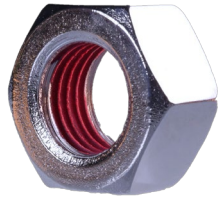
NYLOK®

NySeal® 2.0

The King of Under Head Sealants

NySeal®2.0 Product Overview



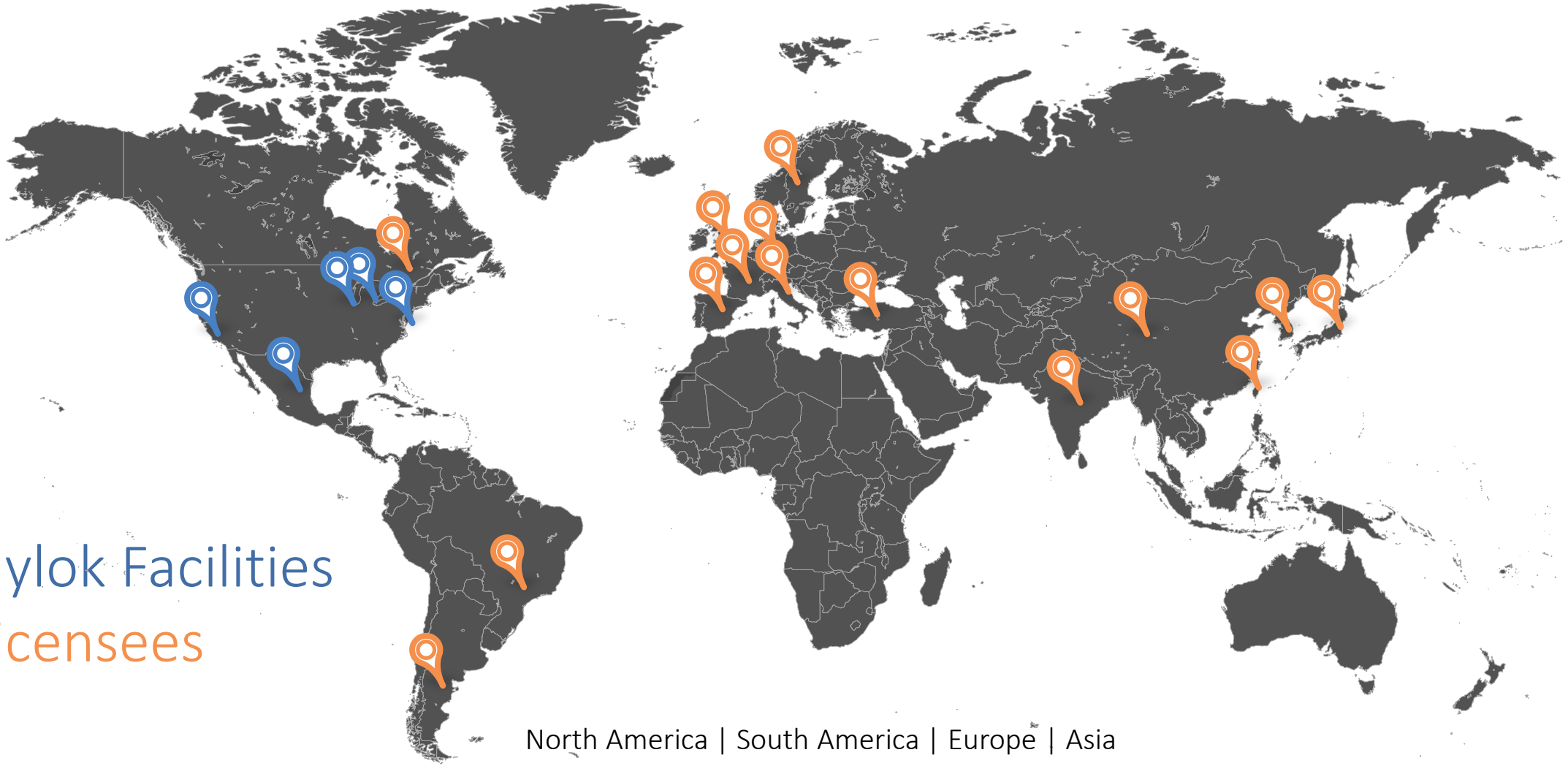
A Marmon/Berkshire Hathaway Company

Nylok | Marmon | Berkshire Hathaway

- # 3 Fortune 500 List
  - 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

NySeal® 2.0
The King of Under Head Sealants

NYLOK®

LOCKING

Mechanical
Reusable

precote®

3M

SEALING

NySeal® 2.0
The King of Under Head Sealants

NEW
Reusable

ASSEMBLY AIDS

PROTECTION

NYSHIELD®

NEW

A Marmon/Berkshire Hathaway Company

NYLOK®

Next Level Durability
Under – The – Head Sealant

NySeal® 2.0

The King of Under Head Sealants

A Marmon/Berkshire Hathaway Company

NySeal® 2.0

Wish List:

- No peeling off
- Reusability (up to 5 times)
- Performs after exposure to -60 to 150°C
- Low clamp load loss at RT

Other Sealant Solutions

NySeal® 2.0
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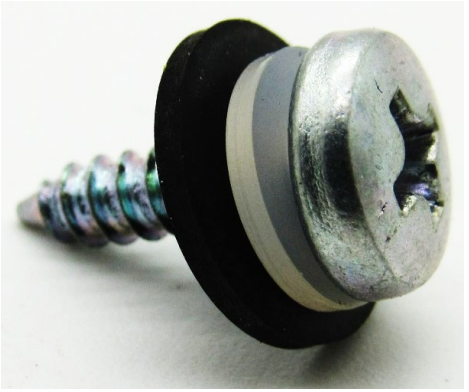
NYLOK®

Issues

- Distort
- Squeeze out of joint
- Outgas (peroxides and / or sulfur)
- Difficult tightening strategy (cannot tighten to a torque)
- Not good for multiple installations



NySeal® 2.0 is a Durable Under Head Sealant

- Each of these M6 fasteners were tightened once to 9.5 Nm

Standard Silicone Sealant

Notice:
No Tearing
or Debris!

Why NySeal® 2.0 is More Durable than Standard Sealants?

