

**Minutes**  
**ASME Research & Technology Subcommittee on the Properties of Water and Steam**  
**Gaithersburg, MD, April 28-29, 2004**

Attendance:

Mikhail Anisimov, University of Maryland  
Dan Friend, NIST  
John Gallagher, NIST  
Allan Harvey, NIST  
Richard Jacobsen, INEEL  
Anneke Levelt Sengers, NIST  
Serguei Lvov, Penn State University  
Bill Parry, General Electric  
Jan Sengers, University of Maryland

*Discussion of some items under agenda item 10 also included Tony Banweg (Nalco Chemical), David Daniels (Mechanical & Materials Engineering), Frank Gabrielli (Alstom Power), and Len Olavessen (Buckman Laboratories)*

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

1 & 2. Approval of Agenda and Previous Minutes

A preliminary agenda (attached) was distributed and approved with minor additions. The final minutes of the last meeting were not available, so their acceptance was deferred. [**Action:** Harvey and Bellows to finalize Pittsburgh minutes.]

3. New Subcommittee Officers

A new Chair was required since Allan Harvey had assumed the post of First Vice-Chair of the Research and Technology Committee on Water and Steam in Thermal Systems. Jim Bellows was nominated and elected as Chair. Allan Harvey was nominated and elected as Secretary. In the absence of Dr. Bellows, Dan Friend agreed to preside over the remainder of the meeting.

4. ASME Steam Tables Book

Total sales as of 3/31/04 are 755, reflecting 110 books sold in the last 11 months. No new Errata have been found in the last year. There are 245 copies left in the current (second) printing.

It was discussed that a Second Edition would be appropriate when new IAPWS formulations were adopted for both viscosity and thermal conductivity. This will be at least 2 or 3 years, however, so the next printing will likely still be the First Edition, with Errata corrected. When the time for a third printing draws closer, Allan Harvey will assess how close a Second Edition is and the pace of sales, so that the number of copies printed can be adjusted if appropriate.

5. ASME Steam Tables Software

Total sales are 468 "Professional" version and 33 "Student" version, reflecting 16 Professional and 2 Student in the past 11 months. Current Version 1.1 has not had any bugs reported yet, and John Gallagher reported very few support requests. Bill Parry is investigating possible drifting problems with cyclic calculations, and a possible issue regarding properties in the metastable steam region.

An issue has arisen regarding the calculation of choked flow in the wet region, where it is not clear that the current calculation in the software represents reality. [**Actions:** Bill Parry will bring this up as an issue for IRS, and Allan Harvey will attempt to find out how this is handled in other implementations.]

There is need for a DLL to allow steam tables functions to be called from applications such as Excel; GE has been trying to do this unsuccessfully. Allan Harvey will contact a colleague at NIST who has done this for other Fortran software to see if there is a way to do this while leaving the original Fortran untouched [update – this was successful]. If it can be done in a straightforward way, a prototype with 5 or 10 routines will be sent to Bill Parry who will check to see if it meets industrial needs.

Eventually, the possibility of making it an ASME product (perhaps part of the Professional version) will be explored. [**Actions:** Allan Harvey and Bill Parry to work on DLL. If successful, Allan Harvey to explore possibility of a DLL product with ASME.]

IAPWS is coming out with further “backward” equations to save computational time. We will assess how and whether to incorporate them into ASME software once IAPWS is finished, which will probably be 2005. Meanwhile, [**Action:** Dick Jacobsen will look into language issues for future ASME software products.]

The topic of creating a suite of test problems for updates to the ASME code was deferred until our next meeting in Pittsburgh. [**Action:** Allan Harvey and Jim Bellows put this on Pittsburgh agenda.]

#### 6. ASME Restructuring

Dick Jacobsen reported on the reorganization of ASME. It is not entirely clear which part of the organizational chart ASME’s Research office will be under, but the reorganization is not expected to significantly alter the way our Committee operates.

