

**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 8.5 DATE March 27, 2003

TC/TG/TRG TITLE Liquid to Refrigerant Heat Exchangers

DATE OF MEETING Monday, January 27, 2003 LOCATION Chicago

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Joe Huber	1999	Josua Meyer	2001	Ken Schultz
Ben Dingel	2002	Art Fovargue	2000	John Thome
James Bryan	2000	Jamal Seyed-Yagoobi	1999	Massoud Neshan
Kash Oza	1999			Jon Hartfield
Louay Chamra	2001	Corresponding Members:		Mahesh Nuduvath
John Judge	2000	Mark Spatz	2000	Michael Pate
Petur Thors	2001	Ming Chyu	2000	Steve Eckels
Zahid Ayub	2001	James Larson	2001	Samuel Yana
Nabil Hanna	1999	Parviz Payvar	2002	Satheesh Kulankara
		Ralph Briesch	2002	Y Feng
Corresponding Members:		Keith Starner	1999	Rusty Smith
Satish Oza	2002	Michael Ohadi	2001	Andreas Knoepfler
Axel Kreigsmann	2000			
William McQuade	2002			
Jim Bogart	2002			

DISTRIBUTION

All Members of TC/TG/TRG plus the following:

TAC SECTION HEAD:	Stanley Westhoff
TAC CHAIR:	William Murphy
ASHRAE MANAGER OF TECHNICAL SERVICES:	Michael R. Vaughn, P.E.
ALL COMMITTEE LIAISONS AS SHOWN ON TC/TG/TRG ROSTERS:	Ron Davis—Handbook Liason Brian Dougherty—Standards Liason Kimball Ferguson—Journal/Insights Liason Arthur Garbarino—Program Liason William Klock—TEGA Liason Thomas Kuehn—RAC Research Liason Marilyn Listvan—Special Publications Liason Alberto Sanchez, P.E.—ALI Liason

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MANAGER OF STANDARDS MANAGER OF RESEARCH	Claire Ramspeck Bill Seaton
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**AMERICAN SOCIETY OF HEATING, REFRIGERATION,
AND AIR-CONDITIONING ENGINEERS, INC.**

Minutes

Technical Committee 8.5

Liquid-to-Refrigerant Heat Exchangers

January 27, 2003

2003 ASHRAE Winter Meeting, Chicago, IL, January 24-29, 2003

1. Introduction of Members and Guests (Sign attendance sheet)

Chairman Joe Huber called the meeting to order at 4:20 PM. The scope of TC8.5 was read. Members and guests introduced themselves. The following were present:

Ben Dingel	The Trane Company 3600 Pammel Creek Road La Crosse, WI 54601
Ken Schultz	The Trane Company 3600 Pammel Creek Road La Crosse, WI 54601
Zahid Ayub	Isotherm, Inc. 7401 Commercial Blvd. East Arlington, Texas 76001
Kash Oza	Standard Refrigeration Co. 2050 N. Ruby St. Melrose Park, IL 60160
Louay Chamra	Mississippi St. University 210 Carpenter Eng. Bldg. Mississippi 38801
John Thome	EPFL Lausanne, Switzerland 1015
Petur Thors	Wolverine Tube Inc. 2100 Market St. NE Decatur, AL 35601
Satish Oza	Wieland Metals Inc. 1052 Harvard Lane Buffalo Grove, IL 60089
Axel Kriegsmann	Wieland-Werke AG Seldcheck 7 Ulm, Germany D89081
Jim Bogart	Flat Plate, Inc 2161 Pennsylvania Ave York, PA 17404
Massoud Neshan	Wolverine Tube, Inc. 200 Clinton Ave. Suite 100 Huntsville, AL 35801

Jon Hartfield	Trane Company 3600 Pammel Creek Road La Crosse, WI 54601
Mahesh Valiya Naduvath	York International P.O. Box 1592-191A York, PA 17405
John Judge	York International P.O. Box 1592 York, PA 17363
James Bryan	University of Missouri-Columbia Dept. Mechanical and Aerospace Engineering Columbia, MO 65211
Joe Huber	Ketema LP 2300 W. Marshall Grand Prairie, TX 75051
Bill McQuade	York International P.O. Box 1592-191A York, PA 17405
Michael Pate	Iowa State University ME Dept. Ames, IA 50011
Steve Eckels	Kansas State University 64 Seaton Hall Manhattan, KS 66506
Samuel Yana	Honeywell 20 Peabody St. Buffalo, NY 14210
Satheesh Kulankara	York International 631 S. Richland Ave.-191A York, PA 17403
Yinshan Feng	Illinois Institute of Technology 10 W. 32 nd St. Chicago, IL 60616
Rusty Smith	SWEP 3483 Satellite Blvd. Duluth, GA 30019
Nabil Hanna	Koax Corp. 518 N. Indiana St. Oklahoma City, OK 73106
Andreas Knoepfler	Wieland-Werke AG Graf-Arco Str. 36 Ulm, Germany