	EXTRA SOFT			SOFT			MEDIUM SOFT			MEDIUM HARD		HARD			EXTRA HARD			
SHORE 00	0	10	20	30	40	50	60	70	80	90	100							
SHORE A					10	20	30	40	50	60	70	80	90	100				
SHORE D									10	20	30	40	50	60	70	80	90	100

	Competitive Under Head Sealants	NySeal®2.0
Hardness	45-65 Shore A	62 Shore D*
Tensile Strength	145 PSI (1 MPa)	2300 PSI (15.9 MPa)
Elongation	400%	40%
Modulus	145 PSI (1 MPa)	31,000 PSI (214 MPa)
* 62 Shore D is 100+ on Shore A Hardness Scale		

M10 Fastener

Enhanced Physical Strength of Polymer Formulation + Exceptional Adhesion to Fastener = Durable, Multi-Use Under Head Sealant

Better Under Head Sealant - NySeal® 2.0

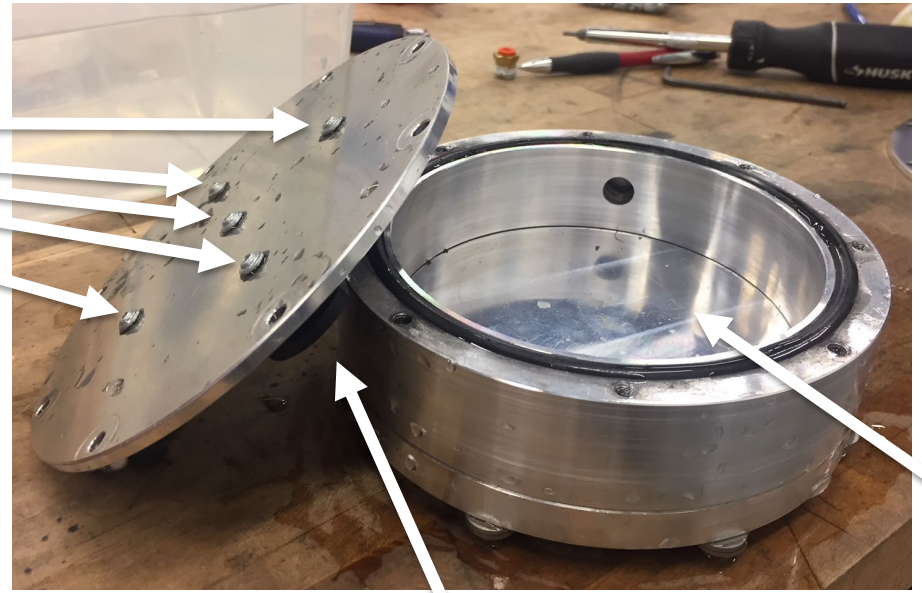
- Nylok released NySeal® 2.0 in 2019 - Today, we would like to explain its strengths and tested abilities
  - Pressurized seal testing – M3 fasteners
  - Automotive fluid testing with engine plugs
  - NySeal® 2.0 Chemical resistance
  - Mechanical performance and SAEJ200 results for NySeal® 2.0

Sealing Tests – Apparatus for M3's

- **Pressurized & Vacuum Leak Testing**
  - Per GMW14906 & FCA PF.90078 Specifications
  - Under water – look for bubbles
  - Before and after thermal cycling

M3 Fasteners

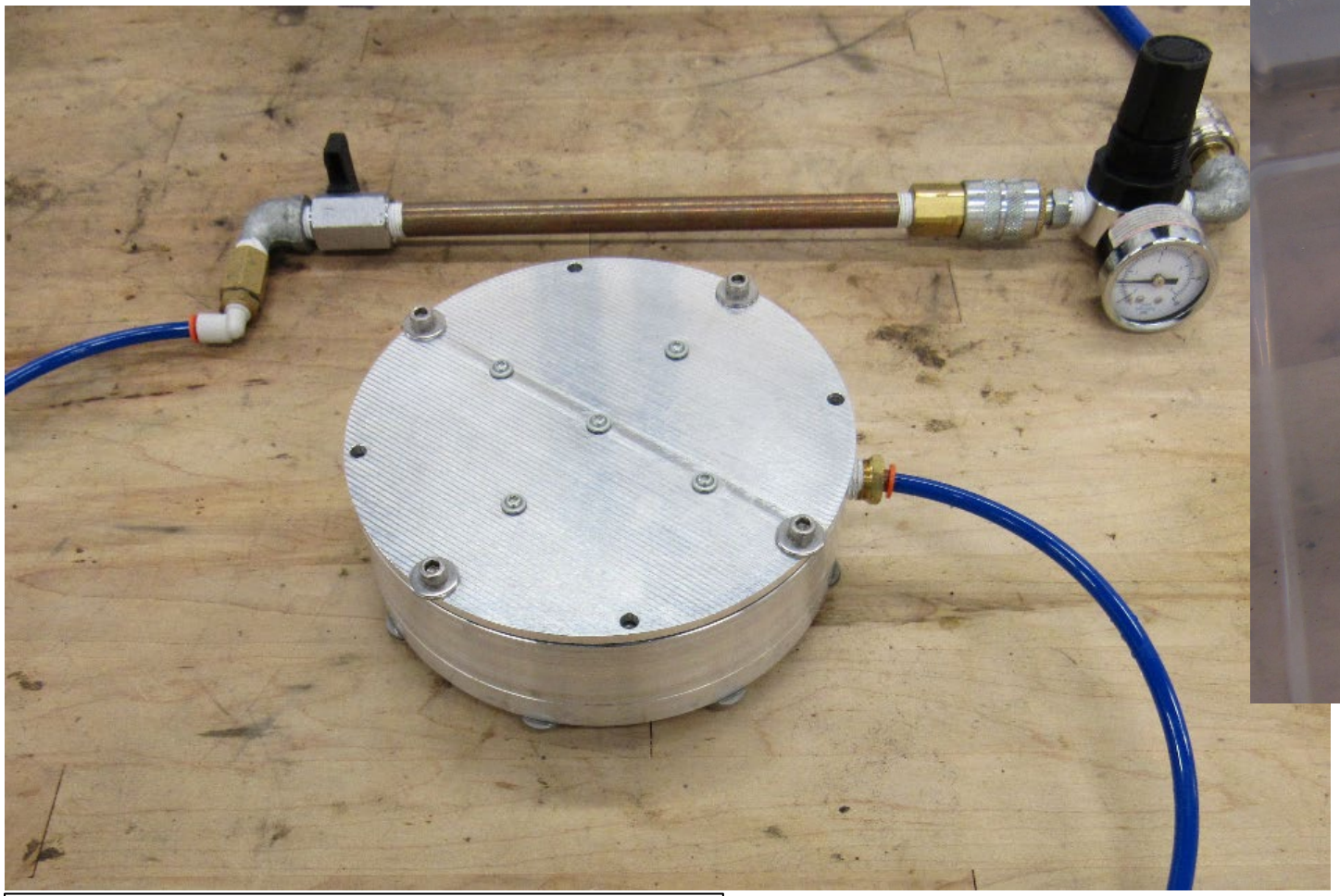
Five test bolt/sealant assemblies tested at a time



