

## Press Release



## Film Forming Substances (FFS) Conference, FFS2018 Highlights and Press Release

The second FFS International Conference was held on the 20<sup>th</sup> – 22<sup>nd</sup> March 2018 in Prague, Czech Republic chaired by Barry Dooley of Structural Integrity. FFS2018 attracted about 70 participants from 30 countries.



FFS is supported by the International Association for the Properties of Water and Steam (IAPWS).

The meeting provided a highly interactive forum for the presentation of new information and technology related to FFS, case studies of plant applications, and for open discussion among plant users, equipment and chemical suppliers, university researchers and industry consultants. The conference provided a unique opportunity for plant users to discuss questions relating to all aspects of FFS with the industry's international experts. A panel session was held which focused on a number of the key questions and uncertainties about FFS some of which are highlighted below.

Key highlights from FFS2018 included:

- The participation of attendees from 30 countries in FFS2018 illustrated the strong and increased interest around the world in understanding and applying FFS.
- Feedback from the first conference, FFS2017 in Lucerne, Switzerland, indicated much confusion about the various terminology used for film forming substances (film forming amines, FFA, and film forming amine products, FFAP). So IAPWS introduced the new international terminology for Film Forming Substances (FFS). Two subsets describe those substances in terms of them either being amine based (FFA and FFAP) or non-amine based (FFP, Film Forming Products).
- International updates were presented on recent experiences from fossil, nuclear and industrial plants. The experience in nuclear plants has been with ODA, whereas there is a wide range of FFS being applied to fossil and industrial plants. The experience of FFP on condensate polishing and methods of determining FFA on surfaces were highlighted.
- Updates were provided on ongoing research activities from different international organizations dealing with decomposition products of FFA, distribution of FFA, measuring/quantifying the concentration of the FFS in the water, adsorption kinetics of film formation, and the effects of FFS on flow-accelerated corrosion.
- Worldwide appreciation of the unique IAPWS TGD8-16 on FFS and particularly the need to apply Section 8 in this document before, during and after application of FFS.

- There were extensive discussions on the possible benefits of using FFS. But it was also recognized that many problems are still occurring worldwide in plant using FFS without the detailed knowledge suggested by Section 8 of the IAPWS TGD. Unfortunately, there wasn't much open discussion on these problems. For future FFS conferences these need to be highlighted.
- From the good balanced discussions on the benefits/risks for application of FFS it was clear that there is still much to learn despite FFS being applied for over 30 years.
- One of the main conclusions from FFS2018 was the need to optimize first the current chemistry on a plant with verification or otherwise through baseline monitoring before application of any FFS.
- Two other main conclusions from the conference were that: a) it is now clear that hydrophobicity does not always equate to protection of the plant, and b) that FFS cannot be quoted as "reducing" FAC simply by indicating a reduction in monitored iron levels. There needs to be data from before and after any application with supporting photographs if possible.
- The need of adapting sampling and monitoring concepts to the individual applied FFS chemistry was highlighted.
- There were intensive discussions regarding gaps of knowledge and needs for further research work.
- There is still a lot of fundamental work that needs to be done to understand the mechanisms at play with FFS. This includes film formation kinetics, equilibrium and stability, film structure (e.g., thickness or number of layers), how the absorption is affected by other amines, and the correspondence to the reduction in corrosion rate.
- Basically, no work has been conducted to understand the mechanism of the interaction of FFS with surface oxides. This was discussed as the "interfacial science" and needs to involve the interaction of the FFS film with existing surface to include initially  $\text{Fe}_3\text{O}_4$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{FeOOH}$ ,  $\text{CuO}$  and  $\text{CuO}_2$ . Further work is needed on the interactions that occur under feedwater conditions up to about 300 °C where magnetite is soluble, boiler water and steam where magnetite forms by different mechanisms.
- Finally, this is the only international conference on this special topic, which is a highlight by itself.

The third FFS international conference will be held in Athens, Greece in March 2019.

Please contact Barry Dooley ([bdooley@structint.com](mailto:bdooley@structint.com) or [bdooley@IAPWS.org](mailto:bdooley@IAPWS.org)) for further information and with presentation suggestions for FFS2019.

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