

Minutes of Properties of Steam Subcommittee Meeting May 14-15, 2003

Attendees:

Allan Harvey
John Gallagher
Jan Sengers
Anneke Sengers
Dick Jacobsen
Jim Bellows
Michael Tinkleman (Thursday)
Bob Holloway (Thursday)

Italics: item for future agenda

Bold italic: action items with volunteer

Agenda approved (see Attachment A).
Minutes approved.

Steam Tables Sales

- As of 4/30/03: 645 books, 452 ì professionalî software, 31 ì studentî software
- Last 13 months: 176 books, 52 ì professionalî software, 4 ì studentî software
- Errata for book available on Website

Steam Tables Software Issues

- Minimal new issues in support, generally 1 question per month
- New version updates (1.0.1 to 1.1) to be available on Web in a few weeks
- New purchases will be of version 1.1: A CD-ROM of version 1.1 with 2 page update to the documentation will be sent in addition to previous edition (shrink-wrapped)

Decision: We will not update the ì studentî version as it currently exists.

There is a concern that the educational value of the student version is potentially lost. We need to develop this idea.

What is the educational mission of the ASME Properties of Steam Subcommittee? What will IAPWS do? Should steam properties be available from the Web?

Dynamic link library

We explored the idea of a contractor. GE is working on a dll. If they have completed it and we can get it, that is the best situation. If we produce one, it should go into the professional package.

Industrial participation

One way of encouraging industrial participation would be to have reports to the managers of the companies that are supporting, have supported and should be supporting the committees. This should be done by the main committee as well.

Industrial use

- *Allan Harvey will contact Bill Parry about nuclear licensing issue.*
- *Jim Bellows will check with Jeff Friedman about Codes and Standards updating to IAPWS IF-97.*

Websites

Website has been redesigned. It contains

- Meeting dates, agendas and minutes
- Near future: fixes to software.
- Should we have a history on the website? *Allan will insert a sentence or two in the committee description. Jim and Allan will write a several page history to be added as a link.*

General and Scientific Version

- 27 sales in FY 2003
- Total sales ~500 copies

Allan will see about putting the NIST internal tables report on the Web.

Transport Properties

- Joint project between IAPWS & IATP (International Association for Transport Properties) (formerly a committee of IUPAC) on viscosities and thermal conductivity
- Ifigeneia Metaxa, a student from Greece, is working on the project at NIST Boulder

IAPWS

Decision: US Approves the TTSE Guideline

- *Anneke to send a note to Barry Dooley approving our nominee for an IAPWS Fellow for the US National Committee*
- Helmholtz Award winner is Erik Luijten who is working in the United States. *Allan will consult him for membership in our national committee.*
- *Jim and Anneke to complete nomination for Gibbs Award by May 31.*
- *Allan will check on complete availability of agendas for Denmark meeting on Website and then send out an e-mail to all US IAPWS attendees.*

Monograph

- Time frame has been pushed back. All chapters now due to publisher (Elsevier) by July 31.

The IAPWS Questionnaire was extensively discussed and the results (after one more post-meeting round of revisions) are attached [ATTACHMENT B].

Meeting schedule

- At International Water Conference: Sunday afternoon (~2:30 to ~5:30) and Monday morning (8:30 to noon) October 19-20, 2003
- April 28-29, 2004 with April 27 for a working day.

Preliminary Agenda
ASME Subcommittee on Properties of Water and Steam
Spring meeting, May 14-15, 2003