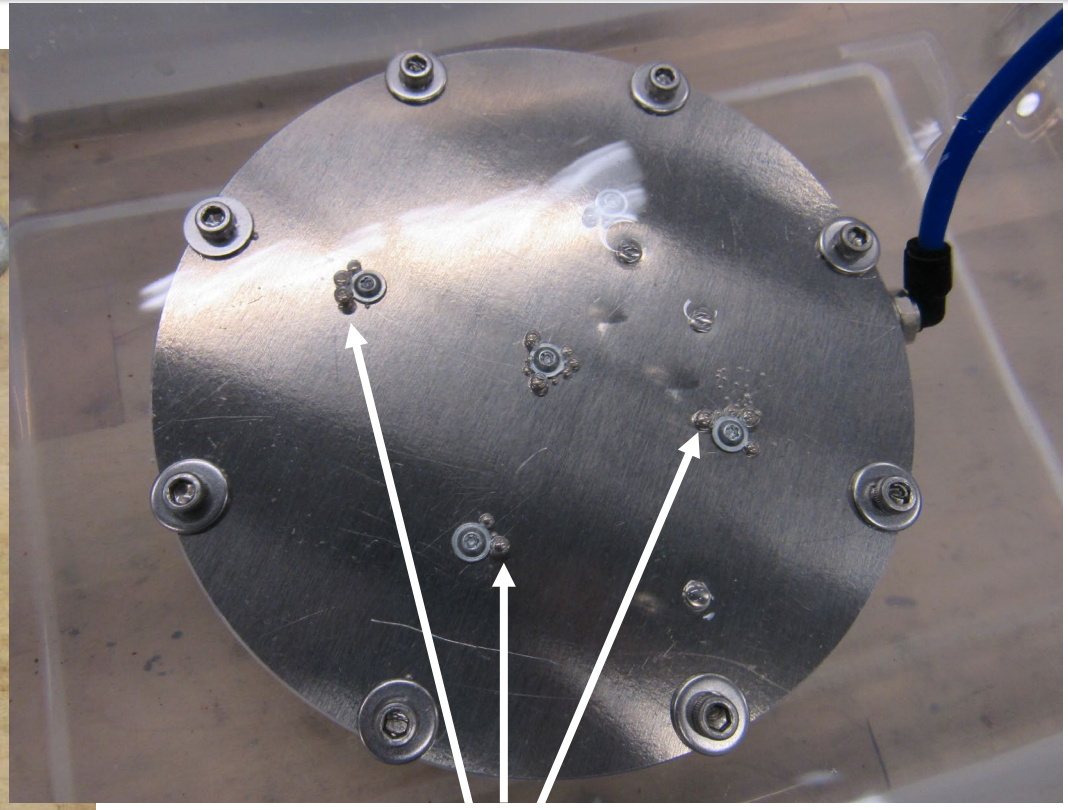
Test fasteners were installed into plastic boss on back side of plate for this test

Inside chamber, once sealed with cover, is pressurized

Sealing Tests – Apparatus for M3's



Tested at 68.9 kPa (10 PSI) typical



Bubbles near the screw heads demonstrate failure on **control samples (no sealant)**

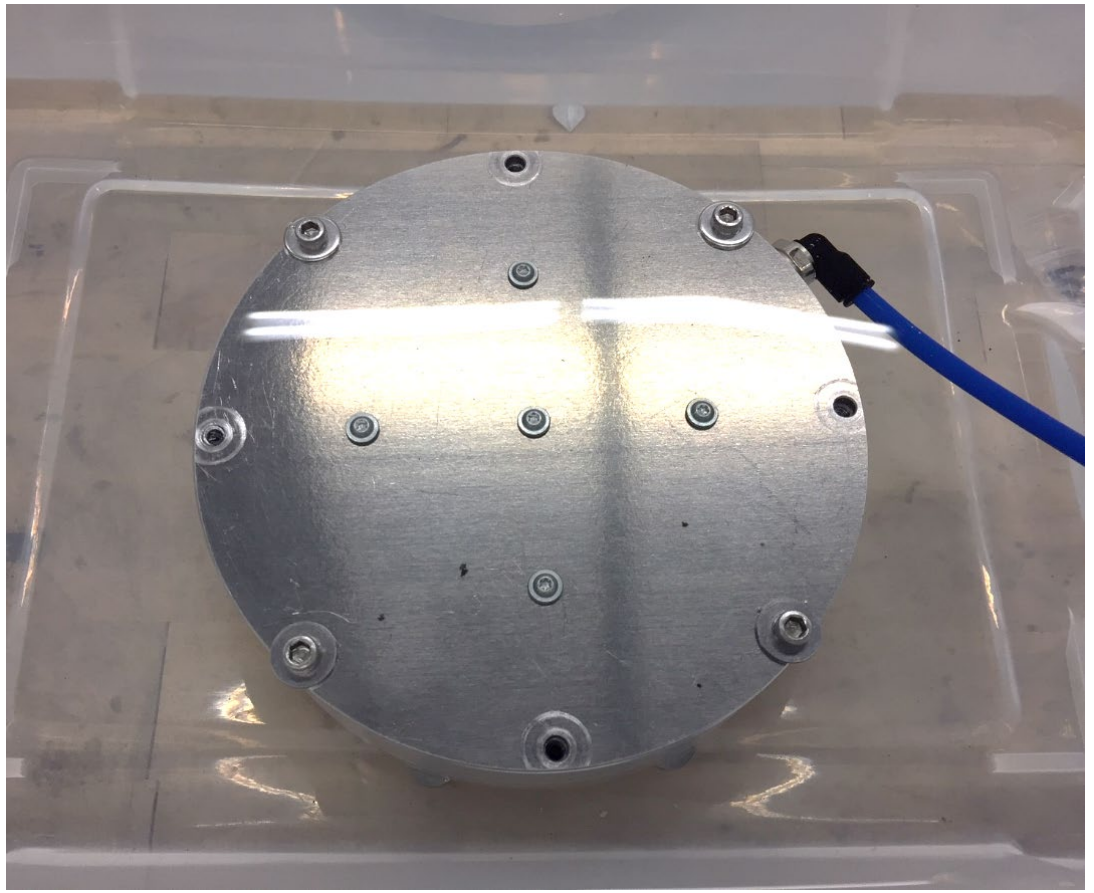
Sealing Tests for M3 Fasteners

TESTING PERFORMED IN NYLOK LAB

- **FCA PF.90078 5.2.1** Sealing Requirement – Submergence (5.2 kPa (0.75 PSI) at RT for 60 sec) ✔ **PASS**
- **GMW14906 4.5.4.3** Pressurization Seal Test (Under 2.5cm water, pressurize to 7 kPa (1 PSI) for 5 min) ✔ **PASS**
- **FCA PF.90078 5.22** Sealant pressure test to failure (passes at pressures up to 68.9 kPa (10 PSI) following GMW14906 4.5.4.3 protocol) ✔ **PASS**
- **GMW14906 4.5.4.1** Vacuum Seal Test (-21.0 kPa (-3 PSI), under water for 15 sec) ✔ **PASS**
- **GMW 14906 4.9.2.12** Storage (must pass above pressure and vacuum tests after exposure below): ✔ **PASS**

Cycle	Temperature	Duration
1	80°C ± 3°C	48 h
	Ambient 23°C ± 3°C	≥ 15 min
2	–40°C ± 3°C	24 h
	Ambient 23°C ± 3°C	≥ 15 min

- **GMW 14906 4.8.2.1.9.2** Rapid Thermal Transition (must pass above pressure and vacuum tests after exposure to rapid transition between -60°C and 85°C) ✔ **PASS**

