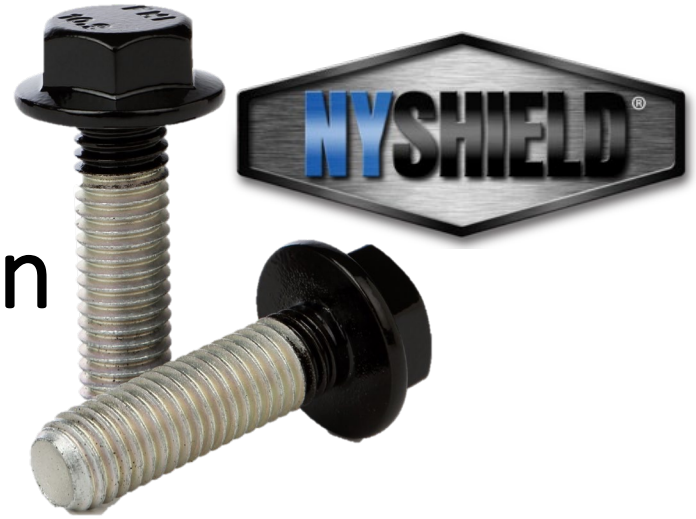
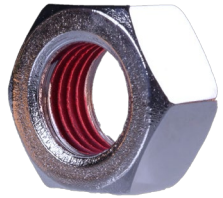
NYLOK®

INNOVATIVE FASTENING SOLUTIONS SINCE 1942

# NyShield® Galvanic Corrosion Product Overview







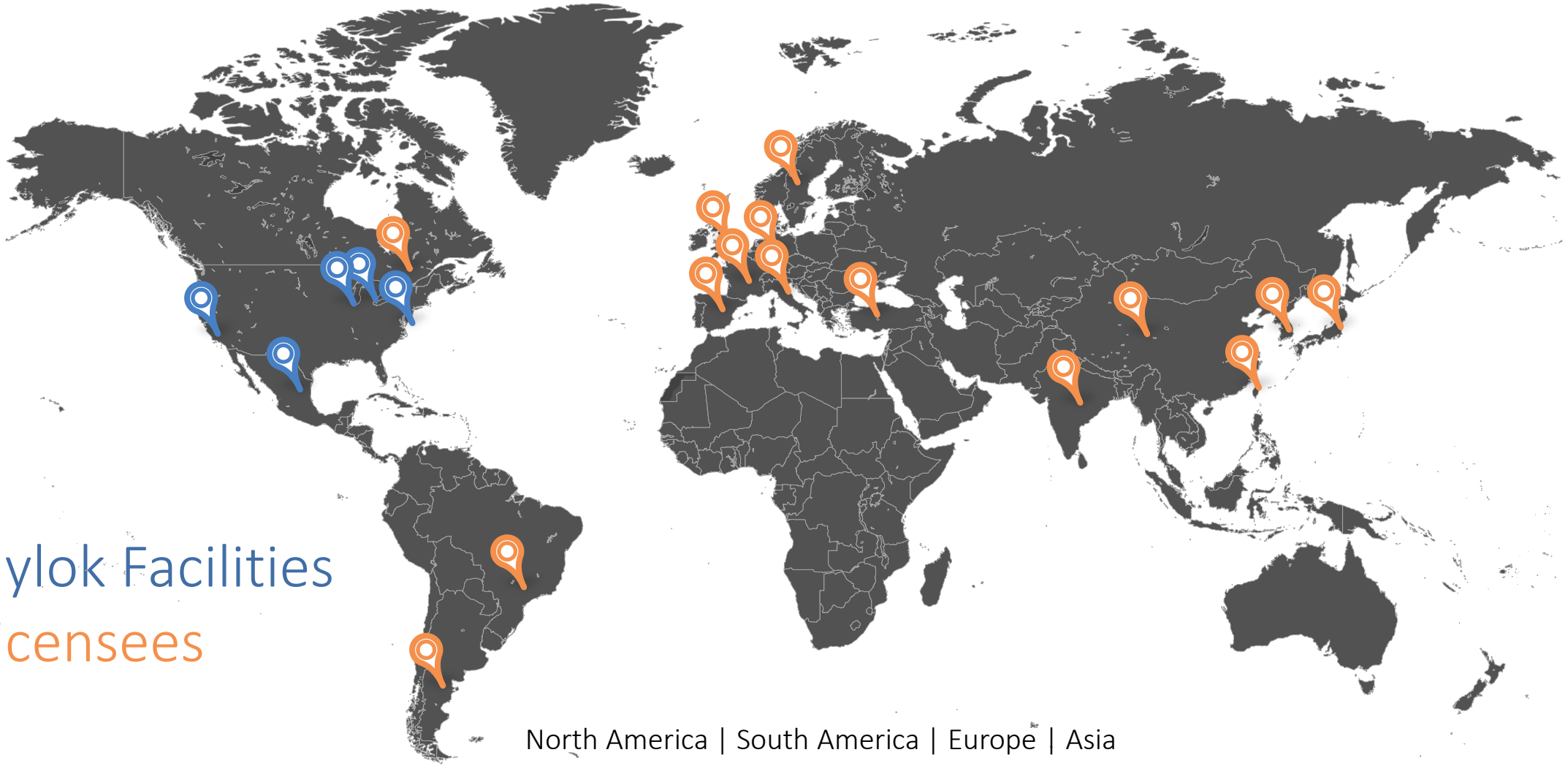
A Marmon/Berkshire Hathaway Company

# Nylok | Marmon | Berkshire Hathaway

- Fortune 500 Company
  - Financially Stable
- Aggressive Investment Strategy
  - Seeking Growth Partners
- Decentralized Culture
  - Close to Customer

