

**Minutes: Properties Subcommittee,
ASME Research & Technology Committee on Water and Steam in Thermal Systems
Gaithersburg, MD, October 2, 2008**

Attendance:

Richard Harwood, Siemens Energy, Inc. (Chair)
Allan Harvey, NIST (Secretary)
Dan Friend, NIST (U.S. IAPWS Delegate)
Jim Bellows, Siemens Energy, Inc.
John Gallagher, NIST
Peter Huang, NIST
Anneke Levelt Sengers, NIST
Serguei Lvov, Penn State University
Peter Murphy, General Electric
Bill Parry, General Electric
Jan Sengers, University of Maryland

[NOTE: Items numbered as on Preliminary Agenda, which is attached.]

1-2. Approval of Agenda and Review of Action Items

A preliminary agenda (attached) was distributed and approved with a few minor additions. Minutes of the Spring 2008 meeting had been approved by email. Progress on action items was briefly reviewed. Leftover (and amended) **Action** items carried over are as follows. [Bellows to circulate 2008 IAPWS PCC minutes to ASME's PPEC committee and Water Technology Subcommittee. Bellows to investigate status of EPRI funding from past years and call Jim Mathews to discuss.] Discussion of previous items led to these new **Action** items: [Harwood (with assistance from Bellows) to send ICPWS Press Release to *ASME News*, after adding paragraphs on ICRNs and on the Helmholtz award, copying Michael Tinkleman at ASME. Harvey to put Word version of Press Release on the IAPWS website.]

3. ASME Steam Tables Books

As of 9/28/08, total sales of the book are 1288, reflecting 105 books sold in the last 11.5 months. Annual sales have been "flat" for several years. The new Compact Steam Tables booklet has sold 3447 copies (many in bulk orders), with approximately 1160 in the past 11.5 months.

A Second Edition will include the new IAPWS Region 5 properties and new viscosity. All the edits for the Second Edition have been transmitted to ASME Press and we are awaiting proofs. Harvey presented a draft of the Preface to the Second Edition which was approved. It was decided to request that ASME make the cover of the Second Edition blue, to match the compact booklet.

[**Actions:** Harvey to coordinate proofs, inform ASME Press about cover decision, and request publicity about the new edition in *ASME News*, *Mechanical Engineering*, and any other appropriate places.]

The issue of making PDF of the book available on CD-ROM was raised. A Task Group consisting of Harvey, Harwood, and Parry was authorized to make a decision about this and to inform the rest of the committee.

4. ASME Software for IAPWS-IF97

Total sales are 563 "Professional" version, reflecting 24 sales in the past 11.5 months; sales have been fairly flat for several years. No new bugs have shown up.

Bill Parry and Peter Murphy reported progress on the DLL. The new viscosity and Region 5 equations have been implemented, along with some useful functions. It has been tested on several machines, but

not 64-bit Vista. Input checking has been implemented to prevent crashes. It is anticipated that there will be no printed documentation, just a PDF on the CD along with installation instructions.

[**Actions:** Parry and Murphy send Fortran code to Harvey for testing. Gallagher to see if he has access to 64-bit Vista for testing. All to test the DLL to the extent possible, with deadline of Thanksgiving for feedback.]

5. Web sites

There was little new to report on this item, but there were some suggestions about use of our committee website for education. A Task Group was formed consisting of Jan Sengers (Chair), Harvey, and Lvov to come up with some ideas to discuss at our next meeting.

[**Actions:** Task Group to report at next meeting. Harvey to provide links to Compact Steam Tables and to ICPWS Proceedings on IAPWS website.]

6. U.S. Implementation of New Formulation for General and Scientific Use

Allan Harvey reported that sales of Version 2.2 in Fiscal 2008 had been 38 (18 with source code), with sales roughly constant for several years. A minor update is needed for the new IAPWS viscosity formulation, new melting and sublimation curves, and slightly revised thermal conductivity formulation. Almost all of the program modifications for this have been done.

In the medium term (perhaps coinciding with the new thermal conductivity formulation in 2 or 3 years), things will be switched over to the interface used for NIST's Refprop software, since the old existing interface cannot be maintained or upgraded.

The committee authorized NIST to be (if it wishes to develop such a product) the U.S. distributor of the new IAPWS formulation for seawater, as was done with IAPWS-95.

7. Transport Properties

Jan Sengers and Dan Friend reported that the new viscosity formulation has been officially approved by IAPWS. A small revision of the thermal conductivity release (only the "general and scientific use" part) was also approved to make it consistent with the new viscosity formulation. A paper is almost ready for submission to *J. Phys. Chem. Ref. Data* describing the new viscosity formulation, along with a smaller paper for *Int. J. Thermophysics* on the critical enhancement. There has been progress on the thermal conductivity; the form of the correlation has been decided and a proposal has been developed for what to do about industrial use. There are issues to look at with the dilute gas.

8. IAPWS Issues

With regard to awards, it was noted that we should be encouraging nominations for the Helmholtz award, which can now come from non-IAPWS people. The subject of a nomination for IAPWS Honorary fellow was discussed, and a candidate was decided on.

[**Action:** Bellows to prepare nomination and coordinate submission with Friend.]

