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LUBRICATING OIL COMPOSITION

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ABSTRACT OF THE DISCLOSURE

Lubricating oil for two-cycle or rotary engines which employ a lubricating oil-fuel mixture, containing the polymeric reaction product of an aliphatic amine and an epihalohydrin compound.

BACKGROUND OF THE INVENTION

Lubricating oil used for two-cycle engines is admixed with the fuel and charged into the combustion chamber of the engine. It, also, has been proposed to utilize the mixture of the lubricating oil and fuel in rotary type engines. Both of these engines may be of the air or water cooled design. The practice of utilizing a mixture of the lubricating oil and fuel (gasoline) finds application in marine engines, outboard engines, snowmobiles, golf carts, chain saws, compact automobiles, etc.

Because the lubricating oil is mixed with the fuel and charged in admixture into the combustion zone, the problems encountered in the efficient operation of the engine appear to be more complicated than encountered in systems in which the fuel and lubricating oil are supplied separately and kept substantially isolated from each other. While some of the problems are common to both types of engines, it is apparent that different chemical and physical phenomena are encountered when the lubricating oil and fuel are supplied as a mixture into the combustion zone.

It is important to protect the lubricity properties of the lubricating oil to avoid seizure occurring and interrupting operation of the engine and/or breakage of the engine parts. It is, also, important to maintain engine cleanliness and avoiding spark plug fouling, deposit formation on cylinder walls, exhaust ports, in the muffler system, etc. In rotary type engines, undue wear adversely affects the seals, with the resultant leakage and inefficient engine operation. With the use of leaded fuels, these problems become even more complicated.

DESCRIPTION OF THE INVENTION

In accordance with the present invention, the lubricity properties and engine cleanliness are improved by incorporating a particular polymeric reaction product in the lubricating oil.

In one embodiment, the present invention relates to a lubricating oil for two-cycle or rotary engines which employ lubricating oil-fuel mixture containing, as an additive to improve lubricity and engine cleanliness, from about 0.5% to about 10% by weight of the polymeric reaction product, formed at a temperature of from about 70° to about 300° F., of from 1 to 2 mole proportions of a primary or secondary aliphatic amine with from 1 to 1.5 mole proportions of an epihalohydrin compound.

In a particularly preferred embodiment, the polymeric reaction product is prepared in a paraffinic and an aromatic solvent. For example, in a preferred embodiment, the polymeric reaction product is prepared as a 30% to 70% and more particularly 40% to 60% solution in an aromatic solvent and the resulting solution then is commingled with a paraffin oil in an amount to comprise from about 10% to about 30% and preferably from about 15% to about 25% by weight of the first mentioned solution and from about 70% to about 90% and preferably 75%

to about 85% by weight of the paraffin oil. By utilizing the mixed solvents, satisfactory solubility of the polymeric reaction product is obtained in the lubricating oil and in the subsequent mixture of lubricating oil and fuel. It is understood that the mixed solvents may be commingled with the polymeric reaction product in any suitable manner, including one-step admixture or sequential addition of the different solvents.

In another embodiment, the present invention relates to the method of operating a spark ignition two-cycle engine or a spark ignition rotary engine, wherein lubricating oil and fuel are charged in admixture and passed into the combustion chamber of said engine, which comprises operating said engine on the lubricating oil-fuel mixture containing the polymeric reaction product herein set forth.

The polymeric reaction product for use in the present invention is formed by reacting a primary or secondary aliphatic amine with an epihalohydrin compound. The aliphatic amine may be a mono or polyamine. In a particularly preferred embodiment, the amine contains from about 12 to about 40 carbon atoms.

