases	Metalworking Fluids - Straight Oils	Transmission Fluids
Greases (Food Grade)		Turbine Drip Oils
Greases (Multi-Purpose)		Water Turbine Bearing Oils

The content of the current catalog is limited to some products in those items which have been designated for preferred procurement status. For lubricants, only Hydraulic fluids and Penetrating oils are referenced.

Company	Hydraulic Fluids	Penetrating
Cargill Industrial Oils & Lubricants	x	
Houghton International, Inc.	x	
Renewable Lubricants, Inc.	x	x
Terresolve Technologies	x	x
Hydro Safe Oil Division, Inc.	x	
Fuchs Lubricants Co.	x	
NATOIL AG	x	
Bunge Oils	x	
BioBlend Renewable Resources, LLC	x	x
Desilube Technology, Inc.		x
SoyClean		x
Bi-O-Kleen Industries, Inc		x

Studies indicate that:

- ➔ 18 manufacturing companies in the United States are currently producing Greases
- ➔ over twenty manufacturing companies in the United States are currently producing Stationary Hydraulic Fluids
- ➔ 11 manufacturing companies in the United States are currently producing 2 Cycle Engine Oils that may be considered for inclusion in the Federal Biobased Products Preferred Procurement Program. Studies are provided on the website:

On Hydraulics:

- http://www.biopreferred.gov/files/Item_Designation_Hydraulic_Fluids_Stationary.pdf
- http://www.biopreferred.gov/files/Stationary_Hydraulic_Fluids_Industry_Investigation_Process.pdf

On Greases:

- http://www.biopreferred.gov/files/Item_Designation_Grease.pdf
- http://www.biopreferred.gov/files/2-Cycle_Engine_Oil_Industry_Investigation_Process.pdf

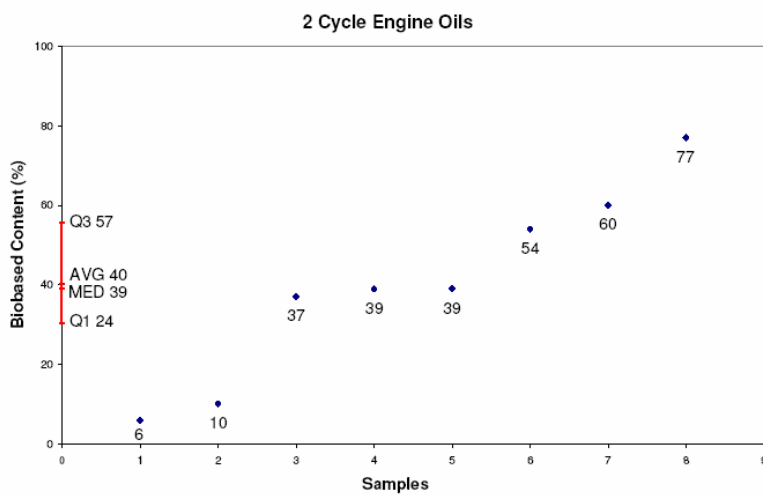
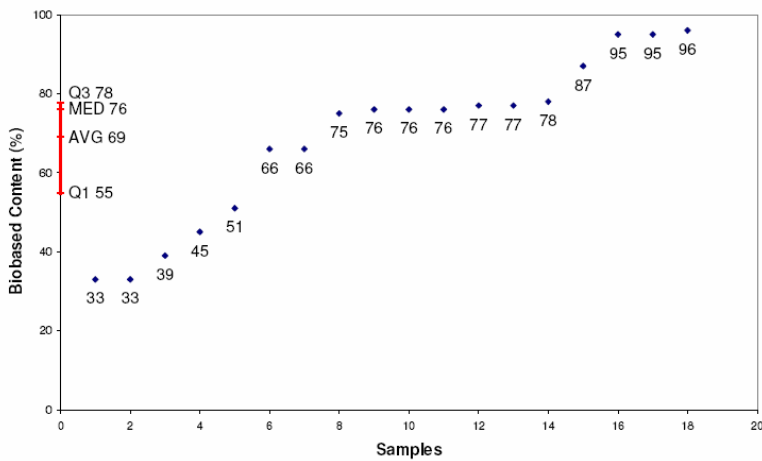
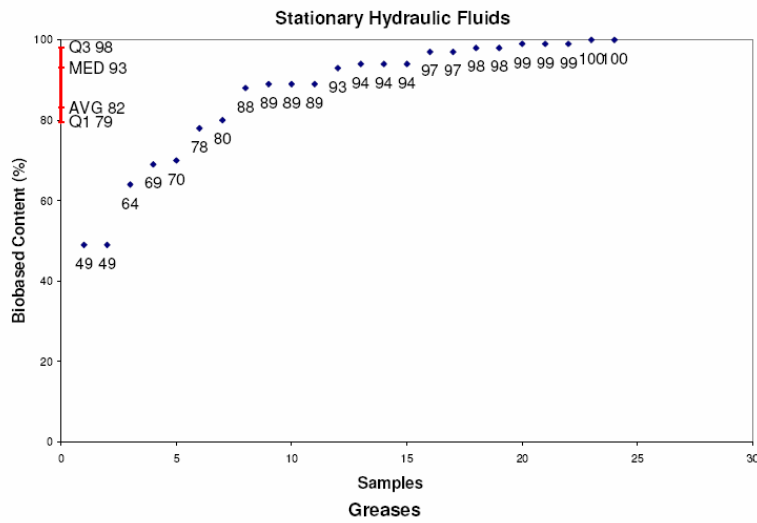
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Appendix A - Biobased Content Data



