

**Minutes: Properties Subcommittee,  
ASME Research & Technology Committee on Water and Steam in Thermal Systems  
Gaithersburg, MD, April 7-8, 2010**

Attendance:

Richard Harwood, Siemens Energy, Inc. (Chair)  
Allan Harvey, NIST (Secretary, U.S. IAPWS Delegate)  
Jim Bellows, Siemens Energy, Inc.  
Dan Friend, NIST  
Frank Gabrielli, Alstom Power  
John Gallagher, NIST  
Dick Jacobsen, Idaho State University (by phone)  
Anneke Levelt Sengers, NIST  
Peter Murphy, General Electric  
Bill Parry, retired GE  
Jan Sengers, University of Maryland  
Anurag Singh, General Electric

[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. Minutes of the Fall 2009 meeting had been approved by email. Progress on action items was briefly reviewed. Leftover Action items carried over (and amended items and new ones generated after discussion) are as follows. Bellows (with help from Harwood for possible OCR) to send PDFs of old IAPWS ICRNs to Harvey for possible inclusion on IAPWS website. It was brought up that Howard White, longtime Secretary of this Committee and former Executive Secretary of IAPWS, had died a few months ago.

[Actions: Levelt Sengers, Sengers, and Bellows draft a letter to Howard White's widow to be sent by Harwood (as Chair) expressing our appreciation for his service. Levelt Sengers and Harvey prepare an obituary to be placed on the IAPWS website.]

3. ASME Steam Tables Books

The Second Edition of the book, reflecting the new IAPWS viscosity formulation and new Region 5 formulation, became available for sale in early 2009. Sales of this edition so far have been 211. This is a somewhat higher sales rate compared to the last few years of the First Edition.

The Compact Steam Tables booklet has sold 5016 copies (4030 in bulk orders), with approximately 800 in the past 12 months, a small decline in the rate.

It was reported that ASME Press was willing to receive camera-ready copy for the Third Edition (which would coincide with the new IAPWS thermal conductivity formulation in 2011 or 2012). Allan Harvey has made progress updating the Word files originally sent to AIP.

[Actions: Harvey and Parry complete making Word (2003) files corresponding to current book, and circulate to others to check for accuracy. Harwood to format files into camera-ready book and properly bookmarked PDF.]

4. ASME Software for IAPWS-IF97

Total sales are 589 "Professional" version, reflecting 12 sales in the past 12 months, a modest decline in the rate. No new bugs have shown up; John Gallagher continues to get occasional support requests.

Bill Parry (along with Peter Murphy and Anurag Singh) reported progress on the DLL. The Fortran source code is complete. The DLL seems to work on most combinations of Windows and Excel, but still needs some testing. There are still some issues to be worked out in the VBA, mostly concerning error messages. For the Excel Add-in, there are some issues with Vista with Excel 2007, and general issues with necessary path modification. It has been decided to make two versions of the documentation: one for Excel 2007 and one for Excel 2003 and before. It is expected that remaining issues should be resolved in the next few weeks.

[**Actions:** Parry send out “gamma” version for testing as CDs in May (to Bellows, Friend, Gallagher, Harvey, Harwood). Parry discuss products and pricing with Mary Grace at ASME Press.]

With regard to implementing recent IAPWS “backward” equations, this should be done, but not given any significant attention until the DLL is finalized. The approach would follow the precedent of the backward equations already implemented in the software.

## 5. Web sites

There was nothing new to report on this item.

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

Allan Harvey reported that sales of Version 2.22 in the first half of Fiscal 2010 had been 16 (6 with source code), with sales roughly constant for several years.

While some clarification on different machines is still needed, it appears that this software will not work on 64-bit operating systems. This means that switching to a new interface (already used for other NIST-produced software) is called for. At the same time, additional functionality could be added such as the ionization constant and the Prandtl number and properties as a function of enthalpy and entropy.

[**Action:** Harvey work with NIST colleagues to develop plan for new interface.]

## 7. Transport Properties

Jan Sengers reported that the issues for the low-density part of the thermal conductivity correlation (where there was some disagreement between the existing experimental data and some theoretical calculations based on a molecular model) have been resolved in a way that meets the requirements specified at the 2009 IAPWS meeting. The work for higher density is proceeding, and it is expected that a recommended equation will be presented at the 2010 IAPWS meeting. It will also be necessary to make a recommendation for industrial use, but that is expected to be straightforward.

