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DOC
IMPROVED PROTECTIVE COATINGS FOR
SONAR DOMES.

Lab. Project 9300-13, Technical Memorandum #5
SS-011-001, Task 8481/2

11 4 APR 1966

MATERIAL SCIENCES DIVISION

Approved: E. A. IMBEMBO
Acting Associate Technical Director

U. S. NAVAL APPLIED SCIENCE LABORATORY
NAVAL BASE, BROOKLYN, NEW YORK 11251
The U.S. Naval Applied Science Laboratory is conducting a program, described in reference (a), for the development of sonar dome coating systems which have good erosion resistance, good anti-fouling properties, and are able to remain adhered when exposed to high level sonic pulses generated by high power sonar transducers. A similar objective is being pursued under BUSHIPS contract NObs 90357 by Prof. Max Kronstein of New York University.

This report presents data on six coating systems prepared by Prof. Kronstein under contract NObs 90357 and submitted under reference (c) for screening in the NASL new high sonic pulse facility. The request for the screening study was made by the Bureau of Ships on the occasion of reference (b).

The coating systems submitted for evaluation are described in enclosure (1). The facility and test procedure, described in reference (a), used for screening of the coating systems, consists of a test tank and a single SQS-26 sonar transducer as the high pulse generator.

The results of the tests on the six coating systems are tabulated in Table 1, and the erosion patterns are shown in enclosure (3).

The results of tests indicate that with the exception of Panel "a", which is actually a Mare Island Paint Laboratory developed exterior dome coating system used as a control, all the experimental coating systems formulated under the NObs 90357 contract eroded down to the base metal, and are not considered suitable for use on sonar domes.
Dear Mr. Cizek:

We are returning six of the test panels which you gave us. They are coated with the following systems:

a) One panel (Gates) is coated with:
   1 coat Wash Primer F.117.
   5 coats red lead vinyl primer F119.
   1 coat GACO Primer N-100-9
   Repeated applications of GACO N-29 Neoprene paint to 20 mil total thickness.
   2 coats polyisobutylene antifouling paint F 13h.

b) Different ones of our experimental paints, as follows:

   #1 : 1 coat of wash primer F 117.
   3 coats of red lead vinyl primer F 119.
   1 coat GACO Primer N-100-9.
   9 coats of our experimental paint V-3-72. This is a systematic combination of a combined vehicle of a Hypalon 30 Synthetic rubber with phenolic resin and tung oil, whereby the pigment is milled with dehydrated castor oil.

Enclosure (1)
#3: 1 coat of wash primer F 117.
3 coats of red lead vinyl primer F 119.
8 coats of our experimental paint V-3-52, up to 16 mil thickness.

#4: Same as #3, followed by
2 coats antifouling paint F 134.

#5: 1 coat wash primer F 117.
3 coats red lead vinyl primer F 119.
13 coats of new experimental paint V-3-56. This a synthetic rubber paint whereby the rubber is combined with synthetic resins after the resins have been heat-combined with tung oil and bodied linseed oil. To total thickness of 20 mils, after which were applied
2 coats of antifouling paint F 134.

#6: 1 coat wash primer F 117.
3 coats red lead vinyl primer F 119.
12 coats experimental paint V-3-62, to total thickness of 19-20 mils.
This experimental paint is similar to V-3-56, modifying its resin component. Then
2 coats antifouling paint F 134.

The preparation of these panels has been delayed somewhat by the fact that due to difficulties in the Railway Express transportation we have not been able to receive the F 134 paint from Norfolk.

After you will have any exposure results, we would be very much interested to get together with you in their inspection.

