June 2024

CORTEC Laboratories, Inc.

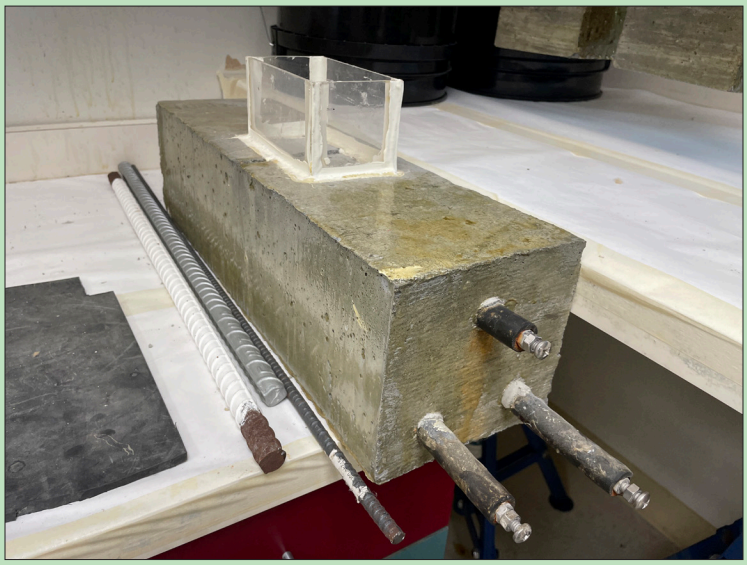
The LEADING Edge

NEW TEST UNDERWAY FOR CORROSION INHIBITING ADMIXTURES

For years, Cortec® Laboratories has been unsatisfied with the only two test methods available for evaluating the performance of corrosion inhibiting admixtures in concrete: ASTM G109 takes too long (several years) and ASTM G180 does not highlight the true nature and behavior of MCI® admixtures as well as we would like. We are therefore excited to have a new project underway to examine and refine a new test method that promises to be more practical and representative of MCI® performance!

Inspiration from the Texas DOT

Colin Gardner (Product Development Chemist) is heading up the development of this third test method based on inspiration from a report on "rapid microcell corrosion testing" from the Texas DOT. Although the report was published many years ago with apparently good results, no one seems to have carried it any farther. Colin hopes to springboard off this method to create an improved version for our own use and potentially the good of the whole industry.



Standard setup for ASTM G109: container on top for saltwater ponding, upper rebar located nearer the surface for exposure to saltwater, lower two rebars protected from saltwater by thick concrete cover. The upper and lower rebars are connected with a wire to measure the difference in corrosion potential and calculate the corrosion rate.

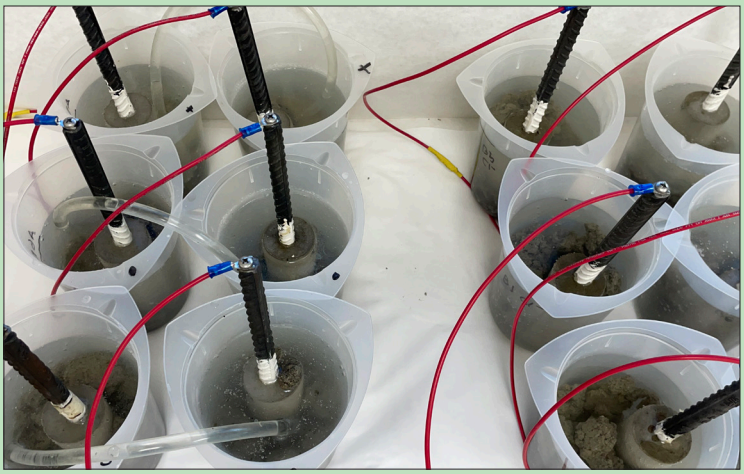
Current Testing Underway

The new test going on in Cortec® Laboratories' concrete lab is very similar to ASTM G109 but condenses the lengthy test into a shorter time frame with smaller test specimens. Instead of embedding rebar in a large unwieldy block of concrete, the new test method requires Colin to make dozens of concrete "lollipops" (concrete cylinders with rebars sticking out of them). Rather than ponding saltwater on top of one large concrete block, Colin is placing one lollipop from each set into a beaker of saltwater. The second lollipop of each set is placed into a beaker of unsalted water to mimic the uncorroded rebars of ASTM G109 (only one is needed for the modified test). A wire connects the rebars in the two beakers to allow electron flow and the measurement of corrosion potential. A plastic tube going from one beaker to the other serves as a "saltwater bridge" so that a positive charge can flow from the regular water to the saltwater to balance out the flow of negative electrons.

