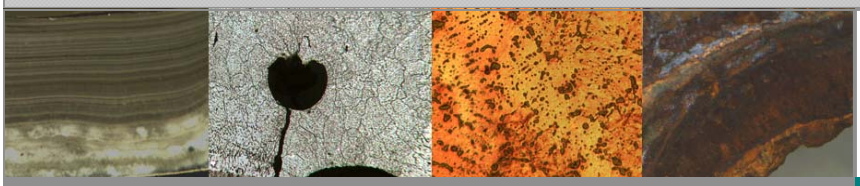
NUTS & BOLTS



New Hampshire MATERIALS LABORATORY, INC.
Your Problem Solving Partner

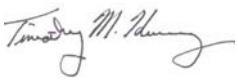
MATERIAL CORROSION AND CARBON CONTENT IN STEEL

JULY 2009 / ISSUE: 2

Welcome to New Hampshire Materials Laboratory

Welcome to our second edition of the Nuts & Bolts e-newsletter. Since, its inception the Nuts & Bolts has gone through some transformations including this electronic one. One thing that has remained true is NHML strives to keep customers informed with on-going issues within the materials industry.

For your enjoyment, we have decided to republish the very first article "Cutting Through Material Corrosion" published in the fall of 1995. This article was written by Fred Hochgraf.



Tim Kenney
Laboratory Director

Cutting Through Material Corrosion

The problem of metal corrosion is familiar to all of us who live in the Northeast. After a winter of snow and salt, who hasn't noticed a spot of rust starting or, worse yet, spreading? Corrosion becomes an even bigger problem for product manufacturers where product quality or production tools may be affected.

Below we've outlined some common types of metal corrosion; a little about their cause and some tips for addressing them. These tips may help you understand and solve your corrosion problems.

Rust is the most common form of uniform corrosion and is routinely found on iron or steel. However many metals (aluminum, copper, silver and brass included) may develop a protective "film" on their surfaces. To solve the problem try protecting the metal with a coating. Paints, oils and other types of coatings often work well. Exchange the material to one better suited for the application. Indeed, manufacturers are finding plastics increasingly valuable in places where metal was once the standard. Where there is no quality or safety concerns consider letting the material corrode.

In This Issue

Quick Links

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Be sure to review our **industry definitions** if you need assistance with terminology

Join Our Mailing List

Staffing Update:

What is Fred Hochgraf up to these days? Many of our long time customers are familiar with Fred. He and his wife, Sally started NHML back in 1979.

This past January, Fred decided it was time to retire. Although, Fred is not here on a day to day basis, he is still available to NHML as a consultant.

The corrosion found on car battery terminals is a good example of galvanic corrosion. It is one of the most challenging types of corrosion to identify. It appears as corrosion on an “easily corroded” metal like aluminum, galvanized steel, or low carbon steels.

This corrosion occurs when two conditions are met: (1) dissimilar metals must be in direct contact, or in indirect contact via a fluid path; and (2) an electrical potential must be present.

The amount of corrosion depends upon the distance between the two metals in the galvanic series and how easily the electrical current can flow between them. (The galvanic series is a list of metals and alloys that are arranged by their relative corrosive tendency.)

Click here to continue reading this article.

NHML Staff Bio

Meet the newest member of the NHML’s staff: Tony Tipton. He is our Chief Metallurgist. Tony has a Masters degree from Rensselaer Polytechnic Institute, and a Bachelor of Science degree from Lehigh University.

Tony comes to New Hampshire Materials Laboratory with 26 years of experience addressing a wide range of materials issues in the turbo-machinery industry. He has held various engineering and technical management positions at Pratt & Whitney Aircraft, Hamilton-Sundstrand, Dresser-Rand, and Westinghouse Electric.

He currently resides in Barrington, NH and enjoys the four seasons and laid back lifestyle New Hampshire has to offer.

Case Studies From Our Materials Lab

CASE HISTORY: SERRATED AUSTENITIC SCREWS

CUSTOMER PROBLEM:

Austenitic screws were losing preload and loosening during low temperature environmental testing.

We miss seeing Fred on a daily basis and are always happy to see him when he pops in the lab.

Did You Know….

That the carbon content in steel has a significant impact on the performance of the material in many applications? If the carbon content is increased, this is what happens….

- The melting point of steel is lowered.
- The steel becomes harder.
- The steel has higher tensile strength.
- The steel is less ductile.
- The steel becomes more wear resistant.
- The steel becomes harder to machine.
- The steel is more difficult to weld without cracking.
- The steel become heat-treatable.
- The steel may become more expensive because of lower volumes of production.

Applied-Chemistry continued at NHML.com

New Hampshire Materials Lab
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What NHML Did To Solve Problem:

Testing at NHML indicated that the serrated design on the underside of the screw heads resulted in far less axial preload than predicated by common mechanical equations based on tightening torque and torque tables. Recommended that customer perform testing to determine the tightening torque versus axial preload relationship for his specific screw design.

Benefit to Customer:

Determination of the correct tightening torque to sufficiently preload the bolts so they stay tight during operation.

Case History: Weld Exams

Customer Problem:

During a routine inspection of a heated pressure vessel transverse cracks were noted in a horizontal weld. A coupon was removed for examination of the weld cracks.

What NHML Did to Solve Problem:

The vessel was constructed of 1/4" type 316 stainless steel plate. Visual examination of the coupon revealed no obvious defects other than two transverse weld cracks. Metallographic coupons were prepared for examination of the weld, heat affected zone, and base metal. Microscopic examination of these coupons revealed extensive branching, transgranular fractures typical of chloride induced stress corrosion cracking. Energy Dispersive Spectroscopy detected approximately 7% chlorine on the fracture surfaces confirming the failure mechanism. The visible transverse weld cracks were found to be part of an extensive network of stress corrosion cracking, severely compromising the integrity pressure vessel.

To find out the benefit to our customer and see more of our case histories click here.

Note From The Chemistry Lab

Our chemistry department can identify polymers by FTIR Spectroscopy and can therefore verify that the right polymer is being used. We can also measure such physical properties as tensile strength and elongation as well as thermal properties such as glass transition, melt temperature and decomposition temperature measured by DSC.

Here are just a few of the polymers we have tested for our customers:

- Polyvinyl Chloride (PVC)
- Epoxy
- Fluoroplastics (Teflon)
- Nitrile (Barex)
- Nylon

Our Senior Chemist, Jeff Masse is waiting to hear from you to help you solve your Polymer dilemma.

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