

IAPWS: Power Cycle Chemistry (PCC) Working Group

Minutes of IAPWS PCC WG Meetings

Location: Dresden, Germany, September 12 - 15, 2016
Chair: Michael Rziha

List of Abbreviations

EC	Executive Committee
ICRN	IAPWS certified research need
ICPWS	International Conference on the Properties of Water and Steam
PCAS	Physical Chemistry of Aqueous Solutions
PCC	Power Cycle Chemistry
TGD	Technical Guidance Document
WG	Working Group

Monday 12 September 2016

Power Cycle Chemistry (PCC) Working Group Meeting

Rziha welcomed participants, particularly new attendees from China, Egypt and Turkey.

1. Agenda

Amendments / Adoption of Agenda

The presentation by Addison on updates to the Corrosion Product Technical Guidance Document (TGD) for flexible plant was moved to Thursday 15 September to allow time for the sub-task group to meet during the IAPWS week.

It was requested that all presentations are listed in the meeting minutes as they are part of the formal proceedings that need to be reported by participants.

Action: Rziha to ensure that presentations are listed in the meeting minutes.

The IAPWS Executive Committee (EC) requested an update on ICRN #29 Coolant Sampling.

The agenda was otherwise adopted.

Week programme: Meetings, Joint Workshops and Task Groups

Rziha described the programme for the PCC WG meetings.

2. Appointment of Clerk of Minutes

P. McCann was appointed.

3. Approval of Minutes of PCC WG in Stockholm, 2015

The minutes from the Stockholm meeting were approved with no changes.

4. Progress Reports 2015/2016 and Future PCC Activities

Review of Actions from Last PCC WG Meeting

Updates to be provided on the following activities during the PCC meeting:

- Finalisation of TGDs on Application of Film Forming Amines in Fossil, Combined Cycle, and Biomass Power Plants and on HRSG High Pressure Evaporator Sampling for Internal Deposit Identification and Determining the Need to Chemical Clean (Dooley).
- The corrosion product sampling campaign lead by SIAPWS (Thomsen).
- Geothermal power plant chemistry (Addison). The presentation will also act as the white paper as it summarises the findings from extensive discussions.

ICRN on Amines (Bellows): There is a separate PCAS agenda item on decomposition of acetic acid.

ICRN #26 Aluminium: No developments since the 2015 meeting.

Rziha noted increased international acceptance of the IAPWS TGDs during his work activities.

International Collaboration

There were no new proposals from PCC WG members for IAPWS international collaboration projects.

Cook/Addison proposed to request the IAPWS EC to extend timescales for their international collaboration project (see Tuesday 13th September, Section 3). Dooley explained that no formal EC approval was required as no additional budget is being requested.

Other Business

Rziha highlighted the IAPWS International Conference on Film Forming Amines and Products to be held in Lucerne, Switzerland on April 4-6 2017. Paper copies of the flyer were available and can also be downloaded from <http://www.scpws.ch/scpws--en.html>.

5. IAPWS TGDs – Status and Future Development

Draft TGDs for EC Submission

The PCC WG approved the submission of the following two TGDs to the EC for issue:

1. HRSG High Pressure Evaporator Sampling for Internal Deposit Identification and Determining the Need to Chemical Clean

2. Application of Film Forming Amines in Fossil, Combined Cycle, and Biomass Power Plants

Action: Rziha to request EC approval for issue at the meeting on Friday 17 September.

Dooley noted that both TGDs have been reviewed extensively by the PCC WG, National Committees and by the Editorial Committee. The film forming amine (FFA) TGD involved most of the major chemical, boiler, HRSG and steam turbine suppliers worldwide. It was also noted that the FFA TGD was targeted at fossil, combined cycle and biomass plants only; nuclear plants need to consider separately.

Demineralised Water Integrity TGD

The TGD content has been drafted by Joy. The sub-task group (Joy [represented by McInnes], McCann, Buecher, Bellows, Hirano and Rziha) will meet during the week to discuss writing responsibilities and schedule. Khalifa, Shinotsuka and Ichihara also joined the task group.