*- Warren Buffett*
*Chairman and CEO Berkshire Hathaway*

# Global Support Network



Nylok Facilities

Licensees

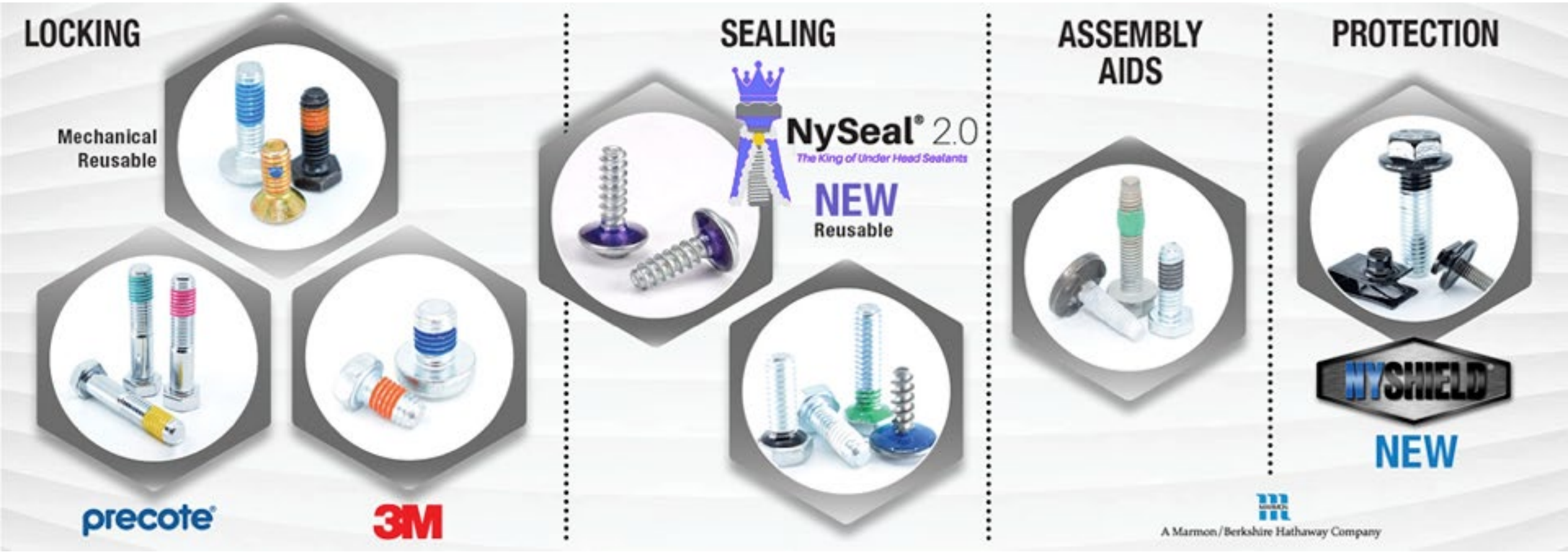
North America | South America | Europe | Asia

# Who We Are & The Role We Play

- *First* and *largest* fully dedicated processer of self locking products in the world
  - Proven history of solving customer fastener issues for over *75 years*


Mission & Vision: *Developing* Innovative Fastening Solutions Globally by *Engineering* Processes and *Formulating* Products

# Product Overview



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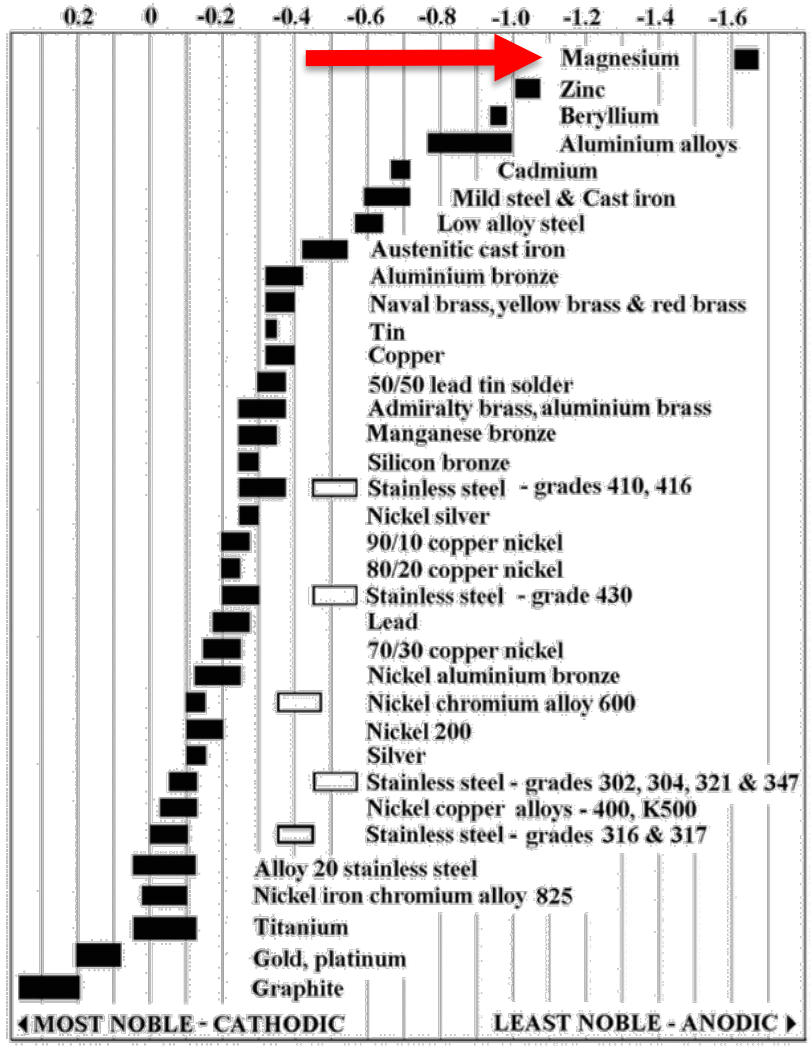
# New Options for Fastening Dissimilar Materials