#### 7. Web sites

Allan Harvey reported on the Subcommittee and IAPWS Websites, with no major changes since the previous meeting.

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

Allan Harvey reported that sales of Version 2.2 since 10/1/03 had been 32 (9 with source code). There had been no new licenses [update – there was a new license in late April to a US-based simulation company].

#### 9. Transport Properties

Dan Friend reported that a preliminary version of the new IAPWS viscosity formulation should be available for the upcoming IAPWS meeting in Kyoto. For the dilute gas region, the form will be the same as the old formulation, but with different coefficients. There are still some decisions to be made regarding additional terms. Thermal conductivity will follow but has not really been started yet.

#### 10. IAPWS Issues

The U.S. delegate to IAPWS was instructed to vote “Yes” on the 2 proposed documents being circulated for postal ballot by IAPWS and on the two award nominations for IAPWS Fellow [**Action:** Dan Friend to inform IAPWS Executive Secretary of these votes by the U.S.].

There were no nominees this year for the IAPWS Helmholtz award, which was disappointing. The U.S. National Delegate was requested to suggest to the Executive Secretary that a reminder of nominations be sent out next time and that the award committee be encouraged to be more proactive in soliciting nominations [**Action:** Dan Friend to make this suggestion to IAPWS Executive Secretary.]

Allan Harvey reported that the proof corrections had all been done on the IAPWS monograph on high-temperature aqueous physical chemistry, and that it was likely the book would be out before the next IAPWS meeting in Kyoto.

Dan Friend reported on the upcoming International Conference on the Properties of Water and Steam in Kyoto, Japan, August 29 to September 3, 2004. Early registration is through July 1; a link to the website for the meeting can be found on the Meetings section of the IAPWS webpage. In terms of increasing participation from the U.S., Dan will write to the local organizing committee to see if any U.S. participants have asked for financial support. A motion was made and approved that Jan Sengers be added to the committee formed in Pittsburgh to assist young researchers in getting to Kyoto, and it was reaffirmed that up to \$3000 in Subcommittee funds could be used for that purpose. [**Actions:** Dan Friend to contact Japan organizing committee, Jan Sengers to contact specific young workers who may need assistance.]

It was reported that the 2005 IAPWS meeting has been tentatively scheduled to be in Greece July 3-8.

IAPWS had asked for specific feedback from the U.S. on some issues. The U.S. feedback is as follows:

We encourage scheduling the annual IAPWS meetings near (both in time and location) meetings of related interest, if it is convenient for the host country.

We agree that liaisons with other organizations should be encouraged; specific organizations we suggest are IUPAC, IEC, UNESCO, IEA.

With regard to the promotion of IAPWS, we suggest IAPWS work through national societies like ASME to connect with like organizations in non-IAPWS countries to assist in recruiting them into IAPWS, and also in current IAPWS countries where membership is threatened.

[**Action:** Dan Friend to communicate this feedback to Executive Secretary of IAPWS.]

Anneke Levelt Sengers briefly reviewed most of the IAPWS Task Groups and Committees set up last year. [**Action:** Dan Friend to remind IAPWS Exec. Secretary that these groups should report back to IAPWS in Kyoto.]

Serguei Lvov reported on the IAPWS Task Groups on High-T Electrochemical Processes and on Fuel Cells. The former is making good progress with an additional member recruited and members giving preliminary input. The latter has made less progress, and some suggestions were made for additional input. If there is little interest in IAPWS, it may be folded into the Electrochemical group.

The opinion of the U.S. National Committee was requested on the proposed new IAPWS ICRN process. The feeling was that the Power Cycle Chemistry Working Group should be encouraged in its efforts to improve its procedures, and encouraged to use the new Discussion Forum that Len Olavessen has set up. The idea of a Task Group to do followup was seen as particularly good. A caveat is that it should be recognized that the proposed procedure is for ICRNs initiated in PCC, and that other Working Groups may produce ICRNs in different ways. [**Action:** Dan Friend to communicate this feedback to IAPWS Exec. Secretary.]

