CORROSION 2020 TECHNICAL PROGRAM MANUAL

CORROSION 2020 Conference and Expo
March 15-19, 2020
Houston, Texas, USA

NACE INTERNATIONAL
Protecting People, Assets, and the Environment from the Effects of Corrosion

15835 Park Ten Place, Houston, TX 77084-5145
Main Phone: 281-228-6200

General Questions: papers@nace.org

Welcome to the NACE CORROSION 2020 Technical Committee Symposia!

Dharma Abayarathna
ACPC Chair

The success of the NACE technical committee symposia is made possible through your contributions and your volunteer efforts.

Authors: Your paper will be peer reviewed and published as part of the CORROSION 2020 conference proceedings. Additionally, if you are a presenting author, you are eligible to receive a one-day complimentary registration at CORROSION 2020 on the day of your presentation. Presenting authors and symposium officers are also invited to attend a Speakers' Breakfast on the day of your symposium, where the Symposium Chair and Vice Chair can talk with presenting authors before the symposium, and conference audio visual staff will provide instructions on using the audio-visual system.

Symposium paper reviewers are responsible for assisting the Symposium Chair in approving the content and quality of symposium papers and making sure that they comply with the style guidelines outlined in this manual. Papers should not include the use of tradenames or commercialism.

The Annual Conference Program Committee (ACPC) oversees all technical committee symposia. Each symposium in the technical program is sponsored by one or more of the NACE technical committees. These technical committees are organized within three general groups, Industry-Specific Technology (N), Cross-Industry Technology (C), and Science (S). There are five ACPC representatives (called Program Coordinators) who are assigned to each of the three general groups. A list of symposia that will be held at CORROSION 2019 can be found on the NACE Web site.

Thank you once again for your participation with CORROSION 2020 Technical Committee Symposia.

Sincerely,

D. Abayarathna

Dharma Abayarathna
ACPC Chair

CORROSION 2020 Symposium Deadlines

Date(s)	Time/Duration	Event
March 25 to May 13, 2019	7 weeks	Call for Papers
May 14 to June 10, 2019	4 weeks	Symposium Chairs Accept/Reject Papers
July 15, 2019	5 weeks	Symposium Chairs to Send Complete List of Reviewers to NACE Staff
August 12, 2019	4 weeks	Symposium Chair Assigns Reviewers to Specific Papers in System
September 9, 2019	**13 weeks between acceptance notification and draft**	**Draft Paper and Biographical Information Deadline**
September 30, 2019	5 weeks	Reviewer Deadline to Submit Comments to Symposium Chairs
November 4, 2019	3 weeks	Symposium Chair Deadline to Send Comments to Authors and Resequence Papers (if desired)
November 25, 2019	**4 weeks**	**Final Paper Deadline for Authors and Copyright Assignment Agreement Deadline** **NOTE: Paper will not be published without signed copyright assignment**
December 23, 2019		Symposium Chairs to Arrange Presentation Order in Paper Trail
December 23, 2019	4 weeks	Deadline for Symposium Chairs to Send Comments to Authors on Final Papers
December 23, 2019		Deadline to Notify NACE Staff of Changes for Final Program Printing
January 13, 2020	3 weeks	Deadline for Authors to Return Corrected Papers for Final Approval
January 20, 2020	2 weeks	Symposium Chair Deadline to Mark Final Papers as Approved **NOTE: Papers not approved by this date will not be published in proceedings**
February 10, 2020	**5 weeks out**	**Authors Deadline to Upload Presentation Slides for Review by Vice Chairs**
February 17, 2020	4 weeks out	Vice Chair to Provide Feedback on Presentation Slides
February 24, 2020	3 weeks out	Authors Deadline to Upload Revised Presentation Slides for Review by Vice Chairs
March 2, 2020	2 weeks out	Vice Chair Deadline for Approving Presentations

Important: Requesting Extensions

- **Insufficient time to prepare a written paper is not a valid reason for missing the paper submission deadline.** In *extreme* cases, a deadline extension may be requested by a Symposium Chair and/or the Program Coordinator.

- The author should immediately contact the Symposium Chair. If the Symposium Chair agrees to grant an extension for a draft paper, he or she will send his/her approval to the author and simultaneously notify NACE staff.
- In the case of a final paper, the Symposium Chair will forward the request to the appropriate Program Coordinator for approval.

- **NACE staff must be notified of any extensions by the person granting the extension. Requests for extensions must be approved by the Symposium Chair or Program Coordinator at least 3 days before the deadline.**

- **A maximum draft paper deadline extension of two weeks is allowed, and only ONE deadline extension may be requested during the entire process.** For example, if you request an extension to upload your draft paper, you cannot receive an extension for the final paper deadline.

Assignment of Copyright. A signed/digitally accepted copy of the official NACE Copyright Assignment Form must be submitted to NACE Headquarters before the final paper is uploaded. In accordance with NACE Publications policy, this form may not be altered, nor can other copyright transfer forms be accepted. The paper will not be published without the NACE Copyright Agreement. If a NACE Copyright Agreement is not submitted, the paper will be withdrawn and the author is unable to present their work at the CORROSION conference.

Who Do I Contact if I Have Questions?

Symposium Chairs and Vice Chairs

The Symposium Chair is responsible for the actual organization of the symposium and will be the main point of contact for authors. If he or she cannot be reached, questions should be directed to the conference personnel in the following order: Symposium Vice Chair, Program Coordinator, ACPC Chair, and ACPC Vice Chair. If these officers cannot be reached, please contact Ashley Zuno (281-228-6418, e-mail papers@nace.org).

Symposium Chair and Vice Chair information is available through Paper Trail, and NACE staff can also provide this to you. If you need to get in touch with your Program Coordinator or ACPC Chair or Vice Chair, please use the NACE Web site to contact them. NACE staff can also provide you with their contact information.

