

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

Minutes

Technical Committee 8.5

Liquid-to-Refrigerant Heat Exchangers

Monday, June 30, 1997

ASHRAE Annual Meeting, Boston, MA, June 27 - July 2, 1997

**1. Introduction of Members and Guests/Signing of Attendance Sheets**

Chairman Art Fovargue called the meeting to order at 4:20 PM. The agenda was presented. Members and guests introduced themselves. The following were present:

Jim Larson	The Trane Company 3600 Pammel Creek Road La Crosse, WI 54601-7511
Art Fovargue	Dunham-Bush, Inc. 101 Burgess Road Harrisonburg, VA 22801-9700
Zahid Ayub	Thermostat 3305 Thorntree Ct Arlington, TX 76016
Parviz Payvar	Northern Illinois University Dept. of Mechanical Engineering, NIU DeKalb, IL 60115
Ming Chyu	Texas Tech. University Dept. of Mechanical Engineering Lubbock, TX 79409-1021
Nabil Hanna	Koax Corp. 518 N. Indiana Oklahoma, OK 73106
Mark Spatz	Allied Signal 20 Peabody Street Buffalo, NY 14210
John Judge	York PO Box 191A York, PA 17402
Mike Ohadi	University of Maryland PO Box 1191 Columbia, MD 21044
Satish Oza	Wieland America 1052 Harland Ln Buffalo Grove 60089
Axel Kriegsmann	Wieland-Werke AG Graf Arco Strasse Ulm, Germany 89079

Petur Thors	Wolverine Tube, Inc. 2100 Market Street, NE Decatur, AL 35609-2202
Kash Oza	Standard Refrigeration Co. 2050 North Ruby Street Melrose Park, IL 60160-1133
Ram Laks	Dunham-Bush 101 Burgess Road Harrisburg, VA 22801
Joe Huber	ATI Ketema 2300 W. Marshall Grand Prairie, 75051
Shane Moeykens	Trane Company 3600 Pammel Creek Road La Crosse, WI 54601
Jamal Seyed-Yagoobi	Texas A&M University Dept. of Mechanical Engineering College Station, TX 77843
Steve Eckels	Kansas State University 341 Durland Hall Manhattan, KS 66506
John Kelly	Kansas State University 302 Durland Hall Manhattan, KS 66506
Neel Gupte	Carrier PO Box 4808, Carrier Parkway Syracuse, NY 13221
Dawood Ali	Modine Manufacturing 1500 DeKoven Avenue Racine, WI 53403
Robert McCabe	Cornell University Humphries Building, Utilities Dept. Ithaca, NY 14853
S. A. Sherif	University of Florida Dept. of Mechanical Engineering 228 MEB, Box 116300 Gainesville, FL 32611

2. **Establish Quorum Requirement**  
Voting members present were A. Fovargue, J. Larson, Z. Ayub, M. Chyu, P. Thors, N. Hanna, N. Gupte, and S. Sherif
3. **Review/Approve San Antonio Meeting Minutes**  
Motion Z. Ayub, second P. Thors, unanimous.
4. **Chairman's Comments**  
A. Fovargue recognized S. Sherif for receiving the EK Campbell Award for Teaching Excellence and S. Moeykens for receiving the Willis Carrier Award for best paper. He had the following comments from the chairman's breakfast.
  - Program plans for the San Francisco Winter Meeting are due at ASHRAE headquarters by 8/15/97.
  - Joe Pietsch is the new standards liaison.
  - The Research Plan should be sent to B. Seaton by 8/9/97. R. Hegberg noted that Research funds are available.
  - There is a new liaison to the TEGA committee. Their mission is to market the technical committees to the local ASHRAE chapters.
  - ASHRAE is concerned about the increasing number of meetings at the conferences. A format change is being considered including
    - Saturday - Technical committees, standards, SPC's.
    - Sunday - Technical programs, 8:00-3:00; Technical Committees, 2:00-9:00
    - Monday - Plenary session , 8:00-10:00, Technical programs, 10:00 AM-9:00 PM; Technical committees 1:00-9:00 PM
    - Tuesday - Technical programs, 8:00-5:00, Technical committees 3:00-9:00
    - Wednesday - Technical programs 8:00-12:00
5. **Section Head's Comments**  
Not Present.
6. **Comments from Liaisons (Handbook, Standards, Journal, Research, Program)**  
Not present.
7. **Handbook Subcommittee Report**  
M. Ohadi requested volunteers to comment on handbook chapters 35 and 37 when he circulates them in the next few months. A. Fovargue, S. Moeykens, J. Larson, and Z. Ayub volunteered. We also need to incorporate results of recent research as appropriate. The principal investigator of our research projects should write these.
8. **Program Subcommittee Report**  
R. Laks reported that Symposium 12, "Thermal and Fluid Characteristics in HVAC and Refrigeration Heat Exchanger Processes" would be co-sponsored with TC 1.3 on Tuesday, 7/1/97. Future plans include: San Francisco; "Flow Maldistribution in Heat Exchangers (seminar) "Pressure Drop and Heat Transfer Characteristics of Alternate Refrigerants and Refrigerant Mixtures" (symposium), "Flow Visualization of Refrigerants and HVAC Heat Transfer Processes" (seminar) Toronto; "Advances in Heat/Mass Transfer of Alternative Refrigerants and Refrigerant Mixtures" (symposium), "Applied Design Methodologies of Evaporators and Condensers" (seminar).
9. **Membership Sub-Committee Report**  
S. Oza noted that F. Schiedeman will not be able to be a member in the future. S. Oza will contact S. Kondepudi and D. Geary, to see if they wish to continue as corresponding members.
10. **Standards Sub-Committee Report**

S. Moeykens reported that the ASHRAE SPLS committee has Standard 22 in process. Standard 24, Method of Test for Rating Liquid Coolers, is in the revision process. The SPC met 6/29/97 and agreed on the revisions to propose. They will circulate the proposed version through the SPC for a letter ballot and, when approved, forward their recommendation to Atlanta.

