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LUBRICANT COMPOSITIONS

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This invention relates to improved engine lubricant compositions which are especially effective in minimizing octane requirement increase. This application is a continuation-in-part of my co-pending application, Serial No. 304,858, filed August 16, 1952, now abandoned.

During the operation of spark ignition internal combustion engines, deposits are formed in combustion chambers and on associated engine parts, particularly when the engines are operated under conditions of low speed and light load. Such deposits are composed of decomposition products of the lubricating oil and the fuel.

Engine deposits bring about the problem of octane requirement increase. During the accumulation of engine deposits, the octane number requirement of the engine increases until a point of equilibrium in deposit formation is reached. Thus a clean engine—i. e. an engine containing no deposits—may have an octane requirement in the order of 70, whereas when deposit accumulation in the engine has reached the point of equilibrium, the octane requirement may be in the order of 80. The difference between these octane requirements is termed the octane requirement increase. In some cases this increase may be as high as 20 numbers.

Among the objects of this invention is that of providing improved lubricant compositions which minimize octane requirement increase. Other objects of this invention will be apparent from the ensuing description.

I have found that the above and other objects of this invention are accomplished by providing an improved crankcase lubricant composition for spark ignition internal combustion engines consisting essentially of crankcase lubricating oil and from about 3 to about 15 percent by weight based on the weight of the oil of acenaphthene. It has been found by actual engine tests that lubricating oil compositions as defined above result in substantial minimization of octane requirement increase. This result is particularly unexpected in view of the fact that this minimization is achieved without reducing the weight of engine deposits formed in the engine.

Acenaphthene is available as an article of commerce and methods of preparing this compound are well known in the art.

The crankcase lubricating oil used in the improved lubricants of this invention can be derived from natural crude oil, that is, mineral oil, or can be a synthetic lubricant. Generally speaking, the crankcase lubricating oil used in the improved lubricants of this invention should have an SAE viscosity number ranging from SAE 5W to SAE 50. For further details concerning the classification of SAE viscosity numbers, see Society of Automotive Engineers Handbook, 1955, pages 356–357.

The following examples illustrate the general methods of compounding improved lubricant compositions of this invention.

Example I

To 14.6 pounds of a phenol-treated, mixed-base mineral oil having a viscosity of 307 Saybolt Universal seconds (SUS) at 100° F. and 53.4 SUS at 210° F. and having a viscosity index (VI) of 103 was added 0.44 pound of acenaphthene. The resulting mixture was then heated to a temperature in the order of about 180° F. with continuous stirring, producing a hemogenous improved lubricant containing 3.0 percent by weight of acenaphthene.

Example II

With 1000 parts by weight of a Mid-Continent neutral solvent-extracted lubricating oil having a VI of 91 and Saybolt viscosity of 208 at 100° F. and 46.5 at 210° F. is mixed 140 parts by weight of acenaphthene.

Example III

With 1000 parts by weight of a commercial multigraded 10W–20 motor oil having a VI of 138 and a Saybolt viscosity of 239 SUS at 100° F. and 55 SUS at 210° F. is blended 30 parts by weight of acenaphthene.

To demonstrate the effectiveness of my improved lubricant compositions in minimizing octane requirement increase, I subject both a lubricating oil treated in accordance with my invention and another portion of the same lubricating oil to a testing procedure involving the use of a single-cylinder CFR knock test engine equipped with an L-head cylinder. This procedure consists essentially of operating this engine initially having a clean combustion chamber under relatively mild cycling conditions for deposit formation until an equilibrium with regard to octane number requirement is reached. In order to establish the octane number requirement of the engine at various stages of deposit accumulation, it is operated under the conditions of the full throttle portion of the test cycle. Reference blends of isooctane and normal heptane are used. Audible knock determinations are made as the ignition timing is varied to the point of trace knock. Three or more reference fuel blends which will produce knock between 5° ATC (after top center) and 15° BTC (before top center) are rated, and the octane number requirement at TDC (top dead center) is interpolated from the plot of these data. In order to establish a baseline, deposits are accumulated with a given fuel and oil, and the requirement of the engine is determined periodically until equilibrium requirement is reached. The difference between this equilibrium requirement and the requirement of the engine when clean is the requirement increase. Since requirement increase is affected by oil consumption rate when certain fuels and oils are used, and oil consumption rate is not necessarily uniform in duplicate tests, it is necessary to apply a correction for the amount of oil consumed during deposit accumulation. Such a correction has been determined experimentally by establishing in several tests the relationship between the rate of oil consumption and its effect upon equilibrium octane requirement increase. The effect of my improved lubricant compositions on octane number requirement increase is then determined by accumulating deposits in other tests operated under the identical conditions. By comparing the results obtained with my improved lubricating oil compositions with the baseline results at a corresponding rate of oil consumption, the corrections for the oil consumption rate are applied, and the resulting requirement increase obtained can be expressed in terms of a percentage reduction from the baseline. Consequently, the effective lubricating oil compositions produce a quantitative effect less than 100 percent of the baseline.

The effectiveness of my improved lubricant compositions in minimizing octane number requirement increase will be apparent from the following example.

Example IV

A single cylinder CFR knock test engine equipped with

an L-head cylinder was operated with a fuel comprising a commercial blend of straight run, and catalytically and thermally cracked stocks containing 3.0 milliliters of tetraethyl lead per gallon and an improved lubricant of the present invention comprising a commercially available lubricating oil containing 3.0 percent by weight of acenaphthene. The octane number requirement was determined in accordance with the preceding discussion. The same engine was then operated with another portion of the same fuel and lubricating oil, with the exception that the latter was free from acenaphthene, and the octane number requirement was again determined in accordance with the preceding discussion. It was found that the improved lubricating oil containing the acenaphthene lessened requirement increase by 49 percent as compared with the additive-free lubricating oil tested under identical conditions. Since the average requirement increase in passenger cars due to deposits amounts to about 10 octane units, a 49 percent reduction in octane number requirement increase would be expected to lower requirement increase to 5.1 octane units. Thus, this minimization of octane requirement increase would produce a net gain of 4.9 octane units. This gain is a significant increase in view of the high cost of supplying increased antiknock value by refinery processes.

Equally substantial reductions in octane requirement increase are brought about by employing lubricant compositions of this invention in which the acenaphthene content ranges from about 3 to about 15 percent by weight. By the same token, substantial reductions in octane requirement increase are brought about by employing such lubricant compositions in conjunction with various gasolines. Thus, the engine may be operated on various

blends of straight run, catalytically cracked, thermally cracked, and reformed hydrocarbons of the gasoline boiling range. The reduction in octane requirement increase brought about by employing my improved lubricants is particularly large when the fuel employed contains a substantial amount of unsaturated gasoline hydrocarbons.

The lubricating oil compositions of this invention can contain other additives. Thus, the lubricants of this invention can contain such materials as viscosity index improvers, e. g. acrylates and methacrylates, foam depressants, detergent-dispersants, pour point depressants and the like. Acenaphthene is effective in reducing octane requirement increase in both synthetic and natural lubricating oils, such as, for example, naphthenic oils, paraffinic oils, and mixed-base oils.

I claim:

1. An improved crankcase lubricant composition for spark ignition internal combustion engines consisting essentially of a crankcase lubricating oil and from about 3 to about 15 percent by weight based on the weight of said oil of acenaphthene.

2. An improved crankcase lubricant composition for spark ignition internal combustion engines consisting of crankcase lubricating oil and about 3 percent by weight based on the weight of said oil of acenaphthene.

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