Responsibilities of Symposium Chairs

- Review and approval/rejection of abstracts in a symposium;
- Selection and assignment of paper reviewers for each paper in the symposium;
- Sequencing papers in the order he/she would like them presented;
- Granting up to two-week extensions for draft papers and communicating any extensions with NACE staff;
- Requesting permission from Program Coordinator to grant up to two-week extensions for final papers, and communicating extensions with NACE staff;

- Approval/rejection of draft papers and final papers;
- Resequencing papers to finalize the order of presentations and reviewing the symposium schedule after times are assigned to papers;
- Collecting biographical information form presenting authors before the symposium.
- Authors are responsible for submitting copyright forms, **but chairs should check to make sure authors have submitted the form so the papers will be published.**
- Communicate with Vice Chair to update on status of symposium and request assistance, if needed.
- Attend Speaker Breakfast on day(s) of symposia at CORROSION.

Responsibilities of Symposium Vice Chairs

- Be able to step in for the Chair when they are not available to address Authors concerns;
- Review symposia schedule for advance program;
- Comment on draft papers, if requested;
- Review PowerPoint Presentations for All Presenters (must be reviewed for commercialism, correct formatting, etc.);
- Communicate with Chair to update on status of symposium and request assistance, if needed.
- Review revised presentations in speaker ready room on-site at CORROSION.
- Attend Speaker Breakfast on day(s) of symposia at CORROSION.
- Pick up Symposium Chair plaque from NACE Business Center to be presented in your Symposium.

NACE Staff

NACE's staff's function is administrative. Staff members are available to help answer questions concerning deadlines, extensions, paper or presentation format, copyright forms, and navigation of the online system. General inquiries should be sent to papers@nace.org.

The Symposium Papers Process

Step 1: Abstract Submission

NACE uses an online system, Paper Trail, through which authors may submit their abstracts. Prospective authors who wish to present a paper should submit a paper title, complete author contact information, an abstract (150 to 200 words), and key words. You must submit complete contact information for each co-author. The system will not allow you to save and submit incomplete address information. However, up until the close of the Call for Papers, primary authors can enter additional co- authors, provided that full address information is submitted. **IMPORTANT: Secondary authors must be entered into the Paper Trail system to appear in the final program and on the Web when presentation times are published.**

The deadline for authors to submit their abstracts for the CORROSION 2020 symposia is May 13, 2019. Authors will be notified about the acceptance or rejection as the Symposium Chairs review and mark the abstracts. This process should be completed by Monday, June 10, 2019. This manual contains guidelines to follow once your abstract is accepted. **You are encouraged to add the deadlines found on page 2 of this Manual to your personal calendar. This will ensure you do not miss deadlines throughout the process.**

Rating of Abstracts

Following the conclusion of the Call for Papers, the chair will be directed to rate submitted abstracts on a scale of 1 to 5 (5 being the highest) using the following criteria:

-- Does the paper relate to the subject of the symposium?
-- Is the title appropriate for the content of the abstract?
-- Does the abstract suggest that quality technical work was performed?
-- Is the paper non-commercial in nature?
-- Does this paper enhance the existing body of literature and advance the corrosion industry?

Online Training Module

Once an author receives notification that their abstract has been accepted, they should review this manual in addition to the online training module that have been created for CORROSION participants. The training module is an archived webinar that will discuss the requirements for successfully submitting a draft paper, final paper, and presentation slides as well as a tutorial on how to use the Paper Trail system. The training modules have many answers to the most FAQs and are accessible on the Volunteer Resource Page, http://nacecorrosion.org/volunteer-speaker-resource.

Step 2: Preparation of Draft Papers

Accepted authors will be sent a link to the Author's Page, where they may download a template for writing their symposium paper. The style guidelines for NACE technical papers are very important and must be followed. The Microsoft Word template found in the 'Resources' tab of the Paper Trail system includes the necessary style guidelines. Note: If the author changes the margins, font size, font type, etc. within the template, it is not guaranteed to adhere to the checklist and guidelines outlined in this manual. The requirements have been revised for CORROSION 2020 and have been streamlined to improve the process for authors and reviewers. Style guidelines are located on pp. 7-11. Plagiarism in any form is unacceptable and is considered a serious breach of professional conduct, with potentially severe ethical and legal consequences. **Please note: Authors should not present the same paper/topic in multiple symposia at CORROSION 2020. There is no limit on how many unique papers/topics authors can present, it just cannot be duplicated in multiple technical symposia. If you have submitted the same topic to multiple symposia and both abstracts were accepted into their respective programs, please contact Ashley Zuno (papers@nace.org) as soon as possible to resolve the issue.**

Checklist for Papers

☐ **Does the paper exceed 15 pages? Papers shall not exceed 15 pages unless the Symposium Chair requests permission from the ACPC Chair and NACE staff, and the ACPC Chair approves. This should be identified in the draft paper process. The Symposium Chair does not have the authority to approve a paper length extension.**

☐ **Does the paper lack commercial bias? ****Definition of a Trade Name -** The name given by a manufacturer or merchant to a product, process, or service to distinguish it as made or sold by the concern which may or may not be used or protected as a trademark. Trade name also refers to any name under which the concern does business (e.g., company name, association, organization, etc.)." This definition includes company names in addition to product, process or software names, URL (Web) addresses, and does not exclude names that are not necessarily copyrighted or have a trademark.

- [ ] **Is the paper written for the reader of a technical journal and not in the vernacular of a speaker?**

- [ ] **Are the title, abstract, tables, figures, and figure captions free of trade names/company names?** Trade names/company names (if they are absolutely necessary) are allowed only **ONCE** in the paper text and must always be footnoted.

- [ ] **Did the author obtain written permission from copyright holders if he or she used copyrighted material (as well as acknowledge the source and copyright holder in a footnote)?**

- [ ] **Is the paper single-spaced?**

- [ ] **Does the paper include an abstract, introduction, and a summary or conclusions?** (A good paper also usually has experimental procedure, results, acknowledgments, and references.)

