DEPARTMENT OF COMMERCE

BUREAU OF STANDARDS

WASHINGTON

ADDRESS REPLY TO
BUREAU OF STANDARDS
OCB:EMS

IN YOUR REPLY
REFER TO FILE NO.
III-8/LC-387

Subject: Graphited Lubricants

In reply to your inquiry of there is inclosed herewith a copy of our Letter Circular No. 387 which gives general information on graphited lubricants. Detailed information on the merits or demerits of trade-marked lubricants is not available at the Bureau of Standards.

Respectfully,

BUREAU OF STANDARDS.

NED

Inclosure

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III-8

DEPARTMENT OF COMMERCE
BUREAU OF STANDARDS
WASHINGTON

Letter
Circular
LC-387

July 25, 1933

GRAPHITED LUBRICANTS

The Bureau of Standards receives numerous inquiries regarding various trademarked lubricants containing graphite for use either in the crankcase of automobile engines or as an upper cylinder lubricant. In order to facilitate the answering of these inquiries, this letter circular has been prepared as a general resume of the available information on graphited lubricants.

Viscosity is the most important property of a crankcase oil. In any given engine operating under normal conditions, the bearing friction is determined by the oil viscosity at the operating temperature, speed, and load. The lower the viscosity, the lower will be the friction under normal operating conditions. If the viscosity is lowered too much, however, inadequate lubrication will result and bearing failure may occur. No evidence has been obtained that graphite by itself will lower friction in engine bearings when the engine is operated under normal conditions. In most cases graphite is added to the mineral oil in the form of a preparation of low viscosity, and in such cases the viscosity of the oil after mixing is lower than the viscosity of the original oil. This lowering in viscosity results in lower bearing friction, an effect which is independent of the presence of the graphite. The same effect could be produced by using a mineral oil of lower viscosity.

Under operating conditions more severe than those normally encountered in service, viscosity is not the only factor determining bearing friction and many substances are known which when blended with oil will materially lower the friction even though the viscosity of the blend is the same as that of the original oil. Under these severe operating conditions, graphite tends to lower the bearing friction, although the effect is slight.

Any effect of graphite on the friction between the piston rings and the cylinders is more uncertain. It is known that graphite tends to fill up the pores of cast iron surfaces and to adhere very tenaciously. This may result in a somewhat smoother surface and may tend to lower the friction to a minor extent. Lowering of oil viscosity as the result of blending with the graphited preparation will, however, lower the cylinder wall friction to an extent dependent upon the change in viscosity on blending.

Use of a lubricated gasoline containing graphite appears to be of little benefit in general while the engine is operating, for in most cases more lubricant than is necessary for adequate lubrication gets past the piston rings. The use of an upper cylinder lubricant at times may be of some assistance as a temporary remedy in reducing the tendency of valves to stick. During engine starting under conditions where the cylinder walls have little lubricant on them, the use of a lubricated gasoline may be of some benefit in tending to reduce the wear on the piston rings and cylinders. During the process of breaking in an engine, use of a lubricated gasoline appears to have real value although the Bureau has no information as to whether the presence of graphite is of any material assistance or not.

Graphited lubricants have frequently been condemned on account of their abrasive properties, but this seems to be largely attributable to impurities in the graphite. It is reported that it is now possible to obtain graphite free from these abrasive materials and that there is little tendency to cause increased wear. This is probably true as regards cylinder walls, for any tendency to wear would be compensated by further adherence of graphite. In the case of bearings, some lapping action seems inevitable. The extent of such action will differ with the quality and fineness of subdivision of the graphite, but whether the lapping action is unobjectionable on bearings after they have been run in, is not known.

One of the major difficulties which has been encountered in connection with some graphited lubricants is to keep the graphite from settling out. This is particularly difficult in the crankcase oil since the oil tends to become acidic during use and in many cases, the presence of acid tends to cause the graphite to separate out.

Any increase in engine horsepower or in maximum car speed as the result of using graphite in an engine in good mechanical condition is extremely small, and well within normal variations with mineral oils. Increases in horsepower or in speed as the result of lowering in viscosity on blending with the graphited preparation may be large enough to be apparent, but such increases are caused only by the change in oil viscosity. Oil consumption with a well-designed engine in good mechanical condition would tend to increase in those cases where there is a lowering in viscosity. Gasoline consumption should not be noticeably different on using a graphited lubricant unless the carburetor

setting is changed to give a leaner mixture, an effect independent of the use of the graphited lubricant. With a car which is not in good mechanical condition, deposition of graphite on the cylinder walls may in some cases result in a better seating of the piston rings against the cylinder walls, and thereby increase the horsepower and car speed, and decrease the oil consumption.