In a preferred embodiment, the amine is an N-aliphatic polyamine and more particularly an N-alkyl-diaminoalkane. Especially preferred are N-alkyl-1,3-diaminopropanes in which the alkyl group contains at least 12 carbon atoms and more particularly from 12 to about 40 carbon atoms. Illustrative examples include

N-dodecyl-1,3-diaminopropane,
N-tridecyl-1,3-diaminopropane,
N-tetradecyl-1,3-diaminopropane,
N-pentadecyl-1,3-diaminopropane,
N-hexadecyl-1,3-diaminopropane,
N-heptadecyl-1,3-diaminopropane,
N-octadecyl-1,3-diaminopropane,
N-nonadecyl-1,3-diaminopropane,
N-eicosyl-1,3-diaminopropane,
N-heneicosyl-1,3-diaminopropane,
N-docosyl-1,3-diaminopropane,
N-tricosyl-1,3-diaminopropane,
N-tetracosyl-1,3-diaminopropane,
N-pentacosyl-1,3-diaminopropane,
N-hexacosyl-1,3-diaminopropane,
N-heptacosyl-1,3-diaminopropane,
N-octacosyl-1,3-diaminopropane,
N-nonacosyl-1,3-diaminopropane,
N-tricontyl-1,3-diaminopropane,
N-hentriacontyl-1,3-diaminopropane,
N-dotriacontyl-1,3-diaminopropane,
N-tritriacontyl-1,3-diaminopropane,
N-tetratriacontyl-1,3-diaminopropane,
N-pentatriacontyl-1,3-diaminopropane,
N-hexatriacontyl-1,3-diaminopropane,
N-heptatriacontyl-1,3-diaminopropane,
N-octatriacontyl-1,3-diaminopropane,
N-nonatriacontyl-1,3-diaminopropane,
N-tetracontyl-1,3-diaminopropane,

etc., and corresponding N-alkenyl-1,3-diaminopropane. Mixtures are available commercially, usually at lower prices, of suitable compounds in this class and advantageously are used for the purposes of the present invention. One such mixture is "Duomeen T" which is N-tallow-1,3-diaminopropane and predominates in alkyl and alkenyl groups containing from 16 to 18 carbon atoms each, although the mixture contains a small amount of groups containing 14 carbon atoms each. Another mixture available commercially is N-coco-1,3-diaminopropane which contains alkyl groups predominating in 12 to 14 carbon atoms each. Still another example is N-soya-1,3-diaminopropane which predominates in alkenyl groups containing 18 carbon atoms per group, although it con-

tains a small amount of alkyl groups having 16 carbon atoms each.

While the N-aliphatic-1,3-diaminopropanes are preferred compounds in this class, it is understood that suitable N-aliphatic ethylene diamines,

N-aliphatic-1,3-diaminobutanes,
N-aliphatic-1,4-diaminobutanes,
N-aliphatic-1,3-diaminopentanes,
N-aliphatic-1,4-diaminopentanes,
N-aliphatic-1,5-diaminopentanes,
N-aliphatic-1,3-diaminohexanes,
N-aliphatic-1,4-diaminohexanes,
N-aliphatic-1,5-diaminohexanes,
N-aliphatic-1,6-diaminohexanes,

etc., may be employed, but not necessarily with equivalent results.

In some cases, polyamines containing 3 or more nitrogen atoms may be employed. Illustrative examples of such compounds include N-dodecyl-diethylene triamine, N-tridecyl-diethylene triamine, N-tetradecyl-diethylene triamine, etc., N-dodecyl-dipropylene triamine, N-tridecyl-dipropylene triamine, N-tetradecyl-dipropylene triamine, etc., N-dodecyl-triethylene tetramine, N-tridecyl-triethylene tetramine, N-tetradecyl triethylene tetramine, etc., N-dodecyl-tripropylene tetramine, N-tridecyl-tripropylene tetramine, N-tetradecyl-tripropylene tetramine, etc., N-dodecyl-tributylene tetramine, N-tridecyl-tributylene tetramine, N-tetradecyl-tributylene tetramine, etc., N-dodecyl-tetraethylene pentamine, N-tridecyl-tetraethylene pentamine, N-tetradecyl-tetraethylene pentamine, etc., N-dodecyl-tetrapropylene pentamine, N-tridecyl-tetrapropylene pentamine, N-tetradecyl-tetrapropylene pentamine, etc., N-dodecyl-tetrabutylene pentamine, N-tridecyl-tetrabutylene pentamine, N-tetradecyl-tetrabutylene pentamine, etc., and corresponding N-alkenyl polyamines.