Thanks to this program, plenty of companies are developing biobased lubricants in the USA:

<http://renewablelubricants.net/>

<http://www.thomasnet.com/products/biodegradable-lubricants-44874907-1.html>

<http://www.viscoinc.com/shop/default.php?cPath=31&osCsid=3c47ff9100b1159203ad0421428c51a8>

http://www.bioblend.com/component/page.shop/browse/category_id,7/option.com_virtuemart/Itemid,69/

<http://www.profoodnetwork.com/>

86 -- MARKETS: Buy Biodegradable Lubricant (Oil Mud Drilling) (United Arab Emirates)

Post Date: Jan 17, 2008

Expiry date: Mar 16, 2008

Detailed Buying Lead Description

We are looking for manufacturers of biodegradable lubricant (oil mud drilling) as follows:

Lubricant Specs:

-biodegradable

-certified by us ministry of agriculture, fisheries&food

-flash point: 70 oc min.

-dispersible in water based muds

-compatible with mud system containing sodium-chloride, calcium&magnesium

Packaging: In 55 gal drums in pallets of 4 drums Quantity: 7200 drum over 3 yrs

Remarks: 1- please quote c&f abu dhabi UAE. 2- commitment should be for 3 years on price and quantity

http://www.alibaba.com/buyofferdetail/11735592/Buy_Biodegradable_Lubricant_Oil_Mud_Drilling_.html

87 -- BOOKS : Renewable Lubricants Manual: Biobased Oils, Fluids, & Greases

Authored by: Jeffrey S. Marth, A Green Chemistry Company, USA

Available on line on <http://www.renewablelubricants.com/>

Chapter 1 - Introduction To Renewable Lubricants

Chapter 2 - Principles of Lubrication

Chapter 3 - Physical Properties

Chapter 4 - Quality Requirements

Chapter 5 - Renewable Lubricant Additives

Chapter 6 - Understanding Biobased & Biodegradable

Chapter 7 : Biobased Oils, Fluids, & Greases

Chapter 8 - Bio Hydraulic Fluids

Chapter 9 - Bio EP Greases

Chapter 10 - Bio Gear Oils

Chapter 11 - Bio Bearing Oils

Chapter 12 - Bio Turbine R&O Oils

Chapter 13 - Non-Renewable Types of Lubricants

Chapter 14 - Selection of Renewable Lubricants

Chapter 15 - Operational Maintenance

Chapter 16 - Environmental Regulations

88 -- TECHNICAL SIDE: Tribological Behaviour of Additive Free Calcium Stearate Greases

N. Anandan, C. R. Jagga and R. K. Pandey (Industrial Tribology, Machine Dynamics and Maintenance Engineering Centre (ITMMEC), Indian Institute of Technology Delhi)

Tribology Online Vol. 2 (2007) , No. 1 pp.34-39 (Received January 9, 2007) (Accepted February 8, 2007). Available on line on http://www.ijstage.ist.go.jp/article/trol/2/1/2_34/article

Two additive free calcium stearate greases have been developed for the requirements of lubrication in automotive components. Two compositions of calcium stearate greases have been prepared by adding 12% and 15% by weight calcium stearate soap in the 450-neutral base oil. Greases have been prepared using the dry technology. The effects of the compositions of calcium stearate soap on

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the tribological properties of greases have been investigated with the aid of four-ball tester, SRV-Optimol tester, scanning electron microscope (SEM), and transmission electron microscope (TEM). The tribological properties of the additive free greases have been compared with similar application intended commercially available greases containing additives. The structure examinations (before and after weld tests on four ball tester) of the additive free calcium stearate greases have been done using TEM. The FTIR analyses of both synthesized additive free greases have been carried out to study the degradation in greases after weld tests on four-ball tester. It has been observed based on the present investigations that the additive free calcium stearate greases show comparable tribological behavior with commercial greases containing additives.