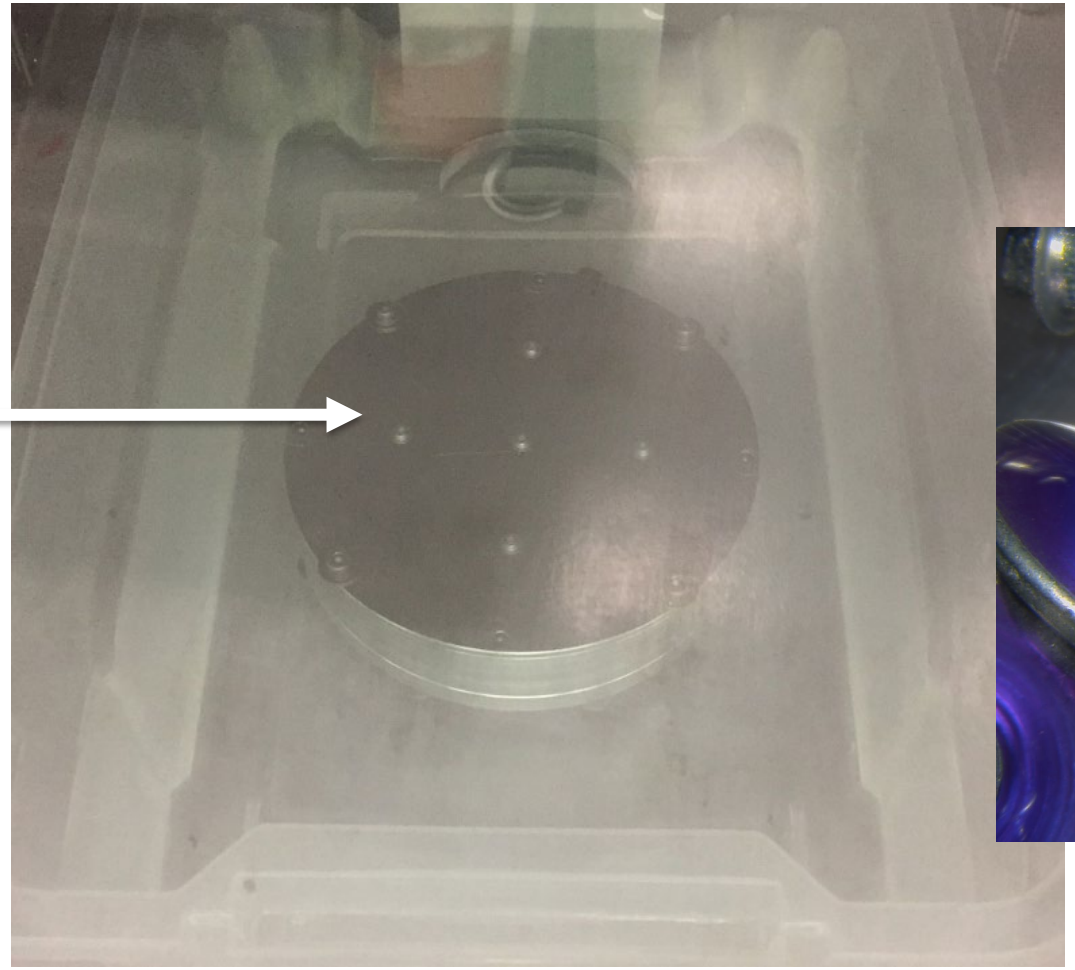


Submerged Pressurization Test – Demonstrates a "Passing" Test

Sealing Tests – Vacuum

Submerged Vacuum Test

- Vacuum test at -21 kPa (-3.0 PSI) vacuum for 15 seconds ✓PASS

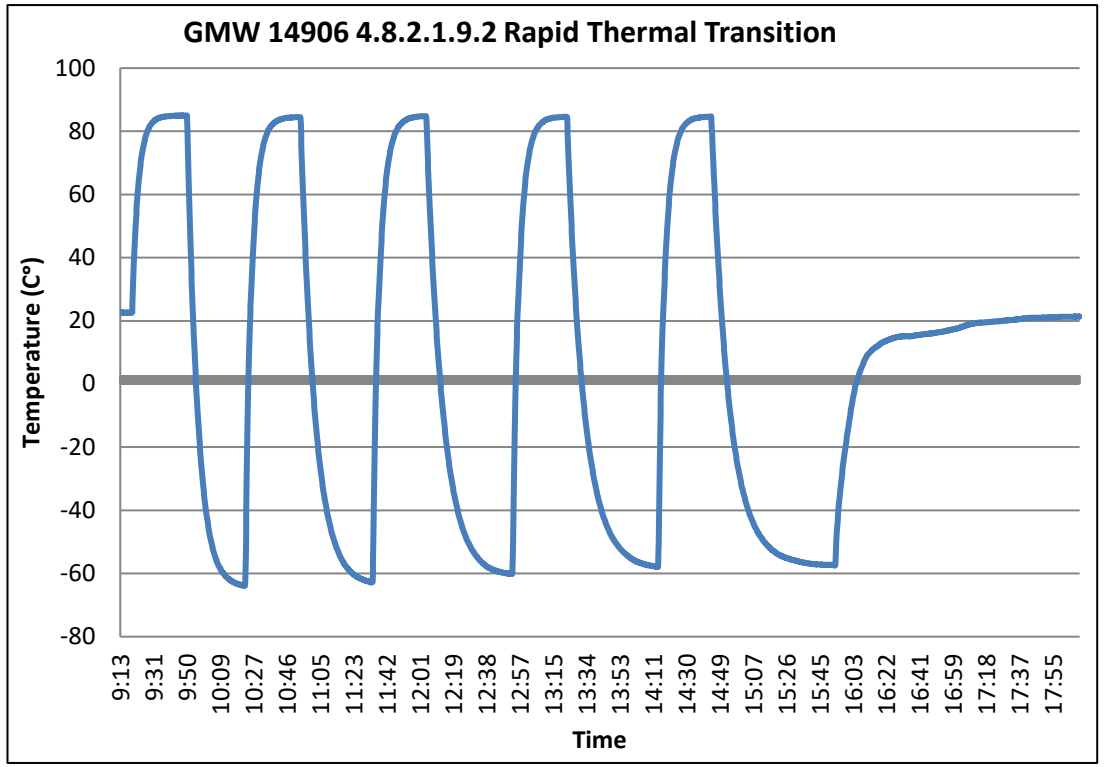


Vacuum Chamber Test

M3 Fasteners

Sealing Tests – Rapid Thermal Transition

- Samples must pass both pressurization and vacuum tests before and after rapid thermal cycling
  - NySeal®2.0 ✓PASS