Location: Admin. Building, NIST, Gaithersburg, MD

Time: Wednesday 10:30 AM ñ 5 PM, Thursday 8:30 AM ñ 11:00 AM

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|--|---------------------------|
| 1) Approval of Agenda | |
| 2) Approval of Minutes | |
| 3) ASME Steam Tables book | Allan Harvey |
| 4) ASME Disk for IAPWS-IF97 | |
| 4a) Technical support | John Gallagher |
| 4b) Known bugs and problems | Harvey, Gallagher |
| 4c) Report on updated Version 1.1 | Harvey |
| 4d) DLL as separate product? | All |
| 5) ASME Software Distribution Issues | Harvey, Bellows, Jacobsen |
| 6) Other IAPWS-IF97 issues | |
| 6a) Nuclear licensing issue | Bill Parry |
| 6b) PTC-6 | Bill Parry |
| 7) U.S. Subcommittee and IAPWS Web pages | Allan Harvey |
| 8) Update on implementation of general/scientific formulation | Allan Harvey |
| 9) Update on transport properties | Dan Friend |
| 10) IAPWS Matters | |
| 10a) IAPWS Executive activities | Anneke Sengers |
| 10b) IAPWS awards and honors | Anneke Sengers |
| 10c) IAPWS Monograph | Harvey |
| 10d) U.S. Response to IAPWS Questionnaire | All |
| 11) Membership and Recruitment | All |
| 12) New Business | |
| 13) Next Meeting ñ Time, Place, etc. | |
| 14) Adjournment | |

Acronyms:

May 29, 2003

IAPWS - International Association for the Properties of Water and Steam

TPWS - Thermophysical Properties of Water and Steam

IRS - Industrial Requirements and Solutions

PCAS - Physical Chemistry of Aqueous Solutions

PCC - Power Cycle Chemistry

ICPWS - International Conference on the Properties of Water and Steam

WG ñ Working Group

FUTURE OF IAPWS QUESTIONNAIRE

Response by the U.S. National Committee

A total of 13 replies were received by the US National Committee.

The respondents were evenly divided over TPWS/IRS, PCAS and PCC. Six recipients were from industry, four from National Laboratories, and three from academe.

Items in **red (bold)** are consensus replies and recommendations by the US National Committee. In a few cases, there were items mentioned that, while not a part of our official recommendations, we thought were sufficiently interesting that we should mention them in our reply. Those items are in **blue (italics)**.

Question 1. New directions

What are the developments in the electric power industry and other areas in your country that your national committee would recommend for consideration by IAPWS? When listing a new technology, or an issue of concern, please explain how IAPWS could contribute.

Recent and new directions include combined gas-steam cycles, ultra-supercritical power cycles, fuel cells, and distributed small-scale power generation. Longer-range perspectives include revival of the nuclear power industry, and production of hydrogen by nuclear technology. IAPWS could provide property data for aqueous gas mixtures, humid air and combustion gases, mass transport of impurities in steam; and study the chemistry in transient conditions related to frequent cycling of the power plant. Corrosion and related chemical kinetics will be major needs in the electric power industry, and are areas where IAPWS may need strengthening.

Among environment-related issues of potential interest to IAPWS, CO₂ sequestration and water purification were mentioned.

Question 2. Focus of IAPWS

What does your national committee consider appropriate areas of focus for IAPWS?

(2A) Status quo: should IAPWS remain committed solely to properties of water, steam and aqueous systems relevant to the electric power industry?

(2B) Expand to other areas of power generation, not necessarily aqueous. If so, to which alternative methods of power generation could IAPWS contribute?

(2C) Expand to aqueous systems in other contexts, such as geothermal, supercritical- water oxidation, or hydrothermal. Which constituencies in addition to the electric power industry should be considered?

(2D) Expand simultaneously in more than one direction. Should IAPWS, for instance, function as a bridge between the electric power industry and new uses of hydrothermal processes?

(2E) Expand in other directions, such as environmental issues, carbon sequestration, etc. (specify).

Please choose a preferred option, or rank your preferences, and present arguments for your choice.

The consensus was that IAPWS needed to remain focused on aqueous systems, with a broad definition of "aqueous" (so as to include for example combustion gases and humid air). The focus should mainly be on aqueous systems at high temperatures, though lower-temperature situations (such as environmental applications) should not be excluded. IAPWS needs to remain responsive to the needs of the electric power industry. The IAPWS expertise, however, should also be applied to other areas of high-temperature aqueous systems of interest to other industries. IAPWS needs to remain focused on products of high standards, based on best available research, and achieved by international cooperation.

