Report on the International Conference on Film Forming Amines and Products in Lucerne, Switzerland

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ABSTRACT

The first International Conference on Film Forming Amines and Products was held in Lucerne, Switzerland, on April 3–6, 2017. The conference was organized by the International Association for the Properties of Water and Steam (IAPWS) with the support of the Swiss Committee for the Properties of Water and Steam (SCPWS).

The main purpose of this conference was to advance the knowledge about film forming amines and products, including the latest science. Scientific papers and case studies provided excellent insights into the most recent developments in this field of cycle chemistry, and numerous examples of the application of film forming amines and products in fossil, combined cycle, nuclear, and other plants were given during the three-day conference.

A short summary of the conference events is given in this report.

INTRODUCTION

The International Association for the Properties of Water and Steam (IAPWS) has published numerous Technical Guidance Documents (TGDs) applicable to fossil and combined cycle plants [1–7]. Through the use of these documents (all of them are downloadable from the IAPWS website free of charge), optimum cycle chemistry guidance can be developed for fossil-fired and combined cycle power plants.

Film forming amines (FFAs), film forming amine products (FFAPs), and film forming products (FFPs) have been introduced to the market in recent years and their use is continuing to increase. Because there were previously no international guidelines or limits for the successful application of these chemicals, there has been a great deal of misunderstanding and confusion for the operators about what exactly these chemicals can achieve when applied.

Therefore, IAPWS developed a new TGD [8] which includes guidance for the application and use of FFAs and FFAPs. The TGD was prepared over the course of two years by the responsible task group and finally authorized at the 2016 Annual Meeting of the IAPWS in Dresden, Germany [9,10].

This new IAPWS TGD is aimed at providing answers to the most common and most important questions asked by plant operators. The TGD includes not only some of the important scientific background but also the key guidance steps for applying FFAs in fossil, combined cycle, and biomass plants. The TGD provides guidance for the user/operator on determining whether these products can be applied to a plant, how they should be applied and monitored, and the procedures that can be used to determine the benefits of the application.

Earlier in 2016, during the European Heat Recovery Steam Generator (HRSG) Forum in Prague, Czech Republic [11], a steering committee was formed to organize a conference with the aim of continuing the discussions and work started within IAPWS to further develop the understanding of FFAs, FFAPs, and FFPs. The Swiss National Committee for the Properties of Water and Steam (SCPWS) offered to host the first meeting of this kind and take care of the organizational work. The first International Conference on Film Forming Amines and Products was held in Lucerne, Switzerland, on April 3–6, 2017.

CONFERENCE SUMMARY

The conference consisted of 10 mixed sessions with 30 presentations covering most aspects of the ongoing debate in the industry. Suppliers of various formulations,

power plant owners and operators, instrument manufacturers, OEMs, and consultants took the opportunity to take part in the discussion by presenting and participating at the conference. Several open discussion periods were scheduled during the three days to allow for open and frank exchange of views.

PRESENTATIONS

The following talks were given and discussed at the conference.

An OEM Perspective on Cycle Chemistry in an FFA World
F.-U. Leidich and J. Sperling, GE Power, Germany, and A. Witney, GE Power, USA

Further Optimization of the Treatment of the Water-Chemistry Cycle of a Combined Cycle Plant Using a FFP
A. Verstraeten, Sloecentrale, The Netherlands

Three Years' Experience with Film Forming Amines at ENGIE
C. Vanschepdael, M. Vermeersch, G. Riga, M. Kooistra, and M.-L. Thielens, Engie Lab, Belgium

Film Forming Amine Product (FFAP) Application in Fertilizer Industry
L. Lensun, Helamin, France

Analytics of Film Forming Amines – A Review
M. Lendi, SWAN, Switzerland

Washing and Preserving Turbines with Film-Forming Amines – Experiences in the Use of Octadecylamine (ODA)
R. Wagner and E. Czempik, REICON, Germany

