Surface Bonded Soluble Salts vs. Coatings Performance

A Special Presentation by: CHLOR RID International, Inc.

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GULF COAST SALES MANAGER

- Marine, Petrochemical, & Offshore Coatings Industry Since 1968
- Involved in Surface Preparation, Application, Manufacturing, Inspection, Consulting & Sales
- NACE CIP Level III Peer Certification # 850 (1988)
- SSPC: The Society For Protective Coatings – Gulf Coast Chapter Chairman 2014 - 2015
Surface Preparation: Doing it Right!

1. Soluble Salts: Understanding the Problem
2. Testing: Where to Test
3. Decontamination: The Best Practice
4. Final Testing: Insuring Success
Overview

Surface Preparation: Doing it Right!

Soluble Salts: Understanding the Problem
DOES THIS LOOK FAMILIAR?
YOU HAVE SEEN THIS BEFORE
The Importance of Surface Preparation

Irrefutable evidence that soluble salts are a leading cause of coating failure.

“The most important single factor influencing the life of the paint is the proper preparation of the metal surface”
Corrosion and Corrosion Control, H.H. Uhlig and R. W. Revie

“For every 1 µg/cm² increase in chloride level, coating life cycle performance can be reduced by 50%.”
Comment from H. Mitschke on the summary of his SSPC award winning work (2002)
What are SALTS?

- Salt is defined as a material that ionizes a solution. In water (H₂O) salt is an electrolyte.

- Hundreds of salts exist.

- The three most commonly encountered problematic salts are chloride, sulfate and nitrate.

Note: There are others but they are not as nearly as Abundant.

Chloride, Sulfate, Nitrate
What are SOLUBLE SALTS?

- Primarily **chloride**, **sulfate** and **nitrate** soluble salts
  - Iodides
  - Fluorides
  - Bromides

- Ionic Contaminants

- Water soluble inorganic compounds

- Non-visible contaminants
THE FACTS: What changed, why are salts a problem?

- Why weren't salts a problem when we used lead based paint?
  - Lead paint reacts with salts and makes it insoluble.
    - Soluble salts cause corrosion when wetted by dew or rain.
  - Paints today do not contain lead therefore the salts remain soluble
  - The transition from lead based to polymeric based coatings and thin film coatings make salt removal that much more critical.
Soluble Salt Sources

- Marine bodies
- Acid rain
- Fossil fuel power plants
- Chemical processes
- De-icing salts
- Vehicle emissions
All coatings are permeable to moisture.

If no salts are present, there is no electrolyte present and salt induced corrosion does not occur.

When moisture passes through a coating and comes in contact with a soluble salt, the corrosion process starts.

WHAT CAUSES PREMATURE COATING FAILURES?
Non-visible Contaminates

Non-visible/Non-Physical
- GOD
- Human Spirit
- Human Thoughts

Non-visible/Physical
- Air-Oxygen
- Carbon monoxide
- Electricity

SOLUBLE SALT-ION

Only the RESULTS are visible
The damage has already occurred at this point
The water is filtered by coating to a Purified or DI water making it Ion deficient.
Corrosion Cell
(Like a battery cell)
The electrochemical attachment of salts to the substrate are greater than the forces applied to remove them.
Sources

Estimated chloride ion deposition, 1999

Sites not pictured:
AK01  0.1 kg/ha
AK03  0.1 kg/ha
VI01  30.3 kg/ha

National Atmospheric Deposition Program/National Trends Network
http://nadp.sws.uiuc.edu
Overview

Surface Preparation: Doing it Right!

Testing: Where to Test
WHERE TO TEST

TEST HERE:
THE DEEPER THE PIT, THE HIGHER THE CONCENTRATION OF SOLUBLE SALTS
WHERE TO TEST

TEST HERE:
Ion specific, accurate, and easy to use field test kits:

**Chloride, Sulfate, Nitrate**

**REMINDER** – These are the most commonly encountered soluble salts.
TESTING FOR SOLUBLE SALTS

CHLOR*TEST

CHLOR*TEST ‘CSN’

CHLOR*TEST ‘A’
Ion specific, accurate, and easy to use field test kits:

- **CHLOR*TEST™:** Field test kit for surface chloride.
- **CHLOR*TEST CSN™:** Measurement of chloride, sulfate, and nitrate contamination.
- **CHLOR*TEST ‘A’™:** Chloride ion test for abrasives
- **CHLOR*TEST™ ‘C’™:** Chloride ion test in concrete
Ion specific, accurate, and easy to use field test kits:

- **CHLOR*TEST ‘W’™:**
  - Chloride test for water

- **NEW! e_CHLOR*TEST™:**
  - Electronic measurement of chloride

**Summary:** Detection of surface salts is critical for life cycle coating performance.
Overview

Surface Preparation: Doing it Right!

Decontamination: The Best Practice
It is impossible to combine a salt remover and a metal surface inhibitor.

- An acidic product is required to effectively remove surface salts.