Update from Existing TGD Sub-Task Groups

Monitoring corrosion products in cycling and two-shifting plants: A white paper is being developed by the sub-task group (Addison lead); the findings from the SIAPWS collaborative testing programme will be presented on Tuesday 13 September.

Instrumentation: A comparison of different methods for measuring Degassed Conductivity After Cation Exchange (DCACE) will be presented by Lendi (see Section 7).

Geothermal power plant chemistry: See Addison presentation, Tuesday 13 September 2016.

Future Developments

FFA TGD for Nuclear Plants: Cook has taken over from Uchida as chair of the Nuclear sub-committee. There is high interest in the use of FFAs in nuclear steam generators. The sub-committee will meet during the IAPWS week to discuss. Sub-committee members for the FFA TGD are: Lister, Jansen, Ichihara, Hirano, de Bache and Wada. The nuclear chemistry conference in Brighton, UK in September 2016 may also be an opportunity to seek participants.

Film Forming Products: Amendment of the FFA TGD for film-forming products that are not amines was discussed. The draft FFA TGD was considered suitable as an application document, though not as a scientific document for these products. No current action was proposed.

Air In-Leakage: The loss of efficiency and heat exchange performance due to air in-leakage is viewed as being poorly understood. A new sub-task groups was proposed, consisting of: Carvalho (chair), Dooley, Rziha, Nielsen and Thomsen.

Practical Experience: Addison presented on Practical Experience with the Application of IAPWS TGDs

6. Presentations

The following presentations were given:

- P. McCann: Experience with the Application of Film Forming Amines at the Uniper UK Connah's Quay CCGT Power Plant
- D. Lister: Studies on Two-Phase FAC; Modelling and Effects of Amine Breakdown Products

- F. Dyachenko: Use of FFAP at HRSG Power Plants in Russia
- T. Petrova: Use of ODA at Russian Power Plants
- S. Vidojkovic: Behaviour of Film Forming Amines in Water/Steam Cycle of Power Generating Units

7. PCC Task Group Meetings on TGDs

Dooley presented an overview of the new TGD on “HRSG High Pressure Evaporator Sampling for Internal Deposit Identification and Determining the Need to Chemical Clean”

Demineralised Water Integrity sub-task group: McInnes provided an initial plan for drafting and timescales with section responsibilities.

Instrumentation sub-task group: Lendi presented on “Measurement of Degassed Conductivity After Cation Exchange - Additional Presentation on Different Measurement Methods”. The key conclusion was that no specific degassing method needs to be specified as the measurement is only used for trending purposes. Information and recommendations could be used to update Steam Purity and Instrumentation TGDs, noting that the recent amendments to these TGDs for fast-starting plants included initial comments. The sub-task group was asked to put together a white paper for the 2017 meeting. To ensure commercial impartiality, the sub-task group needs to ensure that the white paper has input from all instrument manufacturers. Buecher from MT is to join the sub-task group.

Action F-U Leidich: The sub-task group is to prepare a white paper for the 2017 IAPWS meeting, to be circulated in advance to the PCC WG. The white paper is to have input from all instrument manufacturers.

Tuesday 13 September 2016

Power Cycle Chemistry (PCC) Working Group Meeting

1. Copies of Presentations

Rziha noted that presentations from the PPC WG proceedings will be made available to PCC WG members in PDF form on the Opal website.

Action Rziha: Presentations to be uploaded in PDF form onto the Opal website.

2. PCC Topics for ICPWS17

For the 17th International Conference on the Properties of Water and Steam (ICPWS17), the following topics were suggested for the PCC symposia:

1. IAPWS TGDs (Session organiser Dooley);
2. Water re-use and savings at power plant, e.g. grey water treatment, flue gas condensate (Organiser Thomsen);
3. Geothermal power plant chemistry (encouraging previous attendees from Moscow from Japan, Russia, NZ) (Organiser Addison);
4. Nuclear power plant chemistry (Organiser Cook);
5. Conventional and combined cycle power plant chemistry (Organiser Rziha);
6. Film forming amines / film forming products (Organiser Lister).

Action Rziha: Pass these topics onto the ICPWS17 organising committee.