NYSHIELD®

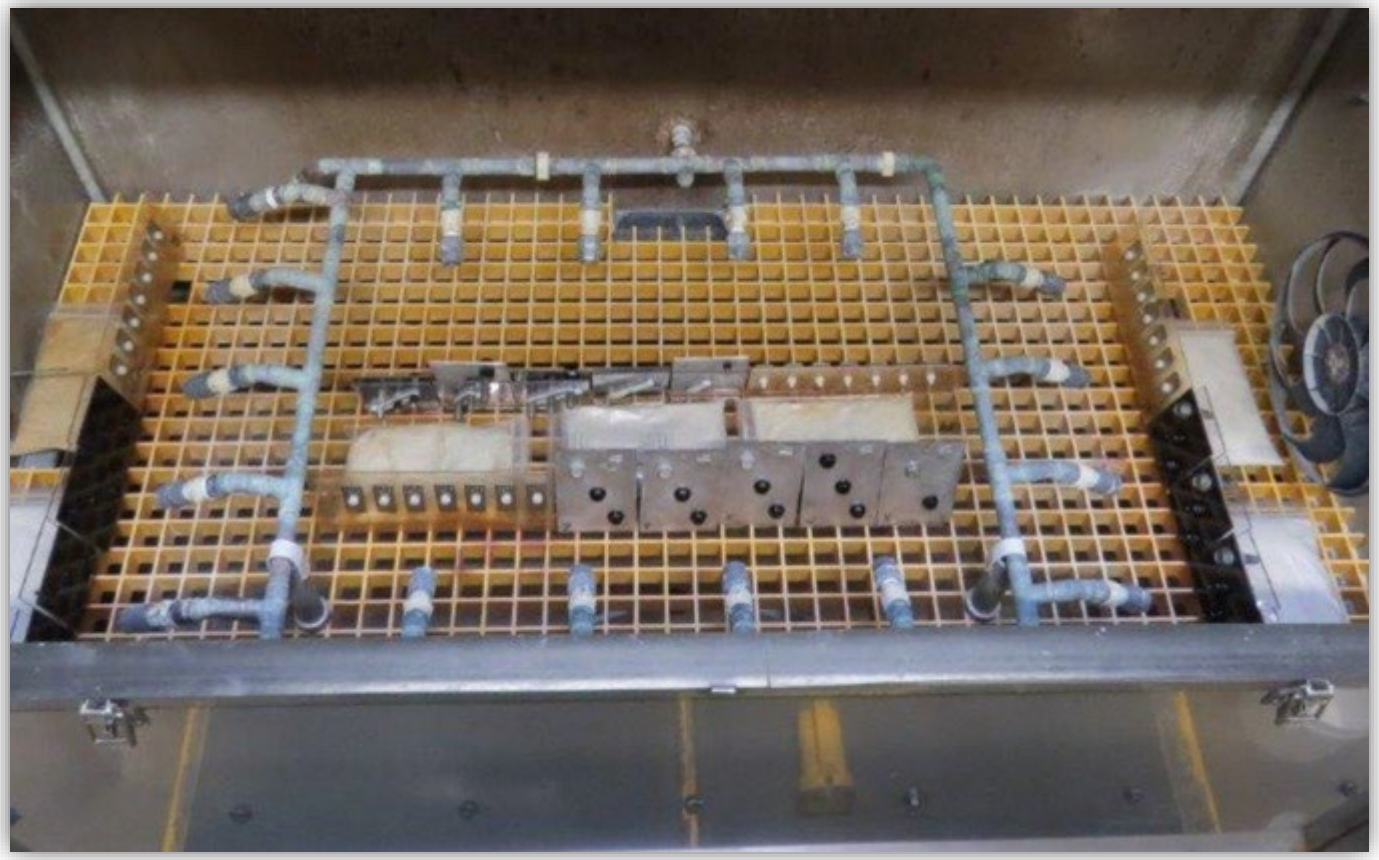
# Toughest Materials To Join

- Nylok's NyShield® coating prevents galvanic corrosion
- NyShield® protects steel fasteners from galvanic corrosion in high-risk material combinations
  - Carbon Fiber
  - Stainless Steel
  - Aluminum
  - Magnesium
- Carbon fiber and magnesium are at the extreme ends of the anodic index
  - Resulting in severe reaction with steel and accelerated corrosion

Nylok® used the toughest materials for galvanic corrosion prevention for all tests (Mg and C-Fiber)



# Nylok® Corrosion Chamber

Replicates GM proving grounds chambers – meets GMW17026 requirements

# Accelerated Corrosion Test

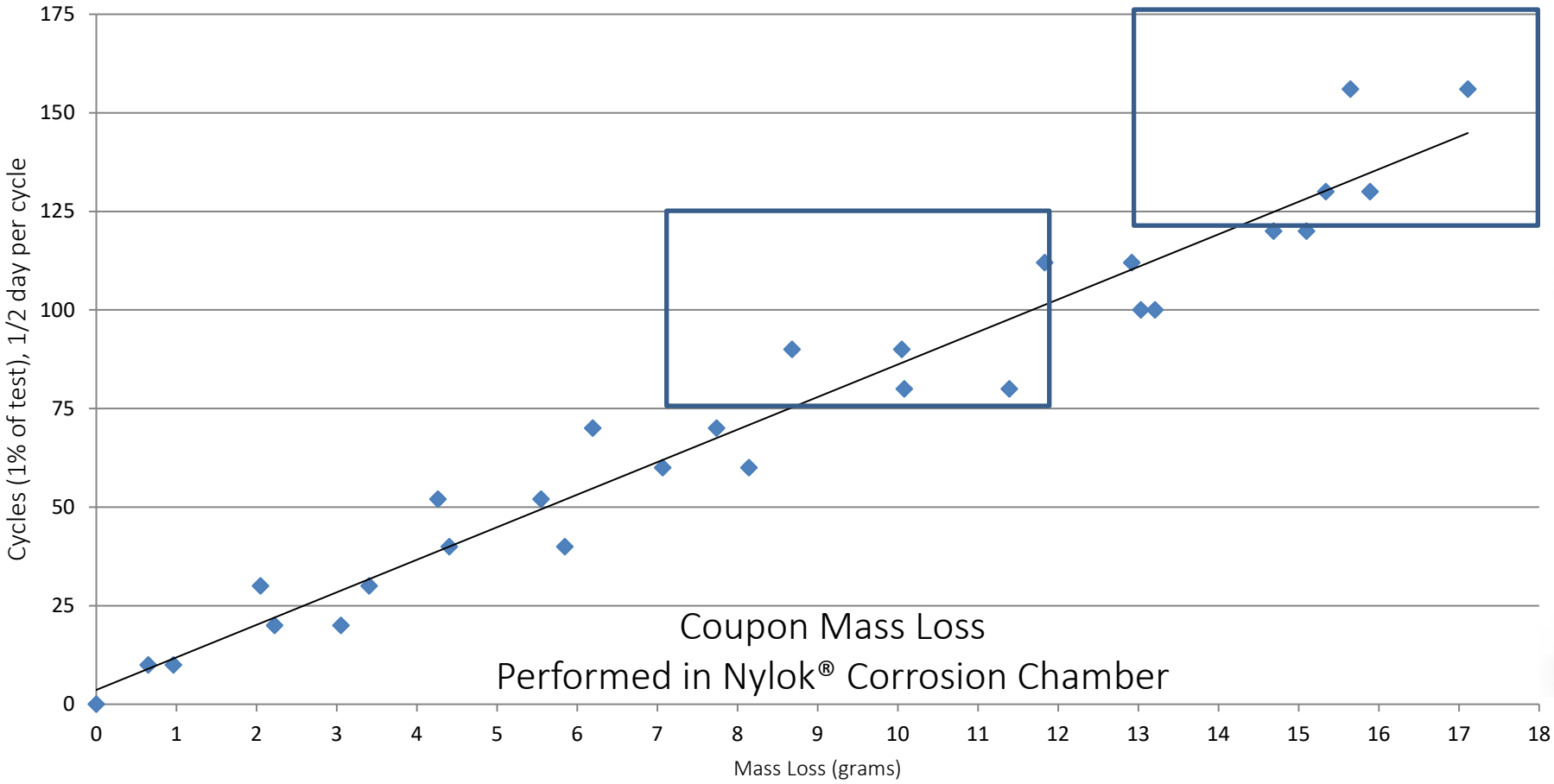
Accelerated Corrosion Laboratory Test for Galvanic Corrosion Mechanisms