89 -- TECHNICAL SIDE: Friction behavior of some seed oils: Bio-based lubricant applications

Adhvaryu, A., Biresaw, G., Sharma, B.K., Erhan, S.Z.

Industrial and Engineering Chemistry Research. 45(10):3735-3740. April 5, 2006

http://genes.pp.ksu.edu/research/publications/publications.htm?seq_no_115=170629 Last Modified: 02/03/2008

In this work, the free energy of adsorption ('G(ads)) of cottonseed, canola, olive and meadowfoam oil is investigated in boundary lubrication regime using steel ball-on-disk geometry. Adsorption values were compared with monoesters with varying chain lengths. It was observed, based on computed 'G(ads), that molecular polarity, hydrocarbon chain length and relative distribution of unsaturation in the FA chain can affect adsorption on the metal surface. Statistical analysis on FA distribution and 'G(ads) was helpful in making a generalized assumption on adsorption behavior. The results are consistent with theoretical assumptions on surface adsorption as a function of molecular structure.

90 -- TECHNICAL SIDE: BIOBASED LUBRICANTS: IMPROVEMENT IN OXIDATION AND LOW TEMPERATURE STABILITY

Erhan, Sevim, Sharma, Brajendra - PENN STATE UNIVERSITY

Adhvaryu, Atanu - CATERPILLAR, INC.

Association for the Advancement of Industrial Crops Conference September 17, 2005 p. 204.

http://genes.pp.ksu.edu/research/publications/publications.htm?SEQ_NO_115=179013 Last Modified: 02/03/2008

This paper presents a systematic approach to improve the oxidation and cold flow behavior of vegetable oil derivatives and the study of antioxidant/antiwear additive synergism in vegetable oils using pressure differential scanning calorimetry (PDSC) and Rotary Bomb Oxidation Test (RBOT). Synergism was investigated on a set of four antioxidants and three antiwear additives. Among the various possible avenues available, the combination of chemical additives and high-oleic vegetable oils offer the best option for achieving the ultimate goal. Vegetable oil-based lubricants formulated using the above approach exhibit superior oxidative stability, improved low temperature properties such as pour points and better wear properties compared to some of the commercially available industrial oils such as bio-based hydraulic fluids, biodegradable oils for heavy equipment and bio-based drip fluid for agriculture equipment. The above vegetable oil-based formulations compare at par with petroleum-based lubricants for use in high-temperature and high-pressure applications and often outperform the competition in some of its properties.

91 -- TECHNICAL SIDE: Soybean Oil Offers High Performance, Low Environmental Impact

United Soybean Board www.soynewuses.org.

Machinery Lubrication Magazine. September 2007

Article available on line on http://www.machinerylubrication.com/article_printer_friendly.asp?articleid=1093

The United Soybean Board (USB) and the soybean checkoff, a research and promotion program funded by U.S. soybean farmers, recognizes the importance of developing soy-based lubricants. USB works to fund and promote industrial uses for soy that inspire the creation of innovative soy-based products and technology. U.S. soybean farmer funding enables numerous companies to take part in the research, development and promotion of new uses for soy in an effort to help develop soy-based products such as lubricants, plastics, coatings and solvents.

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92 -- TECHNICAL SIDE: Fiscal Year 2007 Annual Report for National Program 306, Quality and Utilization of Agricultural Products

http://www.ars.usda.gov/research/programs/programs.htm?np_code=306&docid=16524

Following successful trials at several of the collaborating company's plants of biobased aluminum hot-rolling lubricant formulations developed by researchers at Peoria, Illinois, the company implemented biobased formulations on four hot mills in four different plants in the USA. The company has also implemented biobased lubricants for other metalworking operations such as lathing and sawing in three different plants. The company found the biobased lubricants have superior performance relative to current commercial lubricants while at the same time being cost competitive if not cheaper.