## 8. IAPWS Issues

With regard to awards, the nomination for IAPWS Honorary Fellow was endorsed, and there was no objection to the nominee for the Helmholtz award. With regard to documents, there are several ICRNs at various stages. For ICRN-17, taking the advice of Jim Bellows we are satisfied with the technical content but the references need to be restored. Jim will look quickly at other ICRNs to see if there are any serious problems. There is also a proposed guideline for humid air in contact with seawater and/or ice.

[**Actions:** Bellows to look at ICRNs 21 and 22 and convey any objections to Harvey. Harvey to send copy of “sea air” Guideline to Levelt Sengers and Bellows, who will let him know if they have any feedback. Harvey convey US positions and feedback on documents to IAPWS Executive Secretary.]

Updates were given of activities of the various Working Groups at the 2009 IAPWS meeting and upcoming activities for the 2010 meeting. Some items for attention were noted.

[**Actions:** Harvey request IAPWS President and Chair of Subcommittee on Seawater that chairs of Task Groups be reminded of their tasks well in advance of the IAPWS meeting. Parry be sure that methods for faster calculations (table lookup, splines, etc.) are on IRS agenda. Parry contact IRS Vice-Chair Ingo Weber to arrange transferring chairmanship.]

## 9. Membership

**It was moved and unanimously approved to make Anurag Singh a member of the Subcommittee, and to propose Peter Murphy for membership in the main Research Committee on Water and Steam in Thermal Systems.**

## 10. Old Business

ASME News article: Allan Harvey reported that the article we prepared about IAPWS-related issues appeared in *ASME News* in January 2010.

EPRI reports and funding: Our 2009 report (with 2010 request for funding of \$12K) has been submitted through the ASME CRTD office. We received \$10K in late 2009.

Seawater and Desalination: Jan Sengers (supplemented by a report from a colleague at the University of Maryland) brought up the importance of seawater in industry, and the absence of this area from the current ASME Roadmap in water management technology. There was discussion of a variety of areas where seawater properties, especially corrosion-related properties and processes, are important, such as cooling towers that use seawater. Much of this is related to the area of our sister Water Technology Subcommittee. It was thought that seawater-related topics (perhaps including other concentrated brine systems such as produced water and solutions in zero-liquid-discharge plants) would be a good topic for a Symposium at our Spring 2011 meeting.

[**Actions**: Bellows to propose Symposium to main WSTS committee.]

## 11. New Business

Many of our “long-range” topics were covered above. We want to continue to be aware of topics including desalination, seawater, fast property calculations (table look-up or otherwise), and non-Fortran languages for our products.

## 12. Next Meetings

For Fall 2010, we had hoped to meet at Alstom in Connecticut, but with recent changes in that company a meeting in that location no longer seems like the best option. After some discussion, it was decided to meet at NIST in Gaithersburg for a single day on Tuesday, September 28, 2010.

Our Spring 2011 meeting is scheduled at NIST in Gaithersburg April 13-14, 2011.

It was tentatively decided to try to arrange our Fall 2011 meeting at General Electric in Schenectady.

## **Preliminary Agenda: ASME Subcommittee on Properties of Water and Steam**

**Location: NIST Admin Bldg, Room B-113, Gaithersburg, MD**

**Time: Wednesday, April 7, 2010, 10:00 AM to 5 PM, Thurs. April 8, 8:30 to 10:30**

- 1. Approval of Agenda**
- 2. Review of Action Items from Fall 2009 Minutes**
- 3. ASME Steam Tables book and booklet**
  - 3.1. Report on sales Allan Harvey
  - 3.2. Report on work toward Third Edition and PDF version Harvey, Harwood, Parry
- 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 Parry, Murphy, Singh
  - 4.4. Plans for new backward equations & transport Allan Harvey, Bill Parry
  - 4.5. Testing All
- 5. U.S. Subcommittee and IAPWS Web pages** Allan Harvey
- 6. Update on implementation of general/scientific formulation** Allan Harvey
  - 6.1. Report on sales Allan Harvey
  - 6.2. Future versions (for 64-bit systems) Harvey, All
- 7. Report on transport properties** Dan Friend, Jan Sengers
- 8. IAPWS issues**
  - 8.1. IAPWS Awards Allan Harvey
  - 8.2. IAPWS documents for consideration Allan Harvey
  - 8.3. Current WG activities Harvey, Parry, Bellows
  - 8.4. Preparation for July IAPWS meeting, Niagara Falls All
- 9. Membership**
- 10. Old Business**
  - 10.1. ASME News item Harvey
  - 10.2. EPRI reports and funding Harwood
  - 10.3. Seawater issues Jan Sengers
  - 10.4. Desalination issues All
- 11. New Business**
  - 11.1. Review of “long-term” items All
- 12. Next Meeting – Time and Place**
- 13. Adjournment**