Preliminary Report on Development of Coating for Alloy Case

P. Archibald

July 27, 1956

This is an informal report intended primarily for internal or limited external distribution. The opinions and conclusions stated are those of the author and may or may not be those of the Laboratory.

Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under Contract W-7405-ENG-48.
DISCLAIMER

This document was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor the University of California nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or the University of California, and shall not be used for advertising or product endorsement purposes.

This report has been reproduced
directly from the best available copy.

Available to DOE and DOE contractors from the
Office of Scientific and Technical Information
P.O. Box 62, Oak Ridge, TN 37831
Prices available from (615) 576-8401, FTS 626-8401

Available to the public from the
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Rd.,
Springfield, VA 22161
DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, make any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.
DISCLAIMER

 Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.
MEMORANDUM

To: Barney Rubin
From: Paul B. 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 are described industrial finishes reported to have good resistance to corrosion and inclusion 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 90064 (a nitrocellulose lacquer).
2. Neoprene H-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).
7. XA 200 (an epoxy formulation suggested by Shell Chemical).
8. XA 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.
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 9306A) 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).
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 9306A
Copon ER 201
Neoprene N-700 with an undercoat of Copon ER 201
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
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

Distribution:
Copy 1 of S/A - B. Rubin
Copy 2 of S/A - M. Martin
Copy 3 of S/A - G. Haussmann
Copy 4 of S/A - B. Marsh (Sandia)
Copy 5 of S/A - K. Street
Copy 6 of S/A - J. Hms
Copy 7 of S/A - J. Bell
Copy 8 of S/A - Archibald