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Rust remover gel, rust primer, and VCI film comparison

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Background:
Direct In Supply is a new distributor of Cortec products. They have experience with corrosion products, as they were previously a distributor of a competitor product. Cortec Laboratories was asked to test VCI film they had on hand compared to VpCI-126 film. Cortec Laboratories was also asked to test two gel rust removers as well as a rust primer compared to Cortec's VpCI-423 rust remover gel, and CorrVerter rust primer, respectively.

Sample Received:
Unmarked/unlabeled sample of blue VCI film
Evapo-Rust Gel Rust Remover
Nox-Rust Premium Rust Remover
Total Solutions Rust Converter

Method:
VIA Test Method (CC-027)
ASTM B-117 conditions
Rust remover & primer comparison

Materials:
VpCI-126 lot#810240
VpCI-423 lot#030819
CorrVerter lot#185718

Procedure:
The standard VIA (CC-027) method was followed to test vapor phase protection of both VpCI-126 film and the submitted VCI blue film. Results can be found in Table 1 of the results section. The Buehler Grinder was used to grind plugs evenly.

To compare rust remover efficacy, 9 untreated carbon steel panels were placed into ASTM B-117 conditions. After remaining in ASTM B-117 conditions for 24 hours, panels were removed and allowed to dry. The panels were then divided into 3 groups of 3 panels to test at various time periods. Each set of panels had a small volume (~5 mL) of the selected rust remover, Evapo-Rust Gel, Nox-Rust Premium Rust Remover, or VpCI-423, placed onto the center of the panel. One panel was then rinsed off with water and inspected at 15 minutes, 30 minutes, and 1 hour.

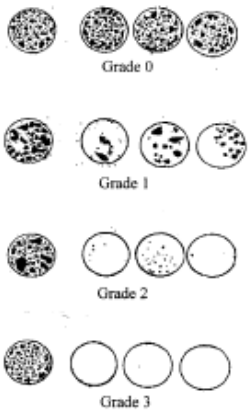
To compare rust converter efficacy, 6 large untreated carbon steel panels were placed into ASTM B-117 conditions. After remaining in ASTM B-117 conditions for 24 hours, panels were removed and allowed to dry. Panels were then divided into 2 groups of 3 for each rust converter to be applied. Total Solutions Rust Converter was sprayed on, and after approximately 3 seconds of spray, the nozzle became clogged by a light yellow/brown gel. The nozzle was wiped clean, and application was attempted again. The nozzle continued to clog within 1 second of product being sprayed on panels. Due to inability to apply product sufficiently to the panels, this portion of the testing was not continued.

Table 1: VIA Results

Sample	Plug #1	Plug #2	Plug #3	End Result
VpCI-126	Grade 3	Grade 2	Grade 3	Pass
Blue film	Grade 2	Grade 1	Grade 2	Fail
Control	Grade 0	--	--	Fail

VIA Test Grades (Grade 2 or 3 are passing)
All three plugs must be grade 2 or better to pass the test

Grade 0: Blind test
No corrosion inhibiting effect
Grade 1: Blind test
Minute corrosion inhibiting effect
Grade 2: Blind test
Medium corrosion inhibiting effect
Grade 3: Blind test
Good corrosion inhibiting effect