93 -- TECHNICAL SIDE: Ester hydroxy derivatives of methyl oleate: Tribological, oxidation and low temperature properties

Brajendra K. Sharma, Kenneth M. Doll, Sevim Z. Erhan

USDA/NCAUR/ARS, Food and Industrial Oil Research, 1815 North University Street, Peoria, IL 61604, USA

Department of Chemical Engineering, Pennsylvania State University, University Park, PA 16802, USA

Bioresource Technology xxx (2008) xxx-xxx Received 26 January 2007; accepted 6 December 2007 ARTICLE IN PRESS

Available online at www.sciencedirect.com

Five branched oleochemicals were prepared from commercially available methyl oleate and common organic acids; and their lubricant properties were determined. These branched oleochemicals are characterized as 9(10)-hydroxy-10(9)-ester derivatives of methyl oleate. These derivatives show improved low temperature properties, over olefinic oleochemicals, as determined by pour point and cloud point measurements. The derivatization also increased thermo-oxidative stability, measured using both pressurized differential scanning calorimetry (PDSC) and thin film micro oxidation (TFMO) methods. Branched oleochemicals were used as additives both in soybean oil and in polyalphaolefin. Their lubrication enhancement was evaluated by both four-ball and ball-on-disk wear determinations. These derivatives have good anti-wear and friction-reducing properties at relatively low concentrations, under all test loads. Their surface tensions were also determined and a trend was observed. The materials with larger side chain branches had lower surface tension than those containing smaller side chain branches. An exception to this trend was found when studying the compound with the carbonyl containing levulinic acid side chain, which had the highest surface tension of the branched oleochemicals studied. Overall, the data indicate that some of these derivatives have significant potential as a lubricating oil or fuel additives.

94 -- TECHNICAL SIDE: Why invest in environmentally considerate lubricants

Frederic Farshchi

World Pumps Volume 2008, Issue 496, January 2008, Pages 36-37 Available online at www.sciencedirect.com

Frederic Farshchi, global industrial product marketing manager at Shell Lubricants, explains that advances in lubricant technology mean that environmentally considerate products have now been brought to the forefront in many high-profile applications in environmentally sensitive areas.

95 -- TECHNICAL SIDE: Substituted esters of stearic acid as potential lubricants

Andrea Kleinova, Peter Fodran, Lucia Brncalova, Jan Cvengros

Department of Physical Chemistry and Chemical Physics, Faculty of Chemical and Food Technology, Slovak University of Technology, Radlinske ho 9, SK-812 37 Bratislava, Slovak Republic

BIOMASS AND BIOENERGY 2007 ARTICLE IN PRESS

Available online at www.sciencedirect.com and <http://www.elsevier.com/locate/biombio>

Preparation and properties of four triesters—derivatives of 9,10-dihydroxystearic acid after the epoxidation of methyl ester of the oleic acid, opening of the formed oxirane ring in suitable medium and esterification of free hydroxyl group is discussed in the paper. Removal of the double bond from acyl of the fatty acid, increase of the molar weight and change of molecular structure resulted in increase of viscosity and oxidation stability of prepared triesters. Lubrication tests performed on a four-ball machine showed better tribological characteristics of synthesized triesters when compared with mineral additivefree base oil.



96 -- ON THE WEB : LUBRICANTS AND CUTTING OILS PRODUCT Biodegradable Hammer Oil (Australia)

<http://www.ausmud.com/pds.php?id=78>

AUSTRALIAN Mud Company (AMC) has released a biodegradable Hammer oil that provides lubricating properties when compared to hydrocarbon based hammer oils. Biodegradable Hammer oil is used in all types of air driven down hole hammers as an air line lubricant. The company supplies drilling fluid products and engineering services, to the oil and gas, mining, waterwell and horizontal directional drilling (HDD) markets. The product is now being used by over 40 (RC and Drill & Blast) companies within Australia. It is available in 150, 320 and 460 centipoise grades and is manufactured from a blend of biodegradable vegetable oils. Biodegradable Hammer oil has excellent extreme pressure lubrication qualities and provides efficient wear protection to moving parts. It maintains optimum viscosity under high temperature and pressure while maximizing the performance of the hammer. It is cost effective, very Environmentally Friendly and non-polluting.

97 -- ON THE WEB: University of Northern Iowa National Ag-Based Lubricants (NABL) Center (USA)

<http://www.abiluni.org/index.htm>

Established in 1991, the University of Northern Iowa's (UNI) National Ag-Based Lubricants (NABL) Center is recognized nationally as a technical service organization offering closed-loop expertise focusing on biobased lubricants. The NABL Mission is to provide a national focus for research and technology transfer activities that creates and nurtures the commercialization of biobased lubricants; which will expand market opportunities for the agricultural community, minimize environmental impact, and help the United States become more energy independent.

98 -- ON THE WEB: E-ION (Belgium)

<http://www.eion-additives.com>

E-ION is a privately-owned company that produces and supplies outstanding and unique lubricity additives much needed in today's lubricants, greases and fuels. E-ION additives also find applications in personal care products, rubber extenders, adhesion enhancers, and wood protection compositions. The E-ION safe and eco-friendly technology of electro-ionization affords unbeatable quality of the final products at economical conditions.

