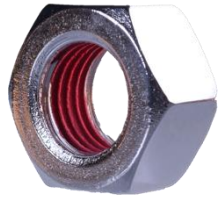
NYLOK®

INNOVATIVE FASTENING SOLUTIONS SINCE 1942

NyShield® Galvanic Corrosion Product Overview



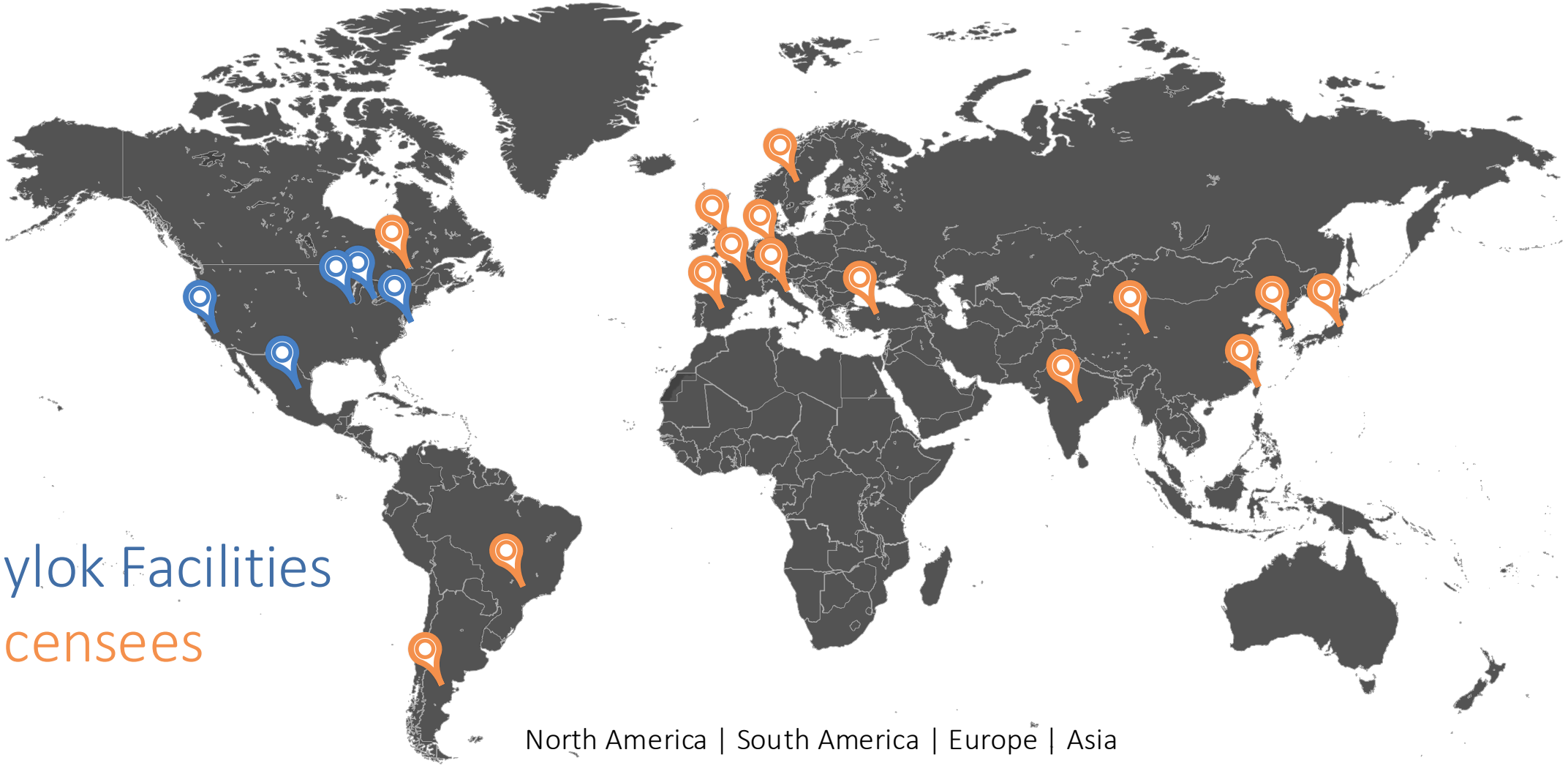
A Marmon/Berkshire Hathaway Company

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

