Corrosion Awareness Day 2020: activities promoted by the Young EFC

The Young European Federation of Corrosion

The Young EFC is an initiative created in 2016 by the European Federation of Corrosion (EFC) who aims at attracting and supporting young researchers and engineers in the field of corrosion. The main objective of YEFC is to provide young corrosionists a platform to help them build their own networks and to strength their scientific careers across national borders.

Ongoing actions promoted by the Young Federation:

- Dissemination of courses and workshops;
- Young EFC Mentoring Program;
- EFC awards for young scientists (EFC Poster Prize; EUROCORR Young Scientist Grant).

The Corrosion Awareness Day on 24th April

In 2010, the World Corrosion Organization (WCO) assisted by the European Federation of Corrosion (EFC), the Chinese Society for Corrosion and Protection (CCPS), NACE (USA) and the Australasian Corrosion Association (ACA), established the Corrosion Awareness Day on the 24th April. In the frame of this event, different events are organized around the globe in order to raise awareness of the extensive problems caused by corrosion.

The last edition of the event (Corrosion Awareness Day 2019) gathered a hive of activities (conferences, poster presentations, live corrosion experiments, webinars) emerging in as diverse countries as China, France, Spain, Israel, South Africa, Pakistan, Portugal and the USA.

The 2020 edition of the event was strongly supported by the YEFC, who invited young researchers to actively take part on online action(s) related to Corrosion Science and Engineering on 24th April (or close dates). Due to the international situation with respect to the COVID-19 virus, participants were encouraged to innovate and modify their initiatives to an online and safe format. Fig. 1 presents the flyer employed to guide participants on how to join the Corrosion Awareness Day 2020 #stayathome:
Fig. 1. Flowchart illustrating how to participate on the Corrosion Awareness Day 2020 #stayathome. Information of steps 1 and 2 should be sent to YoungEFC@efcweb.org.

Activities promoted by the YEFC
In total, 12 activities were independently organized by 24 participants. A few activities took place on Mars, prior to lockdown policy, but the majority of them occurred (or were finalized) on April 24th. Description of the activities based on summaries provided by the organizers and are displayed in which follows.

From **the Reinforcement Corrosion and Structural Safety Group of the Eduardo Torroja Institute of Spanish National Research Council**, the webinar entitled "**how does corrosion influence the health of concrete**?" was conducted by Javier Sánchez Montero, Nuria Rebolledo Ramos and Julio Torres Martín. 27 people connected to the webinar, of the 35 registered in this activity (Fig. 2). The webinar reviewed different processes of degradation that concrete has. It focused on the different types of corrosion that we find in reinforcing steel and the main agents that cause this corrosion. The different tests were explained in order to know how to entry of CO₂ and chlorides into the concrete, the electrochemical measurements to evaluate the degree of corrosion that affects the structures, and the necessary regulations for its assessment.

![Fig. 2.](image)

During an event on March 3rd, Luciane Sopchenski Santos and Leonardo Bertolucci Coelho, from **the Materials Unit of University of Mons (Belgium)** received high school students for the event "**Predicting corrosion protection: First sight at Electrochemical Impedance Spectroscopy**". For all participants, this was their first contact with a research laboratory and corrosion science. First, the participants attended an introduction talk about the basic concepts of corrosion and corrosion measurement techniques. They learned about open circuit potential, potentiodynamic polarization and electrochemical impedance spectroscopy. Following the presentation, they were introduced to the laboratory and its different instruments. The students could observe the different electrochemical behavior of stainless steel and aluminum alloys after different periods of exposure to corrosive media (Fig. 3). After collecting the data, they learned how to interpret and fit an equivalent electrical circuit model for electrochemical impedance spectroscopy. At the end of the event they could understand the protective nature of coatings and learned how to predict their failure.
The Hungarian Corrosion Awareness Day was organized by Dorina Kovács (HUNKOR, Hungarian Corrosion Society) and Balázs Varbai (Budapest University of Technology, Department of Materials Science and Engineering) and presented online on the Facebook page of HUNKOR. Some short videos and articles still can be seen on the page which were sent from different parts of the Hungarian industries. The corrosion resistance of guitar string, design of clamp for corrosion testing and Corten steels were also shown. Besides, the photo competition had greater success. 23 photos were uploaded from all over the continent (Hungary, Spain, Germany). Many people saw these pictures, but during the “like”-competition, Zsombor Krójer was the winner (Fig. 4). Due to these photos, our post was reached more than 1900 persons. For this number, the support of the YoungEFC was indispensable.