Illustrative examples of primary alkyl amines include dodecyl amine, tridecyl amine, tetradecyl amine, pentadecyl amine, hexadecyl amine, heptadecyl amine, octadecyl amine, nonadecyl amine, eicosyl amine, heneicosyl amine, docosyl amine, tricosyl amine, tetracosyl amine, pentacosyl amine, hexacosyl amine, heptacosyl amine, octacosyl amine, nonacosyl amine, triacontyl amine, hentriacontyl amine, dotriacontyl amine, tritriacontyl amine, tetratriacontyl amine, pentatriacontyl amine, hexatriacontyl amine, heptatriacontyl amine, octatriacontyl amine, nonatriacontyl amine, tetracontyl amine, etc. Conveniently, the long chain amines are prepared from fatty acids or more particularly mixtures of fatty acids formed as products or by-products. Such mixtures are available commercially, generally at lower prices and, as hereinbefore set forth, the mixtures may be used without the necessity of separating individual amines in pure state.

An example of such a mixture is hydrogenated tallow amine which is available under various trade names including "Alamine H26D" and "Armeen HTD." These products comprise mixtures predominating in alkyl amines containing 16 to 18 carbon atoms per alkyl group, although they contain a small amount of alkyl groups having 14 carbon atoms.

As hereinbefore set forth, the amine compound is reacted with an epihalohydrin compound. Epichlorohydrin is preferred. Other epichlorohydrin compounds include 1,2-epoxy-4-chlorobutane, 2,3-epoxy-4-chlorobutane, 1,2-epoxy-5-chloropentane, 2,3-epoxy-5-chloropentane, etc. In general, the chloro derivatives are preferred, although it is understood that the corresponding bromo and iodo compounds may be employed. In some cases, epidihalohydrin compounds may be utilized. It is understood that the different epihalohydrin compounds are not necessarily equivalent and that, as hereinbefore set forth, epichlorohydrin is preferred.

The amine is reacted with the epihalohydrin compound in a mole ratio of from 1 to 2 mole proportions of amine to 1 to 1.5 mole proportions of epihalohydrin compound. The polymer will contain from 2 to 20 or more recurring units and preferably from 3 to 10 recurring units. In general, the diamine is reacted with epichlorohydrin in a ratio of 1 mole of diamine to 1.25 moles of epichlorohydrin. When a monoamine is used, the monoamine preferably is reacted with epichlorohydrin in equal mole proportions.

The reaction of amine and epihalohydrin may be effected in any suitable manner. In one method, the desired quantity of amine and epihalohydrin compound may be charged to a reaction zone and therein reacted, although generally it is preferred to supply one reactant to the reaction zone and then introduce the other reactant stepwise. Thus, the epihalohydrin compound may be charged to the reaction zone and the amine is added stepwise, with stirring. Preferably, the reaction of epichlorohydrin with the second or later portions of the amine is effected at a higher temperature than with the first portion of the amine. The reaction preferably is effected in the presence of a suitable solvent and particularly a hydroxylic solvent. In a preferred method, a solution of the amine in a solvent and a separate solution of the epihalohydrin compounds in a solvent are prepared and these solutions then are commingled in the manner hereinbefore set forth, at least one of the solvents being hydroxylic. Any suitable hydroxylic solvent may be employed, a particularly suitable solvent comprising an alcohol including ethanol, propanol, butanol, etc., 2-propanol being particularly desirable. Other hydroxylic solvents comprise glycols including ethylene glycol, propylene glycol, etc., glycerol and other polyhydric solvents.