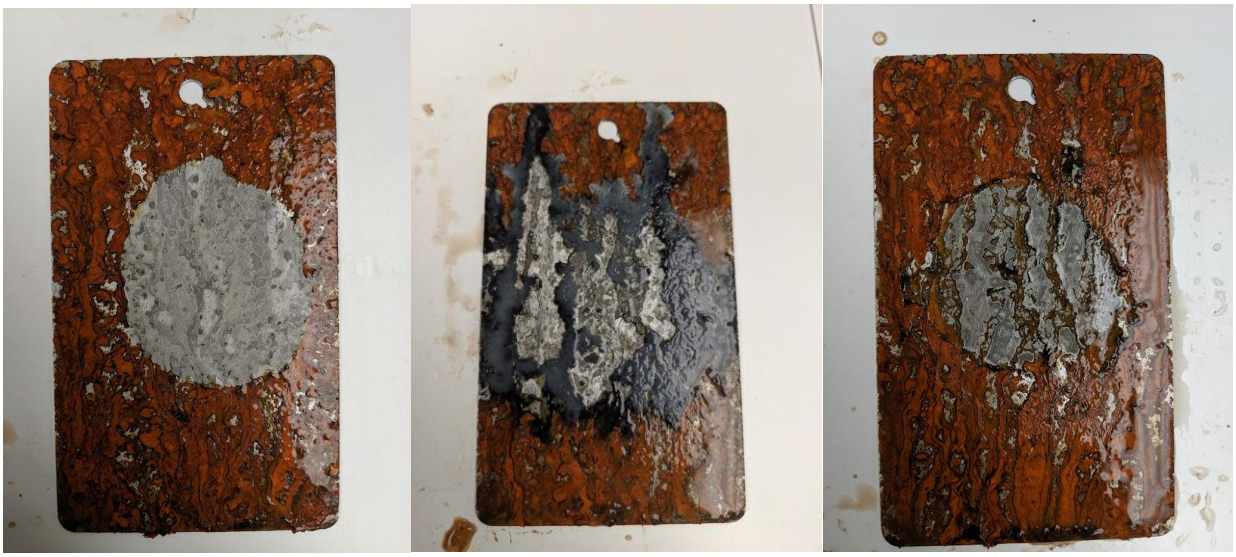


Figure 1: Panels after 1 hour of exposure to various rust removers. From left to right, VpCI-423, Evapo-Rust Gel, Nox-Rust Premium Rust Remover

Full pictures of rust remover test can be found in Appendix A. Panels exposed to VpCI-423 showed complete rust removal on the exposed surface at 1 hour. Evapo-Rust Gel panels showed moderate rust removal from the exposed surface, however, some dark staining occurred where product was applied. This staining could not be removed with a water rinse but could be removed by brushing and scrubbing the panel. Panels treated with Nox-Rust Premium Rust Remover showed significant rust removal as well, but deeper rust remained on the treated surface. From **Figure 1.A**, VpCI-423 performed better than the competitor products after 1 hour.

It was noted that the Evapo-Rust Gel product was not applied as a gel. The bottle was shaken to mix the solution, but the product poured out like a liquid. Therefore, the removal/stain pattern seen on the panel is not a uniform area, as the liquid ran and spread across the surface. A large chunk of gel was observed at the bottom of the bottle and was not able to be mixed back into the solution.

Figure 2: Panels sprayed with Total Solutions Rust Converter. Black spots appeared on the panels where the product was able to be applied, showing some degree of performance. Due to difficulty spraying the product, this test did not proceed further than pictured above.

Due to the inability to apply the product, the rust converter test did not continue. What product was applied showed some degree of reaction with the surface rust, as spots where product was applied did turn black. If the product was able to be applied, either ASTM B-117 conditions would be tested on the rust converter, or an adhesion test would have been done.

Interpretations:

The blue VCI film submitted did not receive a passing grade on the VIA test, but did show medium corrosion inhibiting effect. VpCI-423 performed the best of the tested rust removers, showing complete removal from the applied surface without any staining. The rust converter submitted was not able to be applied due to the nozzle clogging but showed some sign of performance.

Appendix A – Photos from rust remover comparison test

Figure 1.A: Rust remover comparison at 15 minutes. From left to right, VpCI-423, Evapo-Rust Gel, Nox-Rust Premium Rust Remover.

Figure 2. A: Rust remover comparison at 30 minutes. From left to right, VpCI-423, Evapo-Rust Gel, Nox-Rust Premium Rust Remover.

It is worth noting, VpCI-423 at 15 minutes showed similar or better performance than both Evapo-Rust Gel and Nox-Rust Premium Rust Remover after 1 hour of testing. Significant removal of rust was observed in panels tested with VpCI-423 without staining or deeper rust in the panel remaining.