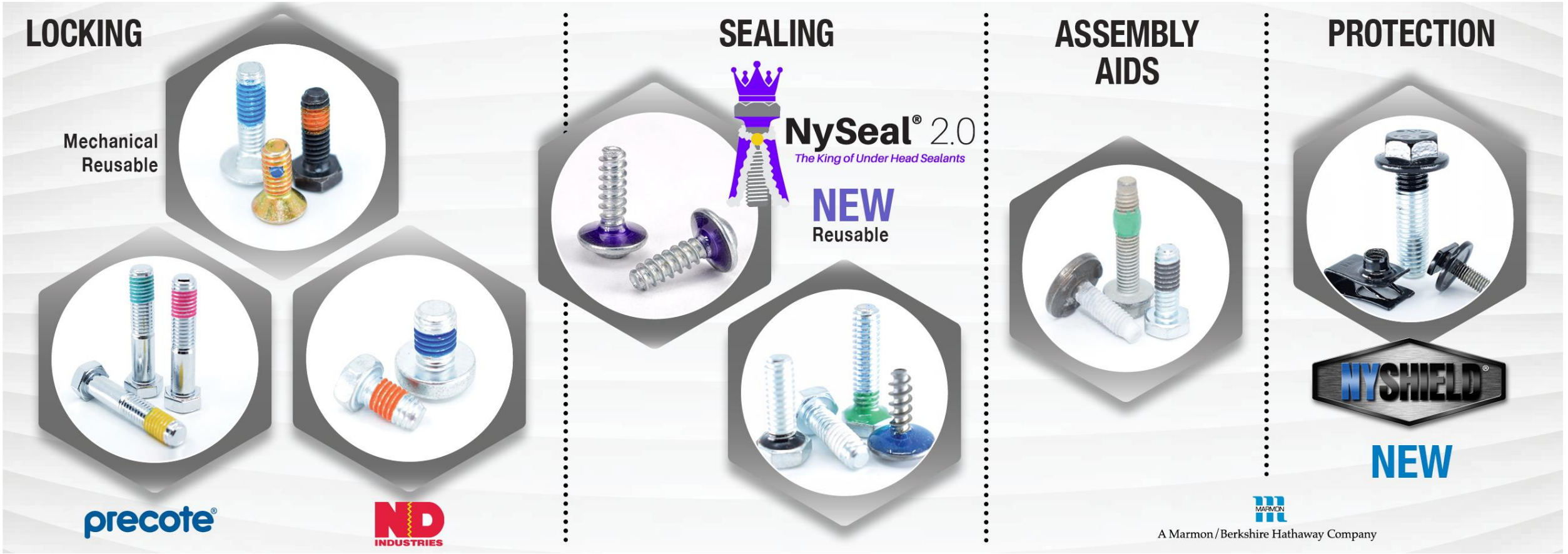
North America | South America | Europe | Asia

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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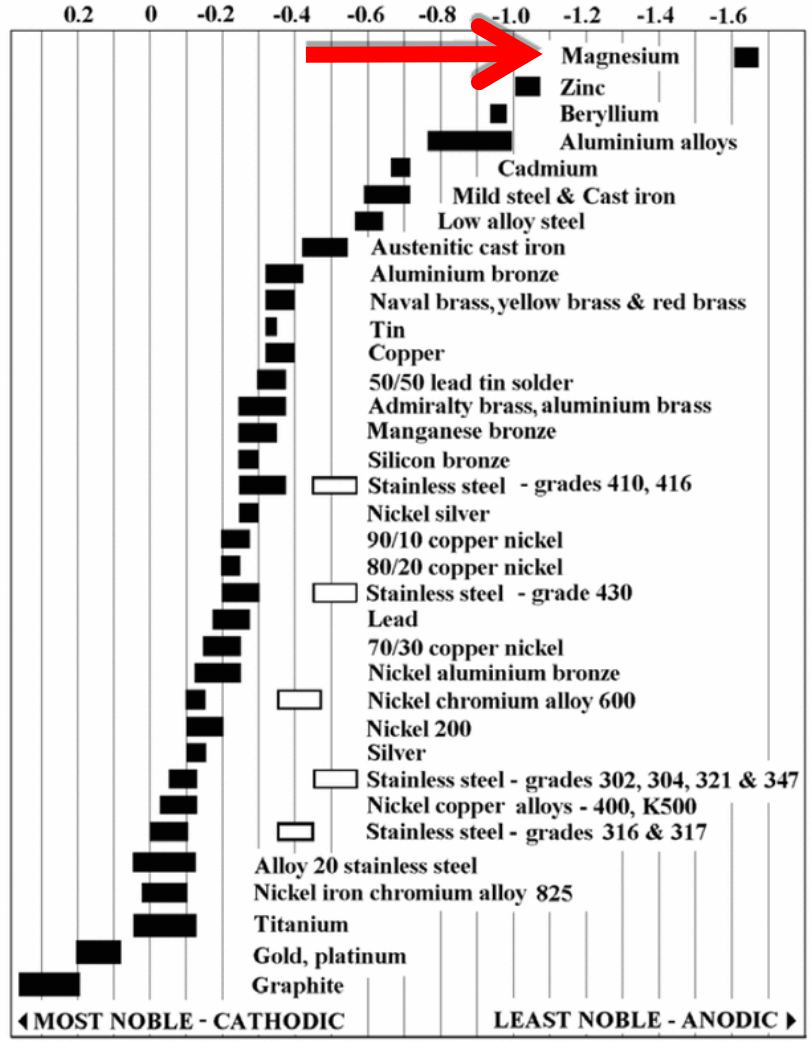
New Options for Fastening Dissimilar Materials

