

Minutes of EFC WP 15

Corrosion in the Refinery Industry

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1 Welcome

The meeting was opened by Hennie de Bruyn from Borealis Group. Borealis was formed in 1994 by merging the petrochemical divisions of Neste and Statoil. The company has over 40 years of heritage in polyethylene (PE) and polypropylene (PP). Borealis focus on providing plastic materials to the infrastructure, automotive and advanced packaging markets across Europe, the Middle East and Asia. Borealis is owned by the International Petroleum Investment Company (IPIC) of Abu Dhabi (64%) and by OMV Aktiengesellschaft, Central Europe's leading oil and gas group (36%). 5400 persons are employed. Borealis production sites are located in Austria (which include an Innovation Centre in Linz and a production site in Schwechat), Belgium (Beringen, Kallo, Zwijndrecht), Brazil (Itatiba and Triunfo), Finland (Porvoo), Germany (production site in Burghausen and a Customer Service Centre in Düsseldorf), Italy (Monza), Sweden (Stenungsund), USA (Port Murray). Borealis has also a joint venture at Ruwais, United Arab Emirates.

17 persons attended the meeting and briefly introduced themselves. Apologies were received from 26 persons. The lists of the participants and the excused persons are enclosed in Appendix 1.

2 EFC WP 15 Activities

2.1 EFC WP 15 Activities & Minutes of Meetings

Information on the activities of EFC WP 15, Corrosion in the Refinery Industry was presented by Francois Ropital. This information can also be found on the [EFC WP15 web-site](#), where the minutes of previous WP15 meetings minutes can be consulted and downloaded. More information is enclosed in Appendix 2.

2.2 Publications

The following publications from WP15 are available:

- [EFC Guideline no. 40](#): Prevention of Corrosion by Cooling Waters.
- [EFC Guideline n° 42](#): A Collection of Selected Papers.
- [EFC Guideline °46](#): Amine Unit Survey.
- [EFC Guideline n° 55](#): Corrosion under insulation (CUI) guidelines.

Guideline no. 55 has been written by an EFC WP15 task force led by Stefan Winnik.

2.3 Project for Future Publications

During the last meetings, some presentations and discussions were related to relaxation cracking of stainless steels that are mainly used for furnace applications. Within the activities of the high temperature group of the French Cefracor petroleum industry commission, some work is going on the elaboration of a procedure to evaluate the sensitivity of coupons to relaxation cracking and to propose guidelines

to avoid this phenomenon. This work could be potentially be published as an EFC guideline. A workshop on this topic is proposed for the next WP15 meeting in Nice on 9 September 2009.

2.4 Collaboration with NACE

Opportunities for collaboration between EFC and NACE are fully supported by the board of administrators of the two associations.

2.4.1 Exchange of Information

Exchange of information between WP15 and the NACE groups dedicated to the same topics are encouraged.

2.4.2 Joint Publication on Cooling

The elaboration of common guidelines between NACE (TG151, TG152 & TG361) and EFC WP1 is also an objective of the collaboration between the two associations. On the cooling water treatment topic, a task force has issued a common document between NACE report 11106 "Monitoring and adjustment of cooling water treatment operating parameters", NACE report 11206 "Biocide monitoring and control in cooling towers" and the EFC 40 guideline "Prevention of corrosion by cooling waters".

2.4.3 Joint NACE-EFC Congress on Corrosion in Refineries (July 2010)

During meetings between NACE and EFC presidents and vice presidents, it was suggested that it may be possible for NACE and EFC to cooperate over the organisation of one conference in Europe dealing with corrosion in refineries. The period around July 2010 and the location in Rotterdam have been proposed by NACE Europe section. This conference should be co-chaired by EFC WP15 and NACE STG 34. Many participants of this WP15 spring meeting advised to not multiply the conferences proposals;

- In the current economic climate most members have restriction on travel budgets as well as time limitations
- In 2010 many WP15 members would probalby only be able to attend one conference: Eurocorr that will take place in Moscow or the joint NACE EFC conference of Rotterdam.

This project has to be discussed within the next weeks both within EFC and with NACE STG 34 and NACE Europe section.

2.5 Collaboration with other EFC Working Parties

F. Ropital proposed that during a next Eurocorr conference, another joint workshop on "High temperature corrosion in refinery and petrochemical industries" could be held together with WP3 "High temperature corrosion" (similar to workshops during the Eurocorr 2004 and 2007 conferences).

Frank Dean suggested that a workshop with upstream activities (WP13) could be proposed: this topic has also been discussed at the end of the meeting with special attention to corrosion agents from the oil fields (fluor, naphthenates for instance).

2.6 EUROCORR 2009

Eurocorr 2009 "Corrosion from the nanoscale to the plants" will take place in Nice, France, from 7-10 September 2009.