The reaction of amine compound and epihalohydrin compound is effected at any suitable temperature, which generally will be within the range of from about 70° to about 300° F. and preferably is in the range of from about 120° to about 200° F. Conveniently, this reaction is effected by heating an epichlorohydrin solution in dilute alcohol at refluxing conditions, with stirring, gradually adding the amine thereto, and continuing the heating, preferably at a higher temperature, until the reaction is completed, or the reverse order of adding the reactants may be employed.

After the initial reaction of the amine compound and epihalohydrin compound is completed, the organic halide salt which is inherently formed, is converted to an inorganic salt to thereby liberate the free amine for further reaction to form the desired polymeric product. This may be effected in any suitable manner and generally is accomplished by reacting the primary reaction product with a strong inorganic base such as sodium hydroxide, potassium hydroxide, etc., to form the corresponding metal halide. The reaction to form the metal halide is effected at a temperature within the range of from about 130° to about 210° F. and preferably from about 165° to about 200° F. The inorganic base preferably is added in at least two steps, with intervening heating and reacting, so that organic halide formed after the first addition of inorganic base is in turn reacted to liberate the free amine.

In one embodiment, the product at this stage of manufacture may be withdrawn from the reaction zone and filtered or otherwise treated to remove the inorganic halide. Generally, however, it is preferred to perform the next step in the same reaction zone without removing the inorganic halide. At the conditions used in forming the polymeric reaction product, the inorganic halide is inert and, therefore, its presence is not objectionable. Regardless of whether or not the inorganic halide is removed, the primary reaction product of the amine compound and epihalohydrin compound is now further heated and reacted in order to form the desired linear polymeric reaction product. This further heating and reacting is at a temperature of from about 130° to about 210° F. and preferably from about 165° to about 200° F.

After formation of the desired polymeric reaction product or before this step as mentioned above, the inorganic halide salt is removed in any suitable manner, including filtering, centrifugal separation, etc. In some cases, it may be of advantage to effect the filtration at an elevated temperature, which may range from about 100° to about 160° F. or more.

As hereinbefore set forth, the polymeric reaction product will have from 2 to 20 and preferably from 3 to 10 recurring units. The reaction products will range from liquids to solids and, when desired, may be prepared as a solution in a suitable solvent for ease of handling and use. A preferred solvent is an aromatic hydrocarbon including benzene, toluene, xylene, ethylbenzene, diethylbenzene, cumene, etc., or a mixed solvent such as naphtha, kerosene, xylene tower bottoms, etc. In one embodiment, all or a portion of the aromatic solvent desired in the final product may be used as a solvent during the reaction. In addition to the hydroxylic solvent, the aromatic solvent is allowed to remain in the final product.

As hereinbefore set forth, in a preferred embodiment the polymeric reaction product is formed as a solution in both an aromatic solvent and a paraffin oil. The aromatic solvent may be selected from those hereinbefore set forth and, for economical reasons, preferably comprises a mixed aromatic product as, for example, xylene tower bottoms, which generally are available at lower cost. Any suitable paraffin oil is used as the other solvent and generally will have an API gravity of above about 20° and a SUS viscosity at 100° F. of between 80 and 120 seconds. The solution of polymeric reaction product to be added to the lubricating oil may comprise from about 5% to about 20% and preferably from about 6% to about 15% by weight of the polymeric reaction product active ingredient, from about 5% to about 20% and preferably from about 6% to about 15% by weight of the aromatic solvent and from about 60% to about 90% and preferably from about 70% to about 88% by weight of the paraffin oil. It is understood that these concentrations are illustrative and that higher or lower concentrations of these components may be used when advantages appear therefor.