- [ ] **Do all cited materials in the paper (including standards) include a reference number, and are the cited materials listed in the "References" section?**

- [ ] **Do all of the figures have captions? Do all the tables have headings? Do the headings and captions follow the format given in the Technical Program Manual?**

- [ ] **Are photos contained in the paper suitable for viewing in black and white as well as color?** While color is suitable for the electronic version of the paper, it must also be able to be produced in black and white.

- [ ] **Are actual units of measurement (U.S. customary or metric) given first, followed by the metric equivalent if the unit is a U.S. customary unit?**

- [ ] **Did the author adhere to the guidelines contained in this manual for producing a PDF file?** It is important that fonts be embedded in the electronic file for it to be read/displayed as intended by the author.

If your answer is "NO" to any one of these questions, authors should double-check the format and style instructions.

Style Guidelines for Symposium Papers

CONTENT

Audience: The paper should be written for the reader of a technical journal, not in the vernacular of a speaker.

Title: Center on page. When writing a title, you should only use capital letters for the principal words. Do not use capital letters for prepositions, articles or conjunctions unless one is the first word.

No trade names/company names may appear in the title of the paper.

Author Information: Center on page, and include author's name, company, and address. To condense the amount of space used, e-mail addresses may be listed only for the primary author, with no telephone numbers.

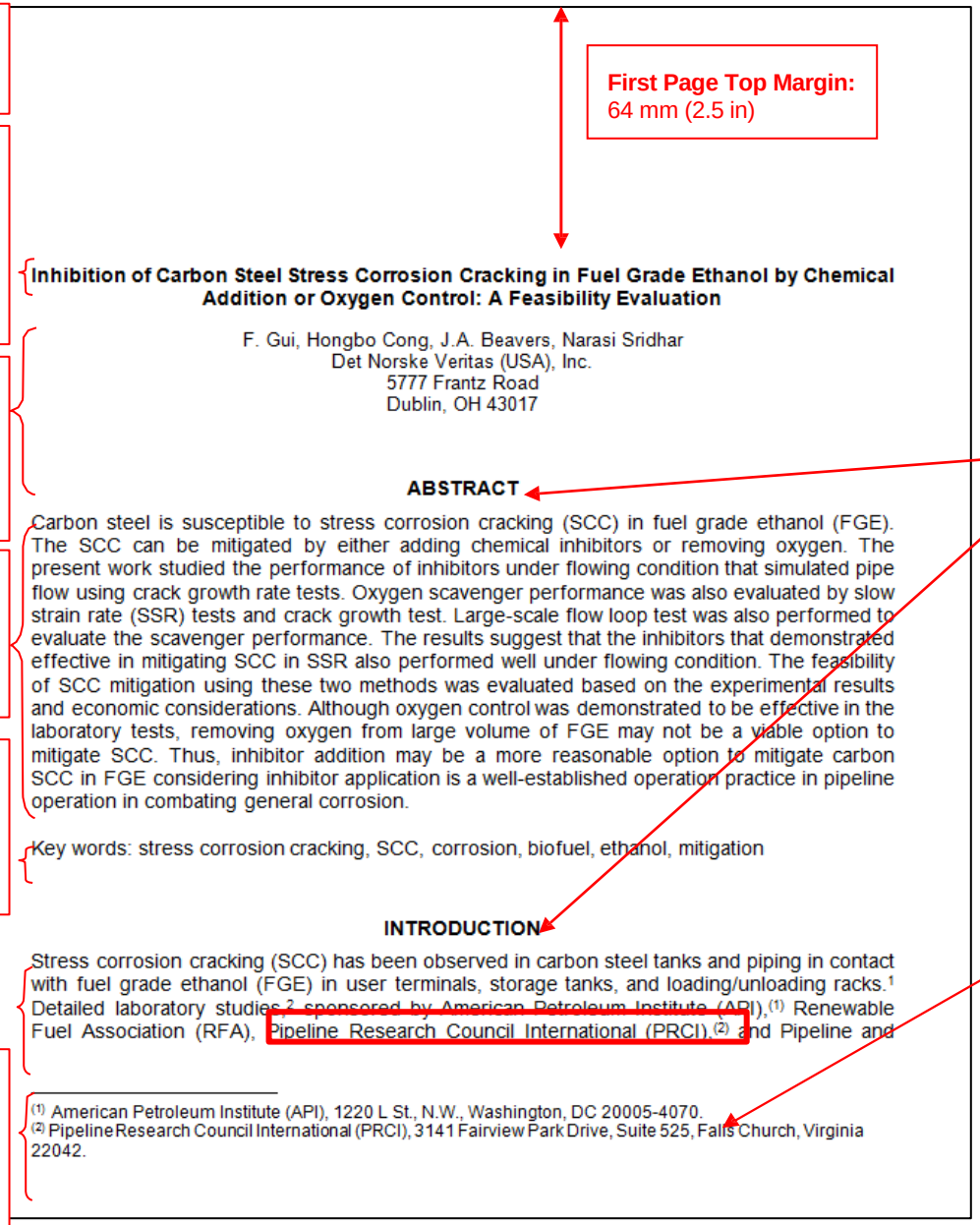
Abstract: A 150 to 200 word abstract should concisely state the significant contributions of the paper.

No trade names/company names may appear in the abstract of the paper.

Key words: A list of relevant key words should be included after the abstract to facilitate searches.

No trade names/ company names may appear in the key words of the paper.

Use of Association Names: The use of association names (e.g., ASME, ANSI, API, PRCI, ASTM, ISO, DOT, PHMSA) is permitted. A footnote must be used with association names, and the full name and address of the association must be cited in the footnote.