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

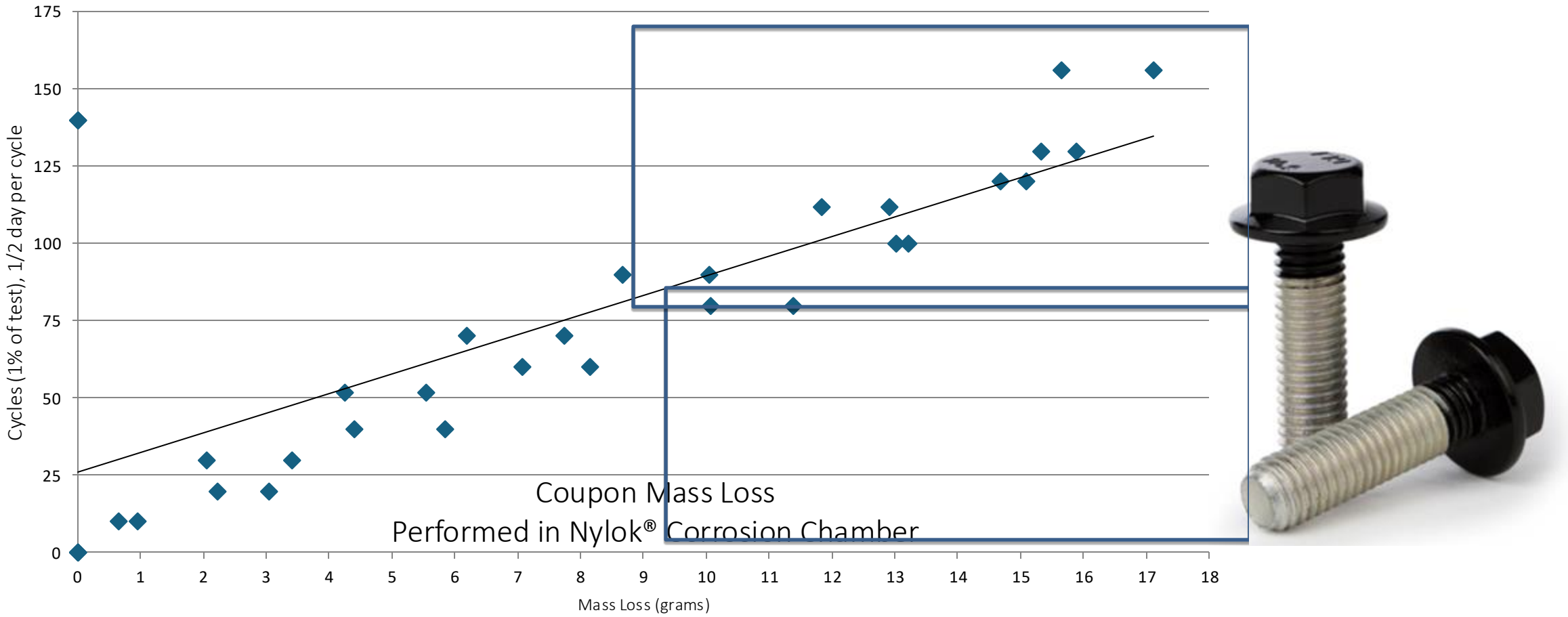
Accelerated Corrosion Laboratory Test for Galvanic Corrosion Mechanisms

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

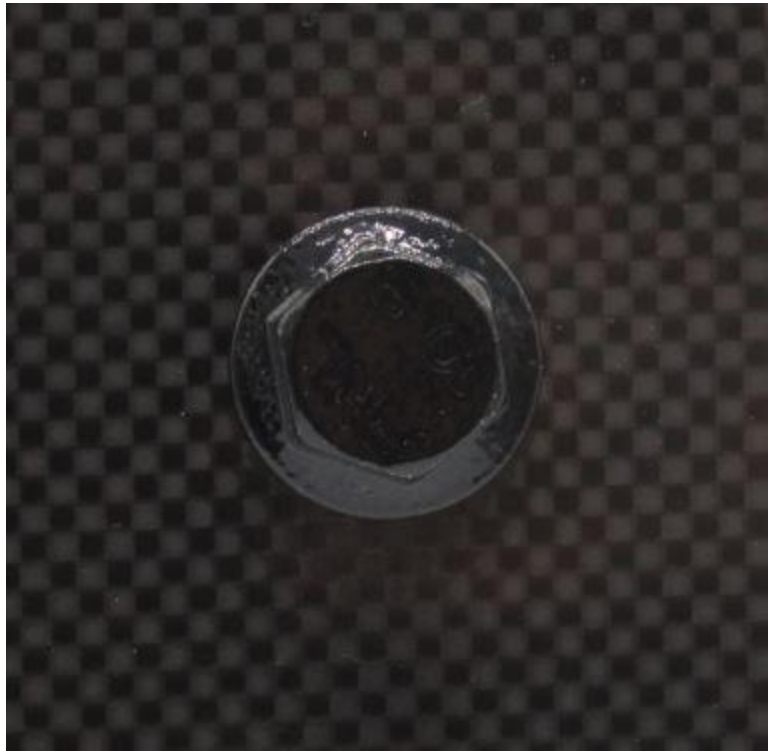
NyShield® Performance Against Carbon Fiber

