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ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1866.

Prevention of Hydrobromic Acid Corrosion by Corrosion-Preventive Compounds (Specification C-27-587).

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Background:

On February 20, 1945, Report of Investigation No. 1797, entitled "Corrosion Resistance of Anti-Corrosion Oils for Aircraft Engines," was submitted to A/C. A. L. Johnson, Director of Aeronautical Inspection, Department of National Defence for Air, Ottawa, Ontario. This report (requested under D.N.D. (Air)'s File No. 832-33C-11(AMSO/S.4-O-1)) described the results of tests made in accordance with Specification C-27-587 on three corrosion-preventive compounds. None of the three compounds fulfilled the specification requirements

(Background, cont'd) -

with regard to hydrobromic acid neutralization.

The specification for the hydrobromic acid neutralization test reads, in part:

> "The panels shall be removed from the emulsion, allowed to drain for one minute, then dipped ten times per minute for one minute in the specified compound-lubricating oil mixture."

In the work described in Investigation Report No. 1797, the samples were dipped ten times straight up and down in the compound-lubricating oil mixtures.

The present investigation was performed with the thought that corrosion-preventive compounds of this type might neutralize hydrobromic acid with less difficulty if a different interpretation were to be placed upon the test instructions outlined in the specifications.

The three compounds investigated were (1) Intava, (2) a compound submitted by the Shell Oil Co., and (3) a compound submitted by the R.C.A.F. which already had been tested by the University of Manitoba (see letter from the R.C.A.F., dated April 21, 1945).

TESTS PERFORMED:

The following dipping procedures were used in this investigation:

1. In the case of each corrosion-preventive compound, three samples of steel were slushed in the emulsion, removed, allowed to drain for one minute, then dipped ten times in the compound-lubricating oil mixture. During each dip the samples were moved back and forth in the mixture. It was felt that this washing action might cause the compound-lubricating oil mixture to mix more intimately with the hydrobromic acid emulsion on the surface of the metal, thus permitting more effective neutralization.

(Tests Performed, cont'd) -

2. In the case of each compound, one sample of steel was dipped in the compound-lubricating oil mixture only.

3. Two samples of steel were slushed in the hydrobromic acid emulsion only.

All of the above samples were then air-dried for two hours and finally treated for 24 hours in the humidity cabinet, in accordance with the specifications.

RESULTS:

The following results were obtained at the end of the treatment in the humidity cabinet:

1. In the case of each of the three corrosion-preventive compounds tested, the steel sample which was dipped in the compound-lubricating oil mixture only was entirely free from corrosion. A typical sample is shown in Figure 1.

2. In the case of each of the three compounds tested, the steel samples which were dipped in both hydrobromic acid emulsion and compound-lubricating oil mixture showed a certain amount of corrosion. Typical corroded samples are shown in Figure 2. It should be noted that a certain amount of corrosion took place on these samples during the unavoidable delay which occurred before the samples could be photographed. Accordingly, these samples were in somewhat better condition when removed from the humidity cabinet than is indicated by the photographs.

3. The steel samples which were slushed in the hydrobromic acid emulsion only showed a much greater amount of corrosion than that which occurred when the hydrobromic acid treatment was followed by treatment in the compound-lubricating oil mixture. A typical sample is shown in Figure 3.

CONCLUSIONS:

The following conclusions were drawn from this investigation:

1. The results obtained by moving the samples back and forth during each dip in the compound-lubricating oil mixture were not greatly different from those obtained by dipping straight up and down.

2. The treatment in the compound-lubricating oil mixture eliminated possibly 95 per cent of the corrosion which would have taken place due to the hydrobromic acid emulsion treatment.

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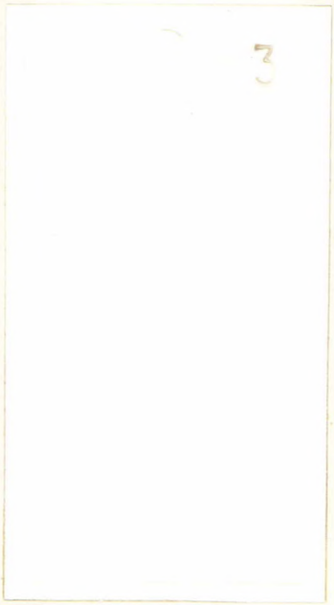
Figure 1.



TYPICAL STEEL SAMPLE WHICH HAD BEEN DIPPED IN THE COMPOUND-LUBRICATING OIL MIXTURE ONLY AND THEN TREATED IN THE HUMIDITY CABINET.

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Figure 2.

(a) (b) (c)

TYPICAL STEEL SAMPLESWHICH HAD BEEN DIPPED IN HYDROBROMIC ACID EMULSION, THEN IN THE COMPOUND-LUBRICATING OIL MIXTURE, AND FINALLY TREATED IN THE HUMIDITY CABINET.

(a) Intava compound was used for this sample.

(b) Shell Oil Co. compound was used for this sample.

(c) Compound submitted by the R.C.A.F. was used for this sample.

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Figure 5.

TYPICAL STEEL SAMPLE WHICH HAD BEEN SLUSHED IN HYDROBROMIC ACID EMULSION ONLY AND THEN TREATED IN THE HUMIDITY CABINET.

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