4119 White Bear Parkway, St. Paul, MN 55110 USA
Phone: (651) 429-1100, Fax: (651) 429-1122
Toll Free: (800) 4-CORTEC, E-mail: info@cortecvci.com
cortecvci.com • corteclaboratories.com

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Certificate # L2267 Testing

Testing Corrosion Protection of Water Based Rust Preventatives

From: Cortec Corporation Laboratories
4119 White Bear Parkway
St. Paul, MN 55110

cc: Boris Miksic
Anna Vignetti
Cliff Cracauer
Jessica Carpenter

Project #: 12-242-1825.bis

Test conducted by:

Caleb Pheneger
Technical Service Engineer

Approved by:

Margarita Kharshan
Laboratory Director

Date: January 11, 2013

Background: The customer would like to determine which water based rust preventative will provide the best corrosion protection to metal rings coming out of a high temperature process.

Sample Received:

- Four pre-coated steel rings (9.5 cm in diameter)
- Four un-coated steel rings (11.5 cm in diameter)

Method: ASTM D-1748 Humidity (120ºF, ~99% relative humidity)

Materials: Steel test rings
BioCorr Rust Preventative (16072)
VpCI-377 (14922)
Laboratory grade methanol
VpCI-414
DI Water

Procedure: The following procedure was used:

1) Clean the 4 uncoated steel rings with VpCI-414 and let dry.
2) Clean the 4 uncoated steel rings with methanol and wipe dry.
3) Coat these 4 rings each with a rust preventative as follows:
    a. VpCI-377 (5% dilution in DI water)
    b. VpCI-377 (5% dilution in DI water)
    c. BioCorr
    d. BioCorr
4) Allow parts to hang overnight to dry.
5) Label all 8 parts and then hang in ASTM D-1748 humidity cabinet by plastic coated paper clips.
6) Monitor the parts daily to check for visual corrosion.
7) Remove all parts and photograph at end of test.

Results: The following results were found:

ASTM D-1748 Humidity- 600 hours of testing

Rust Preventative	Time to Failure (Hours)
International Chemical 152	480
International Chemical 152	384
International Chemical 152	528
International Chemical 152	432
BioCorr	DNF
BioCorr	DNF
VpCI-377	DNF
VpCI-377	264*

DNF = did not fail during 600 hours of testing
* Part fell to bottom of chamber causing failure

Interpretations: Parts coated with BioCorr and VpCI-377 at 5% dilution both protect these steel rings better than the parts pre-coated with International Chemical 152. The average failure time of the pre-coated parts was 456 hours. BioCorr and VpCI-377 at 5% dilution did not fail during 600 hours of testing. The photos below verify the results. It should be noted that the dark color of the pre-coated parts makes it difficult to see the pitting and black oxides. Also, the small spots of corrosion on the BioCorr and VpCI-377 parts are where the plastic coated paper clip was supporting the part.

Photos: Photos of parts taken after 528 hours in humidity cabinet:

Figure 1: International Chemical 152 coated part after 600 hours of testing

Figure 2: Close up of International Chemical 152 coated part to show corrosion

Figure 3: Part Coated with VpCI-377

Figure 4: Part Coated with BioCorr Rust Preventative

* Red boxes indicate spot of corrosion. In each case the plastic coated paper clip supporting the part was in contact with this area.