

**AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS,
INC.**

**1791 Tullie Circle, N.E./Atlanta, GA 30329
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TC/TG/TRG MINUTES COVER SHEET

(Minutes of all TC/TG/TRG Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/TRG NO TC 1.3 DATE 21 July 2010

TC/TG/TRG TITLE Heat Transfer and Fluid Flow

DATE OF MEETING 29 June 2010 LOCATION Albuquerque, NM

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Zahid Ayub	2006	Rick Couvillion	2008	Omar Abdelaziz
Joe Huber	2007	Jon Hartfield	2006	Ebrahim Al-Hajri
Amir Jokar	2008	Michael Ohadi	2006	Ben Dingle
Justin Kauffman	2009	John Thome	2008	Kevin Dunshee
Branko Korenic	2008	Samuel Yana-Motta	2008	William Foxx
Axel Kriegsmann	2009			Tony Jacobi
Bruce Nelson	2006			Man-Hoe Kim
Lorenzo Cremaschi	2009			Andreas Knoepfler
				Satheesh Kulankara
				Liping Liu
				Stanislav Perencevic
				Kent Perkins
				Ray Rite
				Ken Schultz
				S.A. Sherif
				Jun Wang
				Mustafa Yanik

DISTRIBUTION

<i>All Members of TC/TG/TRG plus the following:</i>	
TAC Section Head: Victor Penar	
TAC Chair: Charles Wilkin	
All Committee Liaisons As Shown On TC/TG/TRG Rosters:	
Manager Of Standards	Claire Ramspeck
Manager Of Research & Technical Services	Mike Vaughn



ASHRAE TC 1.3 – Heat Transfer and Fluid Flow Annual Meeting 2010 (Albuquerque, New Mexico)

Introductions (B. Korenic)

Branko Korenic called the meeting to order at 1:01. He then read the title, purpose and scope of the TC and solicited changes to the proposed agenda. It was suggested, and the committee agreed, to rearrange the schedule to allow votes to happen early in the meeting to accommodate members who could not stay for the duration of the meeting. Following this, those present introduced themselves.

Confirmation of quorum (B. Korenic)

Seven of thirteen voting members were present.

Members present: Ayub, Huber, Jokar, Kauffman, Korenic, Kriegsmann, and Nelson.

Members absent: Couvillion, Cremaschi, Hartfield, Ohadi, Thome, and Yanna-Motta.

Approval of the Minutes from the previous meeting in Orlando, FL

Bruce Nelson moved to approve the minutes as accepted. Joe Huber seconded the motion. The motion passed by a vote of seven for, none opposed, none abstained (7-0-0). Lorenzo Cremaschi then arrived, bringing the count to eight voting members present.

Liaisons' Comments (B. Korenic)

Victor Penar is the section head. He suggested that TCs should be sure to keep track of members rolling off and rolling on to ensure appropriate committee membership, and he suggested that committees should try to provide a mentor for new members. ASHRAE membership is now 53,000, including 12,000 international members, up from 50,000 two years ago. He also added that ASHRAE is adding the ability to host webmeetings so that subcommittees can meet prior to the two main meetings. The service is provided free of charge for ASHRAE committees and members should contact Mike Vaughn for details (mvaughn@ashrae.org, 404-636-8400). Penar also noted that Hightower award nominations are due in April. The application is available online (<http://www.ashrae.org/technology/page/1707>).

Report from Membership Sub-Committee Chair (B.Korenic)

Jon Hartfield was unable to attend the meeting, but he provided a membership report to Branko. There are four members rolling off as voting members July 1, 2010: Ayub, Hartfield, Nelson and Ohadi. There are three new voting members rolling on as of July 1, 2010: Eckels, Schultz, and Thors. So, for 7/1/2010-6/30/2010, membership includes five from academia and seven from industry, including two international members.

Report from Research Sub-Committee Chair (J. Huber)

The 2010-2015 research plan has been released and is available on the ASHRAE website. It was stressed that research is initiated by TCs, and that research that is in line with research plan has a higher likelihood of being approved. Any new work statements or RTARs should reference the new research plan. The ASHRAE research manual has also been updated. TAC has a new procedure for evaluating RTARs, designed to provide more consistency in the review process and to provide feedback more clearly.

HVAC&R and transaction papers are acceptable as a final deliverable for a research project. Conference papers are published in the transactions, but they will not be accepted as a final deliverable for a research project. The paper must only be submitted, not approved to close out a project.

The 2010-2011 research budget includes \$2.6 million already committed, with \$310k in anticipated additional commitments. A number of \$200k short-term projects were approved recently causing a bulge in expenditures, so only two or three projects will be awarded this fall. Additional projects are expected to go out for bid in Spring 2011.

Current Research

- **RP-1352 – Evaporation in Corrugated Plate Heat Exchangers with Ammonia and Ammonia/miscible oil (PI: S. Khan, PMS Chair: Z. Auyb).**
This project is complete except for the final report. The report was submitted days before meeting and has not yet been reviewed. The committee should expect a letter ballot to approve the final report.
- **RP-1444 – Experimental Evaluation of Two-Phase Pressure Drop and Fluid Flow Patterns in U-bends for R134a, R410a, and Ammonia (PI: J. Thome, PMS Chair: B. Nelson).**
With the permission of the PMS, the researchers are excluding ammonia from the test. Dr. Thome showed many interesting videos for R-134a. He noted that effects of a U-bend may be significant +/- 100 diameters upstream and downstream of the U-bend. Bruce Nelson made a motion to provide a 12-month, no-cost extension. Justin Kauffman seconded the motion. The motion passed with a vote of eight for, none opposed, none abstained (8-0-0).
- **RP-1327 – Flow Regime and Pressure Determination for Two-Phase Ammonia upward flow in various riser sizes (PI: Lars Reinhold, PMS Chair: G. Grace).**
TC 1.3 is a cosponsor with TC 10.3 leading the research. Gary Price is the liaison. The researchers are continuing to experience difficulty with flow measurements. The PI had hoped to present data at this meeting but with the measurement difficulties, they now hope to present in Las Vegas.