Control – pre test

Control – post test

Uncoated steel coupon are used as a control to monitor the average general bare steel corrosion produced by the test environment per GMW17026

# Accelerated Corrosion Test




Coupon mass loss chart – correlation to number of years exposure in field

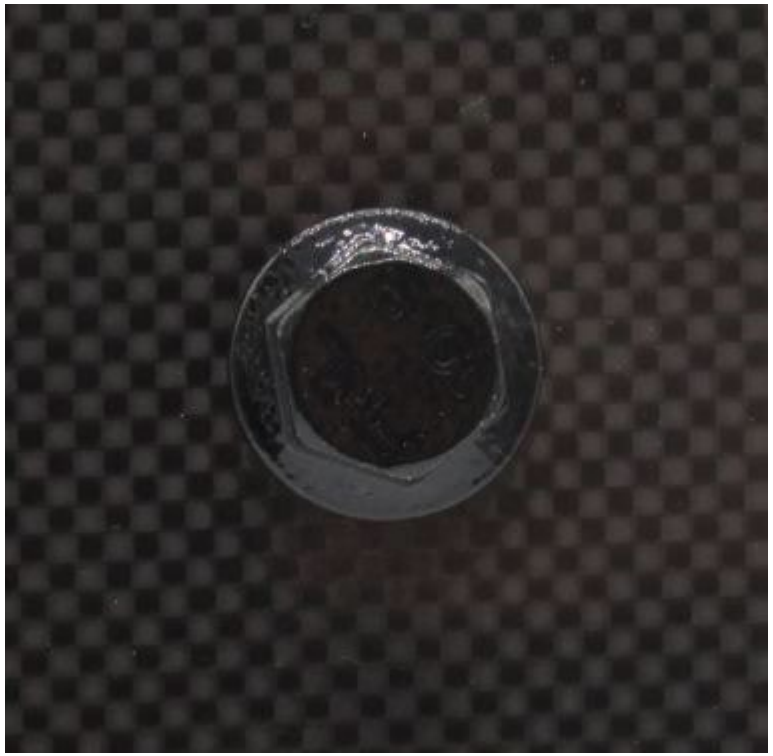
# NyShield® Performance Against Carbon Fiber