With regard to documents, one ICRN (on dew point of flue gases) will be circulated. *The U.S. National Representative was authorized to give our approval for this document.*

Updates were given of activities of the various Working Groups at the recent IAPWS meeting in Berlin. Allan Harvey reported on the TPWS (Thermophysical Properties of Water and Steam) and IRS (Industrial Requirements and Solutions) Working Groups, which met together. Numerous new and revised documents (see www.iapws.org) had been approved. There is also a new Subcommittee on Seawater that will report directly to the Executive Committee. Serguei Lvov reported on the Physical Chemistry of Aqueous Systems (PCAS) Working Group. A monograph edited by Prof. Valyashko is nearing publication, and work will be done during the year on an ICRN describing the need for a model of the NaCl/H₂O system (and, prior to that, the dielectric constant) consistent with IAPWS standards and based

on the best data. Prof. Nakahara will become Chair of PCAS as of Jan. 1, with Dr. Anderko as the new Vice-Chair. Jim Bellows reported on the PCC (Power Cycle Chemistry) Working Group. A new “Technical Guidance Document” was adopted which is hoped to be the first of many such documents.

More generally, the conference in Berlin was praised, and the U.S. Representative was asked to send a message of appreciation to the organizers. The 2009 IAPWS meeting will be in Arnhem, The Netherlands, Sept. 6-11. The next ICPWS may be in the United Kingdom in 2013, but we should monitor the progress there since the U.S. may be a backup site (possibly in 2012).

[**Actions:** Friend to send note of appreciation to ICPWS organizers, addressed to B. Rukes. Friend to send email (copying Jan Sengers) offering assistance (such as finding a Symposium speaker) to 2009 organizers.]

The U.S. will assume the Presidency of IAPWS for the calendar years 2009 and 2010, and we will need to supply a different person as U.S. National Representative. *It was agreed that Dan Friend would serve as IAPWS President, and that Allan Harvey would replace him as U.S. delegate for that period.*

9. Membership

No changes.

10. Old Business

Allan Harvey reported that we should soon be getting royalties for the Compact Steam Tables booklet, and that the Second Edition of the large book would be priced with a royalty built in (as would the DLL product when that was ready).

There was discussion of the status of our EPRI support and the effective increase of IAPWS dues due to the decline of the dollar.

[**Actions:** Bellows (by the end of November, with prodding from Harwood as needed) to check with Norma at ASME about status of EPRI reports and payments, going back 5 years, and talk to Jim Mathews at EPRI about their support. Friend and Harvey to draft 2008 report by mid-January 2009 and send to Harwood for forwarding to ASME, considering increasing the request by \$2K pending discussion of feasibility by Bellows with Mathews. Friend to look into history and accuracy of IAPWS dues structure.]

11. New Business

Peter Huang explained the industrial need for better (and standardized) calculation of enhancement factors in the area of humidity, and explained the humidity Working Group within the CCT.

[**Actions:** Huang to check with incoming chair of CCT humidity WG to see if there was interest in working with IAPWS on a project. Harvey to represent these interests to the IAPWS TPWS WG.]

There was discussion of the growing importance of desalination and future IAPWS work in the area.

[**Action:** Harwood (copying Parry) inform M. Tinkleman at ASME about IAPWS interest in desalination and ask if there is current work and/or interest in this area within ASME.]

12. Next Meetings

In Spring 2009, we will meet at NIST-Gaithersburg on Wednesday and Thursday (just the morning on Thursday), April 29-30.

For Fall 2009, we have two options. If we will be involved in a desalination session at the IWC, we will meet at the IWC in Orlando (scheduled for October 4-8). If not, we will plan to meet at the Alstom facility in Connecticut, for 1.5 days (probably a full day and then a morning), where we would plan to have a Symposium with both Committee members and Alstom people presenting.

[**Action:** Bellows to present desalination topic to Main Committee at this year's IWC (late October) and report ASAP on the result. If the report is negative, Harwood begin planning with Alstom.]

Preliminary Agenda: ASME Subcommittee on Properties of Water and Steam

Location: NIST Admin Bldg, Lecture Room D, Gaithersburg, MD

Time: Thursday, October 2, 2008, 8:30 AM to 4 PM

- 1. Approval of Agenda**
- 2. Review of Action Items from Spring 2008 Minutes**
- 3. ASME Steam Tables book and booklet**
 - 3.1. Report on sales Allan Harvey
 - 3.2. Progress toward Second Edition of book Harvey, All
- 4. ASME Software for IAPWS-IF97**
 - 4.1. Report on sales Allan Harvey
 - 4.2. Technical support, bugs John Gallagher, Allan Harvey
 - 4.3. DLL/Excel product Bill Parry, Peter Murphy
 - 4.4. Testing All
- 5. U.S. Subcommittee and IAPWS Web pages** Allan Harvey
- 6. Update on implementation of general/scientific formulation** Allan Harvey
- 7. Report on transport properties** Dan Friend, Jan Sengers
- 8. IAPWS issues**
 - 8.1. IAPWS Awards Dan Friend
 - 8.2. IAPWS documents for consideration Dan Friend
 - 8.3. Current WG activities and reports on Berlin meeting Harvey, Parry, Bellows, Lvov
 - 8.4. US representation to IAPWS All
- 9. Membership** All
- 10. Old Business**
 - 10.1. Royalties
 - 10.2. EPRI reports and funding Bellows, Harwood
- 11. New Business**
 - 11.1. Humid air and moist gases Peter Huang, Allan Harvey
- 12. Next Meeting – Time, Place, etc.**
 - 12.1. Spring 2009 in Gaithersburg, April 29-30
 - 12.2. Fall 2009 plans (Alstom?)
- 13. Adjournment**