TECHNICAL REPORT No. 388-45

ADDITIVE FOR LUBRICATING OIL

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SUMMARY

Description of an additive to lubricating oil developed for decreasing the break-in period of aircraft gasoline engines from 50 hours to 10 hours.

This information was previously forwarded as NavTec-MisEu Letter Report No. 119-45, File No. A 9-8 (10/Ma), Serial 452, dated 12 June 1945.

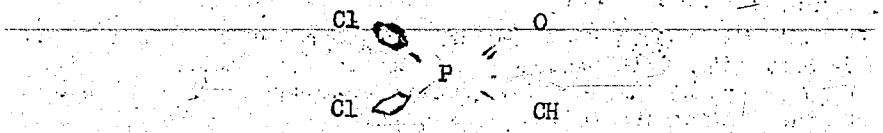
September 1945

U. S. NAVAL TECHNICAL MISSION IN EUROPE

3 p.

ADDITIVE FOR LUBRICATING

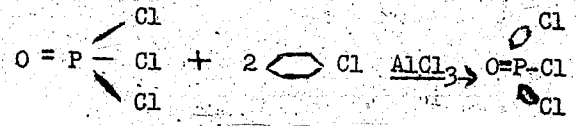
1. The information reported herein was obtained during an interrogation of Dr. Werk of the I-G Farbenindustrie at the Leverkusen Plant on 26 May 1945. To speed up delivery of aircraft engines, effort was directed toward finding an oil additive to decrease the time for the break-in period. In a long research which involved the preparation of many compounds, one successful compound was developed. This is a condensation product of phenyl chloride with phosphorous oxychloride to give:



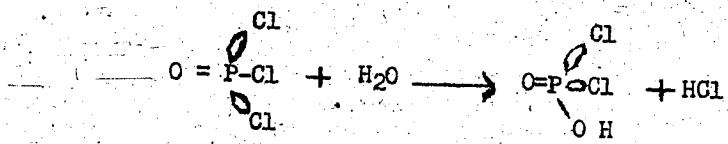
The solubility of this compound in lubricating oil was increased by preparing its stearylamine salt. The additive is used in concentrations of 0.5 to 1.0 percent by weight based on the phosphorous and was successful in reducing the break-in period from an average of 50 hours to an average of 10 hours. A quantity of approximately 10 tons per year was manufactured by directive of the Luftfahrt Ministerium and the entire production was used by Deimler-Benz and Junkers, manufacturers of engines for aircraft.

2. This additive is somewhat corrosive, a property claimed to be desirable for the break-in period, but not desirable for general use. For this reason it is not proposed as a general use additive for oils.

3. Phenyl chloride and phosphorous oxychloride react in the normal manner of a Friedel-Crafts condensation in the presence of aluminum chloride according to the following equation:



4. The apparatus used is a conventional glass-lined steel autoclave equipped with an agitator and effluent duct for the by-product hydrogen chloride. The optimum reaction temperature is given as 130° C. Aluminum chloride is not used in catalytic quantities but in amounts varying from one to three mols per mol of phosphorous compound. The crude reaction product is then hydrolyzed by treating with water:



5. The phosphorous compound is separated from the aqueous media by extraction with benzene. The benzene is removed by distillation and the resulting acid phosphorous compound is treated with stearylamine to give the following compound:

6. Other amines including the ethanelamines, have been tried but were not as successful as the stearyl compound. In spite of the shortage of stearin, containing materials which are among the edible fats, it was deemed important to use the stearylamine here instead of a less desirable substitute material.

7. It is to be noted that a production of only 10 tons per year was contemplated which, in concentration of one percent means only 1000 tons of lubricating oil. No information given as to the quantity actually produced. Furthermore the fact that the product is corrosive, and that its use is advocated by only one German technician, leads to the belief that this is not a currently used additive, but one which is merely in the process of development, under the guidance of Dr. Werk.

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