99 -- ON THE WEB: DSI Lubricant (USA)

<http://www.dsifluids.com/>

Full Synthetic and Biodegradable Lubricants, Electrical Insulating Oils, and Heat Transfer Fluids ECO lubricants are made from highly biodegradable esters and vegetable seed oils, for the ultimate in heat and wear resistance.

100 -- ON THE WEB: CASTROL MARINE LAUNCH BIODEGRADABLE MARINE LUBRICANT

<http://www.castrol.com/castrol/genericarticle.do?categoryId=4504740&contentId=7038530> (Release date: 14 November 2007)

The new range of biodegradable hydraulic, stern tube, gear oils and greases exceed the requirements of the US Environmental Protection Agency. This cuts the risk of environmental damage from accidental leakage, a routine occurrence in the maritime industry, particularly among older vessels. It is estimated that over 30 million gallons of oil is leaked from ships during normal operations in ports and harbours every year – more than three times the Exxon Valdez oil spill. According to industry data, leakages of five to 1,000 tons have dropped dramatically in the last few years, but those under five tons have eased only marginally. Underlying causes of pollution incidents included failure and misuse of valves, overflows, defects in plate and pipes, hose rupture, contaminated bilges and faulty gauges. The replacement of conventional mineral oils with biodegradable lubricant in equipment where there is a risk of accidental spillage or leakage and consequent environmental damage could eventually become mandatory.



101 -- ON THE WEB: BioBlend, Biodegradable Food Grade Gear Lubricants (USA)

http://www.bioblend.com/component/page.shop/browse/category_id,7/option.com_virtuemart/Itemid,69/

BioBlend provides products formulated from environmentally responsible chemistries that are produced from renewable resources and designed to assure optimum performance of our customers' operating systems. We provide the solutions to your operating challenges with innovative technology that leverages the latest advances in bio-based feedstocks and bio-friendly additives. BioBlend combines highly stable vegetable base oils with unique additive technologies to create products that provide excellent thermal and oxidative stability while delivering superior anti-wear and anti-corrosion protection (over 40 renewable biobased products). BioBlend combines highly stable vegetable base oils with unique additive technologies to create products that provide excellent thermal and oxidative stability while delivering superior anti-wear and anti-corrosion protection. Our biodegradable and non-toxic formulations are designed to maximize renewable content that meets or exceeds USDA standards for renewable products. A 99% biodegradable vegetable based food grade lubricant blended in compliance with 21 CFR 178.3570 from temperature stable high oleic canola oils and is recommended for use with gears, bearings and chains in facilities under the Federal Food Safety Inspection Service.

102 -- ON THE WEB: Biobased Lubricants Research & Development History in USA

<http://www.renewablelubricants.net>

Since 1991, United Bio Lube's core technology partner, Renewable Lubricants, Inc. (RLI) has pioneered an extensive research and development program of vegetable oil based lubricants. The primary focus of this program has involved formulating vegetable oil based automotive engine and hydraulic oils for transportation use. The program has directed R&D toward Food Grade Lubricants, Industrial Fluids, Penetrating Lubricants, Corrosion Inhibitors/Preservative Oils, and Transformer Oils. Like petroleum oils, vegetable oils have different traits that are revealed by studying their performances in numerous formulations with various additives. RLI has studied many vegetable base oils and has developed a base oil read-across database formulating these vegetable base oils in combination with other vegetable, synthetic, petroleum, and re-refined oils.

Over the last 15 years, RLI has been able to secure over three million dollars in grant contracts and in-kind contributions to RLI. The program has been identified in the industry as the largest known biobased lubricant program. RLI has successfully developed many vegetable hydraulic and engine oil formulas in different viscosities (SAE 20 to SAE 70). RLI's hydraulic oils were formulated to meet MIL Specifications as described in the U.S. Army's TARDEC report # 13640 (46 cSt. @ 400C).

Biobased Hydraulic Fluids developed for the Department of Defense, (DOD) were achieved in cooperation between government contractor CTC/Unisphere, South West Research Institute (SwRI), U.S. Army Tank-Automotive Research, Development, and Engineering Center (TARDEC). RLI formulates and owns the technology while the DOD pays for testing at SwRI and TARDEC.