Start of Test

CONTROL - ELECTROPLATE ZN FINISH

Control

NYSHIELD® OVER ELECTROPLATE ZN FINISH

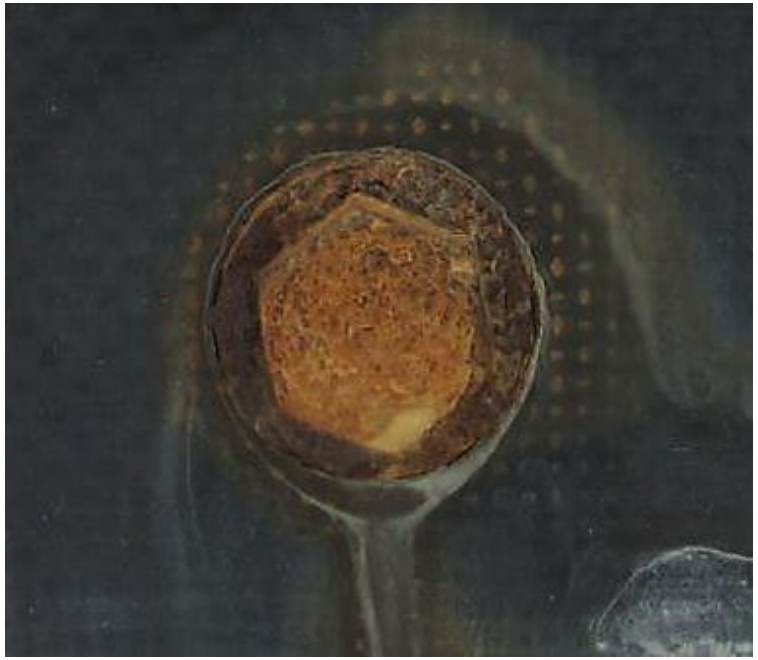


NyShield®

NyShield® Performance Against Carbon Fiber

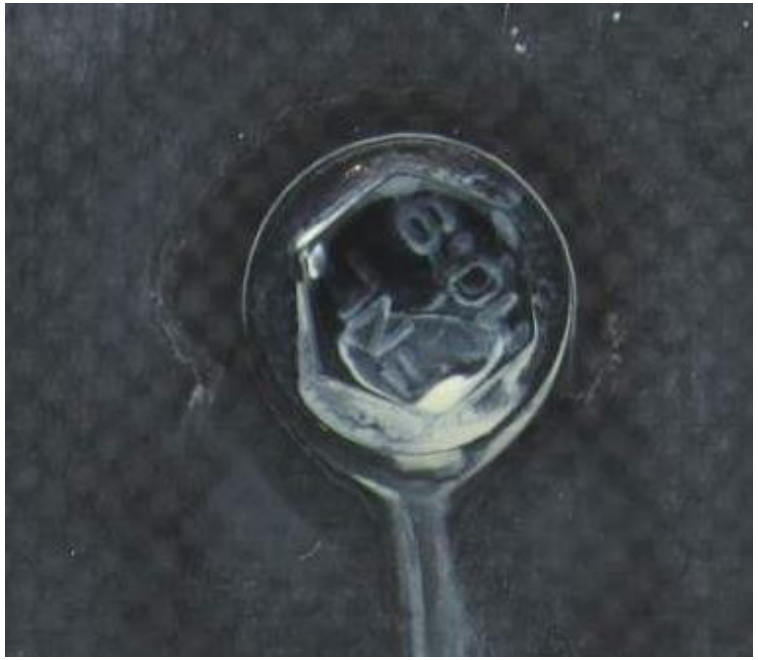
5 Years Simulated Outdoor Exposure

CONTROL - ELECTROPLATE ZN FINISH