The polymeric reaction product is incorporated in the lubricating oil in a sufficient concentration to provide the desired lubricity and engine cleanliness. The concentration may range, on the basis of polymeric reaction product active ingredient, from about 0.5% to about 10% and preferably from about 1% to about 5% by weight of the lubricating oil. Accordingly, the amount of final solution to be used will be sufficient to introduce the polymeric reaction product active ingredient in a concentration hereinbefore set forth.

It is understood that the polymeric reaction product may be used along with other additives which normally are incorporated in lubricating oil including, for example, one or more of viscosity index improvers, pour point depressants, oxidation inhibitors, rust inhibitors, anti-foaming agents, extreme pressure additives, metal deactivators, etc. The additional additives will be selected with regard to the compatibility thereof with the polymeric reaction product and preferably are used in conventional concentrations.

The polymeric reaction product is used in any lubricating oil which is suitable for use in the two-cycle or rotary engine including the Wankel engine. In general, the lubricating oil will be available from those marketed commercially and preferably is of the SAE 30 lubricating oil viscosity. It is recognized that the lubricating oil for use in the two-cycle or rotary engines may differ somewhat from those normally used in other engines. Accordingly, special lubricating oils are marketed for such use by many of the oil companies and the particular lubricating oil will be selected with regard to the manufacturer's recommendations. Similarly, any suitable gasoline or other fuel, including alcohol or gasoline-alcohol mixtures, may be used. In most cases, the generally available gasoline is utilized for this purpose and comprises conventional gasoline boiling within the range of from about 75° to about 400° F., more or less, and comprises a mixture of hydrocarbons. The gasoline may contain conventional additives, including oxidation inhibitor, metal deactivator, detergent, dye, etc., and tetra-alkyl lead or other anti-knock agent. However, the trend is to eliminate lead from the gasoline and such elimination may cause other problems in the operation of the engine, which problems are minimized by the novel method of the present invention. The gasoline and lubricating oil will be used in any suitable proportions and may be within the fuel:lubricating oil ratios of from 20:1 to 150:1, although higher or lower ratios may be used when advantages appear therefor.

The following examples are introduced to illustrate further the novelty and utility of the present invention but not with the intention of unduly limiting the same.

EXAMPLE I

A polymeric reaction product is prepared by the reaction of one mole proportion of epichlorohydrin with one mole proportion of hydrogenated tallow amine. It will be noted that the hydrogenated tallow amine comprises a mixture which predominates in alkyl amines containing 16 to 18 carbon atoms per alkyl group, although they contain a small amount of alkyl groups having 14 carbon atoms. The reaction is effected substantially by first forming a solution of 2 moles of epichlorohydrin in 600 cc. of a solvent mixture comprising 400 cc. of xylene and 200 cc. of 2-propanol. A separate solution of 2 moles of the hydrogenated tallow amine is prepared in an equal volume of xylene. One mole of the latter solution is gradually added to the epichlorohydrin solution with stirring and heating at 130–140° F. for about 2.5 hours, after which another mole of the hydrogenated tallow amine is added gradually to the reaction mixture, stirred and reacted at 175° F. for about 2.5 hours. One mole of sodium hydroxide then is added with stirring and heating at 185–200° F. for 3½ hours, after which another mole of sodium hydroxide is added to the mixture, stirred and reacted at 185–200° F. for about 1 hour.

It will be seen that the heating and reacting after the addition of the sodium hydroxide and concomitant liberation of the free amine results in the formation of the desired polymeric reaction product. Following completion of the reaction, the mixture is cooled, filtered and the filtrate then is distilled to remove the alcohol.

In this preparation at least part and preferably all of the xylene solvent is allowed to remain and the concentration of xylene solvent is adjusted to form a solution containing the active ingredient in a concentration of 60% by weight. The resulting solution then is commingled with a paraffin oil having an API gravity of 23° in a proportion of 1 part by weight of the polymeric reaction product solution to 4.5 parts by weight of the paraffin oil.

