

Evaluating the Vapour Inhibiting Ability Vapro 820 VCI Pak Using German Test Method TL 8135-002

Nelson Cheng¹ PhD (Honoris Causa), Patrick Moe¹ BSc, Grad Dip, MSc, Derek Cheng¹ Dip.
¹Magna International Pte Ltd
Singapore

Dr Benjamin Valdez Salas², Dr Michael Schorr²
²Autonomous University of Baja California

Article Info

Article History

Date of Publication:

15 January 2018

Available online:

05 February 2018

Keywords:

VCI Pouch

Corrosion

Inhibition

Abstract

Controlling vapour pressure of VCI Products is the state-of-the-art of VCI manufacturers as different VCI carriers are used to meet each unique application due to the wide applications of VCI products. Ascertaining the Vapour Corrosion Inhibition Ability of VCI product is of paramount importance to all manufacturers.

In view of the above, a reliable test method is essential. The German TL 8135-002 Test Method has been adopted to ascertain the Vapour Inhibition Ability (VIA) Properties.

Introduction

Different VCI carriers such as polyurethane foam, Tyvek pouches, Tyvek sachets, polyethylene film, kraft papers, oils, solvents, water, etc. are used in the production Vapro VCI Products. The German test method TL 8135-002 is used to determine the corrosion protection effect of VCI auxiliary packing materials such as VCI foam emitter, VCI pouch, VCI powder, VCI papers, oils, powders, and films on a defined test object of constructional steel.

A test sample with a high degree of sensitivity to corrosion through condensation water is packed together with a VCI auxiliary packing material in a vessel, which is then tightly closed. Condensation is then forced on the surface of the test sample. By means of a blank trial that is, a trial structure of the same type, but without VCI auxiliary packing material – it is determined whether the conditions of the trial are sufficient to cause corrosion to appear on the unprotected test sample.

Test object

4 pieces of unalloyed, solid construction steel.

Test Sample

Vappro Pak VCI Pouch



Test solution

10 ml freshly prepared glycerine/water mixture with a density of 1.076 g/cm³ at (23±2) °C, which is intended to produce approximately 90% Relative Humidity in the jar.

Test Equipment and Material

For each test, 4 test sets are necessary. A test set consists of the following parts

- (1) Test Jars, 1 L, wide-necked.
- (2) Rubber stopper, 54 mm \varnothing , with longitudinal through hole
- (3) unalloyed, solid construction steel test objects
- (4) Vappro Pak.
- (4) 10 millilitres freshly prepared glycerine/water mixture with a density of 1.076 g/cm³ at (23± 2) °C (glycerine/water mass ratio about 1:2)
- (5) Ethanol

Procedure of the test

Four test objects were polished with 320 grit abrasive paper to remove all grit and rust, then rinsed with ethanol and dried.

Polished test object was inserted into the rubber stopper. Please see below picture figure A.

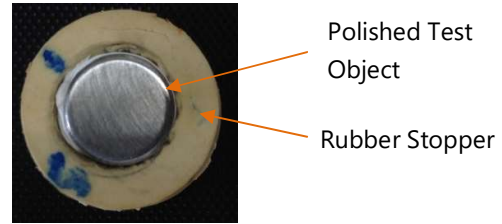


Figure A

The rubber stopper was inserted to the test jar cover, and one piece of Vappro 5 was suspended in the jar. The test jar was sealed with its cover. Please see below picture figure B.

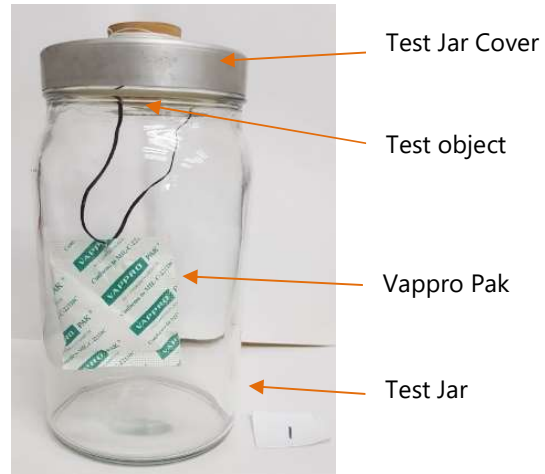


Figure B

For the blank sample, test jar was sealed without inserting the Vappro 5. It contained no VCI chemicals and was only used as a control/yardstick for the experiment. Please see below picture figure C.



Blank Sample without VCI protection

Figure C

The four test sets were stored for a period of (20 ± 0.5) hours at a room temperature. At the end of the storage period, the jar covers were removed from the test jars. The freshly prepared 10 ml of test solution glycerine/water mixture was poured into each jar immediately after opening, and the jars were immediately closed again. Please see below picture figure D.



