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O T T A W A February 20, 1945.

R E P O R T
of the
ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1797.

Corrosion Resistance of Anti-Corrosion
Oils for Aircraft Engines.

REPRODUCED FROM THE ORIGINAL FILED IN THE NATIONAL ARCHIVES AT OTTAWA, CANADA

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Origin of Request and Object of Investigation:

On December 11, 1944, a request (File No. 832-33C-11 (AMSO/S.4-0-1)) was received from the Chief of the Air Staff, Department of National Defence for Air, Ottawa, Ontario, for testing of two samples of anti-corrosion oil in accordance with Specification C-27-587 with the exception of paragraph 2(E) and Appendix IV. Later, a third sample of oil was submitted to be tested along with the first two.

Unfortunately, there was considerable delay in making the test, due to the fact that the construction of the humidity cabinet was not completed at the time the request was received; also, it was difficult to obtain speedily some of the materials required for the test.

Tests Performed:

A sample of diluent lubricating oil (3-GP-4 Class 4B) was supplied by the Department of National Defence for Air along with the samples of anti-corrosion oil. These were mixed in these Laboratories in the proportion of three parts diluent lubricating oil to one part of anti-corrosion oil. The solubility, pour point, viscosity, precipitation number, carbon residue, corrosion, ash, viscosity index and volatility tests were performed in the Fuel Research Laboratories of the Bureau of Mines. The test involving the use of silica gel impregnated with cobalt chloride is still to be completed by the Fuel Research Laboratories and the results will be included in a supplementary report. The protection and hydrobromic-acid neutralization tests were performed in these Laboratories. A humidity cabinet of the design described by Todd (Analytical Edition, Industrial and Engineering Chemistry, Vol. 16, June 1944, page 394) was used in these tests.

Results of Tests:

| | SPECIFICATION C-27-587 REQUIREMENTS | ANTI-CORROSION OIL IN MIXTURE | | |
|--|---|----------------------------------|-------------------|------------------|
| | | NO. 1 | NO. 2 (Intava) | NO. 3 (Shell) |
| (a) Separation after 24 hours at 210° F. | None. | None. | None. | None. |
| (c) Pour point, °F. | 20 (max.) | 10 | 20 | 10 |
| (d) Viscosity, seconds: Saybolt Univ. at 100° F. | - | 1618 | 1621 | 1618 |
| Saybolt Univ. at 210° F. (after elimination of the volatile content) | 100 to 125 | 118.4 | 118.9 | 118.4 |
| (e) Flash point, °F. (Cleveland open cup) | 350 (min.) | 485 | 440 | 485 |
| (f) Precipitation number | 0.1 (max.) | Trace. | Trace. | Trace. |
| (g) Carbon residue, per cent by weight (Conradson) | 2.5 (max.) | 1.7 | 1.5 | 1.8 |

(Continued on next page)

(Results of Tests, cont'd) -

| | SPECIFICATION C-27-587 REQUIREMENTS | ANTI-CORROSION OIL IN MIXTURE | | |
|--|---|---|--|---|
| | | NO. 1 | NO. 2 (Intava) | NO. 3 (Shell) |
| (h) Corrosion (copper strip, 3 hrs. at 212° F.) | Negative. | Negative. | Negative. | Negative. |
| (i) Ash, per cent by weight | 1.0 (max.) | 0.39 | 0.78 | 0.40 |
| (j) Viscosity index | 95 (min.) | 98 | 99 | 98 |
| (k) Volatile content, per cent by weight (24 hours at 221° F.) | 5 max. | 0.5 | 0.5 | 0.6 |
| (m) Protection | No evidence of corrosion, pitting, or other attack. | No evidence of corrosion, pitting, or other attack. | Corrosion as shown in Figures 1a and 1b. | No evidence of corrosion, pitting, or other attack. |
| (n) Hydrobromic-acid neutralization* | No evidence of pitting, corrosion, or discoloration | Corrosion as shown in Figure 2. | Corrosion as shown in Figure 3. | Corrosion as shown in Figure 4. |

* Note. In the instructions for performing this test, it is not stipulated whether the emulsion shall be 10 per cent by volume or 10 per cent by weight. In the above tests, a 10 per cent emulsion by volume was used.

Conclusions:

All of the oil mixtures fulfilled the specifications, with the following exceptions:

1. All of the mixtures produced corrosion in the hydrobromic-acid neutralization test.
2. The mixture containing No. 2 anti-corrosion oil (Intava) produced corrosion in the protection test.

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Figure 1.

(a)



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(b) - Reverse side.



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CORROSION PRODUCED BY THE OIL MIXTURE
CONTAINING NO. 2 ANTI-CORROSION OIL (INTAVA)
IN THE PROTECTION TEST.
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Figure 2.



CORROSION PRODUCED DURING THE HYDROBROMIC-ACID
NEUTRALIZATION TEST USING AN OIL MIXTURE
CONTAINING NO. 1 ANTI-CORROSION OIL.

The appearance of this panel is typical of the four
panels used in testing this material.

Figure 3.



CORROSION PRODUCED DURING THE HYDROBROMIC-ACID
NEUTRALIZATION TEST USING AN OIL MIXTURE
CONTAINING NO. 2 (Intava) ANTI-CORROSION OIL.

The appearance of this panel is typical of the four panels
used in testing this material.

Figure 4.



CORROSION PRODUCED DURING THE HYDROBROMIC-ACID
NEUTRALIZATION TEST USING AN OIL MIXTURE
CONTAINING NO. 3 (Shell) ANTI-CORROSION OIL.

The appearance of this panel is typical of the four panels
used in testing this material.

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