## Start of Test

CONTROL - ELECTROPLATE ZN FINISH


Control

NYSHIELD® OVER ELECTROPLATE ZN FINISH

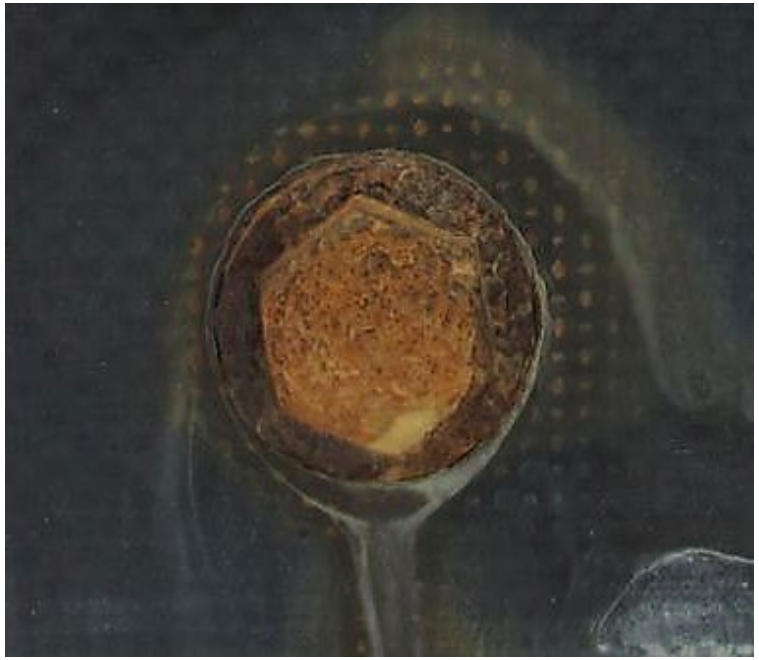


NyShield®

# NyShield® Performance Against Carbon Fiber

## 5 Years Simulated Outdoor Exposure

CONTROL - ELECTROPLATE ZN FINISH



Control

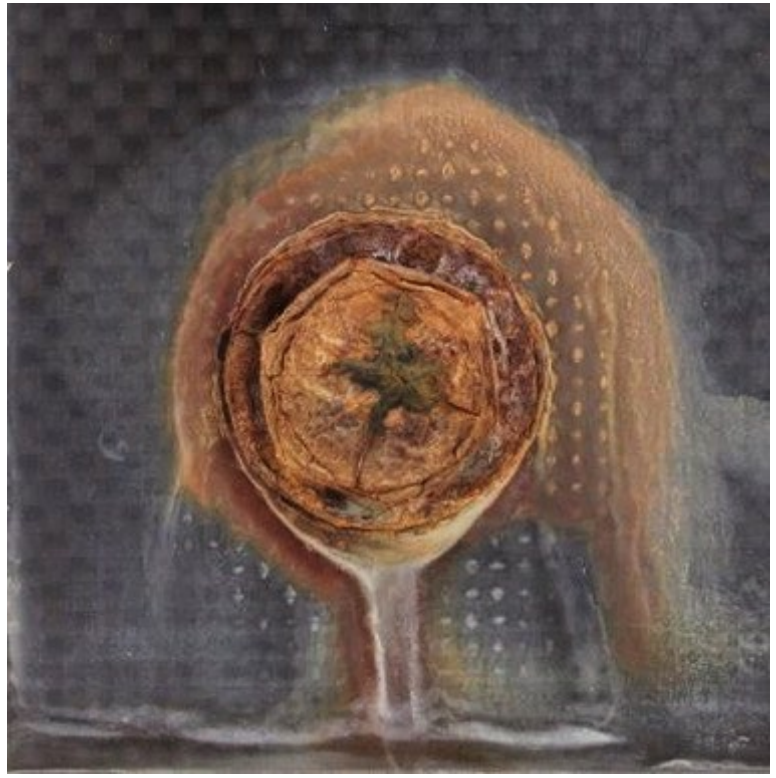
NYSHIELD® OVER ELECTROPLATE ZN FINISH

NyShield®

# NyShield® Performance Against Carbon Fiber

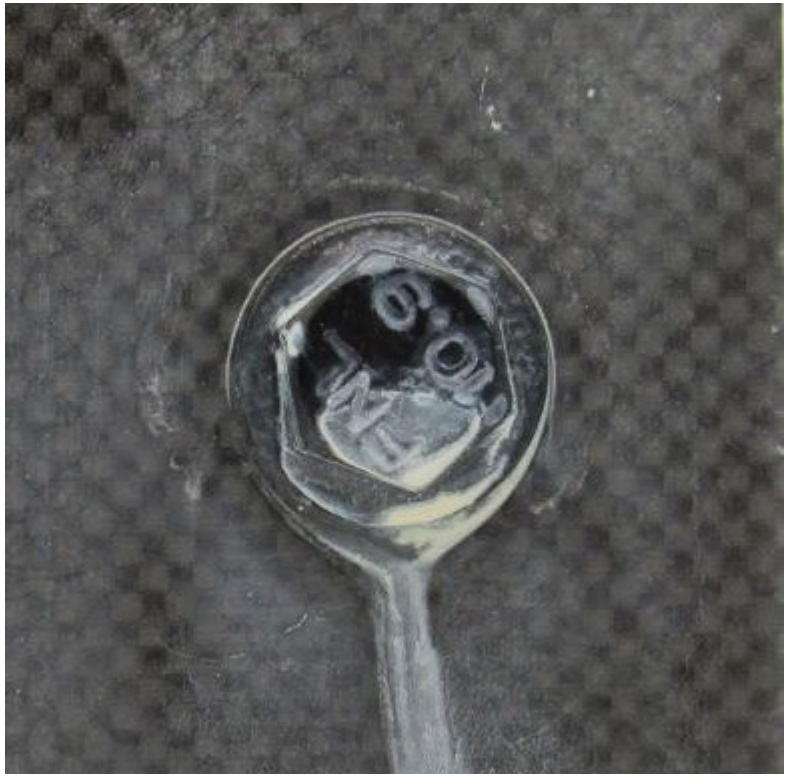
## 10 Years Simulated Outdoor Exposure

CONTROL - ELECTROPLATE ZN FINISH



Control

NYSHIELD® OVER ELECTROPLATE ZN FINISH



NyShield®

# NyShield® Performance Against Carbon Fiber

## 15 Years Simulated Outdoor Exposure

CONTROL - ELECTROPLATE ZN FINISH

Control

NYSHIELD® OVER ELECTROPLATE ZN FINISH

NyShield®

# NyShield® Performance Against Magnesium

## Start of Test

CONTROL - ELECTROPLATE ZN FINISH


Control

NYSHIELD® OVER ELECTROPLATE ZN FINISH

NyShield®

