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## **ASHRAE TC 1.3 – Heat Transfer and Fluid Flow Annual Meeting, June 25, 2013**

### **Introduction**

Justin Kauffman called the meeting to order at 1:01 pm. The title, purpose and scope of the TC were read. Justin announced that he was acting as chair of the committee meeting for this particular meeting since the chairman and vice-chairman were not present. Introductions around the room followed.

### **Establishment of Quorum (J. Kauffman)**

Ten of 14 voting members were present at this time so a quorum was established. Voting members present included: Cremaschi, Kauffman, Schultz, Brown, Ayub, Perencevic, Al-Hajri, Korenic, Eckels, and Jacobi.  
Members absent were: Thors, Ohadi, Yana-Motta, and Kriegsman.

### **Minutes from Dallas, January, 2013**

Amir and I will update list after this meeting and send Denver minutes to list for e-mail ballot.

### **Liaison**

None present at this moment.

### **Membership (J. Hartfield)**

Hartfield presented the status of the membership for the TC. The committee is made up of 14 voting members of which four will be rotating off as of July 1, 2013. These include chairman Yana-Motta, Kauffman, Cremaschi, and Kreigsman. The new chair of TC 1.3 will be Amir Jokar who is moving up from the vice-chair position. Also moving into voting member position are long time committee participants Huber, Kulankara, and Couvillion. Kauffman will be moving from secretary to vice-chair. Finally, Ray Rite agreed to take on the role of secretary following the Denver meeting.

The committee for July, 2013 – July 2014 will consist of 14 members, 8 from industry and 6 from academia, including 1 non-quorum member (Perencevic.)

### **Program (L. Cremaschi)**

Cremaschi reported on the ASHRAE program. In particular, Seminar 5 “Effect of Frosting and Water Condensation on Microchannel Heat Exchangers” was co-sponsored by TC 1.3 and 8.4. Five presenters and a well-attended seminar made for a successful seminar, though one comment was that it was too much quality content in too little time.

General discussion regarding upcoming meetings included several proposals. For New York, the suggestions included:



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- J. Huber suggested application of TC 1.3 related correlations as a potential seminar or mini-conference topic. Mark Johnson agreed to work with TC 8.4 to see if co-sponsorship would be of interest.
- Fundamentals of heat exchangers with potential co-sponsorship with TC 8.5 (Omar A. and L. Cremaschi voiced interest.)
- Hartfield proposed a seminar for New York to be focused on advanced measurement techniques in heat exchangers.

Looking further ahead, there was a motion by S Eckels for TC 1.3 to support a Mini-Conference on Low GWP Refrigerants to be held in Seattle (June 2014) and this carried by a committee 10-0-0 vote.

#### **Research Liaison Comments (A. Giesler)**

Art Giesler stopped by and encouraged timely quarterly reporting by all researchers executing ASHREA research projects. He also stated that 1704 was rejected since it was deemed of no value to ASHRAE. Joe Huber stated that 1837 was readied.

#### **Handbook (R. Couvillion)**

Couvillion reported that the handbook was published and awaiting review. Significant changes to the two-phase flow section. Rick also requested practical examples to assist in improving the content of sections already completed.

The section on properties will be considered for an upgrade next according to Couvillion. The next publish of the handbook will be in 2017.

#### **Webmaster (E. Al-Hajri)**

Ebrahim Al-Hajri reported that the website has been updated recently. Plans to include research update from Joe Huber as well as meeting minutes.

#### **Research (J. Huber)**

Joe Huber presented a briefing on the research subcommittee chair meeting. There are 56 ongoing research project funded by ASHRAE worth approximately \$11 million. Five RTAR's were reviewed; two accepted, two returned and one rejected. Two work statements were also reviewed and Seven additional projects are ready for bid – fall 2013.

#### **Innovative Research Grant Data**

- 18 pre-proposals
- 5 invited
- None accepted



Other comments include that the TC is encouraged to generate more research. Also, the research manual has been re-written. Changes include PES evaluation focus. The research liaison needs to be present at meetings of the PES. Also, discussions are to be held in confidence until the bid process is completed.

A new RTAR form is now available. It includes a funding *range* instead of a single target. A stated RTAR form objective is brevity and clarity and the new form will be available on the ASHRAE website after July 1, 2013.