Temperature Cycling Profile

Fastener/test plate assembly at -60C

High Pressure Spray Test

- Elevated Test parts assembled into a plastic boss with color changing paper

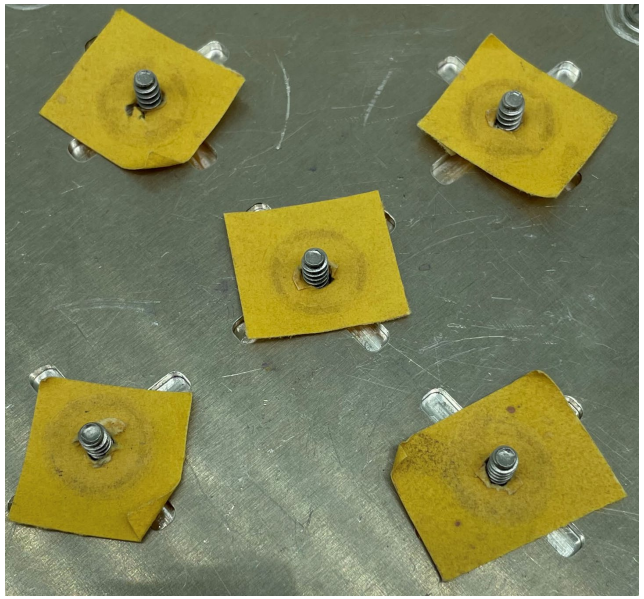
* Per NY1039; Reference GMW16001

High Pressure Spray Test

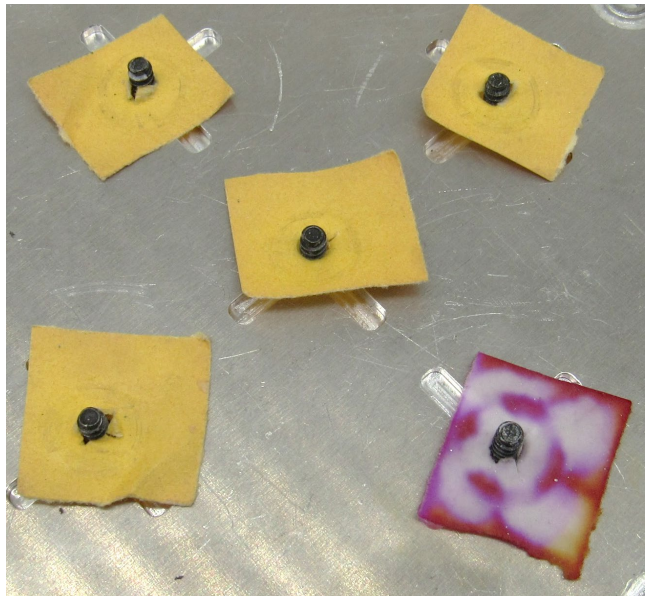
- Elevated Results showing water indicating paper and multiple installations

<u>High Pressure Spray Test</u>*
- Parts with Sealant Mounted to Seal Plate
- Sprayed by Pressure Washer with 76 Bar (1100 psi) at 14 liters/minute for 3 minutes

Delta 40 x 12mm Torx Plus Rnd Screw
Finish: black zinc electroplate**



NySeal® 2.0
After 25 Installations

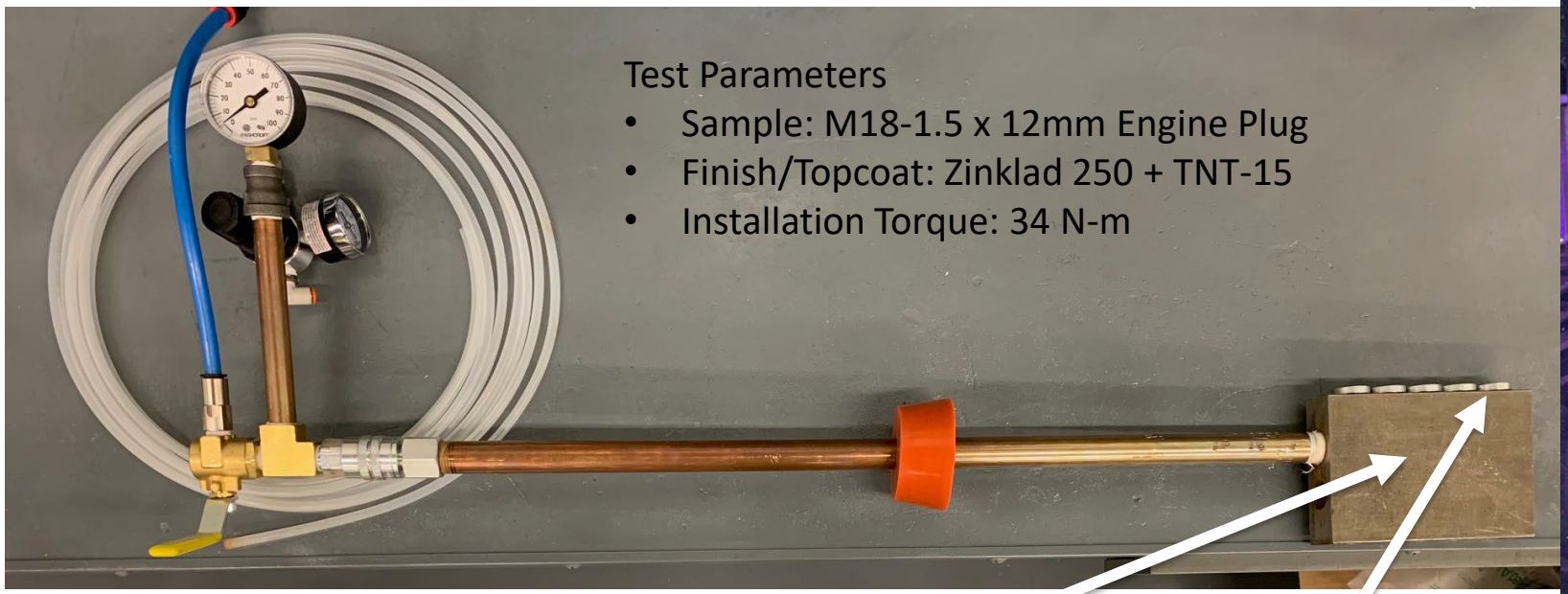


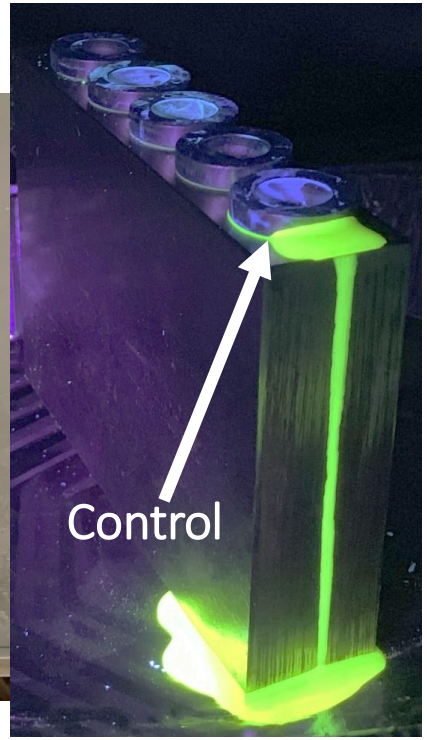
Alternative OEM Approved Sealant
After 2 Installations

* Per NY1039; Reference GMW16001
**These were acquired competitive samples w/o paperwork

Sealing Test – Engine Plug

- Automotive fluid testing: pressurized while being exposed to an elevated temperature for a 5-hour duration





- Bolt without sealant
- Shows a failed test
- Green tracer added to test fluid
- Tracer is visible under black light illumination

* Tested per Ford WSS-M21P27

Sealing Tests – Engine Plug

Test Results*

- Coolant/Antifreeze Resistance (120C for 5 hours @ 2 bar) ✓PASS
- Engine Oil Resistance (SAE 10W30 @ 160C for 5 hours @ 4 bar) ✓PASS
- Automatic Transmission Fluid Resistance (Ford ATF service fluid @ 120C for 5 hours @ 4 bar) ✓PASS
- Fuel Resistance (commercially available gasoline @ 70C for 5 hours @ 4 bar) (not tested yet) ✓PASS