RLI's technology has been verified through outside laboratories including DOD/Fort Belvoir, TARDEC Warren MI, Penn State University Department of Chemical Engineering, South West Research, and Lubrizol. Engine tear down and dynamometer studies were conducted on several engines by consultant David Smith from Creative Energy Products. Volunteer Chevrolet in Sevierville, Tennessee supplied the engines and dynamometer equipment. Volunteer Chevrolet won the 1999 ASA Stock Car Championship using a High Oleic Soybean and Canola Bio Motor Oil blend in a high performance 500 HP Chevy engine along with Bio Transmission Fluids and Bio Differential Fluids. Many technical papers have been published through SAE and STLE on this research.

In October 1993, RLI was contracted to develop lubricants for USDA-DOD Advanced Materials from Renewable Resources Program (AMfRR), titled, "Formulating Functional Vegetable Base Motor and Hydraulic Oils". This three year project included collaboration with Pennsylvania State University, Dept. of Chemical Engineering. During this research and development program, many different additives and vegetable base formulas were evaluated, including more than 15 different types of vegetable-based oils. The main areas of interest were oxidation and wear. Testing was also conducted at Lubrizol (an RLI competitor's laboratory) under a non-analytical and confidentiality agreement.



In 1993, RLI developed Sunflower based 10W30 Motor Oil, which has been tested in an Oldsmobile 3.8-liter engine for three years with over 45,000 miles acquired. This 10W30 motor oil received recognition in 1993 for Product of the Year Awards in Lubricants World Magazine. Nervo/Coggin Racing uses RLI's SAE 30 High Performance Sunflower Base Racing Oil, as a factory fill for their 12,000-RPM single cylinder engines, and recommends this oil as an OEM requirement on their engine warranty.

In 1994, RLI developed SAE 70 High Performance Corn Base Racing Oil for IHRA Five Time World Champion Mark Thomas Racing Team. This 3000 horsepower ethanol-fueled racing car set track records using corn oil lubrication in the engine, transmission, and differential. Due to this accomplishment, RLI was approached by the National Corn Growers Association (NCGA) to develop a corn based motor oil for a new Flexible Fuel Vehicle FFV E-85 (Ethanol) Ford Taurus. The Ohio Corn Growers sponsored a trip in this vehicle across the U.S. later in 1994. This vehicle has been in the testing program with more than 70,000 miles of test data. RLI has patents filed worldwide on the chemistry in these formulas.

In October 1997, the United Soybean Board (USB) joined RLI's R & D program with an additional contract for RLI to continue the research project with soybean oil. (Project No. 7430 and 7431, "Commercializing Super High VI Soybean Vegetable Lubricants for High Temperature Engine and Hydraulic Applications.") The technology was secured with RLI's seventh patent application and is currently being commercialized.

Since 1999, RLI has been working with many end users to develop field studies and marketing data. Two major national parks, Pictured Rocks Lakeshore, Michigan and Isle Royale on Lake Superior have purchased RLI's biodegradable products for use in their equipment. These parks are very pleased to be among the first Department of Interior (DOI) demonstration sites for these biodegradable lubricants. The temperature range in the Great Lakes region provides an excellent field test site, ranging from > 90  F in the summer to < - 30  F in the winter.

In July of 2000, Pictured Rocks Lakeshore received a grant from the DOI/DOE to purchase a range of RLI's products: Bio Hydraulic Fluids, Bio Trans-Hydraulic Fluids, Bio Hydrostatic Fluids, BPLTM - Bio Penetrating Lubricants, Bio Bar & Chain Oils, Bio Two-Cycle Engine Oils, and BioPowerTM Diesel Fuel Conditioners. The Minnesota Department of Natural Resources is also purchasing RLI's products. Both pilots resulted in successful case studies on operating heavy duty vehicles and equipment running RLI's bio lubricants under extreme temperature conditions.

Over the last 5 years, RLI has been testing a proprietary biobased 10W40 Motor Oil formulation in a 1999 Ford F-250 Power Stroke Diesel in collaboration with the Ohio Soybean Council and the United Soybean Board. In this vehicle, motor oil formulas have been field tested for physical and chemical properties. Data collected shows excellent performance for RLI's technology and demonstrates Biobased Lubricant technology performs as good or better than mineral based formulas.

In July of 2004, RLI received a letter of recognition from CTC acknowledging 4 years of successful DOD testing RLI's Biobased Lubricants technology. RLI is presently working with CTC/Unisphere and the DOD/TACOM, Warren, MI, designing fire resistant Bio Hydraulic Fluids to meet improved MIL-PRF-6083 and MIL-H-46170 for tactical equipment.

Additionally, RLI and Chevron Phillips Chemical Co. have been working in a joint venture research partnership on a Bio Hydraulic R&D project for the U.S. Postal Service. This project has produced fully functional Bio Hydraulic Fluids achieving 'Ultimate' Biodegradability ratings (ASTM D-5864) while improving several performance parameters, not previously attainable.