ASHRAE New Investigator Awards

- **Using micro-scale anisotropic surface chemistry to manipulate condensate droplets on aluminum (PI: A. Salmers)**
Dr. Salmers was unable to attend to make a presentation.
- **Heat Transfer and Fluid Flow of Nanofluids in micro and mini channel heat exchangers. (PI: A. Jokar)**
Dr. Jokar is currently working with CFD software to develop a model with multiple smooth plates to serve as a benchmark for the CFD simulation. Next he plans to model corrugated plates.

Long-Range Research Plan

- **WS-1556 – Characterization of liquid refrigerant flow emerging from a flooded evaporator tube bundle” (J. Hartfield).**
Due to ASHRAE research budget issues, it is unlikely that this project will go out for bid before Spring 2011.

Other topics of interest.

- **Two-Phase NH₃ flow through tees and u-bends.**
Bruce Nelson suggested preparing an RTAR that could go out for bid at the conclusion of RP-1444.
- **Low mass-flux correlations for in-tube boiling of NH₃.**
Bruce Nelson will prepare an RTAR.
- **Heat transfer performance of new low GWP refrigerants.**
This topic was suggested for an RTAR, but Jon Hartfield and Samuel Yana-Motta are already working on an RTAR. Zahid Ayub suggested that RTARs should be prepared for tube-side condensation and evaporation. Sathesh Kulankara suggested that shell-side research may be more

valuable because other researchers are already evaluating tube-side performance. Ben Dingle suggested a higher-level look at low GWP refrigerants with members of TC 1.3, 3.1, 8.4, and 8.5 to discuss the appropriate research path. Joe Huber agreed to contact the research chairs for the other committees to kick off the discussion. There were also discussions of which fluids to include and discussions of the benefits of individual fluid correlations versus more general correlations.

- **Particle fouling for in-tube flow of CO₂ sequestration equipment (M. Ohadi).**
- **Heat Transfer and Pressure Drop correlations of refrigerant mixtures in low-temperature applications (M. Ohadi).**
- **The effects of fouling on airside droplet condensation in heat exchangers (Eric Rats).**
- **Effect of Dust on Fouling of air side heat exchangers.**
- **Heat Transfer enhancement with micro encapsulated phase change materials.**
- **Nanofluids in HVAC.**

Research in this area was thought to be premature.

Zahid Ayub left the meeting, bringing the count to seven voting members present.

Report from Program Sub-Committee Chair (A. Jokar)

The deadline for submitting seminars and forums for Las Vegas is 6 August 2010. The deadline for submitting transaction papers for Montreal is 24 September 2010, which is also the deadline for submitting abstracts for conference papers for Montreal.

TC 1.3 submitted two seminars for Albuquerque.

- **Refrigeration systems using environmentally friendly refrigerants.**
This program was a resubmission that was accepted for Albuquerque as Seminar 61.
- **Micro-Nano fluids and systems in HVAC&R**
This was a new program submitted for Albuquerque, but it was not accepted. It will be resubmitted for Las Vegas, with Satheesh Kulankara chairing.

Future program ideas

- **Forum regarding performance of low GWP refrigerants**
This would be a collaboration with TC 3.1 leading (if they accept). Amir Jokar will discuss this with TC 3.1.
- **Advances in Heat Exchangers**
This is a conference paper session in queue for Las Vegas with the hope of additional papers being added to the one abstract already accepted.
- **Advances in Heat Transfer and Fluid Flow**
This seminar will be proposed for Montreal.

Report from Handbook Sub-Committee Chair (R. Couvillion)

TC 1.3 needs to address chapter five in the fundamentals handbook, two-phase flow. Steve Eckels and Ken Schultz volunteered to help in the past but were not present to discuss. In late April there was an extensive exchange of emails from Mitzah Shah to the committee, with Dr. Shah offering help to review the two-phase chapter. The committee is very supportive of Dr. Shah's offer to help. Bruce Nelson also offered to review the two-phase chapter. Justin Kauffman will follow up with Rick Couvillion to determine the status of the subcommittee reviewing the two-phase chapter. Amir Jokar suggested adding results of recently completed RPs into the TC 1.3 handbook chapters.

Report from Webmaster (Ebrahim Al-Hairi)

Ebrahim has posted the member list and meeting minutes to website. It was suggested to add videos from RP-1444, but storage space may be a limitation.

New business (B. Korenic)

The committee continues to be frustrated by ASHRAE's lack of commitment to provide a projector for the research review. Amir mentioned this to the section head.

Announcements from TC Chairs' Breakfast Meeting (B. Korenic)

- A help wanted section will be added to the ASHRAE website. TCs can advertise committee needs, from research to handbook support, etc.
- The ASHRAE hosted web-based meetings were emphasized as a way for subcommittees to meet outside of the main meetings. See the discussion under Liasion's comments for contact information.
- The TC/TG/TRG manual of procedures has been revised.
- TAC/ECC is sponsoring a presentation on using google groups in the fall.
- For employer thank you letters, go to www.ashrae.org/thankyouletter.

Adjourn.

Justin Kauffman made a motion to adjourn the meeting. Bruce Nelson seconded the motion. The motion passed with a vote of seven for, none opposed, none abstained (7-0-0). The meeting adjourned at 2:40.