Looking Forward to Positive Results

"I'm pretty excited to finally be starting this," Colin commented. "We've been talking about this for

Colin setting up "lollipop" samples for "rapid microcell corrosion testing" with slight modifications to improve upon the process previously explored by the Texas DOT.



Top view of test beakers. Each pair of rebars is connected by wire for electron flow and corrosion measurements. Each pair of beakers has a "saltwater bridge"—a plastic tube that allows positive charges to complete the cycle from the unsalted water back to the saltwater sample. The white coating at the rebar base is to prevent extraneous corrosion at the vulnerable sample interface so test results can be focused on the rebar portion in the center of the concrete.

a long time…." During this round of testing, Colin will be evaluating five sample groups: a control, concrete treated with calcium nitrite, and concrete treated with three different formulas of MCI® admixtures (equaling three MCI® groups total). Meaningful results should start appearing in a couple of months and the entire project will be complete in about 16 weeks or 100 days. If all goes well, Cortec® will have an improved method of screening potential new admixture materials, evaluating the effectiveness of MCI®, and possibly presenting a new test standard that could help the entire industry better evaluate all corrosion inhibiting admixtures!

Cortec® Makes Significant Contribution to AMPP Conference Symposia

AMPP 2024 was a special year for Cortec® as our founder and CEO, Boris Miksic, FNACE, was honored for 50 years of membership in the National Association of Corrosion Engineers (NACE) turned AMPP! During this important milestone year, we are proud to have made a substantial contribution to the conference technical program with seven papers written variously by members of Cortec® R&D, Cortec® technical services, and technical associates from the University of Zagreb and California State University, Northridge. We invite you to browse the following titles as posted on the AMPP store website!

- "Compostable VCI Film Brings Corrosion Protection 'Back to Nature'" by Antonia Đurin, Ming Shen, Dijana Zrinski, and Julie Holmquist
- "Developing Vapor Phase Corrosion Inhibitors for Aluminum Alloys in Ethylene Glycol Coolant Solutions" by Behzad Bavarian and Lisa Reiner
- "Evaluating the Flash Rust Protection of Water-Based Cleaners and Their Role in Surface Preparation" by Lisa Marston and Luke Stone
- "Gearbox Corrosion Mitigation During Storage and Intermittent Operation" by Pavlo Solntsev and James Holden
- "General Corrosion Mitigation of Carbon Steel Using Corrosion-Inhibiting Oil as Possible Solution for Hydrostatic Testing of Product Tanks" by Ivan Stojanovic, Vesna Alar, Boris Miksic, Ivana Borsic, and Marin Kurtela
- "High-Temperature-Stable Vapor Corrosion Inhibitor for CUI" by Ming Shen, Boris Miksic, and Pavlo Solntsev
- "Redefining Conventional, with Biobased Alternatives" by Technical Service Engineers Luke Stone and Lisa Marston

At right: Luke Stone presenting paper on biobased alternatives to traditional rust preventatives. Co-authored by Lisa Marston.

Lab News

Cortec® Laboratories, Inc. Passes Another ISO 17025 Audit

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

Cortec Laboratories, Inc.
4119 White Bear Parkway, St. Paul, MN 55110

(Hereinafter called the Organization) and hereby declares that Organization is accredited in accordance with the recognized International Standard:

ISO/IEC 17025:2017

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (as outlined by the joint ISO-ILAC-IAF Communiqué dated April 2017):

Mechanical Testing
(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen
President

Perry Johnson Laboratory Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

Initial Accreditation Date:	*Issue Date:*	*Expiration Date:*
September 07, 2023	September 07, 2023	September 30, 2025

Accreditation No.:	*Certificate No.:*
116482	L23-670

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

Page 1 of 3

Cortec® Laboratories, Inc. has been ISO 17025 accredited since 2010. ISO 17025 accreditation optimizes quality management, establishes credibility, and provides a competitive advantage and global recognition. It also allows Cortec® to offer accredited testing on 16 different test methods for our direct customers and other parties in need of these services. The accreditation requires that calibrations for equipment and instruments used for testing must be performed by an ISO 17025 accredited laboratory which enables Cortec® to demonstrate that they operate competently and can generate valid results, thereby promoting confidence in their work both nationally and around the world.

