IEAGHG Information Paper; 2013-IP24; Summary of discussion wrapping up the Corrosion Workshop held on 11.09.2013 during the OCC3, Ponferrada, Spain

Discussion moderated by Dr. Axel Kranzmann
Notes taken by Gosia Stein-Brzozowska

The Corrosion Workshop was organised by IEAGHG, Dr. Axel Kranzmann (BAM) and Gosia Strein-Brzozowska (IFK - Univ. of Stuttgart) and held on the 11.09.2013 in the frame of the Third Oxyfuel Combustion Conference in Ponferrada, Spain (OCC3, 9-13.09.2013). A total of 9 presentations with focus on high temperature corrosion under oxyfuel combustion were presented by the representatives from the industry and research. After an overview given by Prof. John Oakey, the most important results from the OxyCorr project (Vattenfall, Alstom, IFK - Univ. of Stuttgart) were presented together with the experiences of Vattenfall collected at OxyPP in Schwarze Pumpe. Three presentations encompassed results generated in the USA (B&W, REI) and in Japan (IHI). A 10-minute-long wrap-up held by Dr. Axel Kranzmann (BAM) opened a discussion summarising the most important issues related to high temperature corrosion during oxyfuel combustion. Below a summary of the discussion, moderated by Dr. Axel Kranzmann can be found. The notes were taken by Gosia Stein-Brzozowska.

PROBLEMS EXPECTED?

Alexander Gerhardt (AG), Vattenfall expects similar corrosion rates during oxy- and air-combustion, although some mechanisms might differ. It is difficult to evaluate the results from OxyPP and make predictions for the lifetime behaviour due to limited exposure times, changing fuel quality (influence of SO_x, H_2O and HCl) and operation modi (air vs. oxy). According to Jörg Maier (JM) the current data should be expanded in order to approximate alloy behaviour for a lifetime of a boiler. The exposure conditions should be extended under real conditions. Moreover, the steam parameters under real USC-conditions should be considered as well (OxyPP operates at low steam T and p). Nevertheless, Vattenfall would be ready to risk building of an oxy-fuel power plant not seeing corrosion as an obstacle that cannot be handled.

Chris Spero (CS), raised a topic of potential risk related to erosion resulting from different gas/particulate matter flows within the combustor compared to air-combustion. Additionally CS expects more pronounced oxidation (scaling) due to different gas composition compared to air combustion. IHI continues corrosion tests at Callide, where a severe corrosion due to standstill was identified during the operation breaks.

Until now carburisation has been noticed (Vattenfall, Alstom, BAM, FZJ, IFK - Univ. of Stuttgart, etc.) without additional impact on mechanical properties proven yet. It needs to be kept in mind that the exposure times during the tests were in a 1000-hour-range. Bettina Bordenet (BB) believes however that carburisation might be an issue if more temperature driven. Axel Kranzmann (AK) points out that mechanical properties should be tested together with fire- and steamside corrosion (due to the fact they influence each other). Subsequently a joint effort should be done to combine modelling of corrosion with mechanical changes observed.

FURTHER TESTING?

AG, William M. Cox (WMC) and CS agree that further long-term observations are necessary in a bigger unit. WMC thinks a better corrosion management strategy would be achieved if on-line sensors were used in both hot and cold range. Terry Wall (TW) agrees.

However, according to Steven Kung (SK), on-line corrosion signals are only of limited value yet. Such systems need further studies and comparisons with conventional methods. SK and BB further agree that laboratory tests are essential in order to better predict what can be expected in the field (e.g.

morphology of corrosion products). BB emphasizes the importance of correlations more than of models.

GENERAL REMARKS

- A general agreement was made that laboratory tests are significant to identify the corrosion mechanisms. Long laboratory and field tests in real boiler conditions are significant but still missing.
- The synergy effect of fire- and steamside corrosion with erosion, stresses and change of mechanical properties of boiler elements is crucial.
- On-line corrosion monitoring wins on attention, providing the first information on potential corrosion risk in-situ. The system however needs further tests and evaluations.
- There is a severe communication gap between corrosion specialists and boiler constructors. More communication is necessary in this field.

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