# NyShield® Performance Against Magnesium

## 5 Years Simulated Outdoor Exposure

CONTROL - ELECTROPLATE ZN FINISH

Control

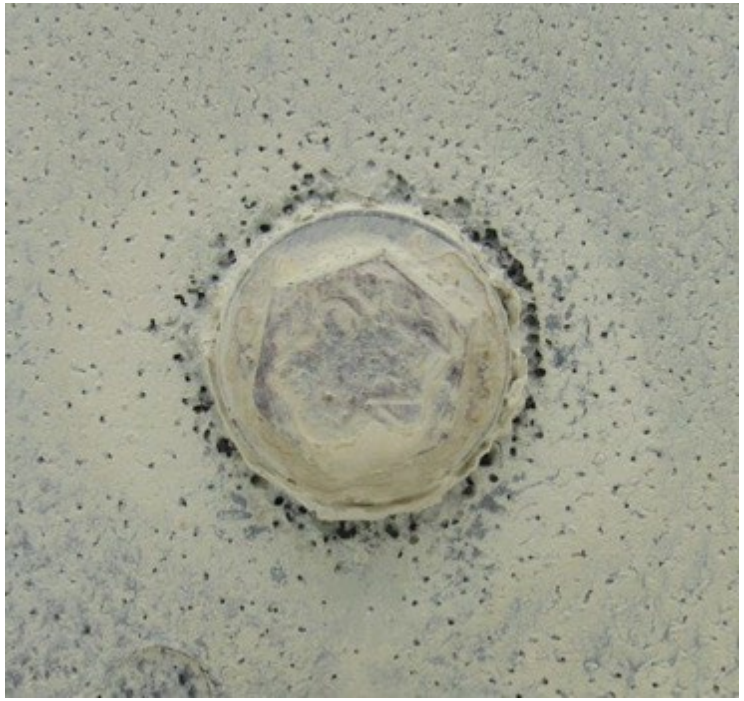
NYSHIELD® OVER ELECTROPLATE ZN FINISH

NyShield®

# NyShield® Performance Against Magnesium

## 10 Years Simulated Outdoor Exposure

CONTROL - ELECTROPLATE ZN FINISH



Control

NYSHIELD® OVER ELECTROPLATE ZN FINISH

NyShield®

# NyShield® Performance Against Magnesium

## 15 Years Simulated Outdoor Exposure

CONTROL - ELECTROPLATE ZN FINISH

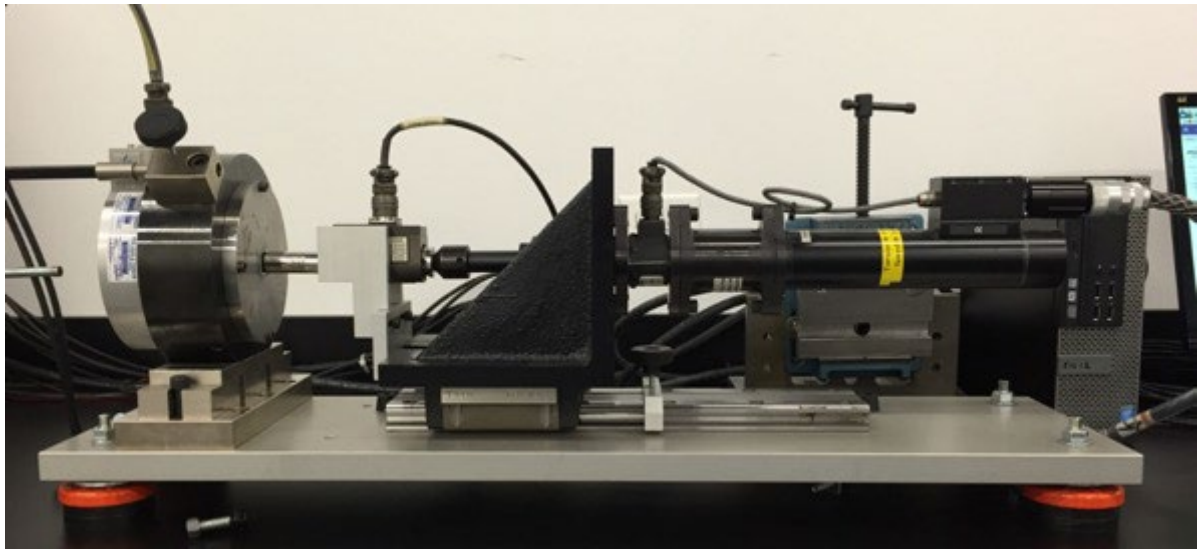
Control

NYSHIELD® OVER ELECTROPLATE ZN FINISH

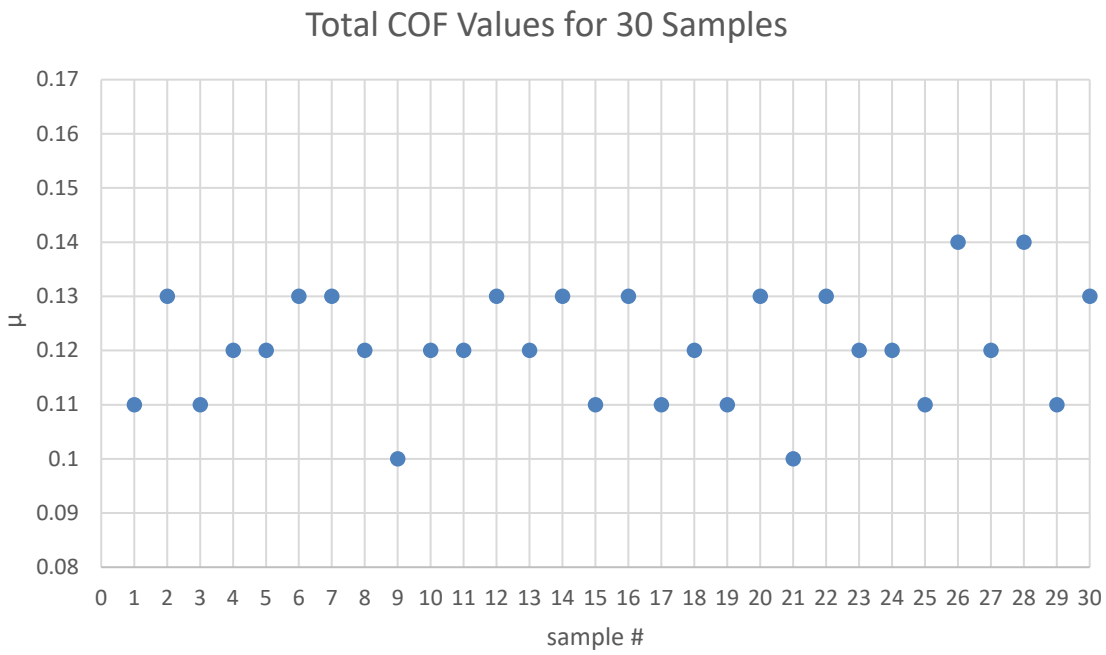
NyShield®

# COF Test & Results

- M10 X 1.5 X 40 Wilson Garner 9.8 plain test bolt
- Zinc plated washer
- Rundown:  30 RPM / tightening:  30 RPM
- Shut off value:  50 NM
- NyShield® with torque modifier applied



COF testing performed on RS torque tension equipment




Coefficient of friction values are able to be adjusted as necessary (typical range of +/- 0.03).