First Page Top Margin: 64 mm (2.5 in)

Inhibition of Carbon Steel Stress Corrosion Cracking in Fuel Grade Ethanol by Chemical Addition or Oxygen Control: A Feasibility Evaluation

F. Gui, Hongbo Cong, J.A. Beavers, Narasi Sridhar
Det Norske Veritas (USA), Inc.
5777 Frantz Road
Dublin, OH 43017

ABSTRACT

Carbon steel is susceptible to stress corrosion cracking (SCC) in fuel grade ethanol (FGE). The SCC can be mitigated by either adding chemical inhibitors or removing oxygen. The present work studied the performance of inhibitors under flowing condition that simulated pipe flow using crack growth rate tests. Oxygen scavenger performance was also evaluated by slow strain rate (SSR) tests and crack growth test. Large-scale flow loop test was also performed to evaluate the scavenger performance. The results suggest that the inhibitors that demonstrated effective in mitigating SCC in SSR also performed well under flowing condition. The feasibility of SCC mitigation using these two methods was evaluated based on the experimental results and economic considerations. Although oxygen control was demonstrated to be effective in the laboratory tests, removing oxygen from large volume of FGE may not be a viable option to mitigate SCC. Thus, inhibitor addition may be a more reasonable option to mitigate carbon SCC in FGE considering inhibitor application is a well-established operation practice in pipeline operation in combating general corrosion.

Key words: stress corrosion cracking, SCC, corrosion, biofuel, ethanol, mitigation

INTRODUCTION

Stress corrosion cracking (SCC) has been observed in carbon steel tanks and piping in contact with fuel grade ethanol (FGE) in user terminals, storage tanks, and loading/unloading racks.[1] Detailed laboratory studies,[2] sponsored by American Petroleum Institute (API),[(1)] Renewable Fuel Association (RFA), Pipeline Research Council International (PRCI),[(2)] and Pipeline and

[(1)] American Petroleum Institute (API), 1220 L St., N.W., Washington, DC 20005-4070.
[(2)] Pipeline Research Council International (PRCI), 3141 Fairview Park Drive, Suite 525, Falls Church, Virginia 22042.

FORMAT

Paper Length: Papers shall not exceed 15 pages unless the Symposium Chair requests permission from the ACPC Chair, and the ACPC Chair approves.

Page Numbering: Please do not add page numbers to your paper.

Font and Spacing: Font size should be 11 or 12. Arial and Helvetica fonts should be used. Paper must be single spaced.

Paper size: Standard sized letter paper (8.5 x 11 in. [216 x 279 mm]) must be used.

First-level headings: Headings for major sections of the paper should be centered in all capital **BOLD** letters (ABSTRACT, INTRODUCTION, etc.). Do not number or underline this heading.

Use of Graphic Materials: Graphic materials from other copyrighted sources may only be used when written permission has been obtained by the author from copyright holder; and source and copyright holder have been properly acknowledged in a footnote.

Footnotes: Footnotes should be noted in the text with a ***superscript number in parentheses*** to differentiate them from reference numbers (i.e., [(1)], [(2)], [(3)], etc.) and numbered consecutively throughout the paper.

Style Guidelines for Symposium Papers

CONTENT

FORMAT

Experimental Procedure (when a test program was involved): Explanation of how the equipment was used/how tests were conducted. Any unusual test procedure should be explained; the development of experimental equipment should be discussed, with illustration, if possible; evaluation of equipment and its application may be included.

Tables: All graphic elements in tabular form shall be designated as a "Table."

No trade names/company names may appear in tables or headings.

Results: Results should be presented in the clearest form, whether it is text, graphs, or tables. The text should be used to give essential information on illustrations. All terms used in text, tables, and graphs should be defined.

EXPERIMENTAL PROCEDURE

Samples of a Ni-based (UNS N06601) industrial alloy were prepared by cutting 15×8 mm^2 coupons from a 0.5 mm thick sheet, and subjecting these to a set sequence of grinding and polishing steps. The alloy samples were first ground up to P2400 grid (10 µm) in SiC papers and finally polished with 1 µm diamond dust to give a mirror finish, and then ultrasonically cleaned in hexane (99%) before the experiment. Oxidation and carbon monoxide (CO) exposure tests were conducted in a laboratory experimental setup with a vertical steel tube enclosed in a furnace. The alloy samples were hung inside the steel tube with the internal wall plated with gold in order to mitigate the effect of metal dusting on the reactor wall.

After raising the temperature by 10 °C/min in pure oxygen (100% O_2) or diluted oxygen (0.5% O_2 in Ar) the alloy coupons were dwelled for 6 h at either 540 °C, 760 °C, or 980 °C followed by purging and cooling under Ar until room temperature. The resulting oxidized samples were either unloaded for characterization or again raised to 550 °C in Ar atmosphere and kept for 20 min to stabilize the temperature. The carbon formation was thereafter investigated under a high carbon activity (a_C>>1) gas mixture: 20 h at 550 °C in 10% CO in Ar. After exposure, the samples were cooled in Ar and unloaded at ambient conditions. The total gas flow rate was 100 Nml/min and the total pressure was 1 atm (1.01×10^5 Pa) in all experiments.

The resulting oxide layers and carbon deposits were investigated by means of optical microscopy, scanning electron microscopy (SEM) and depth profile analysis by Auger electron spectroscopy under Ar ion sputtering. Cross-sections of selected samples were also prepared and subjected to combined SEM and energy-dispersive X-ray spectrometry (EDS). The mass change by carbon build-up during CO exposure experiments were studied by means of thermo-gravimetric analysis (TGA) in a conventional microbalance setup using 10% CO in N_2 gas mixture and otherwise similar conditions.

Finally, the bulk composition of the fresh alloy sample was checked by electron probe micro analysis (EPMA) via wavelength-dispersive X-ray spectroscopy (Table 1), and found to be in agreement with the specifications of this industrial alloy.[22,23]

Table 1
Bulk Composition of the As-Received Alloy

Composition	Elements present (%)						
	Ni	Cr	Fe	Al	Mn	O	Ti
Average mass%	60.65	22.71	13.38	1.28	0.60	0.14	0.31
Average atomic%	57.65	24.31	13.33	2.64	0.60	0.24	0.36

RESULTS AND DISCUSSION

Optical micrographs of pre-oxidized alloy samples after CO exposure are shown in Figure 1. These samples were all polished before pre-oxidation as described earlier. Optical imaging of polished samples before oxidation and CO exposure could not be obtained due to their mirror-like finish, so an image of an as-received, unexposed alloy specimen (Figure 1[a]) was included for comparison. All the CO-exposed samples manifest presence of solid carbon on the surface, although less apparent from optical micrographs in the case of samples that underwent pre-oxidation at the highest temperature (Figure 1 [d] and [g]).