M18 Fastener Used for All Testing
Zinklad 250 + TNT-15

* Tested per Ford WSS-M21P27

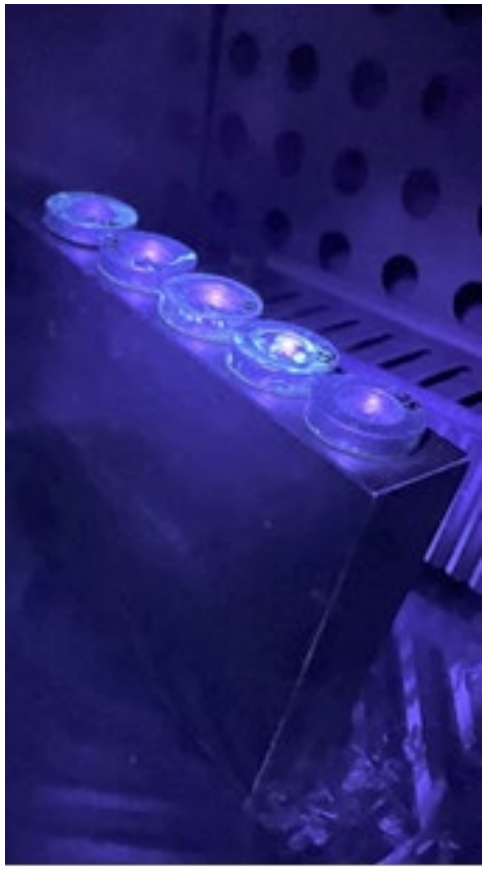
Sealing Tests – Engine Plug

- Elevated Temperature with Automotive Fluid Testing*

Test Results:

- Engine Oil Resistance (SAE 10W30 @ 150°C for **168 hours** @ 4 bar)

✓PASS



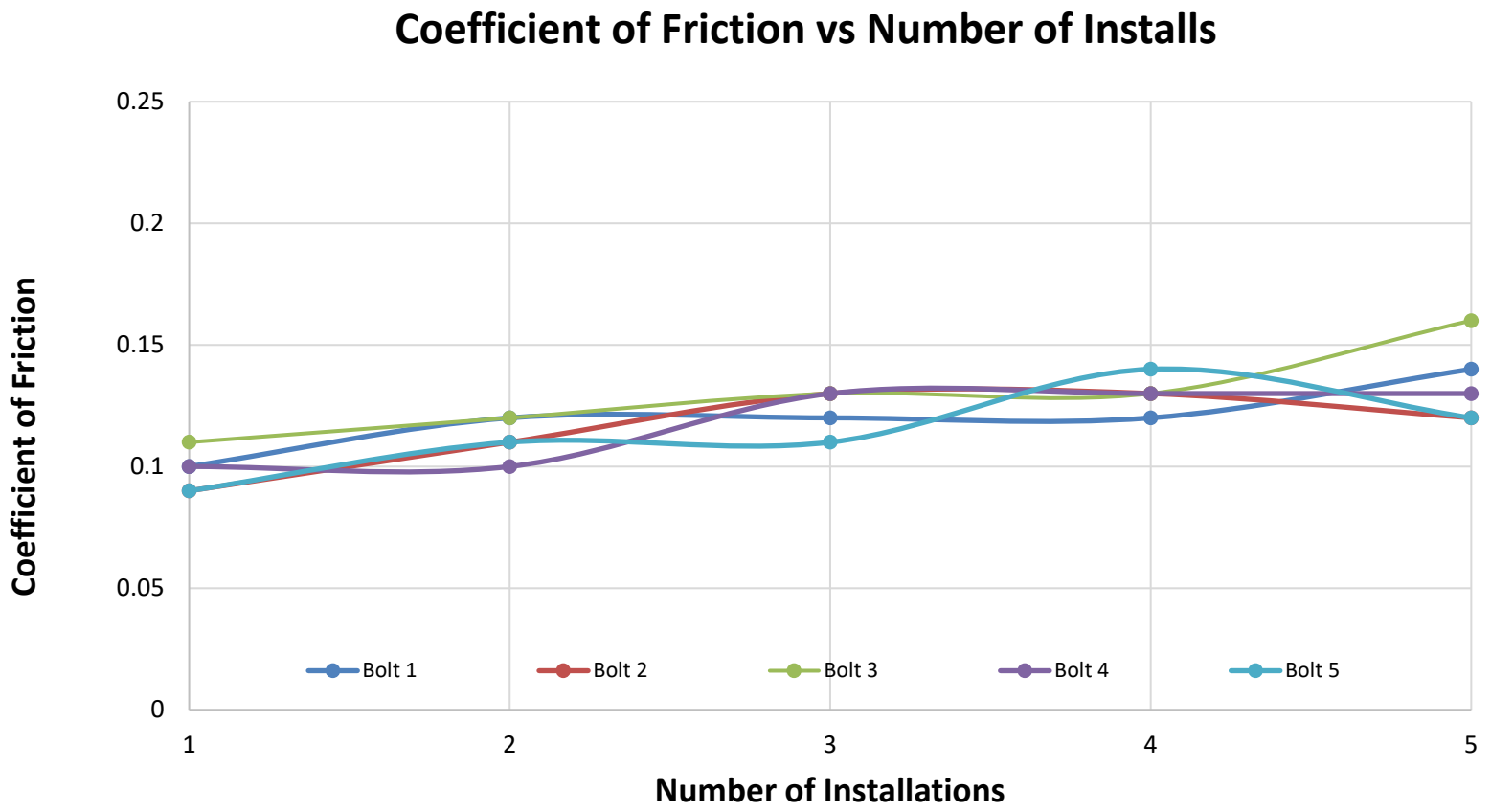
* Tested per Ford WSS-M21P27

Chemical Resistance

- NySeal®2.0 is unaffected and still seals in standard sealing tests after 24 hrs of room temperature exposure to the following fluids: ✓PASS
  - 50% methanol in water
  - AutoZone 50/50 antifreeze and coolant
  - AutoZone power steering fluid
  - Black Magic No Scrub All Wheel Cleaner
  - Castrol DEXRON VI Transmax Automatic Transmission Fluid
  - Commercial Car Shampoo - Meguiar's® Car Shampoo
  - Commercial Glass Treatment Agent - Rain-X 2-in-1 Glass Cleaner
  - Commercial Paintwork Cleaning Product - P21S Paintwork Cleanser
  - Commercial Tar and Road Oil Cleaner - Turtle Wax Bug and Tar Remover
  - Commercial Vehicle Cleaning Agent - Simple Green Cleaner
  - Commercial Washer Fluid - AutoZone Windshield Washer Fluid
  - Commercial Window Cleaning Agent: Windex®
  - Deionized Water from Nalco Filters
  - Water/Soap Solution (Approx. 2% soap)
  - Diesel Fuel
  - Gila Window Application
  - Ice Spray Wax
  - Mercon® ULV Auto Transmission Fluid
  - STP High Mileage Motor Oil SAE 5W-30
  - Transit Coating/Protective Wax - Turtle Wax Super Hard Shell