**11. Journal/Insight Article Subcommittee**

J. Huber reported that R. Laks had submitted an article, but when received by ASHRAE was past the deadline for the targeted issue. About 4 months lead time is required. A calendar of topics is available to anyone interested in writing an article. There is also a page of instructions available for those who wish to submit electronically.

**12. Research Sub-Committee Report**

In K. Starner's absence A. Fovargue reported that currently ASHRAE has 51 projects in the Research Plan, but only 19 of those have works statements. K. Starner had circulated 2 project descriptions. A. Fovargue proposed a third. S. Sharif moved and N. Gupte seconded a motion to add the proposed project to the research plan. Motion passed 7-0-0. Z. Ayub moved and P. Thors seconded a motion that the research plan include:

1. "Experimental Evaluation of the Effect of Oil on Heat Transfer with HFC 410A and HFC 507."
2. "Experimental Evaluation of the Heat Transfer Impacts of the Use of an Immiscible and Insoluble Lubricant/Refrigerant Pair."
3. "Water-Side Fouling Inside Smooth and Augmented Condenser Tubes in Cooling Tower Water Applications."

The project would be in the above order of priority. The motion passed 7-0-0. S. Moeykens and R. Laks will write the work statement for 1) above, M. Spatz will write the work statement for 2).

**13. 984-TRP: Effects of Inundation and Oil on Condensing R134a**

S. Moeykens reported that the literature review for this new project is in process. Wilson plots are being done to determine the tubeside heat transfer coefficients. Initially, single tube R134a tests are planned with data expected by October. Consideration is being given to whether an oil fog produced by spray nozzles will provide practical oil particle size and oil circulation rates. Trane will donate a 10 ton scroll compressor as a back-up.

The configuration of the small bundle tester was reviewed. It will be modified with a large enough drop tube to prevent liquid build-up. Construction should be complete by the end of the year.

**14. 751-RP: Effect of Oil on Heat Transfer in Flooded Evaporators**

A. Fovargue reported that P. Payvar has completed with 26 FPI tube and R123, R134a,, and R22; Turbo BII and R123. The tests with Turbo BII and R134a are in process. An extension has been granted and the report will be complete in September. Two papers are in process for presentation in San Francisco or Toronto. He will try to prepare a journal article as well. P. Payvar commented that he has presented data in a preferred method compared to previous report.

15. **752-RP: Heat Transfer - Brazed Plate HX's**  
Numerical data had been mailed to the committee prior to the review. No summary or conclusions were provided with this data. The data had not been reduced by the methods previously specified. Based on the recommendation of the monitoring sub-committee, P. Payvar moved and N. Hanna seconded that the committee recommend to ASHRAE that the project be terminated and a summary of data taken to date be provided to the subcommittee. The motion passed 5-1 (abstaining). Z. Ayub commented that he did not feel that his action was fair.

16. **857-RP: EHD Enhancement in Evaporating Refrigerants**  
J. Larson reported the following progress:
1. Measured electrical properties of R123, R134a, R404a, R407c, 410A as functions of temperature.
  2. Completed pool boiling experiments - smooth and 19FPI tube, 4°C and 20°C w/R123, R134a, R404a, and R410a (also R407c, at 20 and 35°C)
  3. Long term effect high pressure apparatus complete. Test will run July through November.
  4. Presented some initial results w/R134a at saturation temperature of 5°C, in smooth tube w/center rod electrode. Results show EHD enhancement to be dependent on quality, flow regime, heat and mass flux.
  5. Plan - to continue R134a testing with a revised electrode
    - test R404a with 2 electrodes and smooth and enhanced tubes @ 5°C
    - complete tests in October
  6. A no cost extension until November has been approved.

17. **922-RP: EHD Enhancement in Condensing Refrigerants**  
P. Thors reported that in tube testing is complete for R407c in 0.5" smooth tube. The heat transfer coefficient increased with decreases in quality and mass flux and decreased with decreases in temperature. Testing has included heat fluxes up to 14000 kW/m<sup>2</sup>; the work statement specified heat fluxes up to 20000, but heat flux has not influenced the heat transfer coefficient much. In tube testing will continue with R404a and R134a.

The 300 PSIG facility for external condensation testing is completed. It will handle 1 or 2 tubes, 23" long; either horizontal or vertical. (The Work Statement only requires data for horizontal condensation.) The Work Statement calls for testing with R134a and R123. In addition, tests with R404a, R407c, and R410a are planned.

The project is on schedule.

18. **New Business**  
We will try to schedule the Project Monitoring Sub-committee meetings to start at 3:00 PM on Sundays in the future. SPC 24 will be scheduled either earlier on Sunday, or on another day.

A. Fovargue will continue to serve as chairman for one more year. He needs to propose the roster of committee officers by December, 1997.

19. **Schedule Next Meeting and Adjourn**  
The next meeting will be Monday, January 19, 1998 at 4:15 PM during the Winter ASHRAE meetings in San Francisco.

The meeting was adjourned at 6:55 PM.