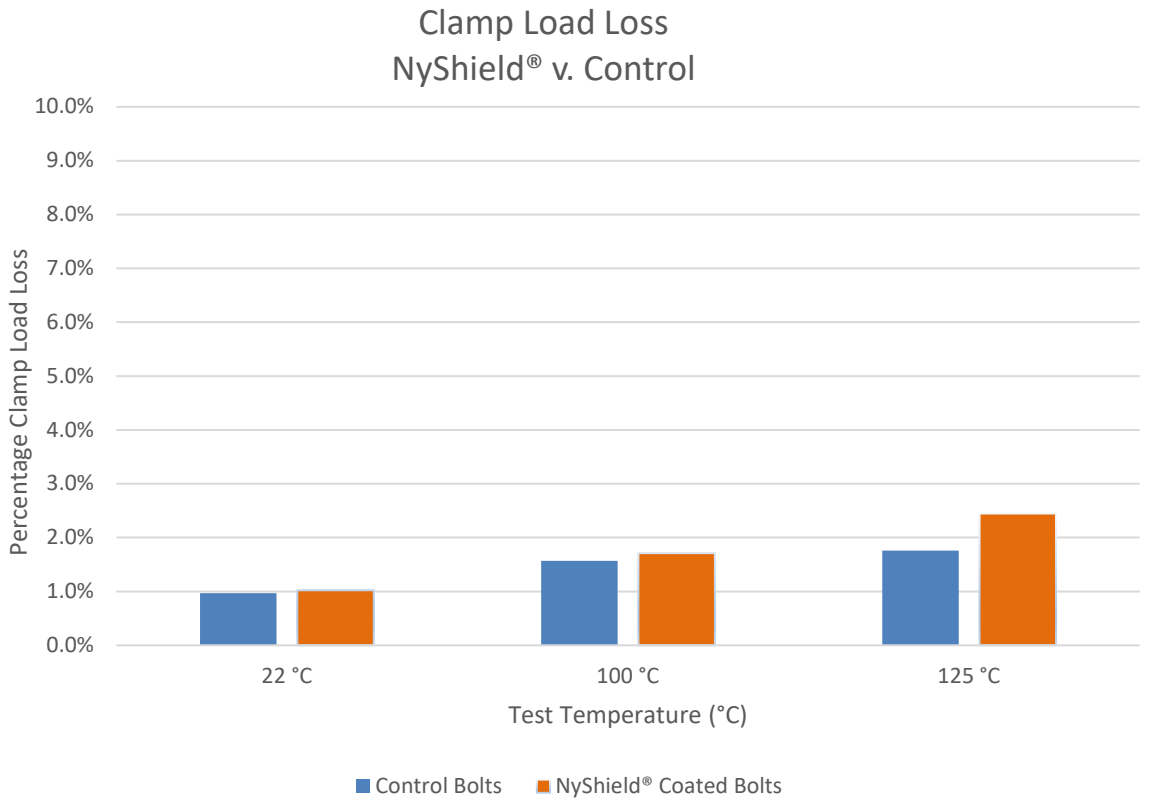
# Clamp Load Loss Test & Results

## Test Conditions

- M10X1.5 fastener tightened to 36kN
- ZN electroplate finish on bolts
- NyShield® thickness 50-75 microns

| Average % Load Loss after 24 hrs* | | |
|---|---|---|
| Temperature | Control Bolts | NyShield® Coated Bolts |
| 22 °C | 0.97% | 1.02% |
| 100 °C | 1.57% | 1.71% |
| 125 °C | 1.76% | 2.45% |

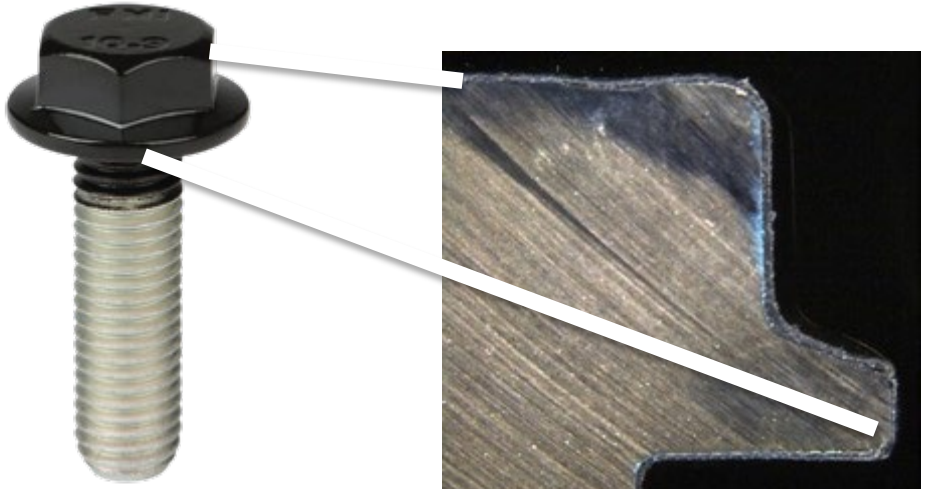
*Average of 6 samples reported at each condition




No significant difference was found for NyShield® coated and control bolts at 22°C, 100°C, & 125°C

