Corrosion Solutions for the Transportation Industry

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Background

Automotive International, founded in 1971, is centrally located in the Cincinnati suburb of Blue Ash. Our mission is to build customer relationships through Excellence in product technology, service, on time delivery and consultancy. Automotive International is Registered to ISO 9001 : 2015

Truck & Trailer

Magnesium Chloride And Corrosion

- **The use of Magnesium Chloride has led to a profound increase in vehicular corrosion.**

New Road De-icing Methods

Effects on Vehicle Components

Road De-icing Background

- Sodium Chloride (in rock salt form)
  - Has been the traditional and most widespread used substance
  - Not effective in very cold temperatures
  - Washes away during thaw/freeze thaw precipitation

Road De-icing Background

- Due to limitations of Rock Salt, and for cost savings, other chemicals/systems have been implemented
  - Liquid Magnesium Chloride (MgCl2)
  - Liquid Mag. Chloride / Sodium Chloride Combo
  - Sodium Salt Brine
  - Beet Juice
  - Cheese Brine

Road De-icing Background

- Differences between new systems and Rock Salt
  - Liquid application
  - Pre storm application
  - Clings to the surface
  - Does not need moisture to work
  - Stays wet longer

Road De-icing Background

- Many Trucking Companies reported increased corrosion on vehicles with the advent of $MgCl_2$ use resulting in:
  - Excessive pitting and corrosion
  - Accelerated metal component wear
  - Breakdown of electrical systems
  - Increased maintenance and cleaning costs
  - Higher maintenance costs

De-icer Corrosion Testing

- State of Colorado Testing –
  - Ran Sodium Chloride & Magnesium Chloride Testing under 3 industry accepted test methods
    - ASTM B-117 (American Society for Testing & Materials)
    - SAE J2334 (Society of Automotive Engineers)
    - NACE TM-01-69 (National Association of Corrosion Engineers)
  - CRS Steel, galvanized steel, aluminum, chromed and stainless steel were included in the testing

De-icer Testing

- State of Colorado Test Results –
  - Mag Chloride
    - Higher viscosity (thicker) than Sodium Chloride
    - Sticks and crystallizes on the surface and in seams etc.
    - Reactivates at 27% relative humidity or in damp conditions
    - Does not wash off easily

De-icer Corrosion Testing

- Conclusion –
  - MgCl2 is more corrosive with cyclical test methods which result in wet and dry exposure.

    (SAE J2334 and NACE TM-01-69)
    - ***Real world winter conditions have wet and dry cycles!***
  - Sodium (Salt) Brine Solutions will also be more corrosive due to this clinging affect.
  - **Increased corrosion levels were noted on stainless, galvanized, copper and chromed steel as well as cold rolled steel.**

Automotive International's Response To More Corrosive De-icer's:

Objective:

- Formulate products to resist Magnesium Chloride exposure
- Use Independent laboratory testing to validate results (Detroit Testing Lab and Ideas Inc.)
- Test using SAE J2334 Method
  - Cyclical high and low humidity and temperature
- Test using NACE TM-01-69 method
  - Cyclical wet and dry immersion testing

SAE J2334 Test Cycle Included in SAE J2721

Since 1903

Detroit Testing Laboratory, Inc.

Test Cycle-The J2334 test cycle consists of three basic stages:

1. Humid Stage-50 C and 100% humidity, 6 h in duration
2. Salt Application Stage-15 min duration conducted at ambient conditions
3. Dry Stage-60 C and 50% RH, 17 h and 45 min in duration

Note: Full test report available upon request

NACE TM-01-69 Test Cycle

Test Cycle-The TM-01-69 test cycle consists the following stages run at 70F and 50% humidity:

1. 10 minutes emersion in Mag Chloride solution
2. 50 minute air dry
3. Duration – 72 hours continuous
4. Panels are weighed and weight loss due corrosion is noted

Note: Full test report available upon request

WHAT CAN YOU DO.

- Build a better truck by spec'ing corrosion resistant materials. Or upgraded coatings.
- Cost!
- Current fleet

WHAT CAN YOU DO.

- Maintenance solutions.
- Clean daily or weekly during the season.
- Not always practical.
- Cost.
- Down time.

What can you do.

- Preventive measures such as application of-
  - Corrosion protection products
  - Cavity waxes
  - Under Coatings
  - Soft coatings

New Vs. Existing

- Corrosion protection Coatings are most effective when applied to new vehicles.
- Can be applied to existing vehicles when properly prepared.
- Cost effective.

QUALIFYING COATINGS

Types of corrosion prevention coatings

- Cavity wax or Rust Inhibitors for inside panels, frames or cavities.
- Under Coatings for under bodies and frames.
- Easily applied by end user.
- Cost effective

CAVITY WAXES.

- Solvent carrier
- Calcium Sulfonates
- Corrosion Inhibitors
- Waxes
- Adhesion promoters

CAVITY WAXES (cont.)

Displaces moisture

Easily applied with inexpensive equipment

Can be applied in house

No need to drill holes!

Die-Electric strength

CAVITY WAXES (cont.)

- Permanent coatings
- No HAPS
- Fights corrosion where you can’t see it starting.
- Testing by independent lab (A2LA)

UNDER COATINGS

- Come a long way
- Not a tar
- New technologies
- Hard coatings (paints)
- Soft coatings
- Easily applied with airless pump system

UNDER COATINGS (cont.)

