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RESEARCH ON SUBSTITUTES FOR ETHYLENE DIBROMIDE

by

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SUMMARY

Butylene chloride is the most suitable substitute for ethylene dibromide, but when this substance is used, the plugs must be changed every 25 hours of engine operation.

I. INTRODUCTION

In 1941, it was one of the most urgent problems to seek substitutes for ethylene dibromide for the following reasons:

A. Dimunition of imported stock of ethyl fluid.
B. Decrease in production of bromine from salt brine liquor due to rainy weather in 1940 - 1941.
C. Delay in construction of bromine production plant from sea water.

The author selected chlorine compounds as substitutes for ethylene dibromide, because the resources of iodine and fluorine were also very meagre in Japan. Also, the patents of Ethyl Gasoline Corp. disclosed the use of chlorine compounds.

II. DETAILED DESCRIPTION

A. Laboratory Test

Mixtures of ten compounds were selected from the standpoint of mass production out of liquid chloride compounds. These ten chlorine compounds were substituted in the ethyl fluid on the basis of an equivalent amount of ethylene dibromide. Then each of these fluids in the concentration of 0.15% tetra ethyl lead was added to the regular gasoline. After burning these gasolines in the laboratory, the deposits of the burnt gas on a glass plate were examined by a microscope. The author selected for further study the compounds showing the most amorphous deposits, for example, butylene chloride or benzyl chloride.

B. Single Cylinder Engine Tests

By single cylinder engine test, the effects on the plug and lubricating oil were examined (in co-operation with Mech. Eng. Comm. N. SAITO) and the results were compared with ethylene bromide and ethylene chloride (the latter is one of the patented compounds of the Ethyl Gasoline Corp.). Butylene chloride was more desirable than benzyl chloride or ethylene chloride, both in regard to corrosion or sludge formation in the engine.

C. Full Scale Engine Test

Using a full scale engine ("Sakae" engine for combat planes) the following test data were obtained.

Ethylene Dibromide	more than 40 hrs	)
Butylene Dichloride	25 hrs*	) until misfiring of
Ethylene Dichloride	17 hrs*	) plug

*Based on memory

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III. CONCLUSIONS

Butylene chloride is the most suitable substitute for ethylene dibromide, but when this substance is used the plugs must be changed every 25 hours (ca) of engine operation.