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Lubricants.

The invention provides a lubricating oil for a two-stroke engine based on vegetable oil rather than mineral oil and in which the base fluid is palm olein.

This invention relates to lubricants and particularly to lubricants based on vegetable oils that are intended for use in two-stroke engines.

Automotive lubricating oils have hitherto been largely based on mineral oils. Despite the wide availability of vegetable oils and the apparent attractions of using such renewable and environmentally-friendly source materials, the use of vegetable oils as lubricant base fluids has been highly restricted. They have not found wide applicability in high-performance modern lubricants. Rape seed oil and castor oil, for example, have been and are used in lubricants in specific applications.

Two-stroke engines have for many years now enjoyed considerable success, for example, as motor cycle engines, outboard motors and chainsaw engines. This is due in no small part to their high output per unit weight and their relative simplicity and versatility, for example, their having no sump.

However, the high speed of two-stroke engines together with their basic characteristics that the lubricant is burned with the fuel, i.e. a total loss system, place high demands on the lubricant. It must have high load-carrying ability with good cleanliness properties and avoid piston wear, spark plug fouling and excessive engine wear generally.

The invention provides a satisfactory, high performance lubricant for two-stroke engines, which is based on palm oil.

In one aspect the invention provides a lubricating oil for a two-stroke engine which comprises palm olein as base fluid and one or more dispersants in an amount of from 1 to 10% by weight. Preferably the lubricating oil comprises the following constituents by weight:

base fluid -	palm olein	30	to	99%
	anti-oxidants	0	to	2%
	smoke suppressant	0	to	30%
	dispersants	1	to	10%
	detergents	0	to	4%
	corrosion inhibitor	0	to	2%
	diluent	0	to	25%
	other base fluid	0	to	30%

In another aspect the invention provides the use as a lubricating oil for a two-stroke engine, of a palm olein-based formulation as detailed in the immediately-preceding paragraph.

Preferably the palm olein is present in an amount of from 40 to 90% by weight.

As indicated above, in addition to the palm olein base fluid in the formulation, any balance of the formulation may be made up using other base fluids, preferably synthetic or mineral oils, i.e. refined petroleum fractions. Suitable synthetic base fluids include, for example, poly alpha olefins and synthetic esters, e.g. polyol or dibasic acid esters. Other base fluids derived from vegetable oil sources may also be incorporated in the formulation.

Any other desired additives may be included, e.g. a metal passivator, to reduce the tendency of metals to catalyse oxidation of the oil, may be used in up to 0.5% by weight. Suitable passivators are well known in the field of lubrication. Other additives which may be included dependent on the intended use and environment of use include thickeners and pour point depressants.

An ester additive to retard crystallisation of the palm olein is preferably included in an amount up to about 0.24% by weight, preferably from 0.04 to 0.18%.

Preferably, the ester additive is an ester of sorbitan and stearic acid. For example, it may be sorbitan mono-stearate, sorbitan tristearate or poly-oxyethylene sorbitan tristearate, sorbitan tristearate being particularly preferred. Alternatively, it may be, for example, a polyglycerol ester.

Palm olein is a liquid fraction derivative obtained when the palm oil is fractionated into solid and liquid fractions. It typically has Iodine Values (IV) in the range from about 55 to 67. Iodine Value is an indication of the degree of unsaturation of the oil, the higher the value the greater the unsaturation. See Institute of Petroleum method IP84 for a detailed explanation of its measurement. Palm olein has been widely used, particularly in the Far East and South America, as a food/edible oil, particularly for frying.

It is well known that clear palm olein of IV approximately 55 becomes cloudy as its temperature drops below about 20°C. This is believed to be due to crystallisation of some of the molecules, primarily tri-glycerides, within

the palm olein. It is also known that such crystallisation may be retarded by suitable additives such as, inter alia, sorbitan esters as described above.

The actual temperature and form of crystallisation depends on a number of factors including the IV of the olein used, the rate of cooling and whether the test method is isothermal or temperature programmed. For example, if test methods are equal, a specific palm olein of relatively high IV might start to become cloudy due to crystallisation at, say, 15°C, whereas one of lower IV, e.g. 55, might start at 20°C. Similarly, two identical oleins may crystallise at different temperatures if subjected to different temperature regimes.

Preferably, for use in a two-stroke lubricating oil, the stabilised palm olein should have an IV of at least 60 and preferably from 62 to 67. Palm oleins of lower IV have been found to be less preferable, albeit still usable, in that, even when stabilised, they are likely to undergo crystallisation causing cloudiness during normal temperature changes in a tropical climate. Thus, two-stroke lubricating oils of the present invention can be formulated to have particularly useful application in relatively hot climates where minimum temperatures are unlikely normally to fall below about 12°C. Thus, for example, they may be of particular value in tropical regions of countries such as Brazil, Malaysia, Singapore, Indonesia and Thailand.

The anti-oxidant may be, for example, an amine, phenol or phosphite-based additive, well known per se in the lubricant art, and is preferably present in an amount of from 0.5 to 1.5% by weight.

The smoke suppressant may be, for example, polyisobutene and may be used in sufficiently large amounts to be considered also as an additional synthetic base fluid.

The dispersants, detergent and corrosion inhibitors may be any conventionally used in the lubricant art and are preferably present in amounts of from 4 to 9%, 1 to 3% and 0.5 to 1.5% by weight respectively.

Examples of suitable dispersants are alkyl (mono and bis) succinimides of a range of molecular weights, or a Mannich type base.

Examples of suitable detergents are neutral and/or overbased calcium, magnesium, sodium or barium sulphonates or phenates.

Examples of suitable corrosion inhibitors are metal phenates, basic metal sulphonates, fatty acids and amines.