Some of the most popular tests we are accredited to perform under ISO 17025 include ASTM B117 salt spray testing, ASTM 1748 humidity testing, and ASTM G31 immersion testing. If you need testing done or want to learn more about our test capabilities, please contact us: https://www.corteclaboratories.com/contact-us/

CE Recertification for Five MCI® Products

It was 2017 when we were first certified to use CE marking on several of our MCI® products, allowing them to be sold as construction additives in the EU under the EN 1504 standard. This marks our seventh year of recertification, an annual process that involves a variety of internal and external testing, calibrations, and review of batch tickets and in-stock raw materials. As part of the certification, we must maintain our ISO 9001 quality management certification and allow the Applus+ accrediting agency to review our internal audits, corrective actions, training, and other relevant information. As usual, we passed this year's audit with no non-conformances and continue to carry CE Markings for the following five MCI® products:

- MCI® CorrVerter®
- MCI® EcoRainbow® Architectural Coating
- MCI®-2018
- MCI®-2019
- MCI®-2021

If you work in Europe and want to learn more about our CE certifications, contact our MCI® team: https://www.cortecmci.com/contact-us/.

Ensuring Quality and Consistency Across Borders

With multiple branches in the U.S. and Croatia, how does Cortec® manage quality assurance for products manufactured in different states and countries? Some plants like Cortec® Advanced Films and EcoCortec® have in-house testing practices that have been well-established for years. Other plants are smaller or newer to the production/testing scene and are therefore required to send quarterly "retain" samples to Cortec's laboratory to verify quality and consistency.

What does this look like? At Cortec® Biotechnology Campus (CBC) in Sarasota, Florida, it means regularly sending samples of VpCI®-386 Black and Clear, two of its main production batches, to headquarters for QC (quality control) testing and

validation. Although issues with Cortec® VpCI® Paper quality are practically non-existent, Cortec® Coated Products (CCP) in Eau Claire, Wisconsin, regularly sends VpCI® coated paper samples to headquarters for VIA testing and confirmation that the right amount of VpCI® has been added to the paper. For CorteCros®, which does their own testing and has been producing a variety of Cortec® products onsite for the last several years, test requests are more random. Headquarters picks four to six items from the list of products made at CorteCros® during that quarter. CorteCros® then sends a retain sample along with their own "C of A" (certificate of analysis) to make sure their test results match up with those of QC and the laboratory at headquarters.

Quality and consistency are important pillars of good manufacturing and customer satisfaction, and this is an excellent example of how Cortec's laboratory steps in to help Cortec® ensure quality control across state and international borders.

EcoCortec® Lab Continues to Add New Test Capabilities

On the other side of the Atlantic, Cortec's daughter company, EcoCortec®, is further enhancing its own laboratory capabilities to better and more independently serve Europe and nearby regions. Some of the latest additions to the onsite laboratory are a salt spray chamber, humidity chamber, moisture analyzer, QUV Accelerated Weathering Testing chamber, a GC-MS (gas chromatography/mass spectrometry) unit, FT-IR (Fourier Transform Infrared Spectroscopy) equipment, and an electrochemistry set.

Snježana Mikolić, Quality Control Manager at EcoCortec®, explained the importance of the new devices: "All new equipment is necessary for the development of new products. It enables us to provide better technical support to customers, as well as a wide range of tests at their request according to ISO and ASTM standards."