3. Presentations

The following presentations were given:

K. Thomsen: SIAPWS Water Chemistry Network

K. Thomsen: Data from Corrosion Product Monitoring Measurements – Results of a Preliminary Test of Sampling Uncertainty

N. Ishihara: Water Chemistry Management Practices and Sampling Method of Japanese PWR Plants. It was noted that the sampling guidance presented may be used in a new TGD from the nuclear sub-committee.

W. Cook / D. Addison: Progress Report and Preliminary Results from the International Collaboration Project on Boiler Corrosion with Mixed Contaminants. IAPWS funding has been used to support D. Addison travel for 3 off 2 week visits to the University of New Brunswick for project scoping and design, rig construction and initial test work. There is £4,272 remaining of the IAPWS budget that will be used to continue support from Addison into 2017. The first tests are expected to start in January 2017.

4. Changes in Membership & Election of Officers

New PCC WG Members

The following new PCC WG members were proposed and seconded:

- Moataz Khalifa; PGESCO (Rziha/Dooley)
- Luis Carvalho, ChemTreat (Rziha/Dooley)
- Dr Yoichi Wada, Hitachi Ltd. (Rziha/Dooley)
- Sho Shinotsuka, Mitsubishi Hitachi (Rziha/Dooley)
- Dr Andreas Wecker, VGB (Rziha/Dooley)

- Monika Nielsen, Dong Energy (Rziha/Thomsen)
- Utku Kerem Gulcek, Enerjisa (McCann/Rziha)
- Mike Sparrey (Rziha/McCann).

Action Rziha: Submit the approved nominations to the IAPWS EC during the meeting on Friday 16 September.

Election of Officers

The terms of IAPWS WG chairs generally last for around 5 years. Rziha has served as PCC WG chair for 4 years, but was willing to continue for a further 3 - 4 years. The WG agreed with this proposal.

PCC/PCAS Joint WG Meeting and Workshop

The workshop consisted of the following presentations:

Y. Wada: Electrochemical Corrosion Potential (ECP) Monitoring in Boiling Water Reactors

A. Anderko: Modelling Actinide Solution Chemistry: Thermodynamic Fundamentals for Nuclear Power Industry

D. Addison: Update on Geothermal Chemistry. This presentation was effectively the white paper for Geothermal chemistry. The sub-task group is close to being able to produce a guideline. It is intended to update the geothermal section in the Steam Purity TGD and write ICRNs for missing knowledge. The sub-task group is aiming for the updates to be made in time for all reviews and approvals to be completed to allow formal approval at the IAPWS 2017 meeting.

PCC Workshop / WG Task Group Meetings

Iron Monitoring and Corrosion Product Sampling Sub-Task Group: The white paper will include the findings from the SIAPWS sampling programme. A key issue for benchmarking will be what are achievable values for different plants – there is an experience base for normal plant operation, but nothing available for flexible plant at present.

Nuclear Sub-Committee: The sub-committee will consider developing two TGDs; (1) nuclear power plant specific application of film forming amines / film forming products and (2) sampling and instrumentation. It is likely that only one TGD will initially be developed. The sub-task group consists of: Lister, de Bache, Wagner, Petrova.

Geothermal Sub-Task Group: International consensus is required for the final draft of the TGD, including Japan, Russia, etc. Much work has been done in New Zealand and international contacts are already well known. Luis Carvalho to join the sub-task group.

Meetings are planned of the Air In-Leakage and Demineralised Water Integrity sub-task groups.

Thursday 15 September 2016

Power Cycle Chemistry (PCC) Working Group Meeting

1. Presentations

The following presentations were given:

- J. Jensen: Water Chemistry Issues when Constructing a New Add-On Drum Boiler to an Existing Ultra-Supercritical Boiler/Turbine
- J. Jensen: Flue Gas Condensation – Possible Optimizations and Makeup Water Production
- H. Hirano: Overview of the Revision of JIS B 8223 “Water Conditioning for Boiler Feed Water and Boiler Water”
- S. Shinotsuka: High- AVT(LO) Water Treatment Application to Combined Cycle Plant
- D. Addison: Update on Iron Monitoring and Corrosion Product Sampling. This presentation described the plans from the TGD sub-task group to develop current guidance and to address knowledge gaps.
- B. Dooley: Plants with Aluminium Cooling Towers and Jet Condensers
- L. Daal: Applying Film-Forming Amines and Need for a Guidance Document from an Independent View
- L. Daal: Water Savings for Coal Fired Power Plants – Results of a Literature Search and Operator Opinions
- L. Daal: Global Experience Optimizing Cooling Water Systems Through Pulse-Chlorination