There was a discussion of priorities for power-cycle chemistry, for which U.S. input to IAPWS was requested. Barry Dooley is putting together a list from an EPRI perspective which we expect to receive shortly. The following items were seen as priorities in our group:

- 1) Combined cycles, particularly the behavior of amines and organics at cycle temperatures in terms of their degradation and effect on pH at temperature.
- 2) Oxidation-reduction potentials (ORP) for high-temperature boiler corrosion.

3) Ultrasupercritical plants operating around 600-650 °C, with the main issue being how different treatment chemicals (such as NH<sub>3</sub>) behave at these conditions.

4) Issues of deposition related to steam-cooled turbines.

[**Action:** After receiving the priority list from Barry Dooley, Dan Friend will prepare a draft of the U.S. input and circulate it for review to Banweg, Daniels, Gabrielli, Olavessen, and Bellows.]

The difficulty for industrial people to attend IAPWS meetings was noted. It was suggested that the U.S. Representative to IAPWS send a letter to possible industrial participants in the PCC Working Group stating the importance of their attendance. [**Action:** Dan Friend to send letters.]

#### 11. Membership

The Subcommittee Secretary was authorized to contact some inactive members to see if they wanted to continue to be listed [**Action:** Allan Harvey to contact people].

#### 12. New Business

Dick Jacobsen suggested that we should have a brief document outlining the uses of our Custodial Fund in case questions arose. It was decided that [**Action:** the Chair and Secretary would draft such a document for consideration at our next meeting.

#### 13. Next Meeting

The Fall 2004 meeting will be held in conjunction with the International Water Conference in Pittsburgh, PA. This Subcommittee will meet for most of the day on Monday, October 18, ending in time for the Main Committee meeting at 4 PM. If a need for more time arises, Sunday afternoon can be added for additional Subcommittee matters.

Respectfully submitted,  
Allan Harvey, Secretary

**Preliminary Agenda**  
**ASME Subcommittee on Properties of Water and Steam**  
**Spring meeting, April 28-29, 2004**

**Location: Room B-111, Admin Building, NIST, Gaithersburg, MD**

**Time: Wednesday 10 AM – 5 PM, Thursday 8:30 AM – 11 AM**

- 1) Approval of Agenda**
- 2) Approval of Minutes**
- 3) Election of New Subcommittee Officers**
- 4) ASME Steam Tables book**
  - 4a) Report on sales Allan Harvey
  - 4b) Errata Allan Harvey
  - 4c) Future plans All
- 5) ASME Software for IAPWS-IF97**
  - 5a) Report on sales and new Version Allan Harvey
  - 5b) Technical support John Gallagher
  - 5c) Known bugs and problems John Gallagher, Allan Harvey
  - 5d) Possible DLL/Excel product Bill Parry
  - 5d) Plans for new backward equations Allan Harvey, Bill Parry
  - 5e) Testing of future versions Bellows, Harvey, Parry
- 6) ASME restructuring issues** Tinklemann, Jacobsen
- 7) U.S. Subcommittee and IAPWS Web pages** Allan Harvey
- 8) Update on implementation of general/scientific formulation** Allan Harvey
- 9) Report on transport properties** Dan Friend
- 10) IAPWS issues**
  - 10a) IAPWS documents for approval Dan Friend
  - 10b) IAPWS Awards Dan Friend
  - 10c) Update on IAPWS Monograph Allan Harvey
  - 10d) 14th ICPWS in Kyoto, Japan Dan Friend
  - 10e) Issues regarding changes in IAPWS Dan Friend, Anneke Sengers
  - 10f) Fuel cells, electrochemical systems task groups Serguei Lvov
- 11) Membership**
- 12) New Business**
- 13) Next Meeting – Time, Place, etc.**
- 14) Adjournment**