There were a couple of suggestions for IAPWS to go outside these aqueous boundaries, in the areas of fuel cells and CO₂ sequestration. But a larger number of respondents warned that, with limited resources and personnel, IAPWS should remain focused and not "spread itself too thin" by going into areas far outside its core expertise.

Question 3. Structure of IAPWS

Please consider what changes in the structure and functioning of IAPWS your national committee considers necessary or desirable.

3A Annual meeting

(3A1) Should the balance between product-oriented work (releases, guidelines, etc.) and scientific presentations be changed? Please be specific.

While most seem satisfied with the balance, there is a tendency for PCC people to want more product-oriented work and for PCAS people to want more scientific presentations. We recognize that this "balance" can and probably should be different for different working groups.

(3A2) Is there efficient use of time at EC and working-group sessions? Is there a reasonable balance between time spent on business affairs in the EC meetings, and on technical matters in the working groups? If not, please make concrete proposals for change.

Most respondents felt the balance was about right. There were a few suggestions to reduce the amount of time spent on business affairs. Since IAPWS operates by international consensus, however, it is necessary that national representatives find the patience that is required for reaching consensus across linguistic and cultural barriers. We suggest that the EC would be more efficient if it refrained from annually revisiting issues such as software on the Web, policies for spending money, etc.; decisions should be made once and then the issue should be dropped. Such items should not be copied over on the EC agenda from year to year unless there is a clear need to consider the issue again.

(3A3) Is more coordination between the working groups needed? Are the joint working group meetings a success? What changes would you propose?

The interaction that does not seem to be satisfactory is PCAS/PCC, and to a lesser extent PCAS/TPWS. It seems like the biggest need is for PCC to frame important problems in the power industry in ways that PCAS can understand, and then for PCAS (in conversation with PCC people rather than in isolation) to give some priority to solving these problems. Better coordination of WG agendas and schedules is also a need, so it becomes easier for attendees to move between working groups.

The US National committee recommends that on the Thursday of the annual meeting, a plenary session be held for all WG, to present and discuss all projects and problems they came up with that require inter-WG consultation.

(3A4) Should the timing of the IAPWS annual meeting be coupled to relevant meetings of other organizations in nearby countries? If so, name the organizations to be considered.

Some respondents express interest in this idea, and no one will object if the hosting country works out a way to arrange things that way, as long as the meetings are back-to-back. Incorporating a few IAPWS days within a larger meeting, however, is felt to inhibit concentration on IAPWS work, and is discouraged.

A dozen or more organizations named included EPRI, VGB, NACE, IWC, hydrothermal, geothermal, supercritical water oxidation, and fuel cells conferences. See, however, Other, Industrial Perspective, item (1).

(3A5) Is the overall length of the annual meeting appropriate? If not, please suggest what changes should be considered in meeting content and time allotted to the Executive committee -, working group -, and other activities.

Most members are satisfied with the current arrangement. There was some sentiment for reducing the annual meeting by one day or half a day. For trans-ocean travel, however, little benefit would be gained from a day saved. If more output is to be produced during the workweek (see 5. Other, PCC/PCAS), then the annual meeting must not be shortened.

(3A6) Is the one-day Symposium held at the meeting worthwhile? Do you have any specific suggestions for changing the Symposium to better serve the goals of IAPWS?

The Symposium is viewed as very worthwhile across the board, both for IAPWS and for the host country. The US National Committee recommends that efforts be made to involve students from the host country, and to encourage the host country to select excellent speakers on a broad range of topics. IAPWS might help by submitting a list of experienced IAPWS speakers for consideration by the host country ahead of time, although the host countries should have freedom to focus as suits their situation.

3B Working group structure

(3B1) Is the present structure, IRS, TPWS, PCAS, and PCC, optimal for the current and perceived new directions of IAPWS? If not, please suggest other working group arrangements.