2. **Introduction of Members and Guests (Sign attendance sheet)**
Voting members present included: Joe Huber, Ben Dingel, James Bryan, Louay Chamra, John Judge, Kash Oza, Nabil Hanna, Zahid Ayub, Petur Thors. Nine of the twelve voting members were present, establishing the quorum.
3. **Review/Approve Previous Meeting Minutes**
Minutes from the Atlantic City (Winter 2002) meeting were unanimously approved without modifications. TC 8.5 did not meet at the summer 2002 meeting in Honolulu.
4. **Chairman's Comments**
Joe Huber passed along the following comments and information from the Chairman's breakfast. Additional comments were covered under the appropriate agenda items.
 - The ASHRAE Learning Institute, responsible for educational offerings sponsored by ASHRAE, is looking for volunteers to write and put together material for short course offerings. J. Yagoobi is TC 8.5s representative for interfacing with the ALI.
 - ASHRAE Journal and ASHRAE Insights are looking for publishable papers and articles. Fred Turner is the contact for information.
 - TEGA is looking for ways to improve the relationship of ASHRAE and its local chapters. Feedback/suggestions are appreciated.
 - Special Publications is conducting a web-based survey. Ideas for special publications should be submitted on the website.
 - The ASHRAE organization overseas has been reorganized into 14 separate regions, which more closely resembles the current US structure.
 - The ASHRAE TAC is realigning technical committees. Three committees will be leaving group eight. The realignment does not affect TC 8.5.
 - Joe reported that the practice of providing a complimentary copy of a handbook or standard given to members working on the activity will continue in spite of some pressure to eliminate this tradition.
5. **Comments from Liasons (Handbook, Standards, Journal, Research, Program, TEGA, Technical Services, Refrigeration)**
Tom Kuehn, the Research liaison, offered the following comments
 - The 2003 research budget was 2.5 million. 86 RTARs were accepted, 15 work statements are on hold and 8 work statements are up for bid.
 - Tom suggested that work statements and RTARs be routed through him prior to submittal
 - The Research Digest, which serves as a summary and guide for the research project (RTARs, Work statements, etc.) is available on the ASHRAE website and should be followed as closely as possible to assure project approvals.
 - The next deadline for Work Statement submittal is May 15.
5. **Handbook Subcommittee Report**
Louay Chamra reiterated that the electronic version of the handbooks will become the official handbook versions, as opposed to the bound, paper copies. ASHRAE is trying to push electronic versions over paper versions. TC 8.5 is responsible for chapters 35 (condensers) and 37 (liquid coolers) in the 2004 Systems and Equipment handbook. June 1, 2004 is the publication date. Bill McQuade and John Thome volunteered to review the two chapters and offer feedback to Louay as to whether they require revision. Comments were requested by March 1. A suggestion was made to add references to recently completed TC 8.5 sponsored research projects (Eckels [RP984], Payvar [RP-751]).

6. **Program Subcommittee Report**

Ralph Breisch is resigning as program committee chairman. No programs are planned for the Summer Kansas City meeting (deadline for program packages is February 7).

Joe shared the following comments related to Programs:

- ASHRAE encourages seminar presentations to be placed on the web. Seminar .ppt (powerpoint) presentations may be placed on TC websites.
- Manuscript central (web-based program) appears to be working well for the review of technical papers.
- The number of symposiums have been declining in recent meetings. ASHRAE is encouraging technical committees to promote symposiums.

7. **Membership Subcommittee Report**

Satish Oza reported that TC 8.5 currently has 13 industry members and 8 university members. In 2003, the following people will roll off as voting members of the committee: Joe Huber, Kash Oza, Jamal Yagoobi, and Nabil Hanna. The following people will begin a rotation as voting members: Jim Bogart and Satish Oza. Satheeth Kulankara and Ken Schultz applications for TC 8.5 membership were received and were appointed as corresponding members by the chairman. John Thome agreed to become TC 8.5's international (voting) member starting in July. With these changes, the roster will consist of 11 voting members beginning in July.

