Minutes of EFC WP 15

NACE Italia Joint Meeting

Corrosion in the Refinery Industry

Porto Marghera (Italy)

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Prepared by

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Acknowledgement

The EFC WP 15 Refinery Corrosion Group would like to express thanks to Eni Venezia Tecnologie for hosting this meeting in their Porto Marghera research centre and also Stefano Trasatti, Nace Italia Chairman, for the co organisation of the meeting.

1 Welcome

The meeting was opened by Dr Mogalati Director of Venezia Tecnologie S.p.A. Venezia Tecnologie has been structured to support industries in their technological development. For more than twenty years it has been working for the industrial productions of its shareholders and of other companies, mainly in setting up production processes and in applications of metallic, plastic, semiconductor and ceramic materials and, more recently, in food technologies. At present, 40 permanent employees and several externals (consultants, trainees, other) are working at Venezia Tecnologie. Among the former, 14 are senior Project Managers, 8 are researchers, 14 research technicians and 4 are administration and general support employees. Know how mainly focus on:
- Material Technology,
- Chemical Processes,
- Process control,
- Chemical analysis and material testing.

35 persons attended the meeting and shortly introduced themselves. Apologies were received from 23 persons. The lists of the participants and the excused persons are enclosed in Appendix 1.

Giovanna Gabetta (Eni) and Professor Stefano Trasatti (chairman) presented the activities of the Nace Italia section. Since 1997 one or two per year thematic meeting is organised on specific topics such as fitness for service or storage tank management.

2 EFC WP 15 Activities

2.1 EFC WP 15 Activities and Minutes of Meetings

Information on the activities of EFC WP 15, Corrosion in the Refinery Industry were presented by Francois Ropital. This information can also be found on the EFC web-site (http://www.efcweb.org/WP_on_Corrosion_in_the_Refinery_Industry.html) 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 publication is available at Maney Editor:

- EFC Guideline no. 40: Prevention of Corrosion by Cooling Waters. http://www.maney.co.uk/search?fwaction=show&fwid=623

Two EFC WP 15 publications are under press:

- EFC Guideline no. 42: A Collection of Selected Papers (ed. John Harston).

- EFC Guideline n° 46: Amine Unit Corrosion Survey managed by John Harston.

Publications in preparation:

- Corrosion under insulation issues in modern refinery and petrochemical plants. This new guideline advancement had been presented during the meeting by Maarten Lorenz (see Appendix 10) .

- Typical refinery failure cases Atlas: an inquiry form had been sent by November 2005 to the members of the group in order to get an overview of the failure cases that can be collected. More proposals of failure cases are still welcomed and may be send to Francois Ropital.

2.3 EUROCORR 2006

Eurocorr 2006 "Reliability management of technical systems" will take place in Maastricht, Netherlands from 25-28 September 2006.

Its web site is http://www.eurocorr2006.nl

The Eurocorr 2006 Conference will have 2 sessions dealing with refinery corrosion:
Session M: "Corrosion in the Refinery Industry" on Monday 25 September (11h-17h) and Tuesday 26 September (9h-10h30)
Session T: Joint session with WP1 "Corrosion and Scale Inhibition in the Refinery Industry" on Thursday 28 September (9h-11h)

You will find the draft program of these 2 sessions in Appendix 3
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3 Material and repair

3.1 Application of duplex stainless steels to prevent corrosion in refineries – Giuseppe Sala – Sandvik Italia

Giuseppe Sala presented the corrosion behaviour of 22-05, 25-07 and of a new 27-07 HD grade of duplex stainless steel in acidic media (hydrochloric, acetic, formic acids) in comparison with austenitic grades. Some examples of application had also been presented and detailed in:
- crude oil desalting feed/effluent exchanger,
- crude distillation unit and vacuum distillation overhead condensers,
- HDS feed/effluent cooler,
- sour water stripper,
- FCC condensing section.

During the discussion, welding procedures had been discussed including the specification of nitrogen content of the shielding gas. More information is provided in Appendix 4.

3.2 Advanced Weld Overlay Technology for Pressure Vessels & Boilers with presentations of history cases in Refineries - Andrea Pacchiarotti - Aquilex Welding Services

The weld overlay technology had been presented by Andrea Pacchiarotti not only as a repair solution but mainly as an engineering alternative. The technology based on pulse spray gas metal arc welding, is available for deposition of carbon steels, stainless steels (austenitic, duplex grades), and nickel based alloys (Monel 400, Inconel 622 or 625, Hastelloy C2000 C276 C22). This point was illustrated with several cases of application:
- CUI protection in delayed coking units,
- horizontal drum of solvent dehydration tower,
- high pressure separator vessel,
- catalyst tube flange in methane steam reformer.

