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MANUFACTURE OF LUBRICANTS

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This invention relates to the manufacture of lubricants comprising certain hydrocarbons which have been subjected to a regulated degree of oxidation.

Under certain conditions of lubrication in which very high bearing pressures are encountered, often in connection with high temperature operation, the usual types of lubricants, either oils or greases, are found to be unsatisfactory. Under conditions of very high pressure and comparatively slow speed, oils are usually of insufficient body to separate the bearing surfaces and their use under such conditions results in destruction of the bearing surfaces and loss of power in the machine due to friction. In the lubrication of such bearings it is customary to employ a solid or semi-solid lubricant usually known as grease, which ordinarily is made up of a hydrocarbon oil thickened with a soap of an alkali or other metal. This type of lubricant is of little advantage over oil alone due to the fact that heat, either that produced through friction or that which is normal to the machine of which the bearing is a part, changes the composition and the structure of a grease of this type, entirely destroying its lubricating properties.

I have discovered that a superior lubricant may be prepared from a particular type of hydrocarbon oil by subjecting the same to carefully regulated oxidizing treatment. By the practice of my invention there is provided a series of solid and semi-solid lubricants which are not subject to the objections pointed out in connection with the ordinary type of lubricants. The new products not only exhibit unique and extraordinary lubricating properties but are very highly resistant to decomposition from heat and are homogeneous in composition throughout.

My invention contemplates a process for the manufacture of a novel lubricating material which comprises subjecting a paraffin or semi-paraffin base crude petroleum to distillation under such conditions that decomposition or cracking does not take place to an appreciable degree, continuing the distillation until the residue has the desired properties as determined by proper tests, then subjecting the residue to an oxidizing treatment at elevated temperature, the temperature and the amount of oxidation being carefully controlled to produce the desired properties, which will depend upon the use to which the final product is to be put.

The invention may be better understood by reference to the following specific example thereof in which the preparation of a particular grade of the novel lubricant is described, it being understood that the example is only given for the purpose of illustration and does not impose any limitation upon the scope of the invention. In this particular case a crude petroleum of the type usually obtained in the Mid Continent field is charged into a battery of continuous crude stills of the usual type and is subjected to distillation in the presence of steam to avoid decomposition. The distillation is continued, the oil in the still being frequently tested until after progressing to the last of the series of stills, the oil is found to have reached the required properties. At this point the oil will be found to be quite similar to the usual residuum from which, by further refining, the heavy lubricating oils known as cylinder oils are manufactured. In the particular case being described as an example the residuum is reduced until it has reached a flash test (standard Cleveland open cup) of approximately 475° F. and its viscosity (Saybolt standard) is approximately 130 seconds at 210° F. This residuum is then transferred to another still fitted with convenient air connections so that air may be forced through the oil. The contents of the still are heated to a temperature of about 435°–450° F. and air is blown through it at such a rate as to produce the desired degree of oxidation. With a thoroughly insulated oxidizing still, the rate of oxidation may be such as to supply sufficient heat for the reaction, the process thus requiring no additional external heat. However, in most cases and with ordinary uninsulated equipment it will be found necessary to apply a small amount of heat to the still during oxidation.

The quantity of residuum charged to the oxidizing vessel or still may be approximate-

ly 400 barrels in which case, the oxidation may be continued for 50 to 60 hours at the given temperature of 450° F., during which time air is forced through the residuum at the rate of approximately 30,000 cubic feet per hour.

The product from the above treatment should have the following approximate properties or tests.

Penetration (at 77° F.)	65 to 75
Melting point (dropping pt.)	280°–300° F.

The properties of the lubricating grease prepared under the conditions of the specific example are such as to yield a compound particularly suited for the lubricating of bearings operating at unusually high temperatures and pressures, such for example as the lubrication of rolls and like machinery used in steel mills. Other grades of the lubricant may be prepared ranging from a material which is a highly viscous liquid at ordinary temperatures and which is suitable for use in automobile transmissions, to a solid material melting above 300° F. and suitable for use under the most extreme conditions of high temperature lubrication.

There are several factors in the manufacture of the lubricant which are of importance in obtaining products having the varying physical properties thus described. In the first place, the degree to which the original crude petroleum is reduced by distillation will affect the properties of the final product obtained. In general, it will be desirable to reduce the crude until the residuum has a flash test of from 375° to 475° F., and it may be said that oxidized lubricants prepared from low flash residuum will, for a given melting point, have a higher penetration, that is, will be softer and more nearly plastic than lubricants prepared from high flash residuum. The melting point in the final product will be dependent upon the degree of oxidation employed, long continued treatment yielding a higher melting product than a comparatively short treatment, and it is also true that the temperature at which the oxidation is carried on may have some effect upon the melting point of the final product. The temperatures of oxidation may range from about 400° F. to 515° F. but best results are usually obtained by carrying on the oxidation in the neighborhood of 450° F., as it is found that the reaction proceeds quite slowly at the lower temperatures while at the upper limits, over 500° F., there is a tendency to form free carbon in the product.

From consideration of the foregoing, it may be readily seen that products may be manufactured the properties of which may have practically any desired relationship between melting point and consistency or penetration and that lubricants suitable for practically any condition of lubricating service may be prepared in accordance with the process of the invention.

Obviously many modifications and variations of the invention, as hereinbefore set forth, may be made without departing from the spirit and scope thereof, and therefore, only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. The process of manufacturing lubricants which comprises reducing a paraffin base crude petroleum by distillation without substantial decomposition until the residuum has a flash test within the range of 375° to 475° F., then intimately contacting the residual oil with a current of air at temperatures between 400° and 515° F.

2. The process of manufacturing lubricants which comprises reducing a paraffin base crude petroleum by distillation without substantial decomposition until the residuum has a flash test within the range of 375° to 475° F., then intimately contacting the residual oil with a current of air at temperatures between 400° and 515° F. until a product melting at a temperature in excess of 200° F. is obtained.

3. The process of manufacturing lubricants which comprises reducing a paraffin base crude petroleum by distillation without substantial decomposition until the residuum has a flash test within the range of 375° to 475° F., then intimately contacting the residual oil with a current of air at temperatures between 400° and 515° F. until a product melting at a temperature in excess of 300° F. is obtained.

In witness whereof I have hereunto set my hand this 4th day of October, 1926.

FELTON S. DENGLER.