8. **Standards Subcommittee Report**

ASHRAE has asked TC 8.5 to consider developing a Method of Testing (MOT) for ARI Standard 400-2001 LIQUID TO LIQUID HEAT EXCHANGERS. The standard is available for review at <http://www.ari.org/std/individual/400-2001.pdf>. There was some discussion on whether or not an accompanying ASHRAE standard is needed or if there would be some duplication with the existing standard (Appendix C of standard 400 contains a Method of Test). The committee concluded the "potential" standard was within TC 8.5's scope and that ASHRAE may be looking for standards similar to Standard 22 and 24. James Bryan to clarify the desire/need for an accompanying ASHRAE standard with ARI. The issue will be reviewed at the next meeting.

A decision on whether or not standard 24 (Methods of Testing for Rating Liquid Coolers) required revision was needed. ASHRAE recommended updating references and reaffirming the standard. John Judge moved to reaffirm standard 24. The motion was seconded by Ben Dingel and approved unanimously.

Joe reported that Standard 22 (Methods of Testing for Rating Water-Cooled Refrigerant Condensers) required an updated foreword, which Joe completed independently.

9. **Journal/Insights/Webmaster Subcommittee Report**

Joe Huber reported that ASHRAE will begin providing web space for TC websites. The only requirement is that if a TC utilizes ASHRAE web space, then the ASHRAE template must be used for the site.

10. **Research Subcommittee Report**

Current/in-process research projects are summarized below:

RP 984 "Effects of Inundation and Miscible Oil upon the Condensation Heat Transfer Performance of R-134a"

Joe Huber reported that this project is complete. The final report was approved by letter ballot on 5/20/02 by a vote of 12 for, 0 against, and 1 abstention. A paper is forthcoming in the January 2003 International Journal of HVAC&R Research.

RP 1089 "Flooded Evaporation Heat Transfer Performance Investigation for Tube Bundles Including the Effects of Oil Using R-410A and R-507A"

Petur Thors reported that John Thome's work is continuing on a no-cost extension basis. Testing activities to date have resulted in a very significant body of data for pure refrigerant evaporation, both for single tubes and tube bundles. The PMS is dealing with one deviation from the work statement. A high flux tube from UOP was tested, but the results were withdrawn from the project at the manufacturer's request, apparently due to problems with the manufacture of the tube samples. Future work will focus on obtaining data for various refrigerant/tube combinations with the presence of oil and on the development of modeling/prediction methods. A final report is expected in July. Petur also reported that two papers have already been submitted to ASHRAE and that 3-4 more papers are expected to be published as a result of this project.

RP 1205

The first critical portion of this project was a national survey of water quality. Although the objective was to analyze water samples from 60 diverse sites, only 19 sites agreed to send water samples, representing 16 different cities. In order to address this reduced number of surveys, a request to compare survey results with a pre-existing water quality database was made. The primary investigator (Louay) has made a proposal for the scope of testing in terms of water quality and test conditions. The PMS will review this proposal. It is expected that testing will commence in March.

New Projects

In accordance with the current research plan, the priority and status of future research projects are summarized below. The research plan was approved by the committee via letter ballot on 7/29/02, by a vote of 11 for, 1 against, and no abstentions. Currently, TC 8.5 has 3 RTARs which have been accepted, one with a priority designation. Of the three accepted RTARs which need work statements, volunteers to lead the development of work statements were noted: Mahesh Valiya Naduvath for the Study of Single Phase Flow-Induced Vibration in Shell and Tube Heat Exchangers, Ben Dingel for the Experimental Evaluation of the Heat Transfer Impacts of Tube Pitch in a Highly Enhanced Surface Tube Bundle, and Jim Bogart and Rusty Smith for the Performance and Cleanability of Brazed-Plate Type Condensers Operating under Fouling Conditions.

Priority 1: Study of Single-Phase Flow-Induced Tube Vibration in Shell and Tube Heat Exchangers

Current Status: RTAR written and accepted by ASHRAE (RTAR# 2004-38)

Awaiting writing of Work Statement

Priority 2: Experimental Evaluation of the Heat Transfer Impacts of Tube Pitch in a Highly Enhanced Surface Tube Bundle (RTAR)

Current Status: RTAR written and accepted by ASHRAE (RTAR# 2004-39) for priority status

Work Statement awaiting revision and final submission to ASHRAE

Priority 3: Performance and Cleanability of Brazed-Plate Type Condensers Operating Under Fouling Conditions

Current Status: RTAR written and accepted by ASHRAE (RTAR# 2004-40)

Awaiting writing of Work Statement

Priority 4: Experimental Evaluation of the Heat Transfer Impacts of the Use of an Immiscible and Insoluble Lubricant/Refrigerant pair

Current Status: Work Statement written

Priority 5: Effect of Long-Term Electrohydrodynamic Cycling on Boiling Heat Transfer, Condensation Heat Transfer, and Working Fluid Properties

Current Status: RTAR written

Awaiting writing of Work Statement

11. New Business

The committee voted unanimously to approve an updated/reworded scope of TC 8.5.