Control

NYSHIELD® OVER ELECTROPLATE ZN FINISH

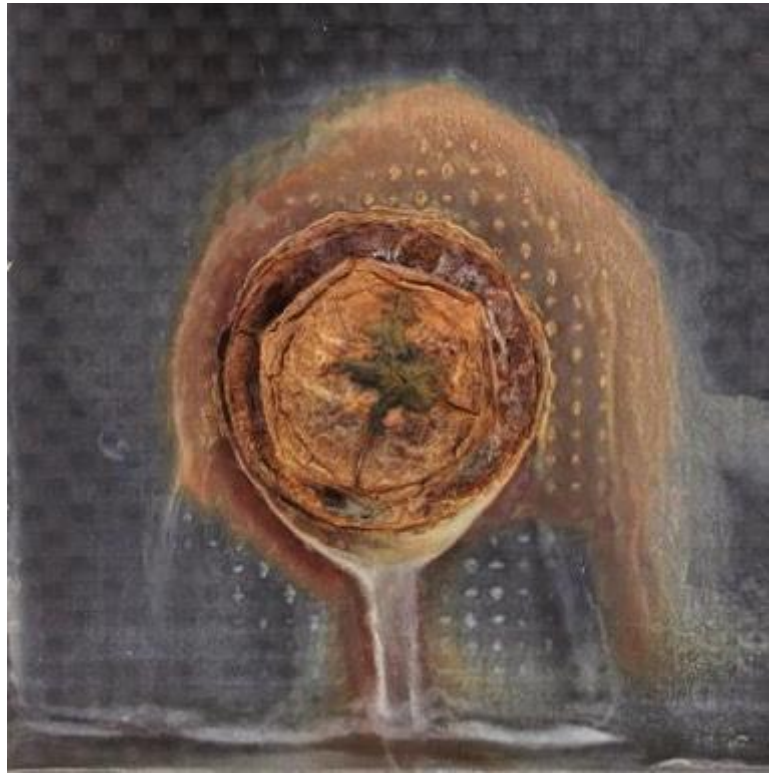


NyShield®

NyShield® Performance Against Carbon Fiber

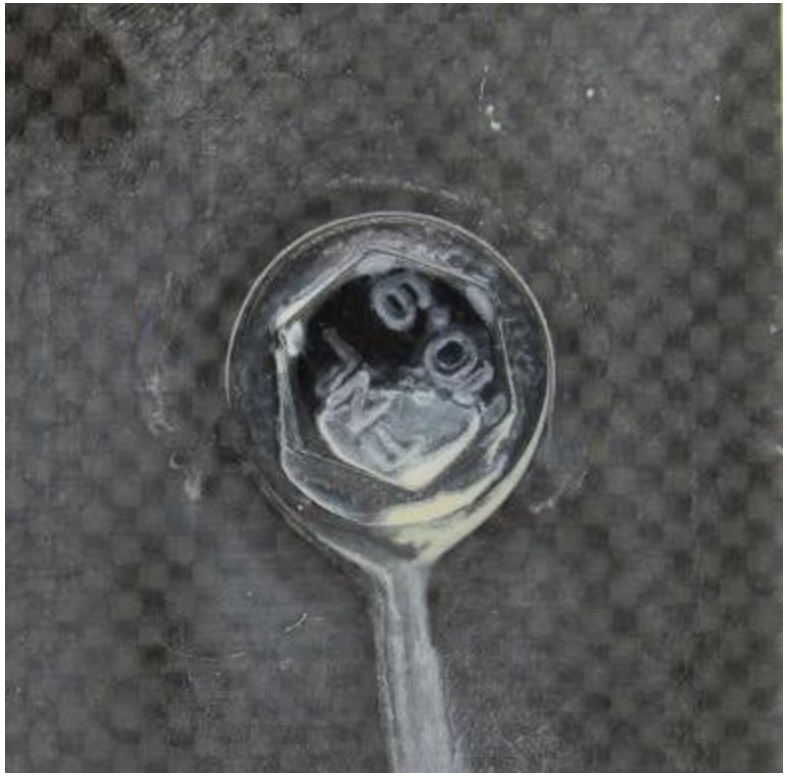
10 Years Simulated Outdoor Exposure

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