More information is enclosed in Appendix 5.

3.3 Thermal spray coatings - Dave Harvey – TWI

Dave Harvey presented the different technologies available for coating deposition by thermal spraying with a focus input on the selection of the particles temperature and flow velocity. TWI has performed extensive work on the new cold spray technology for which superfine powders are projected in a high temperature and pressure gas: this technique leads to non oxidised state metallic deposits (examples of metallic copper or titanium have been given).
In order to progress in the application of thermal spray coatings, TWI has launched several Joint Industrial program (primarily for offshore applications). New projects more relevant to the refinery industry are proposed such as a state of the art of corrosion mitigation or prevention of CUI with Thermal Sprayed Aluminium. More information is provided in Appendix 6.

4 Data base and failure cases

4.1 The role of technical societies and working parties in the management of knowledge - Giovanna Gabetta – ENI E&P and MarinoTolomio,- VeneziaTecnologie

The management of knowledge project that Eni is developing, had been presented by Giovanna Gabetta. One of the objective of this project is to help the organization to gain insight and understanding from its own experience. Tasks have been developed in order to collect and share the knowledge with the aim that tacit knowledge becomes explicit. Several virtual communities of practice have been created one of which is dedicated to materials. Its mission is to promote and support the development and diffusion of knowledge in the field of structural integrity of materials, to perform survey of needs and resources within Eni group, to implement data base and also to support the successful life of international network such as Nace or EFC. More information is provided in Appendix 7.

4.2 Cases of failure analysis in industrial plants - Sergio Volontè – Tecnimont

Two cases of failure analysis had been presented by Sergio Volontè. The first one concerned the degradation of a tube bundle of a heat exchanger Kettle type. Due to a bad mechanical design, crevices have been formed between the tube and the 304 stainless steel shell side within 2 months. The hydrolysis of K_2CO_3 to KOH led to a highly corrosive alkaline media. To remedy this malfunction, the design was modified by extension of the mechanical expansion for the all thickness of the tube sheet. The second failure case occurred under the thermal insulation of a heat exchanger condenser in a marine environment. After 6 months, some leakage happened due to the chloride stress corrosion cracking of the 316 stainless steel shell. An epoxy coating was applied in order to remedy this corrosion problem. More information is enclosed in Appendix 8.

5 Corrosion Under Insulation

5.1 Current topics relevant to CUI - Dave Harvey – TWI

David Harvey presented some of the work that is performed by TWI on aluminium thermal spray (TSA) coating development to avoid CUI. TSA has been compared with conventional painting technologies. TWI developed a specific test for taking into account external SSC by Chlorides. TWI launched a JIP to establish the long term mitigation of CUI prevention using TSA. More information is given in Appendix 9.

5.2 Recent advancement of the EFC WP15 CUI Guideline – Maarten Lorenz – Shell Global Solution

The advancement of the EFC WP15 Corrosion Under Insulation guideline was presented by Maarten Lorenz (Shell Global Solutions). This guideline intends to contribute to reducing unexpected CUI failures by improving safety and reliability.

It will provide best practice from the field in order to manage CUI effectively. The objective of editorial group is to issue the first version by mid 2006. More information is enclosed in Appendix 10.

6 Inspection, monitoring and control

6.1 RBI tank inspection strategy – Algra Rindert - RTD Group

The presentation concerned the safeguarding of the integrity of tanks by implement of strategies based on Risk Based Inspection (RBI) and inspection plans. Algra Rindert gave information on experiences that led to less unplanned outages and a better integrity knowledge of the tanks. The complete presentation is enclosed in Appendix 11.

6.2 In-service equipment integrity - Jacco Rosendaal - RTD Group

The second presentation on the monitoring topic was about in service integrity inspection techniques. Jacco Rosendaal presented the complementarities of some in service NDT methods (UT spot check, Incotest) and the RTD approach for the screening for suspicious location in order to minimise downtime. Detailed follow up inspection have also been discused and more information on this presentation is enclosed in Appendix 12.

6.3 Artificial Neural Network for process control and monitoring – Giovanni Zangari – Process control consulting

The benefits of the application of Artificial Neural Networking (ANN) for the control and monitoring of industrial process had been presented by Giovanni Zangari with examples from the steel making industry of real time prediction of process quality by ANN. Applications in the corrosion field had been discussed such as the identification of localized corrosion or the corrosion classification by electrochemical noise. More information is given in Appendix 13.

7 Next Meeting

*The next autumn meeting will take place in **Maastricht** during the Eurocorr 2006 conference, on **Tuesday 26 September from 10h30 – 19h** .*
The finalised agenda is in preparation and it will be send to WP15 members by 15 July.