Properties - COF

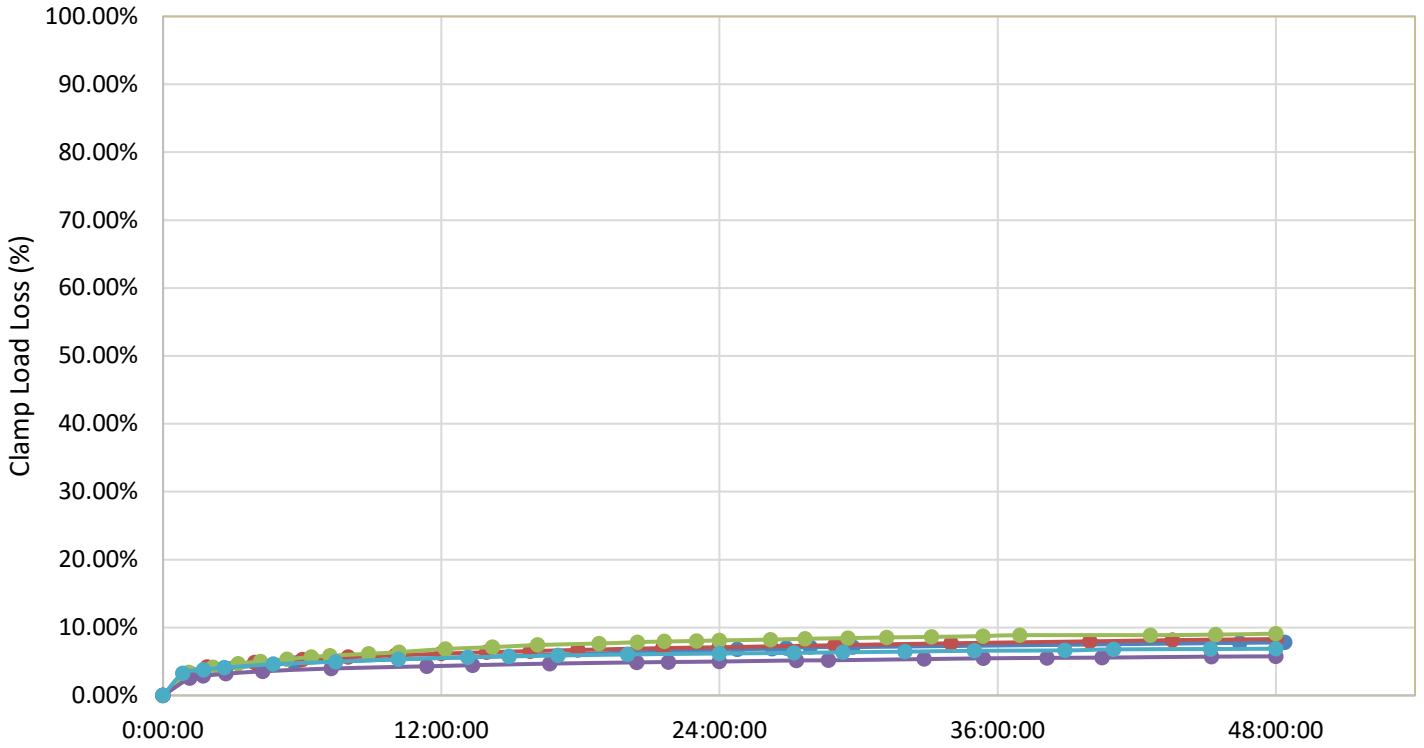
- Coefficient of friction values are controlled within normal COF specifications, even after multiple installations. COF values can be adjusted per customer needs.



- Size: M10 x 1.5mm x 45mm
- Finish: Electroplated Zn Ni
- Tightened against Zn Ni finish on washer

Low Clamp Load Loss

- Average Clamp Load Loss over 48 Hours for M8 Fastener: 7.5% (same fastener w/o any sealant had 5.1% clamp load loss over same time frame)



Larger Fasteners Also Benefit From NySeal®2.0

Electroplated Zinc Nickel Finish

Sample Before Testing

Electroplated Zinc Nickel Finish

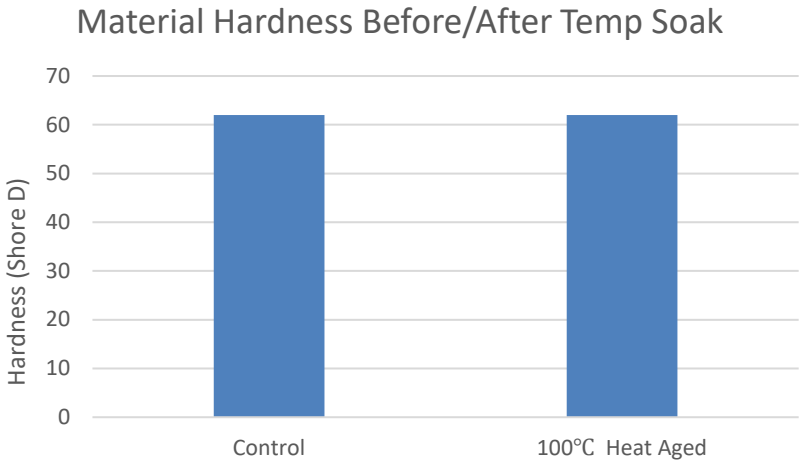
Sample After 5 Installs

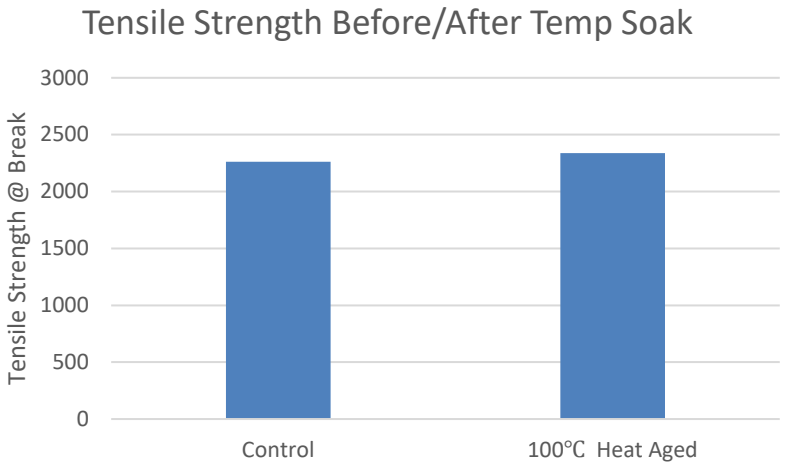
Effects of multiple installations on M10 bolt tightened 5 times at 58 Nm tightening torque.