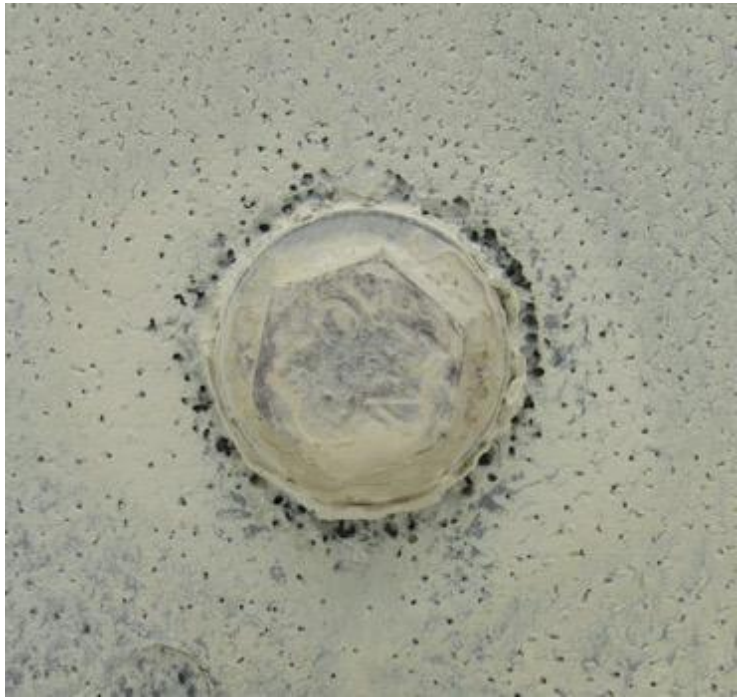
NYSHIELD® OVER ELECTROPLATE ZN FINISH

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

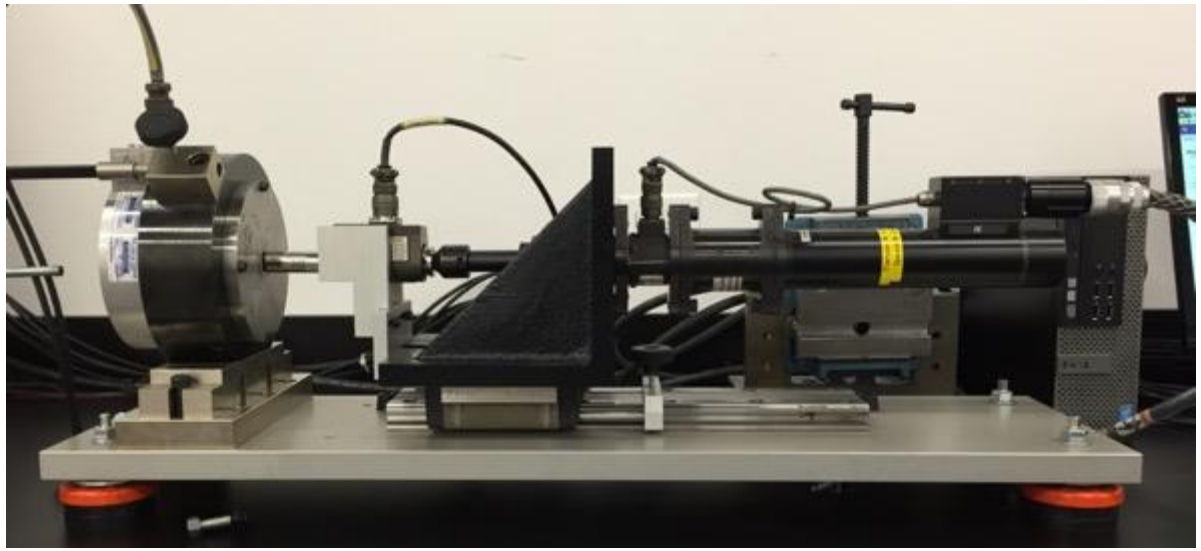
Control

NYSHIELD® OVER ELECTROPLATE ZN FINISH

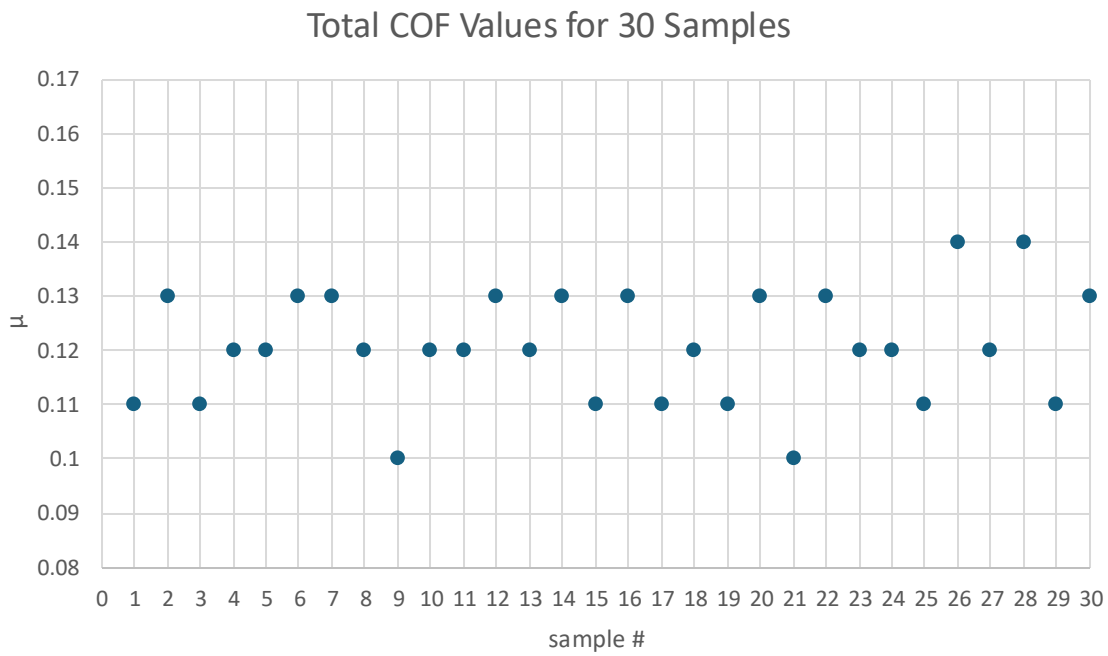
NyShield®

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).