Šejla Zukić, Product & Market Development Specialist, Europe, added, "We have introduced methods for QUV testing according to ISO and ASTM standards (they differ in testing parameters and types of UV lamps that are used) to offer customers both solutions, especially since [the] ISO standard is more acceptable in Europe. GC-MS and FT-IR testing will be used for comprehensive detection, evaluation, and comparison of various products. These tools will also be employed for analyzing competitors' products and for rigorous quality control.

"Electrochemistry is used for the characterization of our inhibitors in different electrolytes, as well as for evaluating the performance of our protective coatings that are in the R&D phase via electrochemical impedance spectroscopy."

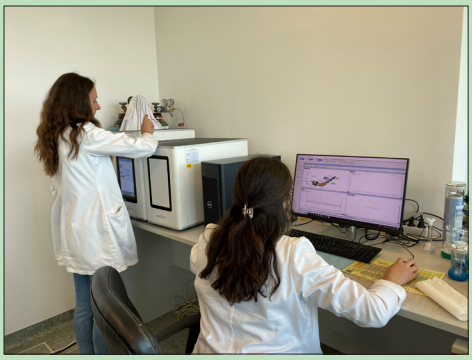
It is exciting to see our EcoCortec® lab move ahead in these areas and we look forward to providing better support than ever as a result of these important investments!

Moisture analyzer. A low concentration of moisture in granules and powder is extremely important for production and a good product. In order to be able to control it, we use a precise moisture analyzer that calculates to four decimal places.

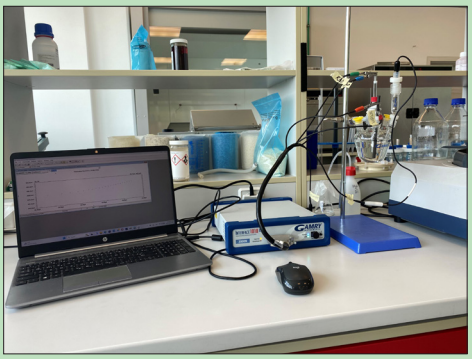
Testing

The purpose of using the salt spray chamber is to control the corrosive environment used to obtain relative corrosion resistance data for metal and clad metal samples exposed therein.

The purpose of using the humidity chamber is to evaluate the properties of metal protection against corrosion in conditions of high humidity.

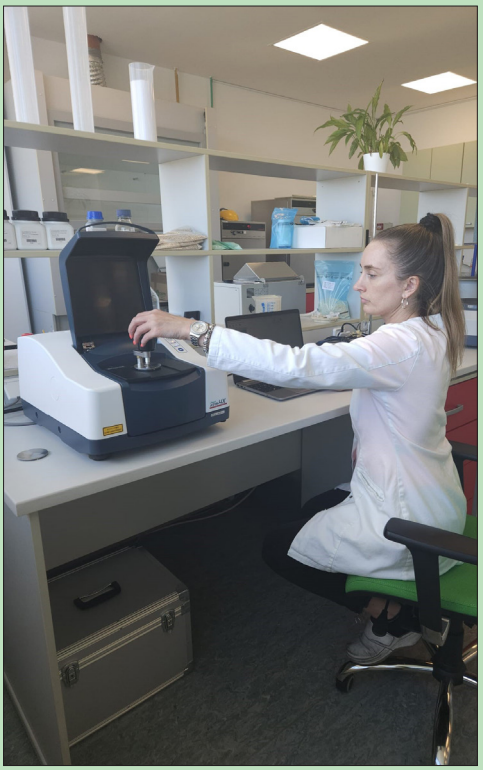


Mirjana Kramar and Antonia Đurin work on GC-MS.



Electrochemistry set for evaluating VpCI® inhibitors in different electrolytes.

QUV test chamber.



Nikolina Grgić works on internal FT-IR test method.

Keywords: Cortec, Cortec Laboratories, concrete admixtures, AMPP 2024, corrosion inhibitors, lab accreditation, salt spray testing, EcoCortec, CE marking, Cortec quality assurance

CORTEC CORPORATION
Environmentally Safe VpCI®/MCI® Technologies

ISO/IEC-17025 LABORATORY TESTING ACCREDITED
ENVIRONMENTAL ISO 14001 CERTIFIED SYSTEM REGISTERED
ISO 9001 CERTIFIED QUALITY SYSTEM REGISTERED

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