Tables: All tables shall be numbered consecutively, using Arabic numerals and shall be mentioned in the text in numerical order.

Center title above the table with the table number centered on the first line (e.g., Table 1 [no colon]), the table title centered on the next line, and start the table on the third line.

Style Guidelines for Symposium Papers

CONTENT

FORMAT

Use of UNS Numbers: If they have been assigned, Unified Numbering System (UNS)[1] numbers, specification numbers, or chemical compositions must be used in place of material trade names on first mention. Generic names may be used thereafter.

Use of Metric Units of Measurement: The actual unit of measurement (U.S. customary or metric) shall be given first. If this is a U.S. customary unit, it shall be followed by its metric equivalent in parentheses. If the actual measurement is in metric units, no U.S. customary conversion is required. The use of metric units is preferred and must conform to those defined by ASTM SI 10.

Do **NOT** use hash marks to show measurements (e.g., 1" for 1 inch).

Use of Trade Names: Generic names shall be used in place of trade names. Trade names shall not appear in the title, abstract, tables, figures, or captions.

A trade name may be used only ONCE in the text of the paper and must be identified with a footnote that states "Trade name."

Materials Investigated

Tests were conducted with two types of steel each in its own type of coupon. Cylindrical coupons made from UNS G10180 mild steel were used in the initial testing. The trends observed from the experiments with the cylinder or rod coupons were confirmed by conducting a separate series of tests with UNS G10500 steel in the form of flat coupons.

UNS G10180 Steel Coupons: 75 mm (3 in) long, 6.35 mm (0.25 in) diameter, threaded rod coupons of UNS G10180 steel were furnished with glass bead blasted finish. The rods had an effective surface area of 1580.6 mm² (2.45 in²).

UNS G10500 Steel Coupons: UNS G10500 steel flat coupons were furnished as 75 mm (3 in) long, 12 mm (0.50 in) wide rectangular plates that were 1.6 mm (0.0625 in) thick. With correction for the 6.35 mm (0.25 in) mounting hole and the rounded corners, the flat coupons had a surface area of 2,154 mm² (3.34 in²).

Characterization of Soils to be Investigated

SEM and EDX Analysis.

Specimens were examined using an FEI Nova NanoSEM 630† field emission SEM. This device has low-vacuum capabilities making it ideal for examining nonconductive materials such as soils without special sample preparation or metallic coating. Imaging was performed at an accelerating voltage of 18 kV using a backscattered electron detector.

XRD Analysis.

A PANalytical X'Pert Pro X-Ray Diffractometer† (XRD) equipped with a cobalt tube provided phase characterization of the material by examining the sample in reflection sample mode. Each sample was ground in a porcelain mortar and pestle until the sample passed through the number 325 sieve (0.044 mm). Analysis was performed on a reverse-pack powder sample.

Determination of Soil pH.

Soil pH was determined using a 1:1 soil suspension in distilled water. The pH determination followed the colorimetric strip technique discussed and validated for field agricultural use.[16]

Soil Treatments

Two soils, the Vicksburg Loess and
coupons were placed in the soil-filled
to each of the containers. The weig
corrosion surface of the coupon varie
Loess contained approximately 200 g
approximately 115 g of soil. Where s

† Trade name.

Citing References: References should be numbered consecutively throughout the text with superscript numbers without brackets or parentheses and should be located **after** the punctuation.

The corresponding list of *references should be at the end of the text following the acknowledgments*.

Citing Standards: Standards are considered references and must be assigned reference numbers and cited in the "References" list at the end of a paper. (e.g., ANSI/NACE MR0175/ISO 15156, NACE Standard TM0177, NACE SP0502, API 5L, ASME B31.8)

******Definition of a Trade Name******

The name given by a manufacturer or merchant to a product, process, or service to distinguish it as made or sold by the concern which may or may not be used or protected as a trademark. Trade name also refers to any name under which the concern does business (e.g., company name, association, organization, etc.)." This definition includes company names in addition to product, process or software names, URL (Web) addresses, and does not exclude names that are not necessarily copyrighted or have a trademark.

[1] Unified Numbering System for Metals and Alloys (UNS). UNS numbers are listed in Metals & Alloys in the Unified Numbering System, 10th ed. (Warrendale, PA: SAE International and West Conshohocken, PA: ASTM International, 2004).

Style Guidelines for Symposium Papers

CONTENT

FORMAT

Figures: All illustrative elements (photographs, diagrams, graphs) shall be designated a "Figure." They should be clear and easy-to-interpret photos.

No trade names/company names may appear in figures or captions.

If a photograph includes a device or equipment with a trade name, this must be removed.

The damage state parameter was calculated for each of the three sensor nodes included in the 172 data sets according to Equation 4. An average damage state parameter was then calculated by averaging the three sensor node damage state values. The average damage state parameter was correlated to the coating defect area (R^2 = 0.87) (Figure 23). The data was best fit using a three parameter sigmoidal function, although a logarithmic fit is given in the figure. This empirical fit, using readily measured impedance data, is another approach to in-situ coating characterization that can be used to more simply assess coating damage.

$$\eta_f = \frac{Log(Z_o) - Log(Z_*)}{Log(Z_o) - Log(Z_f)} \qquad (4)$$

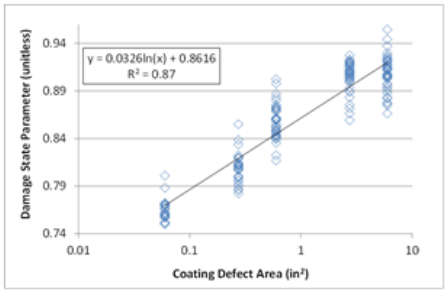


Figure 23: Plot of average damage state parameter relative to the coating defect area for 172 data sets. Logarithmic fit is given; however, a sigmoidal function is more appropriate and statistically significant fit.