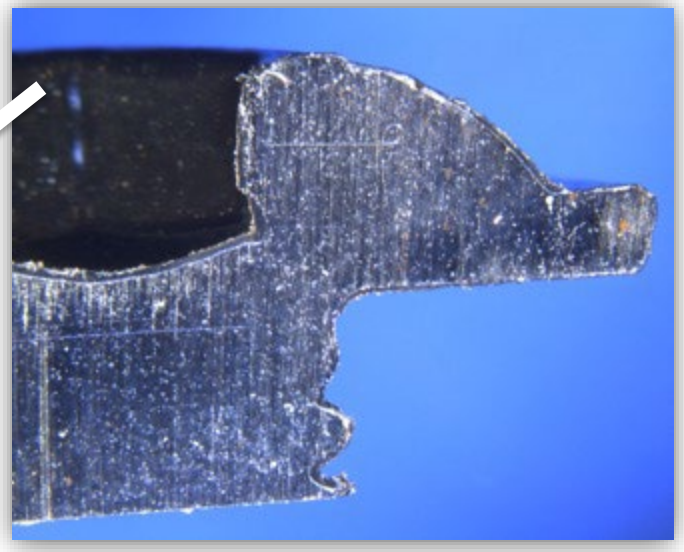
# Coating Uniformity

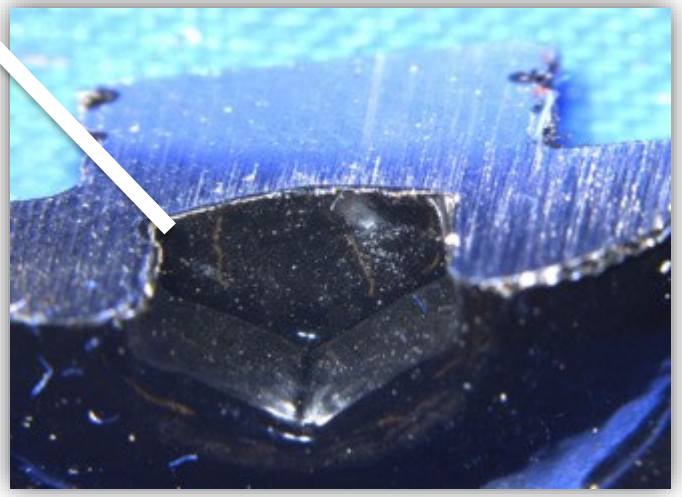
- Typical thickness is 50-90 microns (adjustable on smaller fasteners)
- No interference with internal/external drives
- Responsive magnetic properties



Cross-section
M10

Cross-section
M6





NyShield® coating is very uniform. Even in fastener recesses, such as an internal Torx drive, it doesn't interfere with the tool used in driving.

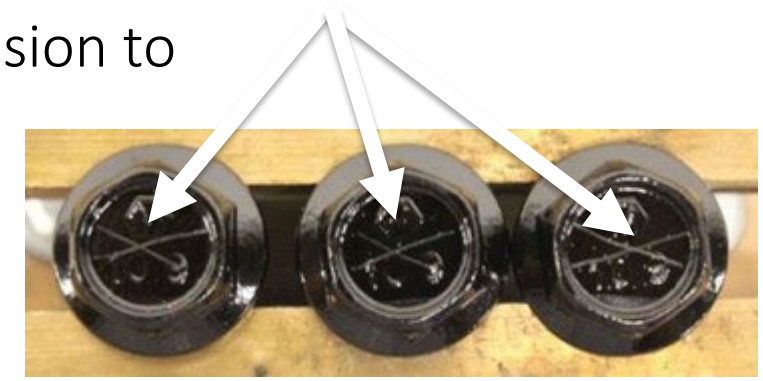
# Tape Adhesion

## Tape Adhesion Test Parameter*

- 10 day @ 40℃ in 100% RH chamber
- Cross hatch cut through coating
- Scotch tape #898 used
- Tape pull 1 hr after removal

## Results

- No removal of coating
- NyShield® has excellent adhesion to the fastener substrate



NYSHIELD® OVER ELECTROPLATE ZN FINISH

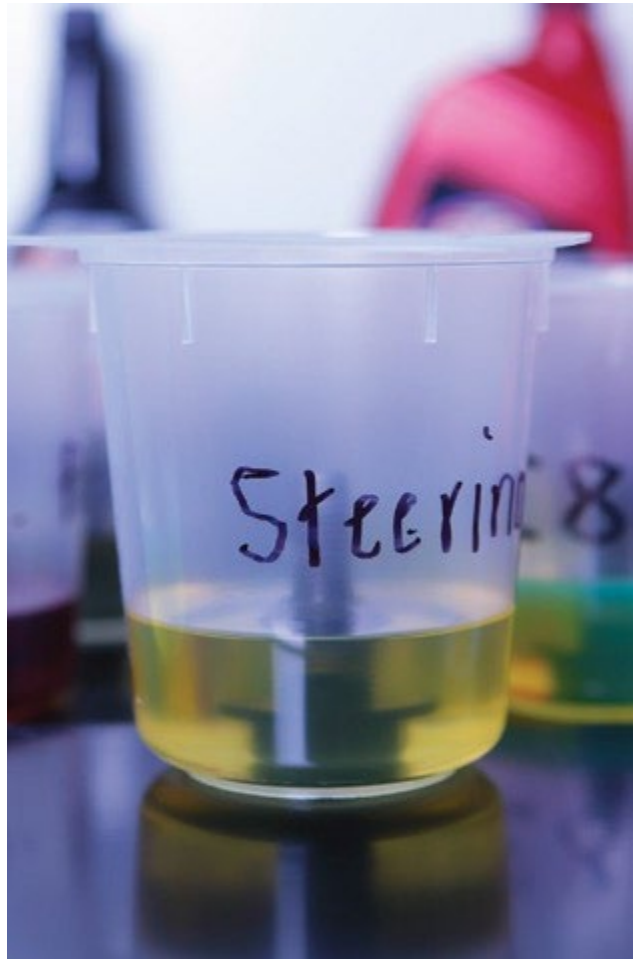
CONTROLLED RELATIVE HUMIDITY CHAMBER

*GMW 14829

# Chemical Resistance Test

**Test Conditions**

- 24hr soak @ room temperature
  - Engine oil (also 2hr elevated 82℃)
  - Coolant
  - Transmission fluid
  - Power steering fluid
  - Windshield washer fluid
- 2hr soak at room temperature
  - E10 & E85 fuel
  - Diesel fuel




**Results**

- No visual change in coating appearance
- No noticeable softening of coating
- NyShield® coating has very good chemical resistance to typical automotive fluids

# Chemical Resistance Test Continued

## Test Conditions

- 24hr soak @ room temperature
  - Vehicle cleaning agent
  - Transit coating / protective wax
  - Car shampoo
  - Paintwork cleaning product
- 2hr soak at room temperature
  - Windex
  - Rain-X 2-In-1 glass cleaner
  - Remover for transit coating
  - Washer fluid
- 10 Min soak at room temperature
  - Tar and road oil cleaner
  - Chrome cleaner


## Results

- No visual change in coating appearance
- No noticeable softening of coating
- NyShield® coating has very good chemical resistance to typical automotive cleaners

# Manufacturing Specifications

| Manufacturer | Specification |
|---|---|
| Ford | WSS-M2G577-A1 |
| GM | GMW17796 |
| Stellantis | MS.90502 |

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# Questions

sales@nylok.com

NYSHIELD®

A Marmon/Berkshire Hathaway Company