Minutes of EFC WP15
Corrosion in the Refinery Industry

Leiden (The Netherlands)
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Acknowledgement
The EFC WP 15 Refinery Corrosion Group would like to express thanks to Nalco-Champion for hosting this meeting in Leiden with special thanks to Valerie Bour-Beucler for organizing the meeting.

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1 Welcome & Introduction

Jim Chew presented an overview of the activities of Nalco Champion and of its parent company Ecolab. Nalco Champion employs 6300 persons and has 47 manufacturing facilities and 19 global technological centers all over the world. Jim Chew gave also information on Nalco key technologies to monitor, control, predict corrosion. The slides presented are enclosed in Appendix 1

43 persons attended the meeting and briefly introduced themselves. The list of the participants is enclosed in Appendix 2.

2 EFC WP15 Activities

2.1 EFC WP15 Activities & Minutes of Meetings

Information about the activities of EFC WP15, Corrosion in the Refinery Industry was presented by Francois Ropital. This information can also be found on the EFC WP15 website, where the minutes of previous WP15 meetings minutes can be viewed and downloaded. More information is enclosed in Appendix 3.

2.2 Existing 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.

2.3 Future and Updated Publications

Stress Relaxation Cracking

This document could be a guideline to avoid stress relaxation cracking failures. WP15 members are participating in a TNO led joint industry project that was launched in April 2012. This project will, at its conclusion, make information available that could be used in the development of a guideline.

Corrosion-Under-Insulation (CUI)

The update of EFC Guideline n°55 (Corrosion under Insulation) with Stefan Winnik (SW Materials And Corrosion Ltd.) as editor is completed. The document was sent to the publisher (Woodhead-Elsevier) by mid-April and a more precise release schedule is expected.

2.4 Next Meetings & Conferences

Eurocorr 2015 (Graz, Austria)

The next Eurocorr-conference will take place in Graz, Austria from 6 -10 September 2015. There will be Refinery Corrosion Session on Wednesday, 9th September 2015.

The next WP15 business meeting will take place during the Eurocorr 2015 conference, most probably on Wednesday afternoon, 9th September 2015. All dates will be confirmed.

2016 Conferences

- NACE CORROSION 2016: 6 – 10 March 2016 (Vancouver, Canada)
- EUROCORR 2016: 11 – 15 September 2016 (Montpellier, France)

3 Ageing - Stress Relaxation Cracking

Arto Kiiski (Neste) introduced the topic and focused on some points: repairing of welds, heat treatments, NDT, new resistant materials. Additional information can be found in Appendix 4.

Then Martin Hofmeister (Bayernoil) reported a failure case of a pressure vessel head made with 316LN steel that operated between 500-530°C. Two mechanisms of cracking can be proposed : stress relaxation cracking (SRC) or sensitization. More information can be found in Appendix 5.

4 Ageing – Embrittlement

Swen Koller (Holborn) presented the ageing characterization of a 34 years old powerformer piping system. A stress analysis had been performed according to EN 13480 and locations selected in order to sample coupons for impact tests. A specific maintenance program with the renewal of the pipe support system for minimizing stresses arising during service has been established. More information can be found in Appendix 6.

5 High Temperature Hydrogen Attack (HTHA)

Some information had been exchanged on the revision (8th edition) of API RP 941 document due to recent HTHA of carbon steel equipment failures. The vote was closed by 17 April and information from API on its results should be available by the next weeks.

6 Failure Cases

6.1 Unexpected Stainless Steel Cracking in High Temperature Service

Frederic Tabaud (BP) presented a failure case concerning the cracking of a 316L HGO/BPA piping. The cracking appeared to be due to fatigue, most likely mechanical or thermal fatigue. Some minor stress corrosion cracks were observed, but the characteristics of the main crack made a primary mechanism of SCC by chlorides highly unlikely. More information can be found in Appendix 7.

6.2 EHTR Metal Dusting Concern

Maria J. Yanes Guardado (Repsol) presented some results in order to prevent an Enhanced Heat Transfer Recovery (EHTR) from metal dusting. Alloy 800H had been protected by aluminum diffusion coatings but after 12 years of service, delamination of the aluminized layer had been observed at the bottom and upper parts of the catalyst tubes and spacers. Some discussion took place in order to select the best protection versus metal dusting.

6.3 Leakage in a Hydrocracker Reactor Effluent

Maria J. Yanes Guardado (Repsol) reported several carbon steel tubes failure in a Hydrocracker Reactor Effluent (REAC). The average dissolved ammonium salts concentration was in the range of acceptable values but corrosion occurred in probably bad wash water repartition locations.

6.4 Failure of Low Carbon Steam Line by Caustic Stress Corrosion Cracking

Piet van Dooren presented a failure case of a steam line in an ammonia plant after 40 years of service. An important leak was discovered near a weld of an eccentric reducer of the steam line An under insulation caustic cracking phenomena could be a likely. More information can be found in Appendix 10.

6.5 Failures – Why they occur and How to prevent them

In his presentation, Alec Groysman (Technion) highlighted some figures and some strategies in order to improve the awareness on corrosion occurring in refineries. More information can be found in Appendix 11.

7 Corrosion Education

Alec Groysman (Technion) presented some slides with musical accompaniment on this topic.

8 Inspection

A discussion led by Arto Kiiski took place on Risk Based Inspection and on the API 581 document.

9 Monitoring – On line control

9.1 Monitoring of crude unit overhead corrosion through improved monitoring and on line control

Philipp Thornthwaite (Nalco-Champion) presented the 3D Trasar systems proposed by Nalco for overhead systems. The automation of this system allows corrosion remediation in near real time conditions and permits to process more opportunity crudes. More information can be found in Appendix 12.

9.2 Online Integrity Monitoring Systems: Applications for Cooling Water Systems, Internal Corrosion in Acid Gas Treatment Units

Kevin Clarke presented the Permasense technology based on an ultrasound waveguide concept. This non-intrusive technology can be used up 600°C. Examples of application are the monitoring of CDU overheads dew point corrosion, or naphthenic acid corrosion (paper7139 Eurocorr 2014), or sulfidation (paper 6169 Nace 2015). More information can be found in Appendix 12.