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FABRICATION PROCESS TEST EVALUATION -
SHIPPING, HI-74-SL

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FABRICATION PROCESS TEST EVALUATION -
SHIPPING, HI-74-SL

By

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Weapons Process Engineering
Research and Engineering
Chemical Processing Department

November 8, 1963

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FABRICATION PROCESS TEST EVALUATION -
SHIPPING, HI-74-SL

Test No.: FPT-63-19

Functional Area: Shipping, HI-74-SL

Test Procedure:

The test parts were canned on 10-7-62 and 10-8-63. Only six parts, all radiographic rejects, were used for the test instead of 12 parts as originally planned. The original test called for using one very porous and one relatively non-porous sand cast aluminum insert in each container. Shipping experience has shown no significant effect of porosity of inserts on corrosion severity of parts shipped in them. All inserts used were full contour support inserts. Each test part was canned in a separate container under conditions described in the process test. The shipping assemblies were stored for 21 days and the parts removed and inspected on 10-29-63. Colored photographs of the parts were taken on 10-30-63.⁽¹⁾

Results:

There was no marked difference in surface appearance between parts stored in inserts outgassed at room temperature and at 380 C. It should be noted, however, that the hot-outgassed inserts were stored in room atmosphere for several days between hot-outgassing and the start of the test during which time sorption of some moisture must be assumed.

The exterior surface of the two parts stored in oil with the container backfilled with argon suffered preferential hydride attack with "freckles" ranging in size from barely visible to .100" diameter. The "freckles" were scattered but concentrated mostly between 30° and 60°. The surface of these two parts was generally bright both inside and out except for the hydrided spots and some darkening of the sanded areas.

The two parts stored "clean" (very light film of oil is assumed) and in argon did not show positive hydriding attack. There were a few questionable spots that may have existed before the test and the numbers were moderately dark. The sanded areas were brownish bronze, there were interference colors on the inside and some dulling of the lustre on the outside.

The two parts stored "clean" and in dry air did not exhibit hydriding attack. The sanded areas were dark with a trace of green on one of the parts on the inside. The inside machined surfaces were generally bright with interference colors and the outside machined surfaces were dull silver. The numbers on the inside surface were quite dark. The outside surfaces from the pole to 45° contained scratches and clusters of small cracklike surface defects or crazed areas which apparently existed before the test.

(1) Copies of these photographs are in the possession of the following:
L. I. Brecke, G. C. Oberg and T. C. Nelson.

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Test parts and environment variables are listed below:

<u>Part Run No.</u>	<u>Date Canned</u>	<u>Oil</u>	<u>Clean</u>	<u>Argon</u>	<u>Dry Air</u>	<u>Results</u>
ZDS-23-9-747	10-7-63	X		X		<p>Inside - Shiny except where sanded. Numbers slightly darkened. No visible hydriding.</p> <p>Outside - Scattered hydride spots ranging from barely visible to .100" diameter occurring mostly from 30° to 60° off pole. Surface bright where not pitted or sanded. Sanded surface bronze to brown.</p>
ZDS-23-9-759	10-7-63		X	X		<p>Inside - Surface bright with some interference colors. Numbers were dark. Part had not been sanded.</p> <p>Outside - Surface a uniform silver color very slightly dulled. No sanded area. There was no evidence of hydride attack.</p>
ZDS-23-10-601	10-7-63		X		X	<p>Inside - No evidence of hydriding except that numbers were black. Machined surface had interference colors. Sanded surface around pole was dark with a green cast indicating some oxidation.</p> <p>Outside - Surface generally good. Sanded area was darkened to a brown bronze. There was no indication of hydriding but surface around the pole had an area of small cracklike defects on crazing.</p>

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Test parts and environment variables (Continued):

<u>Part Run No.</u>	<u>Date Canned</u>	<u>Oil</u>	<u>Clean</u>	<u>Argon</u>	<u>Dry Air</u>	<u>Results</u>
ZDS-23-10-609	10-8-63	X		X		<p>Inside was generally bright with no evidence of hydriding. Numbers were slightly darkened. Surface was brown-bronze where it had been sanded.</p> <p>Outside was generally spotted with hydride -- one bad cluster of deep hydride pits about 40° from pole. Spots did not follow scratches or marks. Sanded area was brown-bronze with no spots.</p>
ZDS-23-10-617	10-8-63		X	X		<p>Inside was dry, had interference colors and was darkened where sanded. Numbers were darkened.</p> <p>Outside had a light film of oil. No definite hydriding spots observed but area around 45° had numerous small surface defects as if part had not quite cleaned up during machining. Sanded area was darkened.</p>
ZDS-23-10-757	10-8-63		X		X	<p>Inside was bright but with interference colors on machined area. Numbers were dark. Sanded area was brown with slight green cast. There were no hydride spots.</p> <p>Outside machined surface was dull silver. Sanded surface was brown. No hydride was observed, but there were numerous scratches, dents and rough surfaces.</p>

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FABRICATION PROCESS TEST EVALUATION (Continued)Conclusion:

Hydriding occurs readily on surfaces with heavy oil film between the part and the supporting aluminum insert. Hydriding attack typical of that experienced in shipments of model 74-C components can be duplicated in storage and is not necessarily associated with actual shipping variables. All sanded areas may suffer mild oxidation during prolonged storage due to residual moisture and/or oxygen, but preferential hydriding attack does not occur readily on sanded surfaces. Clean, alloyed plutonium parts stored in either argon or dry air are not subject to noticeable hydriding attack.

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