To contribute to the Corrosion Awareness Day, PhD students of the ITN mCBEEs (Live Mølmen, Department of Electrification and Reliability, Research Institutes of Sweden; Salil Sainis, Department of Materials and Manufacturing, Jönköping University; Sabrina Patricia Rosoiu, Center for Surface Science and
Nanotechnology, University Politehnica of Bucharest) made videos describing the corrosion problems they are working on, and how they are helping solve these problems (Fig. 5). The videos were 2-5 minutes long. In total 14 videos were made and posted on YouTube. Furthermore, the mCBEEs website, Facebook, Twitter and LinkedIn page were used to share the videos in addition to the students sharing on their personal accounts, and the common accounts for all Marie Skłodowska-Curie Actions. On their website, the videos are sorted by the different application areas: modelling, energy conversion, electronics and biocompatible materials. As well as helping spread awareness for the corrosion awareness day, the videos are a great tool for our students in their work to disseminate their personal projects. For more information on the mCBEEs initiative, please visit their website (www.mcbees.eu).

Fig. 5.

Dr. Eva García-Lecina, Dr. Gemma Vara and Dr. Jesús Manuel Vega (CIDETEC Surface Engineering) published 6 dissemination articles related to corrosion science during the entire week. The subject was “keeping in touch with corrosion” and was
published through the LinkedIn account of our organization. Several topics within corrosion were addressed: the impact of corrosion in society in terms of economic costs and social risks; the importance of high temperature corrosion, which sometimes is not obvious for the society, and strategies to deal with it; to highlight that we are surrounded by electrochemical corrosion and the different approaches/tools to evaluate it from industry and research institutions, respectively; to show how crucial can be localized corrosion if it affects the functionality and the importance to evaluate and address it to getting better understanding of the corrosion phenomena; the need to minimize corrosion damage using protective coatings and also the harmful synergic effect of corrosion when it occurs together to events such as wear; to point out that corrosion monitoring is one of the ways for corrosion control in order to anticipate to catastrophic failures among other advantages. The different posts published throughout the week (from Monday 20 to Friday 24) could be find on CIDETEC LinkedIn page (https://www.linkedin.com/company/fundaci-n-cidetec/) and are illustrated in Fig. 6.

On May 12th, from 10:00 to 12:00, Yara Soares and Frank de Pont (COMSOL) organized a free online COMSOL Multiphysics course. The webinar provided an introduction about how to use the COMSOL Multiphysics® software to simulate corrosion and corrosion protection. The Corrosion Module, an add-on to COMSOL Multiphysics, consists of the tools and features required to create models of different complexity at multiple scales. The module allows you to model all types of electrochemical corrosion phenomena from the microscopic scale of localized corrosion on grain boundaries in a metal, to complex chemical and electrochemical corrosion reactions in pits, gaps, and crevices, to full scale modeling of anodic sacrifice and cathodic protection systems of oil rigs and transport infrastructure, and chemical plants. 25 people followed a two-hour online session introducing the basic theory of electrochemical-based corrosion. In a series of demo models, the different interfaces and features in the Corrosion Module were used to model the cathodic protection of a steel structure using sacrificial AlZnIn anodes.
NACE Islamabad Pakistan Section and Department of Metallurgy and Materials Engineering jointly organized activity “Online Technical Presentation”. Several presentations on distinct topics were delivered by different Researchers/Engineers (Fig. 8). The activity organizer, Ameeq Farooq (Section Secretary and Lecturer of Department of Metallurgy and Materials Engineering, University of the Punjab, Lahore) delivered presentation on ‘Glimpse of NACE Islamabad Pakistan Section Corrosion Awareness Activities’. The presentations highlighted the international practices, design aspects and the challenges likely to be encountered. Overall, the presentations were well received and widely appreciated by the professionals, academia, researchers, graduate and undergraduate students of the corrosion community. Importantly, the event helped to promote networking among the NACE members which we feel shall go long way in fostering close linkage within the corrosion community. All the presentations are available on the NACE Islamabad Pakistan Section Facebook page (www.facebook.com/NACE International Islamabad Pakistan Section).