103 -- ON THE WEB: The 4th International Conference "LUBRICANTS RUSSIA - 2008", November 12-13, Moscow.

<http://www.eng.rpi-inc.ru/conferences/items/conf/?c=40>

We invite industrial companies to take part in forming the next year's Conference program. If you would like to present your evaluation of the lubricants market, your business model or new instruments and approaches to industrial marketing and OEM liaisons, as well as your new technologies or findings, please contact the Conference director Anna Rouskikh at annar@rpi-inc.com or by +7 (495) 967 0117/18.

The following persons have already confirmed their intent to work in the Program Committee of the next year Conference: Ahmad Zareh (Infineum), Raushan Telyashev (LLK-International), Christoph Wincierz (Evonik RohMax Additives), and Boris Bunakov (Russian Association of Automobile Engineers).

104 -- ON THE WEB: 100% Biodegradable Auto Oil - G-OIL From Animal Fat

<http://www.GETgreeneearth.com> or www.getg.com

G-Oil is not petroleum based, but made from animal fat. One barrel of fat can yield one barrel of G-oil (green oil) when mixed with a proprietary chemical. G-OIL is manufactured by **Green Earth Technologies** from tallow acquired from American farmers. Tallow is culled from beef and has been used to make animal feed, soap, and no longer used for cooking. G-OIL is made utilizing a proprietary process that converts tallow from a solid raw material into completely biodegradable motor oil for gasoline and diesel engines as well as hybrid cars. G-OIL was launched to retailers at the 2007 Automotive Aftermarket Products Expo (AAPEX), the world's largest trade show for the \$267 billion automotive aftermarket industry, being held last week at the Sands Expo & Convention Center, Las Vegas. Green Earth Technologies produces "G" Branded green products made with American-grown base oils that utilize the power of nanotechnology to deliver environmentally friendly products.

105 -- ON THE WEB: Cognis launches its first synthetic lubricant product line bearing the EU-Ecolabel

http://www.cognis.com/company/Press+and+Media/Press+Releases/2008/080131_EN_FP.htm

The ProEco HE 801 series of fully formulated biohydraulic oils from global specialty chemicals supplier Cognis combine excellent performance and compliance with the exacting requirements of the EU-Ecolabel and a range of additional environmental aspects. These include the technical requirements of ISO 15380 and the use of a large proportion of renewable raw materials. The novel "green" ester-based products from Cognis are designed for challenging applications and demonstrate outstanding performance even under extreme conditions. This next generation of biohydraulic fluids, the ProEco HE 801 series, available in various viscosity grades, overcomes the disadvantages of former generations of native oils and opens up new possibilities for the use of biofluids in more applications than ever. The ProEco HE 801 series ends the well-known problems of swelling or other interactions with elastomers or sealings (commonly NBRs) that are seen with conventional esters. Combined with this are superior oxidative and hydrolytic stability – important factors for long fluid lifetime, reduced maintenance and reduced sludge formation. The lubricants have a high viscosity index (VI). Even under arctic conditions, the products provide outstanding long-term mechanical protection, due to their excellent flowability. The new products are made from more than 90 percent of renewable feedstocks and comply with the EU Ecolabel and other sustainability requirements. Tests were run with all ISO grades (22, 32, 46, 68) mixed with conventional products in various ratios: foaming was not observed in any mixtures with contamination rates of 5 percent and more.



106 -- Eco-labels in Europe: lists of lubricants suppliers that got licenses (updated 4 February 2008)

	Swedish Standard Hydraulic oils SS 15 54 34 -	Swedish Standard Lubricating greases SS 15 54 70	Nordic Swan (Finland)	BLUE ANGEL Hydraulic Fluids RAL-UZ 79	BLUE ANGEL Lub. and Form. Oils RAL-UZ 64	EUROPEAN ECO-Label (country)	GERMAN POSITIVE LIST
1					Addinol Lube Oil		Addinol Lube Oil
2	Agro Oil	Agro Oil					
3				Agip Schmiertech.			Agip Schmiertechnik
4				Agravis			Agravis
5					Aral .		Aral
6				Avia Mineral��l			Avia Mineral��l
7				BayWa	BayWa		BayWa
8	Bechem (Carl)			Bechem (Carl)			Bechem (Carl)
9	Binol	Binol	Binol Biosafe			Binol Biosafe (FIN)	
10							Blaser Swisslube
11	BP Sm��rjmedel	BP Sm��rjmedel		BP & Deutsche BP			Deutsche BP
12				Bremer & Leguil			Bremer & Leguil
13							Burrenkopf Schmier.
14	Canadian Oil AB						
15				Calpam Mineral��l			Calpam
16							Cargill
17	Castrol						Castrol
18	Cargo Oil	Cargo Oil					
19							
20	Car Oil (Gulf)						
21	Caterpillar			Caterpillar Overs.			
22	Cognis Deutsch.			Cognis Deutsch.			
23							Chemisch. Werke Klu.
24							Deere & Company
25	Eliassons Maskin						
26							ELASKON SACHSEN
27							EMKA Schmiertechnik
28				Esso Deutschland			ESSO Deutschland
29	Exxon Mobil Lub.						
30				FINKE Mineral��lw.	FINKE Mineral��lw.		Finke Mineral��lwerk