After adding 10 ml of glycerine/water mixture

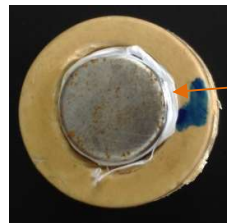
Figure D

After an additional 2 hours \pm 10 minutes, the test jars were stored for a period of 2 hours \pm 10 minutes in the heating chamber at temperature 40°C to create 90% Relative Humidity in test jars.

On conclusion of storage in the heating chamber, the test objects were disassembled from test jars and dried with warm air, then inspected for any signs of corrosion on the sanded surface of the test objects from the four jars.

Test Result

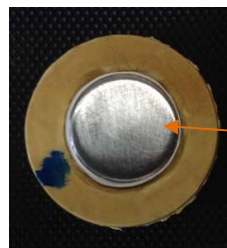
The sanded surface of the test object from the blank sample was badly rusted. Please see below picture figure E.



Blank Sample badly rusted

Figure E

No sign of corrosion was found on three test objects protected with Vapro Pak. Please see below picture figure F.



No corrosion

Figure F

Blank Sample (Without VCI Film)	Protected samples with Vapro Pouch.
	
Badly Rusted	No visible corrosion was found on all three test objects

The Requirement of TL 8135-0002 for the corrosion protection effect:

Evaluation of the test objects



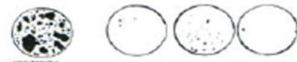
Blindprobe

Keine korrosionsschützende Wirkung



Blindprobe

Geringe korrosionsschützende Wirkung



Blindprobe

Mittlere korrosionsschützende Wirkung



Blindprobe

Gute korrosionsschützende Wirkung

Corrosion protection effect

None (Grade 0)

Slight (Grade 1)

Middle (Grade 2)

Good (Grade 3)

Conclusion:

Based on above the test result, Vapro Pak passed the Grade 3 German test method TL 8135-0002.

References:

1) <http://wenku.baidu.com/view/218bb0cf0508763231121238.html>
http://www.controlox.eu/wp-content/uploads/2017/05/BFSV-Test-Report-2430-17_kar_VCI-film-Englisch_corrosion-protection-effect-TL-8135-0043_170412.pdf

2) German Test Method TL 8135-002 DFJ Appendix A German test method TL 8135-002 Testing of- E-ZAK VOP <https://verejnezakazky.vop.cz/.../12759a42f0ee6e44-priloha-c-4-german-test-method-tl->

3) Paper 04418 - Cortec Corporation

<https://www.cortecvci.com/Publications/Papers/VCIFundamentals/04418.pdf> by AY Furman - 2004 - Cited by 4 - Related articles
The paper presents the example of such a program and the data of this study. Corrosion protection provided by VCI vs. distance from its source was evaluated by corrosion monitoring, utilizing metal coupons and Corrosometer with special probs. Keywords: Vapor corrosion inhibitor, corrosion tests, corrosion rate, corrosion ...

4) Testing of VCI-papers in accordance with the Technical Terms of agris.fao.org/agris-search/search.do?recordID=DE19800582733 by A Duensing – 1980 Testing of VCI-papers in accordance with the Technical Terms of Delivery TL 8135-002 of the German Federal Armed Forces [packages for foods]. [1980]. Duensing A. Access the full text:

4) TL 8135-002_百度文库

<https://wenku.baidu.com/view/218bb0cf0508763231121238.html>

Translate this page

Jul 1, 2017 - Appendix A German test method TL 8135-002 Testing of Anti-Corrosive Effect of VCI Auxiliary Packaging Materials A.1 Purpose and Area of Application A high humidity level in the air and/or condensation can lead to corrosion even in airtight materials, thereby rendering the materials unusable.

5) German test method TL 8135-002 – GREENVCI:Anti Rust Plastic Bags ...

www.ถุงพลาสติกกันสนิม.com/.../german-test-method-tl-8135-0...

Translate this page

Sep 28, 2015 - สำหรับบรรจุภัณฑ์ป้องกันสนิมหรือ VCI Packaging

ซง_ึ้ ในหน_ึ้ จ!ึ้ ะกล่าวรวมทั้ง! พลาสติกกันสนิม (VCI Film)และกระดาษ(VCI Paper)โดยในวันหน!ึ้ างที่มงาน

ENDUPAKขอนำเสนอขบวนการทดสอบความสามารถในการป้องกันสนิมของบรรจุภัณฑ์ป้องกันสนิม (Anti-Corrosion Packaging) ตามมาตรฐานของGerman test method TL 8135-002