### List of Presentations

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of Presenter</th>
<th>Title of Presentation</th>
<th>Date</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Muhammad Hussain</td>
<td>Effects of Stress Corrosion Cracking on Pipeline Integrity Management System</td>
<td>22nd April 2020</td>
<td>Professional</td>
</tr>
<tr>
<td>2.</td>
<td>Dr. M. Abbas Baha</td>
<td>Corrosion Prevention in Idealized Geometric Structure</td>
<td>23rd April 2020</td>
<td>Professional</td>
</tr>
<tr>
<td>3.</td>
<td>Ameeq Farooq</td>
<td>Glimpse of NACE Islamabad Pakistan Section Corrosion Awareness Activities</td>
<td>24th April 2020</td>
<td>Section News</td>
</tr>
<tr>
<td>4.</td>
<td>Muhammad Talha</td>
<td>Oil Field Corrosion and Control Methodologies</td>
<td>26th April 2020</td>
<td>Graduate/Undergraduate</td>
</tr>
<tr>
<td>5.</td>
<td>Shadab Rehman</td>
<td>Vapors Phase Inhibitor (Mechanism, Types and Applications)</td>
<td>27th April 2020</td>
<td>Graduate/Undergraduate</td>
</tr>
<tr>
<td>6.</td>
<td>Azam Ullah Jaffar</td>
<td>RBI Engineering and Corrosion Under Insulation (COI)</td>
<td>20th April 2020</td>
<td>Professional</td>
</tr>
<tr>
<td>7.</td>
<td>Muhammad Rafiqul Shikdar</td>
<td>Corrosion Under Insulation (COI) and Pipelines Rehabilitation</td>
<td>29th April 2020</td>
<td>Professional</td>
</tr>
<tr>
<td>8.</td>
<td>Moksh Kumar</td>
<td>Smart Corrosion Coatings</td>
<td>30th April 2020</td>
<td>R&amp;D</td>
</tr>
<tr>
<td>10.</td>
<td>Safi Nisaruddin</td>
<td>Future of Eco-Friendly Inhibitors</td>
<td>2nd May 2020</td>
<td>Graduate/Undergraduate</td>
</tr>
<tr>
<td>11.</td>
<td>Muhammad Hamza</td>
<td>Microstructure, Mechanical and Corrosion properties of Additively Manufactured Alloys</td>
<td>3rd May 2020</td>
<td>Graduate/Undergraduate</td>
</tr>
</tbody>
</table>

A second activity also organized by Ameeq Farooq was proposed by NACE Islamabad Pakistan Section and Department of Metallurgy and Materials Engineering: “Corrosion Photographic Competition”. The aim was to select corrosion issues from the surroundings, identify the reason and suggest possible ways to control / prevent the same. For this online registration form was floated on the website/Facebook page. 86 participants registered and to whom the rules of competition and template of poster was sent via email. The organizing committee received 39 submissions from the participants. The submissions were split into three categories i.e. undergraduate,
graduate and professionals working in the field. From the undergraduate category Muhammad Zain Azeem poster has been selected (Department of Metallurgy and Materials Engineering, University of the Punjab, Lahore). From the graduate category, Aziz Ali Qureshi (PAF-Karachi Institute of Economics and Technology). And from field engineer category, Hafiz Muhammad Adnan Qadri (Research Engineer at Chair on Gas Engineering at Institute of Chemical Engineering and Technology, University of the Punjab, Lahore.) The posters of the above participants are shown in Fig. 9.

On Tuesday, 26 May 2020 (10:00 AM EDT), OLI Systems proposed their first 90-minute webinar on "Corrosion Modeling Basics" (organized by PhD Diana Miller, Mike Kochevar and Dira Silvera). This free course was oriented for young researchers and engineers challenged by the need for ingenious technical expertise combined with a strong scientific understanding of fundamental materials and corrosion problems. Members of the Young EFC had priority seating. The OLI Studio Corrosion Analyzer is an aqueous corrosion simulation software used for accurate prediction of general corrosion rates and the propensity of localized corrosion, enabling the mitigation of corrosion, increasing useful asset life and improving operational efficiency and reliability. This presentation course was designed to train attendees on how to use the OLI software platform V10 and its underlying chemistry principles to model electrolyte solutions and study their impact on metallic corrosion. Participants left with basic concepts of how to calculate and interpret: general corrosion rates, localized corrosion susceptibility, polarization curves, and Pourbaix diagrams. 31 people participated into this online session and learned how to formulate and build their own electrolyte and corrosion applications and interpret the data presented in reports and plots (Fig. 10)
Fig. 10.

**Links for more information**

World Corrosion Organization: [http://corrosion.org/](http://corrosion.org/)
Young EFC flyer for the Corrosion Awareness Day 2020: [https://efcweb.org/YoungEFC/ /corrosion%20awareness%20day%2024%20April%202020.pdf](https://efcweb.org/YoungEFC/ /corrosion%20awareness%20day%2024%20April%202020.pdf)
Selection of images from the Corrosion Awareness Day 2019: [http://corrosion.org/Welcome+to+WCO/ /Han_2019%20Corrosion%20Awareness%20Day%20Activities.pdf](http://corrosion.org/Welcome+to+WCO/ /Han_2019%20Corrosion%20Awareness%20Day%20Activities.pdf)

**How to join the YEFC?**

If you think that network, communication, innovation and learning are key factors for a successful career in the corrosion field, do not hesitate to join the Young EFC. Visit our website for more information: [https://efcweb.org/YoungEFC.html](https://efcweb.org/YoungEFC.html)
YEFC contact: YoungEFC@efcweb.org