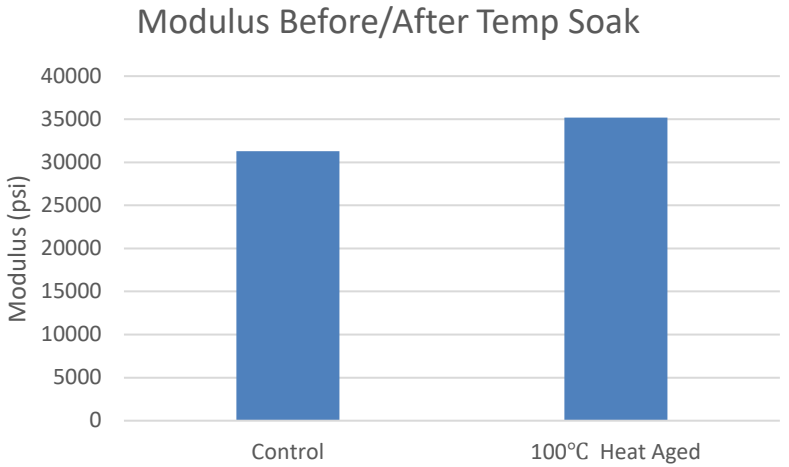
SAE J200 – NySeal®2.0 Temperature Performance

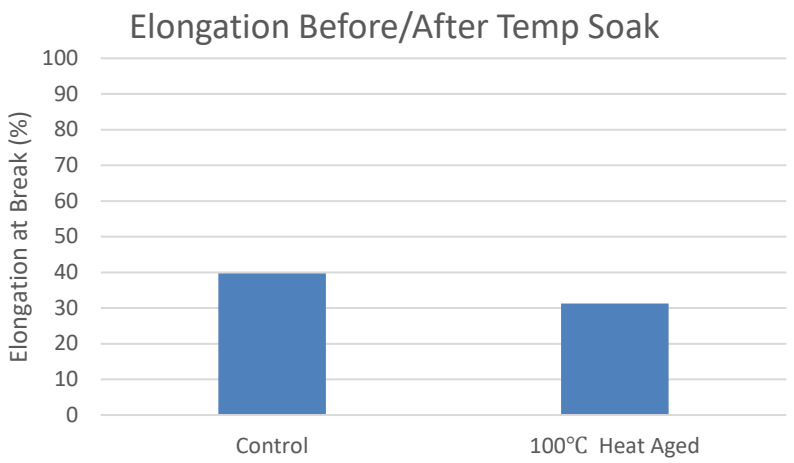
Results:

- Test samples made from NySeal®2.0 show no significant changes in physical properties, even after heat aging @100℃ for 70 hrs.





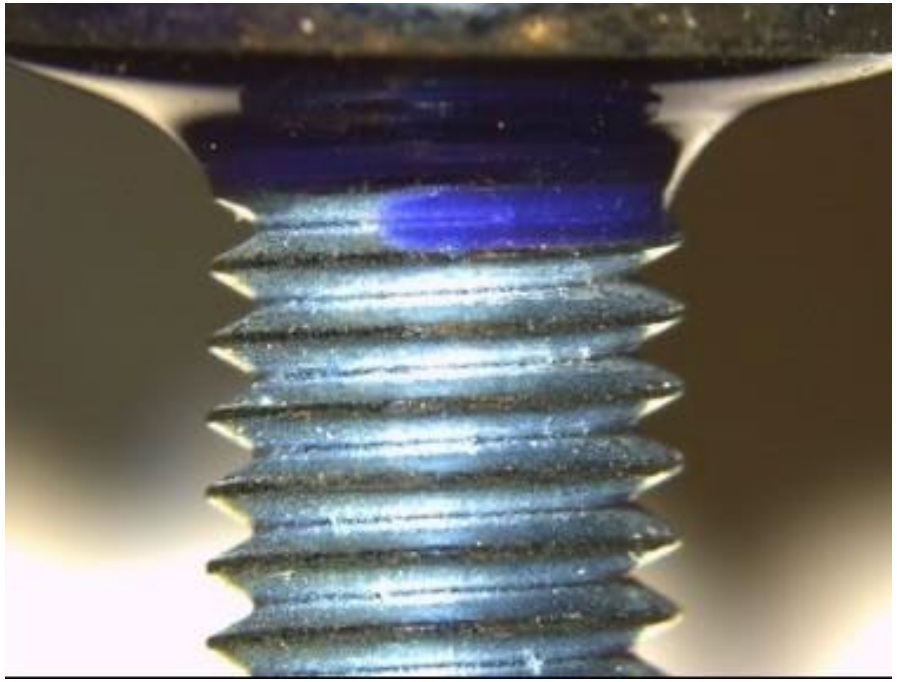




SAE J200 – NySeal®2.0 Resistance to Oil Swell

Results:

- Test samples made from NySeal®2.0 have low percentage swell (10 – 11%) when soaked in specified oil

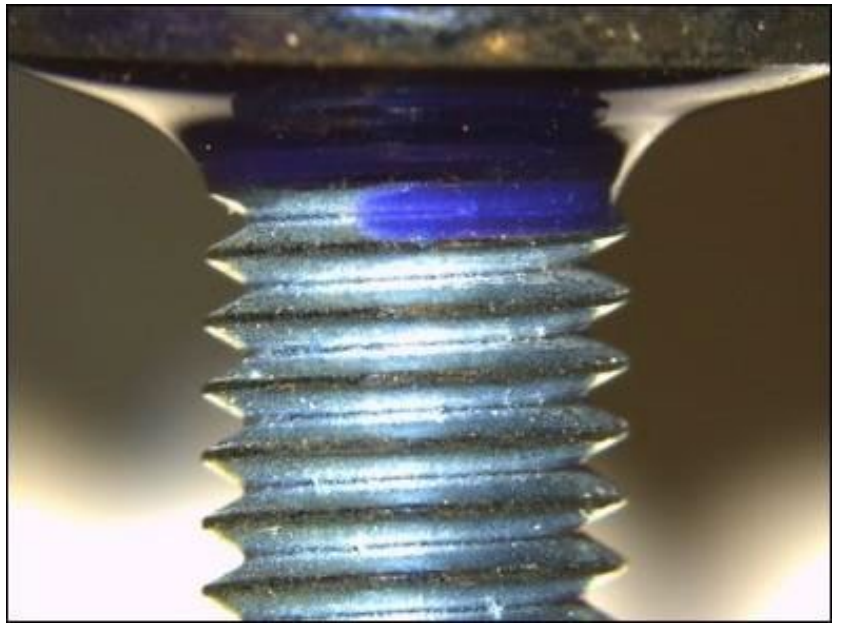


Before Oil Soak		After Oil Soak			
Dry Mass (g)	Wet Mass (g)	Dry Mass (g)	Wet Mass (g)	%Change in Mass	% Change in Volume
2.495	0.300	2.691	0.253	7.86%	11.07%
2.515	0.297	2.705	0.257	7.55%	10.37%
2.501	0.299	2.689	0.256	7.52%	10.49%
2.463	0.297	2.649	0.257	7.55%	10.43%
2.54	0.308	2.724	0.268	7.24%	10.04%

IRM 903 oil soak @ 100°C FOR 70HRS

SAE J200 – NySeal®2.0 Call Out

- **SAEJ200M6BG910A14Z1Z2Z3Z4Z5Z6**
  - Z1: NYLOK® NYSEAL®2.0
  - Z2: MATERIAL: POLYACRYLATE (PURPLE)
  - Z3: HARDNESS: MEDIAN HARNESS 62 SHORE D (APPROX. 95 SHORE A) PER ASTM D2240
  - Z4: VOLUME SWELL IN IRM 903 OIL AT 100℃ FOR 70HRS: <15% PER ASTM D471
  - Z5: ELONGATION: 30-50% PER ASTM D412
  - Z6: MINIMUM TENSILE STRENGTH: 14MPA PER ASTM D412



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Questions

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