Yours very truly,

/s/ Max Kronstein
Senior Research Scientist

cc: Mr. R. Kramer
Code 634 A
Navy, BuShips, Washington, D.C.
### Results of NASL SIM

<table>
<thead>
<tr>
<th>Panel No.</th>
<th>Paint Coating System (Gates)</th>
<th>Dry Film Thickness (Total) Mils</th>
<th>Power Volt-Amps (Average)</th>
<th>Test Period Hours</th>
<th>Top Coat Fail Rem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. 1</td>
<td>1 coat Wash Primer F117, 3 coats Redlead F119, 1 coat Gaco Primer N100-9, 20 Mils Dry Film Gaco N-29, 2 coats F134</td>
<td>30.0</td>
<td>235</td>
<td>4½</td>
<td>0.06</td>
</tr>
<tr>
<td>1</td>
<td>1 coat Wash Primer F117, 3 coats Redlead F119, 1 coat Gaco Primer N100-9, 9 coats Exp. Paint V-3-72</td>
<td>22.0</td>
<td>235</td>
<td>4½</td>
<td>0.23</td>
</tr>
<tr>
<td>3</td>
<td>1 coat Wash Primer F117, 3 coats Redlead F119, 8 coats Exp. Paint V-3-52</td>
<td>28.0</td>
<td>235</td>
<td>4½</td>
<td>1.11</td>
</tr>
<tr>
<td>4</td>
<td>1 coat Wash Primer F117, 3 coats Redlead F119, 8 coats Exp. Paint, 2 coats A.F. F134</td>
<td>30.0</td>
<td>235</td>
<td>4½</td>
<td>0.95</td>
</tr>
<tr>
<td>5</td>
<td>1 coat Wash Primer F117, 3 coats Redlead F119, 13 coats Exp. Paint V-3-56, 2 coats A.F. F134</td>
<td>40.0</td>
<td>235</td>
<td>4½</td>
<td>2.13</td>
</tr>
<tr>
<td>6</td>
<td>1 coat Wash Primer F117, 3 coats Redlead F119, 12 coats Exp. Paint V-3-62, 2 coats A.F. F134</td>
<td>40.0</td>
<td>235</td>
<td>4½</td>
<td>4.05</td>
</tr>
</tbody>
</table>

**Note:**
1. Coating systems were prepared and applied by Prof. Max Kronstein of NYU under contract.
2. Panel No. designation and coating system data were supplied by Prof. Kronstein.
TABLE 1

RESULTS OF SONIC EROSION TEST OF PAINT SYSTEMS USING NASL SINGLE SOS-26 SONAR TRANSDUCER EQUIPMENT

<table>
<thead>
<tr>
<th>Test Period</th>
<th>ERODED AREA, SQ. IN.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>Top Coat Paint Removed</td>
<td>Paint Removed To Bare Metal</td>
</tr>
<tr>
<td>4½</td>
<td>0.080</td>
<td>0.000</td>
</tr>
<tr>
<td>23</td>
<td>0.208</td>
<td>0.000</td>
</tr>
<tr>
<td>4½</td>
<td>0.237</td>
<td>0.160</td>
</tr>
<tr>
<td>23</td>
<td>1.120</td>
<td>0.920</td>
</tr>
<tr>
<td>4½</td>
<td>1.118</td>
<td>0.105</td>
</tr>
<tr>
<td>23</td>
<td>2.858</td>
<td>0.358</td>
</tr>
<tr>
<td>4½</td>
<td>0.950</td>
<td>0.000</td>
</tr>
<tr>
<td>23</td>
<td>2.500</td>
<td>0.500</td>
</tr>
<tr>
<td>4½</td>
<td>2.132</td>
<td>0.048</td>
</tr>
<tr>
<td>23</td>
<td>6.000</td>
<td>0.105</td>
</tr>
<tr>
<td>4½</td>
<td>4.050</td>
<td>0.035</td>
</tr>
<tr>
<td>23</td>
<td>9.000</td>
<td>0.203</td>
</tr>
</tbody>
</table>

NYU under contract NObs 90357. The coatings were applied to 12 in. x 12 in. x 1/8 in. hot rolled mild steel. F. Fronstein.
Remarks

Mare Island Paint laboratory exterior dome coating system.
Anti-fouling formula FI34 showed "checking" of the surface before test.

Anti-fouling formula FI34 top coat eroded in a checkered pattern in a 1" x 1" area.

Badly eroded to base metal.
Badly eroded to base metal.
Badly eroded to base metal.
Badly eroded to base metal.
Slight erosion of top coat.
Badly eroded to base metal.
Badly eroded to base metal.
Badly eroded to base metal.
Badly eroded to base metal.
Badly eroded to base metal.

12 in. x 12 in. x 1/8 in. hot rolled mild steel plates furnished by NASL.