An inhibitor will mask salts, preventing detection. Coatings fail because salts remain!
- Reference: ISO 8502-2; NACE 6G186; NACE SP0716; ASTM 5367-16. Alkaline treatments form a boundary layer, preventing salt detection and removal.

- A-A-A: The steel fabricating, pipelines and auto industries have followed this practice for over 90 years.
  - (Note: A-A-A: Alkaline-Acid-Alkaline. Chemically, cannot combine steps because of specific functionality.)
Surface salts?

Test for salts

Results YES

Salts Exceed Specification?

YES

CHLOR*RID®

Marine environment; Deicing salts; Environmental fallout
How to use CHLOR*RID®

For immersion, splash or atmospheric services.

- **Vapor abrasive blasting**
  - Surface application at 1:50 dilution.
  - Rinse with 1:50 dilution HOLD*BLAST

- **Pressure wash (3,000 psi min.)**
  - Surface application generally at 1:100 dilution
  - No need to rinse.

Test before, during, and after CHLOR*RID® application!
Comparison before & after

White metal blast surface under magnification

Contaminant free white metal after CHLOR*RID 5,000 psi wash
BENEFITS

- Proven soluble salt remover.
- One time use.
- Compatible with all coatings.
- Apply through any high pressure equipment.
  - UHP blasting
  - Vapor/Mist blasting
  - Pressure washers (3,000 psi minimum)
- Removes light surface oils.
- Dilute with potable water.
  - No demineralized, high purity water required.
  - No concerns with residue (scum) on evaporation.
  - WILL NOT leave calcium deposits in equipment or on the surface to be primed!
- No rewashing prior to coating.
**BENEFITS**

- Stocking points close to markets;
  - Wide distribution network.

- Economical:
  - Pennies per square foot.

- Easy to handle and easy to apply.

- Environmentally Friendly

- Non-Hazardous.

- NO VOC’S.
Trailer identified with 7 to 12 µg/cm² of chloride.

Vapor blast with CHLOR*RID, followed by a rinse with HOLD*BLAST.

Close ups of the finished surface preparation.
Marine environment; Deicing salts; Environmental fallout

Surface salts?

Test for salts

NO  Results  YES

NO  Salts below specified limits

HOLD*BLAST™

Salts Exceed Specification?

NO  YES

HOLD*BLAST™  CHLOR*RID®
Surface Passivator

- Chemically changes the surface to a less reactive state.
- Eliminates surface corrosion caused by wet metal surfaces.
- Stops the formation of rust.

Application:
- Apply at 1:50 dilution with potable water.
- Use a minimum 1,500 psi pressure washer to drive into the surface profile.
- Add to the water with vapor abrasive blasting.
  - Surface rinse without the abrasive to remove particulates.
**BENEFITS**

- **Dilute with potable water:**
  - No demineralized, high purity water required.
  - No concerns with residue (scum) on evaporation.
  - **WILL NOT** leave calcium deposits in equipment or on the surface to be primed.

- **Compatible with all coatings.**

- **Prevents flash rust for up to 72 hours, or longer.**

- **Apply through equipment.**
  - Standard pressure washer
  - U.H.P blasting
  - Vapor / Mist blasting
  - No build-up/plating out of minerals inside pressure equipment.
**BENEFITS**

**Economical:**
- Pennies per square foot.
- Eliminate high cost of brush blasting.

**Strategic shipping locations:**
- Wide distribution network.

**No rewashing prior to coating.**

**Easy to handle and easy apply.**

**Environmentally friendly.**
Vapor blast with HOLD*BLAST™ 1:50

72 hours after HOLD*BLAST™ application.

120 hours after HOLD*BLAST™ application
NACE standard SP0716 address’s soluble salt testing
Frequency and locations

SSPC has developed Guide 15 outlining the various methods used to perform field testing for salts.

NACE document 6G186 has general information on soluble salts and discusses removal methods.
Specifiers are writing specifications to test for soluble salts and remove excessive levels.

NACE and SSPC are developing documents that will assist in dealing with Soluble salts.

The CHLOR RID sales and staff are always available to respond to technical questions and provide guidance on the use of CHLOR RID products.

Testing and removal of salts is always less costly than a coating failure!
Summary

Surface Preparation: Doing it Right!

- Soluble Salts: Understanding the Problem
- Testing: Where to Test
- Decontamination: The Best Practice
- Final Testing: Insuring Success
Surface Preparation: Doing it Right!

Final Testing: Insuring Success

Test in the same areas where soluble salts were found in order to insure that they have been successfully removed.
All salts are not equal.

Highlights Today

Soluble salts are non-visible.
Soluble salts cause premature coating failures.
Soluble salt removal requires a slightly acidic product.
A flash rust deterrent requires a slightly alkaline product.

THANK YOU from all of us at CHLOR RID Int’l Inc.
CHLOR RID International Inc.
THE WORLD LEADER IN SOLUBLE SALTS REMEDIATION

WWW.CHLOR-RID.COM