- Solvent based
- Water Based
- No HAPS
- VOC
- Flash point

UNDER COATINGS

- Flexibility
- Adhesion
- Base material
- Asphalt cut back
- Rubberized
- Polymers/Resins

TESTING

- Ensure any product you choose to protect your vehicles have had independent lab testing preformed to include:

Sodium, Calcium and Magnesium Chlorides in the test solution.

TESTING

- ASTM B117
- Industry standard for years
- Salt spray hours 100 -1,500+
- Cycles (1=24 hours)
- Comparative test
- The higher the hours the better the product

PRODUCT TESTING

- ASTM-B117
- SAE J2334
- SAE J2721
- SAE J400 (chip)
- ASTM B117 Modified

Test Method & Results

- SAE J2334 &
  40 cycles (1000 hours)
- NACE TM-01-69
  72 cycles

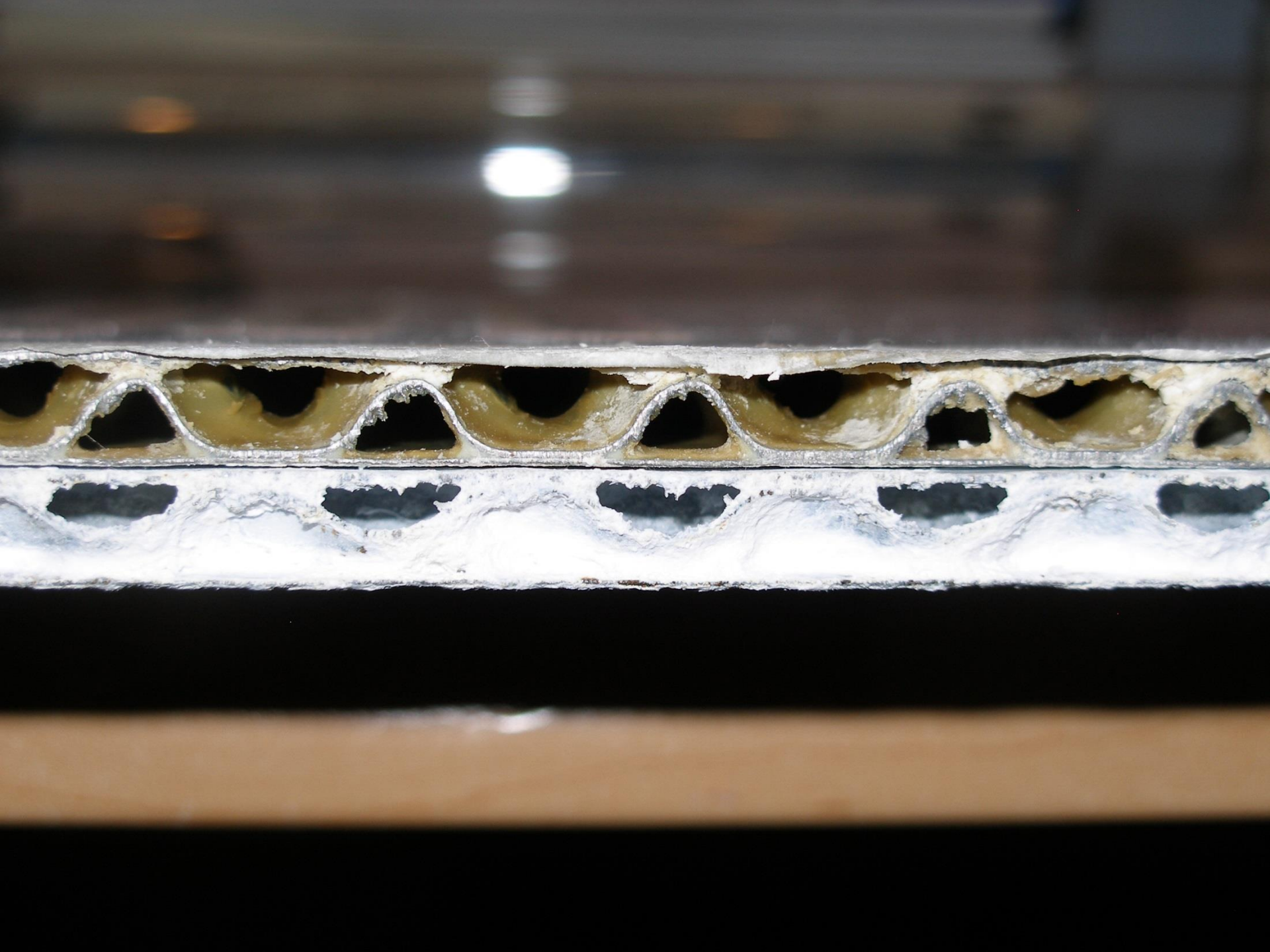
Results

- **VG-104, VG-140 and VG-076Undercoating**
  -Less than 0.5mm creep back from scribe
  -No corrosion on the surfaces
  -No weight loss

VG-101 @ 20 Cycles
Scribe

VG-101 @ 40 Cycles
Scribe

VG-101 @ 40 cycles
Scribe (Coating Removed)



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