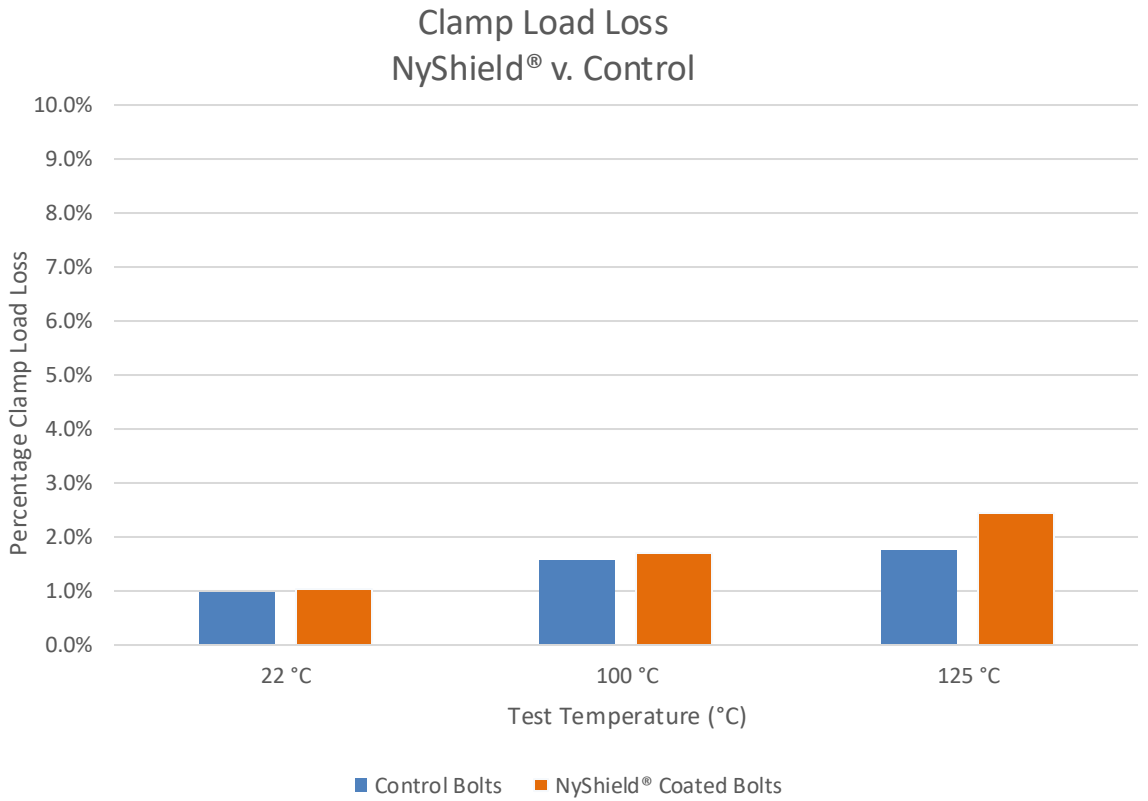
Clamp Load Loss Test & Results

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



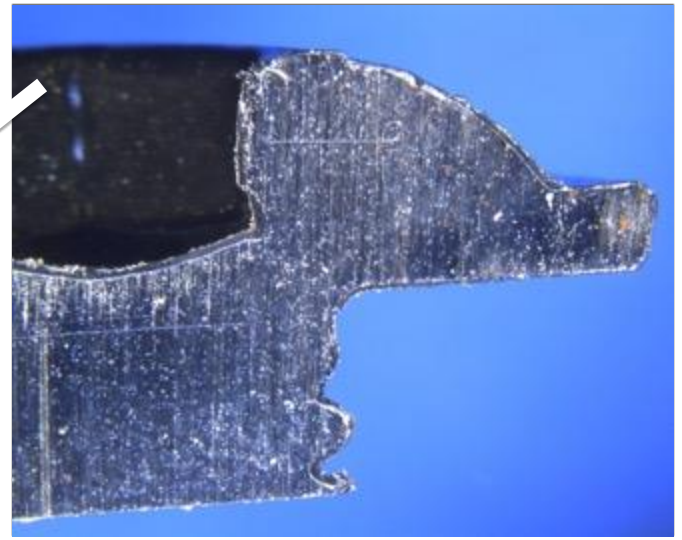
No significant difference was found for NyShield® coated and control bolts at 22°C, 100°C, & 125°C