CONCLUSIONS

It has been demonstrated that two electrode impedance measurement techniques using simple sensing electrodes can be used to predict coating defect size and relative location. The sensor measurements can be used in combination with artificial neural network algorithms to achieve an automated coating damage prediction. Other methods for accommodating changing tank conditions using data normalization and regression modeling with dimensionless damage state parameters are strategies that may also support coating condition assessment.

Future Work

Although voltage was demonstrated to be dependent on coating defect area, the initial ANN work has focus on using electrochemical impedance over a range of frequencies to characterize the coating condition. It is expected that these and other inputs such as phase, solution conductivity, and temperature may all be useful in determining coating condition and level of cathodic protection.

ACKNOWLEDGEMENTS

This material is based upon work supported by the Naval Sea Systems Command (NAVSEA) under Contract No N00167-11-P-0430. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Naval Sea Systems Command.

Equations: Equations should be separated from the text by two lines of space above and below and numbered consecutively throughout the paper with the *number in parentheses at the right margin*. Symbols should not be hand drawn.

Figures: All figures shall be numbered consecutively, using Arabic numerals and shall be mentioned in the text in numerical order.

Center title below the figure, use a colon to separate figure number and caption (e.g., Figure 1: [Caption]).

Unacceptable Graphic Materials Within Electronic Files:

1. Computer printouts (except high-resolution, computerized graphics).
2. Photocopies of photographs.
3. Second-generation photographs (a photo of a photo).
4. Pencil drawings.

Acknowledgments: Special help from individuals or organizations should be cited.

Style Guidelines for Symposium Papers

CONTENT

References: All references should be listed numerically in the order cited.

FORMAT

REFERENCES

1. NACE SP0390 (formerly RP0390) (latest revision), "Maintenance and Rehabilitation Considerations for Corrosion Control of Atmospherically Exposed Existing Steel-Reinforced Concrete Structures" (Houston, TX: NACE).

2. NACE SP0308 (latest revision), "Inspection Methods for Corrosion Evaluation of Conventionally Reinforced Concrete Structures" (Houston, TX: NACE).

3. J. Broomfield, *Corrosion of Steel in Concrete*, 2nd ed. (London, UK: Spon Press, 2007), p. 80.

4. ACI[1] 365.1R, (latest revision), "Service-Life Prediction" (Farmington Hills, MI: ACI).

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6. Concrete Society Technical Report 54, "Diagnosis and repair of deterioration in concrete structures" (Camberley, UK Concrete Society, 2000).

7. C. Andrade, et al., "Test methods for on-site corrosion rate measurement of steel reinforcement in concrete by means of the polarization resistance method," *Construction Materials* 37 (2004): pp. 623–643.

8. Concrete Society Technical Report 60, "Electrochemical Tests for reinforcement corrosion" (Camberley, UK: Concrete Society, 2004).

9. W.H. Hartt, "Corrosion Initiation Projection for Reinforced Concrete Exposed to Chlorides, Part 1: Black Bars," CORROSION 67, 8 (August 2011): pp. 86002-1–10.

10. J.P. Broomfield, "A Web Based Tool for Selecting Repair Options and Life Cycle Costing of Corrosion Damaged Reinforced Concrete Structures," CORROSION 2005, paper no. 05254 (Houston, TX: NACE, 2005).

11. R.L. Purvis, K. Babaei, K.C. Clear, M.J. Markow, "Life-Cycle Cost Analysis for Protection and Rehabilitation of Concrete Bridges Relative to Reinforcement Corrosion" (Washington, DC: Strategic Highway Research Program, National Academy of Sciences, 1994). Downloadable from http://onlinepubs.trb.org/onlinepubs/shrp/SHRP-S-377.pdf (September 23, 2010).

12. J.P. Broomfield, "Modelling the Rate of Deterioration of Reinforced Concrete Structures," CORROSION 2011, paper no.11003 (Houston, TX: NACE, 2011).

13. N.R. Buenfeld, R.D. Davies, A. Karimi, A.L. Gilbertson, "Intelligent monitoring of concrete structures," CIRIA Report C661 (London, UK: CIRIA, 2008).

14. NACE SP0290 (formerly RP0290) (latest revision), "Impressed Current Cathodic Protection of Steel in Atmospherically Exposed Concrete Structures" (Houston, TX: NACE).

15. NACE SP0408 (latest revision), "Cathodic Protection of Reinforcing Steel in Buried or Submerged Structures" (Houston, TX: NACE).

16. NACE/ASTM G193-11a (latest version), "Standard Terminology and Acronyms Relating to Corrosion" (Houston, TX: NACE).

[1] American Concrete Institute (ACI), 38800 Country Club Dr., Farmington Hills, MI 48331.
[2] ASTM International (ASTM), 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959

Sample Standard Reference
Name of standard (latest revision), "Title of Standard" (City of publisher, State of publisher: Name of publisher).

Sample Book Reference
Author's or Editor's initials, Author or Editor's last name, *Book Title*, Edition number (City of publisher, State of publisher: Name of publisher, Year of publication), Page number(s).

Sample Report Reference
Name of report (latest revision), "Title of Standard or Report" (City of publisher, State of publisher: Name of publisher).

Sample Journal Article Reference
Author's initials, Author's last name, "Title of Article," *Name of Periodical* Volume number, Issue number (Date of the volume): Page number(s).

Sample Conference Paper Reference
Author's initials, Author's last name, "Title of Paper," Name of Conference, paper number (City of publisher, State of publisher: Name of Publisher, Date of Conference/Publication), Page number(s).