A new focus may require a new structure. The current WG structure was felt to be mostly satisfactory for present purposes. Problems are not caused by the structure itself but by the way groups are interacting within the structure. The US Natl. Committee believes that PCC will (or at least should) be the driver for most new directions in IAPWS for the next several years, and proposes ways of restructuring that would make it more output-oriented, see 5B. Task Groups should be formed that cross WG lines to attack specific problems.

In order to assess whether the current process for PCC problems to be solved is working well, we suggest assembling the statistics of the fate of ICRNs in the past decade (how many led to funding, how many led to results useful to industry, etc.)

(3B2) Do the names of the current working groups reflect their actual functions? If not, would it be urgent to change names? If so, do you have suggestions for improved names?

Most respondents did not seem to consider the names worth worrying about, and certainly not an urgent problem. There may be some need for change in the TPWS name to better reflect reality, but what the groups produce is more important than what they are called.

(3B3). Can working group agendas, outputs, and productivity be improved? If so, please give concrete examples.

It is important that preliminary agendas are available well before the meeting. Better coordination among WG chairs prior to the workweek would be helpful. There is a definite need for more joint Task Groups to attack particular problems (3B1). A proposal for restructuring the mode of operation of PCC in order to increase its productivity is given under 5B.

There is some sentiment for more coordination with other standards-producing organizations. A committee of IAPWS members active in such organizations could explore this possibility.

3C IAPWS Name

Some have suggested that the IAPWS name be changed. Arguments in favor of a name change include making the name better reflect the full range of IAPWS activities, thus dispelling the notion that IAPWS limits itself to pure water and steam. Arguments against a name change include the value of the established reputation of IAPWS as the definitive source of properties of water and steam, and creating confusion with existing releases and other documents that would refer to the old name. Do you feel that IAPWS should change its name? Please give reasons for either a yes, or a no answer. If your answer is yes, please propose an alternative.

There was very little desire for a name change. On the other hand, there was considerable sentiment against it, because of the current name recognition and storied history of IAPWS and the hassle involved (documents, website, etc.) in changing the name. In our opinion, unless the mission of the organization changes drastically, the negatives of a name change outweigh whatever benefits might derive from such a cosmetic step. Also, of course the decision of future focus must precede any name change if the purpose of the name change is to better reflect the focus of the organization. We also perceive a need to improve the name recognition of IAPWS, particularly in industry.

3D Frequency of the ICPWS

Is your national committee in favor of the present 5-year cycle of the international conferences? Would it prefer a higher frequency, perhaps coupled with a simplification of the organization of the conference, and of the proceedings? Please be specific.

While 5 years is our preferred interval, the US National Committee will not stand in the way of a 4-year, or, as a minimum, a 3-year interval of the ICPWS, if the majority of National Committees desires this and host countries are prepared to shoulder the additional burden, as long as an alternative can be found to the production of a proceedings book.

As to the Proceedings, making the papers available prior to the meeting was proposed as one alternative. Giving attendees the choice of publishing in journals of their choice, perhaps in special issues, was mentioned as another. For PCC-related publications, Power Cycle Chemistry was mentioned as an alternative to publishing in trade journals. Conference organizers would need to make arrangements in advance with the journal to

accept and publish the papers in order to minimize the burden to industrial contributors to the conference.

Question 4. IAPWS Role in Education

Does your committee see a role for IAPWS in the education of engineering students, or in the education, training and capacity building of power engineers and - chemists, as well as the hydrothermal community, by writing small monographs, teaching of short courses, and making good use of the IAPWS Web site? If so, please give examples of interest to your committee.

Education should be seen as part of other IAPWS goals: enhancing visibility and delivery of products. The upcoming monograph is a positive step in making IAPWS work available to users. There is consensus that an increased role for IAPWS in education (especially continuing education for industrial practitioners) would be a good thing, if volunteers to do the necessary work could be found. The US National Committee supports new IAPWS products focused on specific topics of use to industry such as focused monographs, consensus or best practice documents for the power industry, and educational material (perhaps in a layered approach so that it could serve a variety of audiences) on the Website.