The web site for this conference is: [EUROCORR 2009](#)

The refinery corrosion sessions will be on Tuesday 8 September afternoon (14h – 17h50) and Wednesday 9 September morning (8h40 – 10h20).

The annual working party will take place from 10h30 to 18h00 after the Wednesday 9 September conference session.

The draft program for these sessions is attached in Appendix 2.

The complete program can be downloaded from: [EUROCORR 2009 Program](#)

2.7 EUROCORR 2010

Eurocorr 2010 will take place in Moscow (Russia) from 13 to 17 September 2010. Some proposals of topics on joint sessions with other Working Parties have been discussed (see paragraph 2.5). Other proposals are always still welcome.

3 Failure Cases

3.1 Corrosion of the Overhead of a FCCU Primary Reactor

Martin Richez reported a failure case of a carbon steel elbow of the overhead line in a FCCU primary reactor. The failure occurred during a shutdown operated with a catalyst recirculation. During the operating conditions, the media is not corrosive for carbon steels, but during the catalyst circulation periods, the media contains sulfuric acid (due to SO₃ due point formation) with no buffering effect from H₂S/NH₃. Erosion in the elbows accelerated the corrosion damage. During catalyst recirculation, corrosion mitigation had been decided by monitoring the pH of the solution, by keeping the water wash running and by injecting an acid neutralizer when necessary. More information is provided in Appendix 3.

4 Stress Relaxation Cracking of Stainless Steels

4.1 Case study on Stress Relaxation Cracking

Hennie de Bruyn presented stress relaxation failures in 6 years old cross over lines of an ethylene cracking furnace made in alloy 800HT. A copy of the presentation is provided in Appendix 4.

4.2 Advancement of the Cefracor Survey

During previous meetings, many WP15 participants supported the proposal to establish a standard test method and a guideline to prevent these failures. Such a

guideline could be published in the EFC guidelines series. Under the auspices of the Oil and Gas Committee of Cefracor (French corrosion association) with François Dupoiron as a task leader, a group is currently working on this subject in order to propose a characterisation test and to have discussions with steel providers and with Codes authorities. A resume of the advancement of this task force is included in Appendix 5. An informal workshop is planned on this topic during the 9 September 2009 WP15 annual meeting in Nice.

5 Corrosion in Cooling Water Systems

5.1 Advanced Cooling Water Solutions

GE Water and Process Technologies water treatment programs have been presented by Roy Holliday. The performances to reduce scale deposition and corrosion of the new GenGard STP polymer have been compared to the ones of sulphonated acrylic acid polymers. A copy of the presentation is provided in Appendix 6.

6 Corrosion in Acid Gas Treatment

6.1 Corrosion Control in Refinery Amine Treatment Units

Andre Vanhove from GE Water and Process Technologies presented an overview of the corrosion causes, symptoms and control management in refinery amine treatments units. In order to reinforce the iron sulfide protective layer, GE has developed the Max amine program. More information is provided in Appendix 7.

7 Monitoring

7.1 Hydrogen Flux: Correlation with Corrosion & Hydrogen Damage Risk in Refineries

The application of the hydrogen flux monitoring technique has been presented by Frank Dean from Ion Science. After some information on the technique, correlation charts between the hydrogen flux measurements and the corrosion rates have been discussed for different corrosive media met in refineries: naphthenic acid, sulfidic corrosion, ammonium bisulfide, hydrogen cracking with HF. A copy of the presentation is provided in Appendix 8.

7.2 High Temperature Wall Thickness Monitoring Using New Ultrasound Based Technology

Jim Costain (GE) reported on a new ultrasonic based technology that has been developed for application up to 500°C with a sensibility of 2.5 µm. More information is provided in Appendix 9.

8 Inspection

8.1 Stream Digital Radiography

This radiography technology topic, for accurate corrosion detection and wall thickness measurements, was introduced by Jim Costain (GE). Discussion on the cost

of digital radiographies and their acceptability by standardization organisation (ASME) emerged from the audience. More information is provided in Appendix 9.

9 Corrosion-Under-Insulation

9.1 High Temperature Corrosion Protection – a Comparative Overview of CUI Protective Coating Systems

Steve Reynolds (Performance Polymers bv.) reviewed the requirements on specialized coating systems for surfaces at high temperature with some examples of applications for refineries. A new coating for personal protection for temperatures up to 166°C was also presented. A copy of the presentation is provided in Appendix 10.

10 Next Meeting

The autumn meeting will take place in Nice (France) during the Eurocorr 2009 conference. The meeting is scheduled for Wednesday 9 September from 10h30 – 18h00 and will include an open workshop on Stress Relaxation Cracking.

The final agenda is in preparation and will be sent to WP15 members by 15 July 2009.