Preliminary Report on Development of Coating for Alloy Case

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July 27, 1956

MEMORANDUM

To: Barney Rubin
From: Paul E. Archibald
Subject: Preliminary Report on Development of Coating for Alloy Case

Summary

This report summarizes the work done to date on the selection of a coating material for the alloy case. The coatings examined were selected industrial finishes reported to have good resistance to corrosion and included epoxy resins reinforced with fiberglass. For screening purposes this preliminary work was done on commercial sheet magnesium to which had been applied the dichromate finish suggested in the report dated March 23, 1956, by W. Wade.

The coatings tested included:

1. Fuller 9806A (a nitrocellulose lacquer).
2. Neogrene N-700
3. Copon ER201 (a commercial epoxy formulation pigmented with red lead).
4. Copon ER200 (a commercial epoxy similar to ER201, non-pigmented).
5. Epon 828 + Agent T (a standard laminating resin).
6. Epon 828 + Agent T reinforced with fiberglass cloth.
7. KA 200 (an epoxy formulation suggested by Shell Chemical).
8. KA 200 reinforced with fiberglass cloth.

These coatings were tested for:

A. Impact Resistance.

This test consisted of subjecting the test panels to the impact of a 5-Kg weight dropped onto a rounded anvil of 1" radius. The distance of the fall was 100, 150, and 200 cm.

Barney Rubin

-2-

July 27, 1956

The photograph attached (Plate I.) shows the results of this test. The two lower marks on each panel were made at 100 cm, the two center marks at 150 cm, and the upper marks were made at 200 cm.

B. Corrosion Resistance.

This test consisted of the alternate immersion test ASTM B 192-44T. The results of this test are shown in Plate II. (The holes in the panels were punched after the coating was applied.) The panels were tested for 200 hours.

C. Abrasion Resistance.

This test, which is comparative only, consisted of exposing the test panels to a small sand blaster at a constant distance for various lengths of time. The results of this test are shown in Plate III.

D. Thermal Shock Resistance.

This test consisted of exposing the test panels to alternate temperatures of -65°F . and 165°F . The test was for four cycles.

Results

Impact Resistance

Under the conditions of the test previously described, the commercial epoxy formulations stand up very well, as does the XA 200 formulation suggested by Shell Chemical Co. The nitrocellulose lacquer (Fuller 9806A) and the Neoprene N-700 appear to be crushed, although the damage is restricted to the area of impact. The Epon 828, both with and without glasscloth reinforcement, shattered over a wide area (the dichromate finish being actually pulled from the magnesium panel).

Barney Rubin

-3-

July 27, 1956

Corrosion Resistance

Under the conditions of the test the epoxy coatings appeared to be superior to the nitrocellulose and very much superior to the neoprene coating.

Abrasion Resistance

In this test an attempt was made to obtain an eroded spot of approximately the same size by varying the time of exposure. Under such a method the neoprene coating lasted much longer than the other coatings tested, while the epoxy coatings lasted longer than the nitrocellulose.

Thermal Shock

None of the specimens tested showed any visible sign of failure, with the exception of the neoprene coating which developed a slight tack.

Conclusions

On the basis of the foregoing, it was decided to test the following coatings on alloy specimens:

Fuller 9806A

Copon ER201

Neoprene N-700 with an undercoat of Copon ER201

Nitrodur (a commercial epoxy which was not included in the initial tests).

The selection of the epoxy Copon ER 201 for further testing was based on

Barney Rubin

-4-

July 27, 1956

the necessity of limiting the number of specimens and the general practice of using pigmented paints for corrosion resistance.

The use of a single layer of glass cloth as a reinforcement is definitely eliminated. It is planned to make a test laminate of several layers of glass cloth and to form it onto a metal shape with contours similar to the actual case.

Paul B. Archibald

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