The diluent may be, for example, a petroleum distillate with a flash point above 60°C which helps the oil to mix satisfactorily with the fuel prior to ignition in the engine.

Two-stroke engine formulations based on palm olein, and containing dispersant and further additives, diluents and/or smoke suppressants as discussed above, have been tested in the following currently available tests and have demonstrated acceptable results:

- Yamaha RD 350B, API TC Sequence I procedure (to evaluate deposit control and ring sticking).
- Yamaha CE 50S, API TC Sequence II procedure (to evaluate lubricity).
- Yamaha CE 50S, API TC Sequence III procedure (to evaluate pre-ignition and plug fouling).
- Yamaha CE 50S CEC TA procedure (to evaluate piston tightening).
- Yamaha CE 50S CEC TA procedure (to evaluate exhaust blocking).

Furthermore, the formulations in accordance with the invention have been satisfactorily tested to evaluate specific performance in chainsaw engines and to evaluate the level of visible smoke produced from the exhaust. It was found that the formulations were able to be classified as "reduced smoke".

Claims

1. A lubricating oil for a two-stroke engine having a composition which comprises palm olein as base fluid and one or more dispersants in an amount of from 1 to 10% by weight.
2. A lubricating oil according to Claim 1, which comprises palm olein as base fluid in an amount of from 30 to 99% by weight and one or more dispersants in an amount of from 1 to 10% by weight.
3. A lubricating oil according to Claim 2 in which the palm olein is present in an amount of from 40 to 90% by weight.
4. A lubricating oil according to Claim 1, 2 or 3, which additionally contains up to 2% by weight of anti-oxidant.
5. A lubricating oil according to Claim 4, in which the anti-oxidant is selected from amines, phenols and phosphite-based additives.
6. A lubricating oil according to any one of the preceding claims, which additionally contains up to 30% by

weight of smoke suppressant.

7. A lubricating oil according to Claim 6, in which the smoke suppressant is polyisobutene.
- 5 8. A lubricating oil according to any one of the preceding claims, which additionally contains up to 4%, preferably from 1 to 3%, by weight of detergent.
9. A lubricating oil according to any one of the preceding claims, which additionally contains up to 2%, preferably from 0.5 to 1.5%, by weight of corrosion inhibitor.
- 10 10. A lubricating oil according to any one of the preceding claims, which additionally contains up to 25% by weight of a diluent.
11. A lubricating oil according to Claim 10, in which the diluent is a petroleum distillate with a flash point above 60°C.
- 15 12. A lubricating oil according to any one of the preceding claims, which additionally contains up to 30% by weight of other base fluid.
13. A lubricating oil according to any one of the preceding claims, which includes an ester additive to retard crystallisation of the palm olein in an amount up to about 0.24%, preferably from 0.04 to 0.18% by weight.
- 20 14. A lubricating oil according to Claim 13, in which the ester additive is an ester of sorbitan and stearic acid, preferably selected from sorbitan monostearate, sorbitan tristearate or polyoxyethylene sorbitan tristearate.
- 25 15. A lubricating oil according to any one of the preceding claims in which a dispersant is present in an amount of from 4 to 9%.
16. A lubricating oil according to any one of the preceding claims in which the dispersant is selected from alkyl (mono and bis) succinimides and Mannich type bases.
- 30 17. A lubricating oil according to any one of the preceding claims in which the palm olein has an Iodine Value of at least 60, preferably 62 to 67.
- 35 18. The use as a lubricating oil for a two-stroke engine of a composition in accordance with any one of the preceding claims.

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EUROPEAN SEARCH REPORT

Application Number
EP 93 30 7853

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
P,X	EP-A-0 556 995 (CASTROL LIMITED) * column 1, line 17 - line 24 * * column 3, line 13 * * claims 1,10 * ---	1-4,8, 13-15, 17,18	C10M101/04 C10M169/04 //C10N30/04, C10N40/26, (C10M169/04, 129:10,129:76, 133:12,133:52, 137:02,143:06, 145:38,159:04, 159:16)
A	GB-A-2 134 923 (OY KASVIOLJY-VAXTOLJE AB) * page 5, line 15 - line 32 * * page 2, line 15 - line 31 * * page 11, line 1 - line 22 * ---	1-5, 8-11,15, 16,18	
A	GB-A-1 340 804 (LABOFINA) * page 3, line 56 - line 61 * * page 3, line 66 - line 70 * * page 4, line 2 - line 8 * * page 5, line 60 - line 70 * ---	1,2,6-8, 10-12,18	
A	EP-A-0 132 506 (SOCIETE DES PRODUITS NESTLE) * page 7, line 25 - line 29 * * page 8; example 1 * * claims 9,17 * ---	1	TECHNICAL FIELDS SEARCHED (Int.Cl.5) C10M
A	FR-A-2 339 666 (THE LUBRIZOL CORPORATION) * page 39, line 32 * * page 39, line 11 - line 16 * * claims 1,40 * * page 42, line 12 - line 15 * --- -/--	1,2,4,5, 8-12,15, 18	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25 January 1994	Examiner Hilgenga, K
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EUROPEAN SEARCH REPORT

Application Number
EP 93 30 7853

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	DATABASE WPI Week 9246, Derwent Publications Ltd., London, GB; AN 92-379500 GRINDSTED PROD AS "Anti-crystallisers for cooking oil- comprises blend of soprbitan tristearate and lecithin " * abstract * & RESEARCH DISCLOSURE vol. 342, no. 077 , 10 October 1992 ---	13,14	
A	GB-A-1 354 749 (ESSO RESEARCH AND ENGINEERING COMPANY) * page 3, line 105 - line 110 * ---	1,4,5	
A	WO-A-88 05808 (RAISION TEHTAAT OY AB) * page 10 - page 11 * -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25 January 1994	Examiner Hilgenga, K
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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