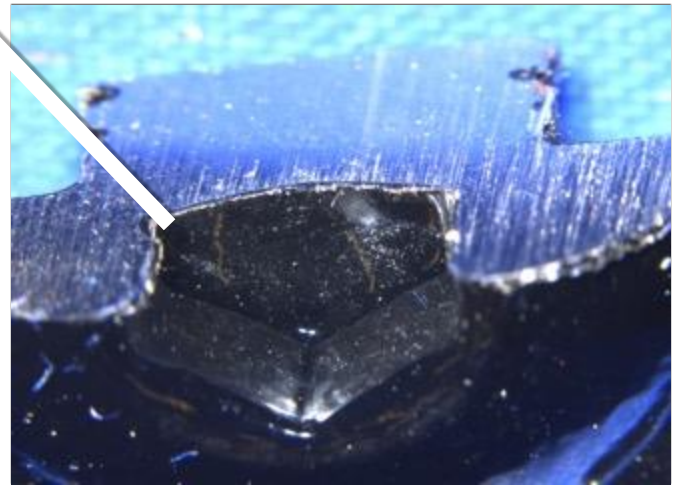
Coating Uniformity

- 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.

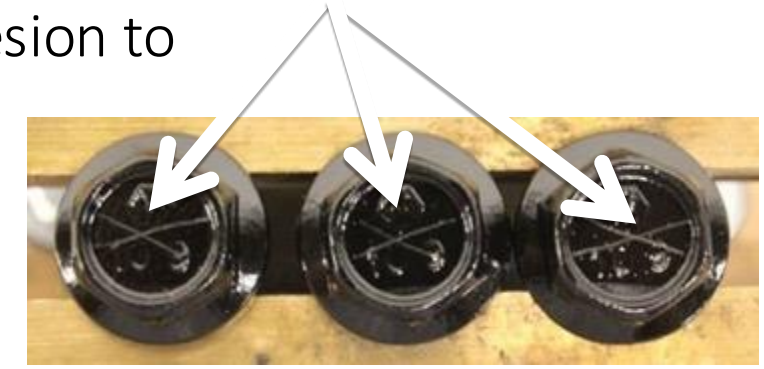
Tape Adhesion

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

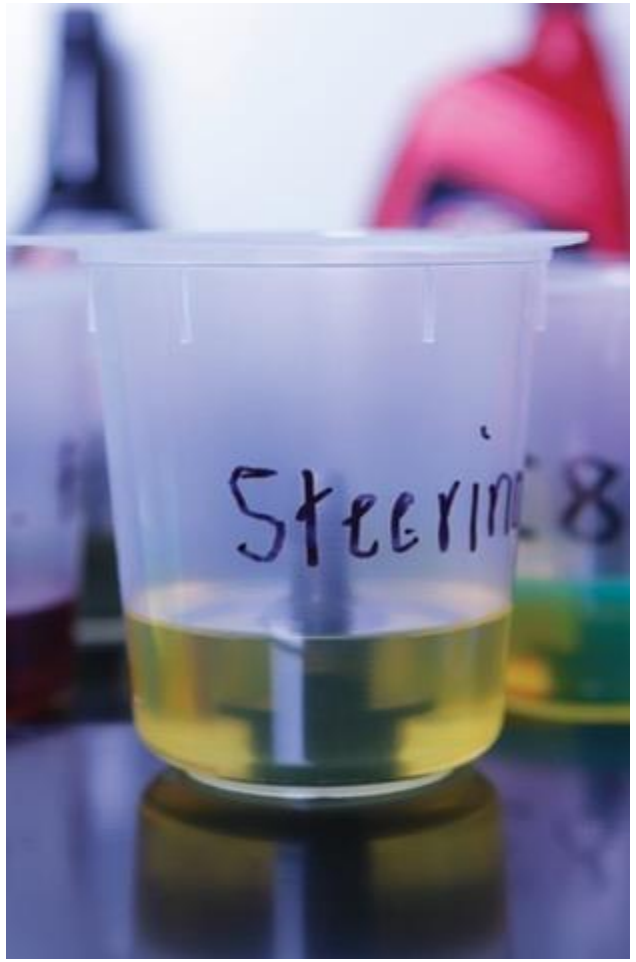
CONTROLLED RELATIVE HUMIDITY CHAMBER

*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

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A Marmon/Berkshire Hathaway Company