Effect of Octadecylamine on Carbon Steel Corrosion and Magnetite Deposit Consolidation under PWR Secondary Side Ammonia Water Chemistry
E. Jäppinen, VTT Technical Research Centre of Finland, S. Järvimäki and M. Mäkinen, Fortum Ltd, Loviisa Power Plant, Finland, M. Bojinov, University of Chemical Technology and Metallurgy, Sofia, Bulgaria, and T. Saario and K. Sipilä, VTT Technical Research Centre of Finland

The Effect of Boiler Conditions on the Thermolysis of Film Forming Amines
E. De Meyer and A. R. D. Verliefde, Ghent University, Belgium, and W. Hater, Kurita Europe, Germany

Film-Forming Amine for Use in Industrial Boilers in Japan
S. Mori, Kurita Water Industries, Japan

The Film Formation and Corrosion Inhibition of Oleyl-diamine on Aluminium
W. Hater, Kurita Europe, Germany

Considerations for the Use of Film Forming Amines and Film Forming Products in the Secondary System of Nuclear Power Plants: Roadmap to an IAPWS Technical Guidance Document
W. Cook and D. Lister, University of New Brunswick, Canada, C. Stuart, CNL, Chalk River, Canada, and S. Uchida, JAEA, Japan

Critical Aspects and Questions with Respect to the Application of FFA / FFAP
M. Rziha, Siemens, Germany

Monitoring and Controlling Film-Forming Amines and Film-Forming Amine Products by On-Line Ion Chromatography
E. Lemon, Metrohm, The Netherlands

Experience in Corrosion Reduction Using a FFP at a Coal-Fired Plant
G. Hoffman, PacifiCorp, Utah, USA, and A. Banweg, Nalco, Illinois, USA

Experience with the Application of Film Forming Amine at Connah s Quay CCGT
W. Hater, Kurita Europe, Germany, P. McCann and B. Smith, Uniper Technologies, UK, and A. de Bache, Kurita Europe, Germany

The Sorption Behaviour of a Film-Forming Amine (FFA) and Its Effect on Flow-Accelerated Corrosion (FAC)
S. Weerakul and D. H. Lister, University of New Brunswick, Canada, and W. Hater, Kurita Europe, Germany

A Pathway to Application of Filming Amines in PWRs
K. Fruzzetti, S. Choi, S. Shulder, and M. Caravaggio, EPRI, USA, and M. Kreider and C. Marks, Dominion Engineering, Inc., USA

FFAP Applications in EAEU: Questionable Results
F. Dyachenko, Aminotek, Moscow, Russia

Potential Film Forming Amine and Film Forming Products Theoretical Applications in Direct Contact Geothermal Power Plants – Analysis of Available Data
D. Addison, Thermal Chemistry Limited, New Zealand, and I. Richardson, Mercury Energy, New Zealand

Comparison between the Use of Conventional Reducing All-Volatile Treatment and Film Forming Amine Treatment for Cycle Chemistry Operation on 8.4 MPa Drum Boiler Units
S. S. Sulliman and S. Marais, Eskom Holdings, South Africa

Film-Forming Product Application at a Conventional Coal-Fired Power Plant
A. Howell, Xcel Energy, USA

Control of Fouling and Corrosion by Polyamine in Distillation Systems and Low Pressure Boilers (with Oil-Contaminated Feedwater)
M. Nasiroleslami, Energy Chemical Company, Iran

The Application of a Film Forming Amine Product at Two Power Plants –Industry Case Studies
L. Carvalho, Canada, L. Harmon and T. Freund, ChemTreat, USA

On-Line Analysis of Oleyldiamine in the Water/Steam Cycle of Industrial Power Plants
W. Hater, Kurita Europe, Germany, and P. Izquierdo, Kurita Iberica, Spain

Nature, Behavior and Application of Film Forming Amines in Power Plant Water/Steam Cycle
S. Vidojkovic, University of Belgrade, Belgrade, Serbia, and M. Mijajlovic, University of Nis, Nis, Serbia

