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Cleaning and protecting brass padlocks

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Project #: 18-253-1825.bis

Results reported by:

A handwritten signature in black ink, appearing to read "Ben Voight".

Ben Voight
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Approved by:

A handwritten signature in blue ink, appearing to read "John Wulterkens".

John Wulterkens
Technical Service Supervisor



Background:

The customer has been manufacturing various types and sizes of padlocks for 150 years. They utilize CNC machines as well as high-speed multi-spindle machines that allow them to develop almost any possible locking device quickly, efficiently and to high tolerances.

They are experiencing issues with corrosion on some models of brass padlocks they are manufacturing. Two oils are used in the manufacturing process (COFCAW32/COFCMico75), and then cleaned off in a three-stage wash cycle. Evercycle 411 is used in the first stage of the wash, followed by two water rinses.

Cortec Laboratories was asked to investigate the effectiveness of Evercycle 411's RP ability compared to a Cortec cleaner. Cortec Laboratories was also asked to investigate the use of an additional RP to use in the wash cycle.

Sample Received:

- ~ 200mL Evercycle 411 – cleaning solution. Good condition, no visible contamination
- ~ 200mL COFCAW32/COFCMico75 oil mixture. Good condition, no visible contamination
- 12 Brass padlocks – minor dirt/grease from manufacturing

Method:

ASTM D-1735 Water Fog

Materials:

- VpCI-418 LM lot# 082918
- VpCI-316 lot# 071616

Procedure:

Twelve brass padlocks were received from the customer. The padlocks were inspected and noted to have minor dirt and grease on them from manufacturing or shipping. The padlocks were cleaned with an alkaline cleaner and rinsed off with water. They were then rinsed with methanol, and pat dry using lint-free Kimwipes. After cleaning, the padlocks were dipped in a bath of the COFCAW32/COFCMico 75 oil mixture. The padlocks were randomly divided into 4 sets of 3, each of which would receive a different cleaning and rust preventative method. The following details are how each set was treated:

- 1) Cleaned with Evercycle 411, two water rinses (current method)
- 2) Cleaned with Evercycle 411, one water rinse, coat with VpCI-316
- 3) Cleaned with VpCI-418 LM
- 4) Cleaned with VpCI-418 LM, coat with VpCI-316

All samples were placed into the ASTM D-1735 chamber and time was recorded. Parts were inspected periodically for corrosion and time to corrosion was recorded. Testing was marked as complete once all parts from one set had corroded.

The pH of both VpCI-418LM and Evercycle was checked using a pH strip as an additional test.

Results:

Corrosion was noted in most samples 596 hours after testing. Full results and photos of corrosion observed can be seen on the next page.



Figure 1. Padlocks after 596 hours using current method (1). Cleaned with EverCycle 411, followed by two water rinses. Significant to moderate corrosion can be seen on the bottom of the padlocks.



Figure 2. Padlocks after 596 hours using VpCI-418LM, VpCI-316. (Treatment method 4). Minor staining can be seen occurring on the bottom edges of the padlocks, but staining can be wiped away with a lint free wipe.

1. ASTM D-1748 Results

Treatment	Parts with corrosion
Evercycle 411 only	3/3
Evercycle 411, VpCI-316	1/3
VpCI-418LM only	2/3
VpCI-418LM, VpCI-316	0/3

2. pH Test

Sample	pH
Evercycle 411	2-3
VpCI-418LM	10-11

Interpretations:

For the conditions tested, a wash with VpCI-418LM followed by application of VpCI-316 provided the best protection to the brass padlocks. Padlocks treated with this cleaning and protection process showed no corrosion after 596 hours (24.5 days). The current cleaning process (Evercycle 411 followed by two water rinses) performed the worst out of the tested methods, with all 3 padlocks showing signs of corrosion after 596 hours. Better protection was achieved by either using an alkaline cleaner or adding a RP after cleaning. However, using both an alkaline cleaner and RP provided the best protection results.

Checking the pH of both the submitted Evercycle 411 and VpCI-418LM showed a significant difference in pH. Evercycle 411 measured a pH of 2-3. While VpCI-418LM measured a pH of 10-11. A higher pH in cleaners/degreasers is generally more desirable. Acidic chemistry is a catalyst for corrosion, increasing the rate that corrosion occurs.