31	F L Nordic (Ambra)						
32				Fragol Schmierstoff	Fragol Schmierstoff		Fragol Schmierstoff
33				Fuchs			Fuchs
34	G. A. Lindberg						
35							Georg Oest Mineralöl.
36	Green Oils						Greenoils
37				Handelsges. für Kr.	Handelsges. für Kr.		
38					Hebro Chemie		Hebro Chemie
39							Hunold Schmierstoffe
40	Hydroscand						
41	Kajo-Chemie			Kajo-Chemie	Kajo-Chemie	Kajo-Chemie (DE)	Kajo Chemie
42							Kaste
43							Kettlitz Chemie
44							Kleenoil Panolin
45							Kock Zerspanungste.
46							Kompressol-Oel Verk.
47							
48							Lubricating Dutchman
49	Matrix Lubricants						
50		MCB Larsson Mill.					
51	Midland	Midland					
52	Mobil Oil						
53				Motorex			
54					Müller (H. Math)		
55							Natoil
56	Neste Oil AB	Neste Oil AB					
57	Nordisk Däck.(Agip)						
58	Norsk Hydro Olje						
59						Novance (FR)	
60	NYCO.						
61							Oelheld
62							Oemeta Chemische W
63							OMV Deutschland
64	OK-Q8	OK-Q8					Kuwait Petroleum
65					OMV Aktiengesells.		
66	Panolin Scandinav.			Panolin	Panolin AG	Panolin (CH)	
67				Pap Star, Vertrieb			
68	Partek For (Valmet)						



69							Polychemie Limbach
70	Preem Pet (Texaco)	Preem Pet (Texaco)					
71				Raiff. Haupt-Gen. N			
72		Ramby Oljor& Verk.					
73							Rhenus Lub
74							Röhrli
75	Skand. Oljecentr.						
76		SKF Maint. Prod.					
77	Shell AB	Svenska Shell		Shell Deutch.Oil			Shell & DEA Oil
78							Sips-Dieter Döcker
79							SRS Schmierstoffvert.
80					Starke & Sohn		
81	Statoil Lubricants	Statoil Lubricants					
82	Sunoco						
83							Swd Lubricants
84					Technolub Schmier		
85	Total Lub.Sweden						Total Deutschland
86							Unitech Kühlschmier.
87	Valvoline Intern.						
88				Veba Oel Vertrieb			
89	Voitel. Tont. Comet						
90							Voitländer
91	Volvo CE			Volvo CE Intern.			
92							WASCUT Industrieöle
93							Willi Schüler e. K. Min
94							Wunsch Öle
95				Zeller & Gmelin			Zeller & Gmelin
96							Zeppelin Baumach.
Status July 2007	36 companies NO CHANGE 76 products	13 companies NO CHANGE 19 products	1 compagnie NO CHANGE 9 products	20 companies +2 - 1 70 products	12 companies NO CHANGE 27 products	2 companies + 2 13 products	52 companies 493 products
Status January 08	36 companies NO CHANGE 76 product NO CHANGE	13 companies NO CHANGE 19 products NO CHNAGE	1 company NO CHANGE 9 products NO CHANGE	22 companies (+1 -1) 67 products (-3)	13 companies (+1) 25 products (-2)	4 companies NO CHANGE 19 products (+6)	53 companies (+1) 491 products (-2)

http://www-v2.sp.se/km/en/tech_ser/kmo/grease.htm (greases)
http://www-v2.sp.se/km/en/tech_ser/kmo/hydraul.htm (hydraulic)

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<http://www.ymparistomerkki.fi/www/tuotteet?jta=search&pg=2> (in Finnish: voiteluöljyt)

http://www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm (hydraulic fluids)

<http://www.eco-label.com/default.htm>

<http://www.fnr.de/> [Startseite > Förderprogramm > Positivliste] http://www.fnr-server.de/ftp/pdf/literatur/pdf_100pdf_100positivliste_2008_2.pdf

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