Impact of Amines on the Direct Measurements of Chloride and Sulfate
K. Buecher, Mettler-Toledo Thornton, USA

The Possible Effect of FFP on Steam Turbine Performance
B. Dooley, Structural Integrity, UK, R. Svoboda, Switzerland, and T. Petrova, Moscow Power Engineering Institute, Moscow, Russia

Polyamine Technology for Advanced Steam Cycle Corrosion Protection
T. Dale, G. Robinson, and P. Wrede, GE Water & Process Technologies, USA, and S. Shulder, EPRI, USA

Those interested in purchasing the proceedings of the conference should contact Tapio Werder, Secretary of the SCPWS, at tapio.werder@waesseri.com.

Anyone interested in IAPWS documents and activities should contact the chairs of their IAPWS National Committee (see the IAPWS website for contact details) or the IAPWS Executive Secretary, Dr. R. Barry Dooley, at bdooley@iapws.org. You do not need to be a citizen or resident of a member country to participate in IAPWS activities.

CONCLUSION

On behalf of the Swiss Committee for the Properties of Water and Steam (SCPWS), we would like to thank everybody who attended and contributed to the discussions at the conference in Lucerne, Switzerland. The conference was a great success, as reflected in the immense enthusiasm and willingness to share new ideas and suggestions. We are also proud to have received a wide variety of nearly 80 participants, representing 20 countries from all over the world, who provided many different points of view. Therefore, we are confident that the results of the discussions on the topic of FFAs, FFAPs, and FFPs will be a great asset to our community.

This First International Conference on Film Forming Amines and Products marked the successful commencement of a new conference series on this topic. Upon completion of this event, the SCPWS formally allocated the organizational responsibilities for future conferences to the IAPWS and its Steering Committee, chaired by Barry Dooley.

The IAPWS and its Steering Committee have already confirmed the Second International Conference on Film Forming Amines and Products, which is provisionally scheduled for April 2018. The exact dates and location of the next conference venue have yet to be announced, but will be published in this journal as soon as they are available.

REFERENCES

[1] *Technical Guidance Document: Procedures for the Measurement of Carryover of Boiler Water into Steam*, **2008**. International Association for the Properties of Water and Steam, IAPWS TGD1-08, available from http://www.iapws.org.

[2] *Technical Guidance Document: Instrumentation for Monitoring and Control of Cycle Chemistry for the Steam-Water Circuits of Fossil Fired and Combined Cycle Power Plants*, **2015**. International Association for the Properties of Water and Steam, IAPWS TGD2-09(2015), available from http://www.iapws.org.

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[5] *Technical Guidance Document: Steam Purity for Turbine Operation*, **2013**. International Association for the Properties of Water and Steam, IAPWS TGD5-13, available from http://www.iapws.org.

[6] *Technical Guidance Document: Corrosion Product Sampling and Analysis for Fossil and Combined Cycle Plants*, **2014**. International Association for the Properties of Water and Steam, IAPWS TGD6-13(2014), available from http://www.iapws.org.

[7] *Technical Guidance Document: HRSG High Pressure Evaporator Sampling for Internal Deposit Identification and Determining the Need to Chemical Clean*, **2016**. International Association for the Properties of Water and Steam, IAPWS TGD7-16, available from http://www.iapws.org.

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[9] *PowerPlant Chemistry* **2016**, 18(5), 264.

[10] *PowerPlant Chemistry* **2016**, 18(6), 358.

[11] *PowerPlant Chemistry* **2016**, 18(4), 210.

AUTHOR

Tapio Werder is the current editor of the PowerPlant Chemistry journal. He started his work for the journal in 2014 as editorial assistant when Albert Bursik, founder and editor of the journal, retired and took a seat on the journal's International Advisory Board (IAB). In 2015 the responsibility for finding appropriate submissions and for the production of the journal as the editor was handed over to him completely. Since 2015 he has been the secretary of the Swiss Committee for the Properties of Water and Steam (SCPWS) – the Swiss national committee of IAPWS.

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