However, for analytical purposes, a portion of the xylene solution is distilled at 0.1 mm. of vacuum to remove the xylene and to recover a substantially pure reaction product. This product is a white to off-white hard, brittle solid, and has a softening point of about 110° F. and melts at 125° F. to a dark yellow liquid, which liquid is soluble in all common hydrocarbons and other organic solvents. This product has an equivalent weight by titration with acid of 334.

EXAMPLE II

It will be noted that in Example I the first mole of tallow amine is reacted with epichlorohydrin at 130–140° F. and then the second mole of tallow amine is reacted at the higher temperature of 175° F. When effecting the reaction in this manner, the polymeric product will have a total of about 12 recurring units. However, when the reaction is effected at substantially the same temperature,

the reaction product will contain 5 or less recurring units. A specific preparation was calculated to comprise 4 recurring units and a molecular weight of about 1400.

The polymeric reaction product is commingled with a heavy aromatic naphtha to form a solution containing the polymeric reaction product active ingredient in a concentration of 40% by weight. The resulting solution then is commingled with a heavy paraffinic naphtha in a weight ratio of 1 part polymeric reaction product solution to 3 parts by weight of the paraffinic naphtha.

EXAMPLE III

The polymeric reaction porduct of this example is prepared by the reaction of 1 mole proportion of "Duomeen T" and 1.25 mole proportions of epichlorohydrin. As hereinbefore set forth, "Duomeen T" is N-tallow-1,3-diaminopropane and predominates in aliphatic groups containing 16 to 18 carbon atoms. The reaction is effected by charging 150 grams of epichlorohydrin, 100 grams of isopropyl alcohol and 15 grams of xylene into a reaction vessel and raising the temperature to about 115° F. Then 180 grams of "Duomeen T" and 135 grams of xylene are supplied to the reaction vessel, while maintaining the temperature at about 120° F. The reaction vessel then is heated to 165° F. and maintained at this temperature for 4 hours, after which the remaining amine (180 grams) and 135 grams of xylene are supplied to the reaction vessel and then heated for 4 hours. Following this primary reaction, 34 grams of sodium hydroxide are added gradually to the reaction vessel which is heated to 185° F. and maintained at this temperature for 4 hours, after which 17 grams of sodium hydroxide are added gradually to the reaction vessel and maintained at 185° F. for another 4 hours. Here again, it will be seen that the continued reaction at the elevated temperature after the addition of sodium hydroxide serves to effect polymerization of the primary reaction product because of the liberation of the free amine. Following the reaction, the vessel is cooled and the products are filtered to remove the inorganic halide salt and the filtrate then is distilled to remove the isopropyl alcohol solvent.

The polymeric reaction product then is formed as a 50% by weight active ingredient solution in xylene tower bottoms. The resulting solution then is commingled in a proportion of 1 part by weight thereof with 4 parts by weight of a paraffin oil available commercially as Shell Carnea Oil 21. This oil is said to have an API gravity of 21° minimum, an ASTM color of 2 maximum, a pour point of less than 15° F. maximum, a Cleveland Open Cup flash point of 310° F. and a SUS viscosity at 100° F. of 90–110 and at 210° F. of 37–40.

EXAMPLE IV

The solution prepared as described in Example III was evaluated as an additive in a fuel-lubricating oil mixture in a weight ratio of fuel to lubricating oil of 80:1. The fuel used in this example is available commercially as Indolene and comprises a high aromatic (38%) no lead fuel. The lubricating oil comprised a mixture of 80% by weight neutral oil and 10% by weight of bright stock and was formulated to simulate a SAE 30 lubricating oil. The evaluation was made in the Falex machine. This procedure is described in detail in a book entitled "Lubricant Testing" authored by E. G. Ellis and published by Scientific Publications (Great Britain) Limited, 1953, pages 150–154. Briefly, the Falex machine consists of a rotating pin which runs between two V-shape bearings which are spring loaded against the pin and provided with means for varying the load. The sample to be tested is poured into the metal trough in which the pin and bearings are partly submerged. In these evaluations, the test procedure consisted of an initial load of 200 pounds for 5 minutes, then increasing the load to 250 pounds for 5 minutes, and then the load is increased by 125 pound increments for 5 minutes each until seizure occurs. At each load increase the torque in pounds per square inch at each load and temperature are reported.