It is a worry that the same people who say how useful this would be, particularly those in industry, may in practice have no time at all to do the work that would be required to make it happen. Restructuring the mode of operation of PCC could lead to the production of small, focused documents during the annual meetings. See Other, 5B.

Question 5. Other

Does your committee have any other thoughts related to the future of IAPWS that could be relevant to new structures, activities, products, etc., to be considered by the Committee on the Structure of IAPWS?

INDUSTRIAL PERSPECTIVE

US Industrial respondents pointed out that they operate under the following conditions:

- (1) To attend a meeting in a foreign country, the very most they can ask for is a week away from work. So coupling annual meetings to other conferences will not work for them.*
- (2) The relatively low profile of IAPWS does not help convincing supervisors that attending IAPWS is in the interest of the company.*
- (3) In order to justify their absence from work, as well as the travel expense, they need to work on problems of concern to their companies, and come back with tangible results.*

(4) Once back to work, they can no longer work on IAPWS-related problems, except in their weekends or vacations, if any.

Our industrial respondents formulated the following questions and recommendations:

A. General

(1) The electric power industry has become global. This is a golden opportunity for an international organization such as IAPWS to solidify its position as representative of a global industry. International status, good conferences, and useful products are all plusses for IAPWS.

(2) The high cost of corrosion makes it the #1 problem in the power industry, which highlights the importance of PCC within IAPWS.

(3) NACE, EPRI, VGB (Germany), BNES (UK), and the IWC (Pittsburgh) are only some of the organizations that have special sessions on water chemistry in annual meetings. What should IAPWS's role be? In what way is it special?

(4) Much more should be done to make IAPWS work known in the power industry.

Suggestions include:

(a) closer links to recognized national or international entities.

(b) an acknowledgement of companies whose members participated in a release or other IAPWS product published in trade magazines or journals;

(c) a thank-you note to participating members for them to show to their manager.

The US National Committee recommends that IAPWS WG chairs adopt the practice of writing a note of appreciation for specific contributions by WG participants from industry during the annual meeting. It recommends that a new IAPWS award be established for dedicated service as a Working Group Chair. It recommends that careful attention be given to acknowledgement of industry participation in producing IAPWS outputs.

B. PCC/PCAS

(1) PCC lacks the broad representation characterizing the above international organizations. To become effective, it needs to broaden representation and provide details on current problems being addressed by engineering tests in operating units. Issues of materials interactions and kinetics are often more important than thermodynamic property formulations.

(2) PCC members should bring their practical problems to the meeting, formulated in such a way that PCAS can translate them into physico-chemical questions they can help with. This can only work if industrial members refrain from being vague, and from invoking proprietary inhibitions when asked for details.

(3) Problems to be worked on should be on the agenda ahead of time. PCC work should be done during the meeting, with the goal of producing tangible written results that attendees can take home.

One industrial respondent stresses the need that IAPWS-funded projects should have demonstrable practical benefits, preferably to the power industry.

The US National Committee proposes a change in the mode of operation of PCC and its interaction with PCAS. From the list of priorities, one or at most two high ones should be selected. During the annual meeting, participants should discuss the item, pinpoint the gaps in knowledge that inhibit progress, and, in interaction with PCAS, frame the questions in a way that PCAS can understand and respond to. By the end of the week, a document outlining the steps for the problem to be solved should be composed and passed on to all participants. Once the problem is solved, the solution might result in a small monograph.

C. Additional

One industry representative advises IAPWS study some of the other organizations to see how they have structured and marketed themselves into relevance for their constituents. Do not mimic, but adopt what makes sense for IAPWS.

One industrial and one National Laboratory respondent brought up, in different contexts, the need to pay attention to the relation of IAPWS and the nuclear power industry.