Step 3: Send Biographical Information to Symposium Chairs

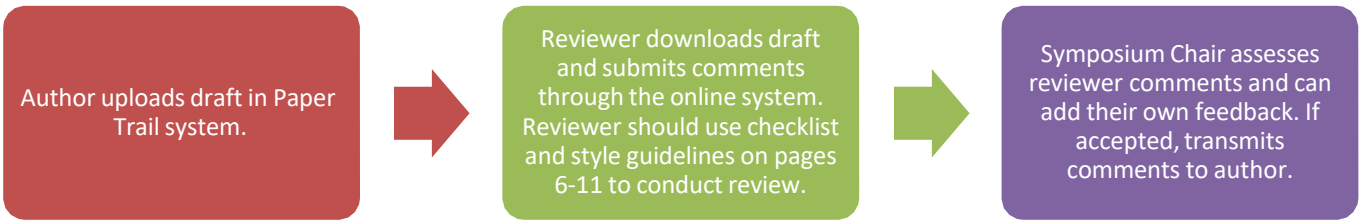
Authors are required to upload biographical information through the Paper Trail system for the Symposium Chair to use to introduce them before their presentations. This task should be completed when the draft paper is uploaded on or before September 9, 2019.

Step 4: Draft Paper Review

Primary authors whose abstracts have been accepted will be given access to the online system and to the Authors' Web site, which provides them with a template to aid in the preparation of their drafts. **The author is responsible for preparing a draft and submitting it through the online system before September 9, 2019.**

The paper reviewers (who have been assigned by Symposium Chairs) will review papers **by September 30, 2019.** The reviewers will submit their comments using the online system. The Chair and/or Vice Chair must 'approve' feedback from the paper reviewer in the Paper Trail system to transmit the comments to the authors. **Please note: Paper reviewers should use the Paper Checklist and Style Guidelines (pg. 6-11) when reviewing papers. Any paper that fails to meet the checklists requirements should be marked as "Returned for Revisions" and the reviewer should offer comments to the author on what must be revised prior to publication in the conference proceedings. Paper reviewers are responsible for identifying commercial bias in presentations. An explanation of commercialism and trade names can be found on page 9 of this manual.**

The deadline for Symposium Chairs to review and transmit comments to authors is **November 4, 2019**. **Both Reviewer and Symposium Chair comments must be addressed.**



Step 5: Final Paper Review

After authors have addressed any comments that have been transmitted to them and have made corrections to their draft papers, they must upload a final paper in the online system in PDF format, which the Symposium Chair will review and approve. **Any PDF files that are not marked as "Final Approved" in the online system by the Symposium Chair are not considered approved.** Please refer to the Checklist for Papers on p. 6 to ensure that all style requirements have been met.

Copyright forms MUST be submitted; the paper will not be published without a valid copyright assignment form. Alternate forms are not acceptable. (See notation on form if author is a government employee.) **Authors must submit all signed copyright forms to NACE Headquarters by this date. Papers will not be published without a signed copyright form. Authors will be prevented from presenting at CORROSION if a final paper is not submitted for publication. Authors should plan accordingly to ensure they have received all necessary permissions from employer to complete the copyright form by the deadline. The inability to submit the copyright form due to insufficient time is not a valid excuse.**

Preparation of PDF Files

No file security should be set on any files. *All fonts must be accurately embedded in the PDF file.* Non-English fonts (Asian fonts), if not embedded correctly, will be substituted automatically by a different font, causing possible inaccuracy in the content of the document. Moreover, files that contain Asian fonts are usually not searchable.

Using Microsoft Word 2010, to create a PDF file with embedded fonts, you must save the Word file as a Postscript (.ps) file first. Once you've done this, open the program Adobe Distiller. Go to the "Settings" menu at the top and select "Edit Adobe PDF Settings." This will take you to a new window. Select the "Fonts" tab and check the box that says, "Embed All Fonts." Then, click OK. Afterward, you may use Adobe Distiller to create a PDF and it will embed your fonts. NOTE: If other versions of Microsoft Word or word processors are used, this process may be different.

File Size

The online system can accept files that are up to 30 MB. It has been our experience that in almost all instances when an author cannot upload a file because of file size, there is a limitation set on his or her computer that limits the size of files. Sometimes uploading files from home rather than work solves this problem.

Step 6: Preparation of Presentations

Once final papers have been approved, authors will be ready to prepare their presentations. PowerPoint is the preferred program for presentation slides. If an author would like to use an alternative delivery method, please contact NACE staff. All presentations must be submitted through the Paper Trail system. **Please note: Authors should not present the same paper/topic in multiple symposia at CORROSION 2020. There is no limit on how many unique papers/topics authors can present, it just cannot be duplicated in multiple technical symposia. If you have submitted the same topic to multiple symposia and both abstracts were accepted into their respective programs, please contact Ashley Zuno (papers@nace.org) as soon as possible to resolve the issue.**

Style Guidelines for Presentations

Time Schedule: The default presentation time is 20 minutes. Five minutes at the end of the presentation should be reserved for questions and discussion. NACE Headquarters will set the starting times and inform authors of the time schedule. The author must present at the time that is printed in the final program. A "speaker timer" is used on the podium to maintain the schedule. The timer will be green for 15 minutes and yellow for 5 minutes to indicate that the presentation should wrap up. At 20 minutes the timer will turn red, this indicates that the presenter should be finished and move on to the question and answer portion of their presentation.

Commercialism: Commercialism in the presentation (e.g., references to trade names, company names, product names, etc.) must be avoided. Commercialism is the excessive use of brand/trade names, product names, logos, failure to substantiate performance claims, and failure to objectively discuss alternative methods, processes or equipment are indicators of a commercial sales presentation which is not permitted. No more than one reference may be made to any product, company, etc., in the presentation of papers, and the Symposium Chair has the responsibility of interrupting the symposium and stopping the speaker if this occurs.

Handouts: Handouts are not permitted.

Recordings: For copyright reasons, recordings of any kind are prohibited without prior written consent of the presenter. Attendees may not capture or use materials presented in any meeting/symposia room. Individuals not complying with this policy will be asked to leave a given session and/or asked to surrender their recording media. Refusal to comply with such requests is grounds for expulsion from the event.

PowerPoint Presentations: NACE no longer provides a power point template for the use of creating a presentation. Presentations should **NOT** be created using company templates that include logos or names embedded in the slide. The company name and logo of the presenter should be only listed **ONCE** in the presentation slides. It can be included on the title slide or at the end on an acknowledgment slide. This is to avoid excessive use of company names, logos, and tradenames.