### Current Research

**1327-RP** Flow Regime and Pressure Drop Determination for Two-phase Ammonia Upward Flow in Various Riser Sizes. (Danish Teknologisk Institut)

Gary Price provided a brief update. This project has been ongoing for a long time and was originally scheduled to be completed in 2008. The team is “close” to completing the work with 2 inch and 4 inch diameter risers and the guidance from the PMS is to not do the 6 inch and just complete this project. There is a possibility of the research team to present in New York (2014).

**1556-RP** Characterization of Liquid Refrigerant Flow Emerging From a Flooded Evaporator Tube Bundle (Kansas State University, Steve Eckels – Principle Investigator)

PMS: Jon Hartfield, Zahid Ayub, Satheesh Kulankara, Satyam Bendapudi

Hartfield provided a summary of the presentation given Sunday afternoon at the research review by Eckels. Key points included:

- Project is moving into the experimental phase. First tube bundle installed and operational with pure R-134a as initial fluid.
- Recording: droplet diameter, velocity, and height.
- Exercise completed to verify tube side correlation to gain useful preliminary experience.
- Liquid level to be varied inside of the test section (very high to low) to determine at which charge the thermal performance of the top tubes in the bundle begins to fall off.
- Team is refining optical technique with their new equipment. Goal is to evaluate droplets in a slender plane.

Requested action from PMS:

- Selection of second refrigerant (properties far different than R-134a) and with pressure at or less than R-134a due to mechanical design of the test vessel. Four weeks target.
- Identify heat flux at top of tube bundle (two tubes or top 5); clarify determination of heat flux in general. (Very soon.)
- JPH will coordinate PMS response.



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Finally, Steve E. claims to be on schedule with no major concerns at this point. Look forward to seeing data in New York.

#### **1683** Ammonia in U-Bends

This RTAR was submitted; request for revisions. Comments were received regarding prior art, justification of cost, and possibility of external support. Bruce Nelson suggested a separate RTAR be formed as a follow-up and targeted with use of CO<sub>2</sub>. Bruce will contact J. Thome for advice. Either way, Bruce will take action to move this topic forward and also look for potential co-sponsorship form TC 8.4.

#### **1704** Ice Formation in Heat Exchanger Tubes and Channels.

This project was rejected by ASHRAE Research; no detailed comments available at present.

**RTAR** draft entitled "Wetting and Drainage of the Water Evaporative Condensers" authored by Amir Jokar is currently under revision.

#### **Additional research ideas:**

- Two phase pressure drop across orifices (Eckels, Satyam)
- Modified surface energy (Bruce Nelson).
- Low GWP refrigerant boiling and condensation. Much discussion here and possibility of partnership with TC 8.5 to investigate flooded evaporator spray evaporator, shell side condensation, and DX / brazed plate with low GWP refrigerants. (Z. Ayub)
- In-tube condensation (de-superheat, condensation, subcooling, with/without oil, with/without refrigerant glide.) – S. Eckels.
- Small gap heat transfer (stirred gap flow currently being investigated for electronics cooling.) – Omar A.
- Note: there was considerable debate over the Low GWP refrigerant research ongoing. One comment for TC 1.3 committee to ponder was raised: should the refrigerant be picked first before delving into a tremendous amount of research work.

Final comment on a research activity opportunity from J. Huber. A person from a National Lab is planning on presenting a paper on innovative research at ASHRAE-New York and is looking for industrial input. If you are interested in participating, contact Joe.

#### **Chairs Breakfast** – briefing from Justin Kauffman

Templates to facilitate improved communication with local ASHRAE chapters available on the website.

Program Chairs encouraged to work with Track Chairs to gain best success.



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ASHRAE is looking for volunteers to review conference papers; let Justin Kauffman or Amir Jokar know if you are interested.

Awards Nominations (Hightower, etc.). Contact Amir Jokar with suggestions .

Every member is encouraged to update their ASHRAE bio.

Nine electronic meetings were held in Denver.

A thank-you letter from ASHRAE may be requested through the website.

18 workshops are upcoming.

Code of ethics link will be included in the minutes.

<https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics>

A copy of the chairs breakfast document to be included in the minutes which provides significant detail to the items described in this section.

### **New Business**

None.

### **Next Meeting**

Tuesday, January 22, 2014 in New York.

Motion to adjourn – passed unanimously.