1. ICRNs – Review and Possible New Additions

- ICRN #22 Steam Turbine Phase Transition Zone Chemistry: The ICRN expired in 2015. Rziha proposed that the ICRN should be updated for 2 years on the recommendation of the author Stasny. This was agreed and Rziha will request the extension at the EC meeting. The contact details require updating. Rziha will manage this with the EC Editorial Committee.

Action Rziha: Submit the ICRN for approval at the EC meeting on Friday 16 September. Update the contacts that are listed with the Editorial Committee.

- ICRN #29 Sampling: The final version has been received by Rziha from Lister. Rziha will present the final version to the EC for approval.

Action Rziha: Submit the ICRN for approval at the EC meeting on Friday 16 September.

- ICRN #26 Aluminium: The ICRN now remains active to June 2019. Rziha proposed preparing a closing statement for the Prague ICPWS meeting in 2018 to include new information that is now available. There was agreed by the WG.
- There were no proposals for new ICRNs.

2. Discussion of Future PCC Activities and Task Groups

The discussions of the TGD sub-task groups were reported back as follows:

- Corrosion Product Monitoring sub-task group: Proposals were presented earlier by Addison.
- Nuclear Sub-Committee: A TGD on FFAs was discussed. There was consensus that there may be different effects compared to fossil plants. The first step will be to prepare a white paper comparing differences to fossil.
- Demineralised Water Integrity sub-task group: The contents list proposed by Joy was agreed. The next step will be to agree section authors.
- Geothermal sub-task group: See previous presentation by Addison.
- Rziha noted that new ICRNs can be proposed and drafted at any time.
- Air In-Leakage sub-task group: A white paper will be produced and the need for a TGD considered.
- Instrument sub-task group and Degassed Conductivity measurement: Following the earlier presentation, Lendi and the sub-task group will produce a summary document for PCC to review to include any recommendations for amendments to the Instrumentation TGD.
- Dyachenko asked about a TGD on preservation. Rziha commented that a new guidance document was available from the VGB that covered all plant areas, not just the water-steam cycle. The German version has been released. It will be available in English later in 2016. It was decided to review the need for an IAPWS document at the 2017 meeting.

Action Rziha: Include as an agenda item at 2017 meeting.

- A white paper on Condensate Polishing Plant was suggested by Khalifa. This would have to be written in a neutral technical matter and it must not be a commercial discussion. Khalifa will provide a paper at the 2017 meeting to include any IAPWS product that could assist in this technical area.

Action Khalifa: Provide paper at 2017 meeting.

3. Gibbs Award

This is an award for a senior researcher in areas of interest to IAPWS. Any nominations from PCC WG members need to be sent to Rziha by May 2017.

4. PCC Public Relations

The following were agreed as PCC WG highlights for the IAPWS meeting press release:

- Two new TGDs – HRSG HP Evaporator and FFAs;
- Two more TGDs in preparation: Demineralised water plant integrity and corrosion product sampling for cycling plants;
- White paper to be developed for air in-leakage;
- Further steps in data collection and knowledge on aluminium as per ICRN#26.

A summary of PCC WG proceedings will be produced for the PowerPlant Chemistry journal by Rziha.

Action Rziha: Produce article for the PowerPlant Chemistry journal.

Participants were asked to consider including the IAPWS logo on future conferences related to power plant chemistry to increase awareness of the organisation. Members can contact B. Dooley about this.

5. Dates and venue for 2017 Meeting

The 2017 IAPWS meeting will be in Kyoto, Japan, on August 27 – September 1.

The 17th ICPWS will be held in Prague on 2 -7 September 2018. PCC topic suggestions have been passed to the Czech organising committee by Rziha.

6. Miscellaneous and Adjournment

Rziha was thanked for his work in chairing the meetings at Dresden. The meeting was then adjourned.