Format: Simplicity is key. Below are some recommendations for preparing your presentation.

1. Company names and logos must not appear on more than the first OR last slide.
2. Written information: no more than **6 to 7 words** on a line; no more than **6 to 7 lines** vertically.
3. Fonts and font sizes used for text and numbers must be readable in a large symposium room. Recommended fonts are sans serif such as Arial or Helvetica. The minimum font size should be 20 point.
4. Tabulated data: (graphs, bar charts, or curves are easier to follow) no more than **3 columns** of numbers; no more than 8 lines vertically.
5. Graphs: **no grid lines**; on ordinate and abscissa lines, show small hash marks for main units only, e.g., 0-5-10-15-20. Identify ordinate and abscissa parameters simply: I for current, E for voltage, T for time, etc. If you use words, do not exceed one word each. No more than **3 curves** on one slide. Preferably, each curve should be a different color; if black and white, each curve should be different, e.g., solid line, line of dashes, line of dots and dashes. Simple identification of each curve.
6. A combination of upper- and lower-case letters is more legible than all caps.
7. Use **light** color lettering against **dark** background; letters should **contrast** with background. White letters on dark blue is best.
8. Use **Standard (4:3 ratio)** orientation for all slides.

Step 7: Presentation Review

Authors are asked to upload their presentations into the online system. It is the Symposium Vice Chair who reviews these presentations and approves them through the online system. Vice Chairs must review the initial draft presentation by **February 17, 2020**. Guidelines for the presentations are provided in the following checklist:

Checklist for Presentations

- ☐ **Are there too many slides for the assigned length of the presentation?**
- ☐ **Are the visuals too detailed for quick comprehension or is copy material too small to be seen in a large room?** (Smaller than a 16-point font.)
- ☐ **Do your slides comply with the instructions given in this manual (e.g., does the company name or logo appear on more than one slide)?** Company names and logos must not appear on more than the first OR last slide (not both).

☐ **Do the visuals lack commercial bias? ****Definition of a Trade Name -** The name given by a manufacturer or merchant to a product, process, or service to distinguish it as made or sold by the concern which may or may not be used or protected as a trademark. Trade name also refers to any name under which the concern does business (e.g., company name, association, organization, etc.)." This definition includes company names in addition to product, process or software names, URL (Web) addresses, and does not exclude names that are not necessarily copyrighted or have a trademark.

☐ **Is the readability of the slides affected by the color of the font against the background?**

☐ **Are the title, figures, and figure captions free of trade names?** Trade names (if they are absolutely necessary) are allowed only once in the presentation text and must always be footnoted.

If your answer is "NO" to any one of these questions, the author should double-check the format and style instructions and make corrections.

Authors who do not submit their presentations through the online system are responsible for contacting the Symposium Vice Chair before CORROSION and having their presentations approved. If a presentation is not reviewed and approved by the Vice Chair in advance of their presentation time, the paper cannot be presented.

6 Microphone Tips for Presenters

1. Get close to the mic! Most mic and volume problems are solved if the presenter simply moves his/her head closer to the mic.
   - •Optimally, you should be about 4-6 inches from the mic, and an easy way to measure that is by using the clenched fist rule. Simply put your fist up to your mouth and put the mic on the other side of your fist. That puts you about 4 inches or so from the mic.
   - •Using a lavalier? They don't have to be as close as a handheld-type mic, but you still need to position the lavalier so it's close to your head. Right under your neck is a great place for the lavalier mic, so for guys wearing ties, clipping the mic right underneath the knot of your tie works great. Women, same thing – wear "lavalier-friendly" clothes so you have a place to pin the mic.

2. Speak directly into the mic (or slightly angled if your P's and S's are popping a lot). I see lots of speakers hold a mic down by their chest. Bad! Be bold, be brave… and talk into the mic.

3. Do a sound check at the beginning of your presentation to ensure the audience can hear you. Make sure to talk into the mic like you normally would during a presentation – no whispering. Also, use that time to get familiar with the mic. See if it has an on/off switch, a mute button, a battery light, etc.

4. If you turn your head to look at your presentation slides on the screen, ensure that you are not turning away from the microphone, it will be difficult for the audience to hear you. If you must look at your slides on the screen, pause what you are saying, look at the screen, turn back to the microphone and begin speaking again.

5. Avoid feedback. That high-pitched, squeaky feedback is easy to avoid, if you follow these three steps:
   - • If you start hearing feedback, move closer to the mic – not farther away from it. If the mic isn't picking up a strong signal from you, it will start picking up other noises, including your voice from the monitors… and that causes a feedback loop
   - • Do not cover the mic with your hand (i.e., more ambient noise = more likely to feedback).

6. Use the on/off or mute button. If you need to cough or say something privately, either step away from the mic or use the on/off/mute buttons.

What if an Author Is Unable to Give Their Presentation?

If a substitute speaker is needed, the author should inform the Symposium Chair and NACE staff. The substitute should be one of the paper's coauthors. If the coauthor is not available, the lead author, with the agreement of the Symposium Chair, may recommend a surrogate who can effectively present the material.

Step 8: When You Arrive on Site at CORROSION

All presenting authors should visit the Speaker Ready Room at least one day before their presentation. If this is not possible, you should visit the Speaker Ready Room at least 2 hours in advance. Please review your presentation to be sure that it looks as it did when you prepared it. If there are problems, audio visual (AV) staff will attempt to help you resolve the problem.

Authors are strongly encouraged to bring a backup copy of their presentations on a flash drive or to have a copy in their email, so it can be accessed at CORROSION.

Authors should plan to attend the Speakers' Breakfast on the day of their symposium, where they will meet with their Symposium Chairs and Vice Chairs as well as with other authors in their symposium.

The ACPC Chair and Vice Chair will give pointers about the symposium, and a representative of the Audio-Visual staff will give a presentation about the equipment in the symposium rooms.