The following table reports the results of evaluations made using the Indolene alone with no added lubricating oil (Run No. 1), the Indolene-lubricating oil mixture containing 10% by weight of a commercial lubricating oil additive (Run No. 2), the Indolene-lubricating oil mixture containing 10% by weight of a different commercial lubricating oil additive (Run No. 3), and the Indolene-lubricating oil mixture containing 10% by weight of the solution prepared as described in Example III (Run No. 4). These results are reported in the following table.

TABLE I

Run No.	Torque							Temperature, ° F.						
	200	250	375	500	625	750	875	200	250	375	500	625	750	875
1	6-8	9-11	17-19	24-26	*27-30			155	177	222	251	283-370		
2	4-5	6-8	*13-30					120	141	174-206				
3	5-7	8-10	*17-19					130	159	202-232				
4	5-8	9-11	16-18	24-26	28-30	32-34	*36-60	150	175	211	245	283	300	340-403

*Seizure occurred in less than 5 minutes at the maximum load. The sample evaporated while running. No additional sample was added.

From the data in the above table, it will be seen that the Indolene alone (Run No. 1) underwent seizure at a load of 625 pounds. For the blend of gasoline and lubricating oil, it appears that the commercial additives for conventional lubricating oils were of no benefit and actually resulted in seizure at a lower load (Runs Nos. 2 and 3). In contrast to the above, the solution of polymeric reaction product prepared as described in Example III served to increase the load to 875 pounds (Run No. 4).

EXAMPLE V

The solution of polymeric reaction product in the heavy aromatic and heavy paraffinic naphthas, prepared as described in Example II, is commingled in a concentration of 8% by weight in a lubricating oil for use in admixture with gasoline in a gasoline to lubricating oil weight ratio of 100:1. The resulting mixture is used as charge to the combusion chamber of a spark ignited rotary engine.

I claim as my invention:

1. A lubricating oil-fuel mixture for two-cycle or rotary engines containing, as an additive to improve lubricity and engine cleanliness, the polymeric reaction product, formed at a temperature of from about 70° to about 300° F., of from about 1 to 2 mole proportions of a primary or secondary aliphatic amine of from about 12 to about 40 carbon atoms with from about 1 to about 1.5 mole pro-

portions of an epihalohydrin compound selected from the group consisting of epichlorohydrin, 1,2-epoxy-4-chlorobutane, 2,3-epoxy-4-chlorobutane, and 2,3-epoxy-5-chloropentane and corresponding bromo and iodo compounds.

2. The lubricating oil-fuel mixture of claim 1 containing said polymeric reaction product in a concentration of from about 0.5% to about 10% by weight of the lubricating oil.

3. The lubricating oil-fuel mixture of claim 1 in which said amine is a primary amine containing from about 12 to about 40 carbon atoms.

4. The lubricating oil-fuel mixture of claim 1 in which said amine is an N-aliphatic-alkylene polyamine containing from about 12 to about 40 carbon atoms in a said aliphatic.

5. The lubricating oil-fuel mixture of claim 4 in which said amine is N-tallow-1,3-diaminopropane.

6. The lubricating oil-fuel mixture of claim 1 in which said epihalohydrin compound is epichlorohydrin.

7. The lubricating oil-fuel mixture of claim 1 in which said polymeric reaction product is prepared as a solution in both an aromatic solvent and a paraffinic solvent.

8. The lubricating oil-fuel mixture of claim 1 in which the fuel is gasoline.

9. The lubricating oil-fuel mixture of claim 1 in which the fuel is alcohol.

10. The lubricating oil-fuel mixture of claim 1 in which the fuel is indolene.

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