The new scope reads as follows:

“TC8.5 is concerned with the thermal and mechanical design, performance, and application of devices for accomplishing heat transfer between refrigerants (including secondary refrigerants) and liquids. Such devices include liquid cooled refrigerant condensers and refrigerant evaporators for cooling liquids.”

Successors to the TC 8.5 chairmanship and Programs subcommittee chairmanship were discussed. Joe Huber is currently serving his third and final year as TC 8.5 chair, and Ralph Breisch has resigned as Programs chair. After some discussion, Jim Bogart agreed to accept the TC 8.5 chairmanship, and Rusty Smith agreed to accept the Programs chair. Jim will relinquish the Research subcommittee chair to become TC 8.5 chair, which will need to be filled. The changes will take place following the June meeting.

12. Schedule Next Meeting

The next meeting will be held on June 30 in Kansas City, MO.

13. Adjourn

At 6:00 PM the meeting was adjourned by unanimous vote.

ASHRAE TC/TG/TRG ACTIVITIES SHEET

DATE: January 27, 2003

TC/TG/TRG NO.: TC 8.5 TC/TG/TRG TITLE: Liquid-to-Refrigerant Heat Exchangers

CHAIRMAN: Joe Huber VICE CHAIRMAN: _____ SECRETARY: Ben Dingel

TC/TG/TRG MEETING SCHEDULE			
Location-Past 12 Months	Date	Location-Planned Next 12 Months	Date
Atlantic City	Jan 2002	Kansas City	June 2003
Chicago	Jan 2003	Anaheim	Jan 2004
TC/TG/TRG SUBCOMMITTEES			
Function	Chairman		
Program	Ralph Breisch		
Membership	Satish Oza		
Research	Jim Bogart		
Handbook	Louay Chamra		
Standards	James Bryan		
Journal/Web/Insights	Joe Huber		
RESEARCH PROJECTS-CURRENT			
Project Title	Contractor	Monitoring Comm. Chpt.	Report Made At Meeting
RP 1089 Flooded Evaporation Heat Transfer Performance Investigation for Tube Bundles Including the Effects of Oil Using R-410A and R-507A.	Swiss Federal Institute of Technology	Petur Thors	Yes
RP 1205 Waterside Fouling Inside Smooth and Augmented Copper-Alloy Condenser Tubes in Cooling Tower Water Applications.	Mississippi State University	Art Fovargue	Yes
LONG RANGE RESEARCH PLAN			
Rank	Title	W/S Written	Apprv.
			To R&T
1.	Study of Single_Phase Flow-Induced Tube Vibration in Shell and Tube Heat Exchangers	No	No
2.	Experimental Evaluation of the Heat Transfer Impacts of Tube Pitch in a Highly Enhanced Surface Tube Bundle	No	No
3.	Performance and Cleanability of Brazed-Plate Tybe Condensers Operating Under Fouling Conditions	No	No
4.	Experimental Evaluation of the Heat Transfer Impacts of the Use of an Immiscible and Insoluble Lubricant /Refrigerant Pair	Yes	No
5.	Effect of Long-Term Electrohydrodynamic Cycling on Boiling Heat Transfer, Condensation Heat Transfer, and Working Fluid Properties	No	No

(OVER PLEASE)

HANDBOOK RESPONSIBILITIES					
Year & Volume	Chapter	Title	No.	Deadline	Handbook Subcom Liaison
2004 Systems	Chapter 37:	Liquid Coolers			
2004 Systems	Chapter 35:	Condensers			
STANDARDS ACTIVITIES-List and Describe Subjects					
Standard 22: No current activity					
Standard 24: Standard Reaffirmed					
TECHNICAL PAPERS from Sponsored Research-Title, when presented (past 3 yrs. present & planned)					
<u>RP-751</u> Effects of Oil on Boiling R-123 and R-134a Flowing Normal to an Integral-Finned Tube Bundle Chicago, 1999 Effects of Oil on Boiling of Replacement Refrigerants Flowing Normal to a Tube Bundle-Part I: R-123 Dallas, 2000 Effects of Oil on Boiling of Replacement Refrigerants Flowing Normal to a Tube Bundle-Part II: R-134a Dallas, 2000 <u>RP-1089</u> Thermal Performance of Flooded Evaporators, Part 1: Review of Boiling Heat Transfer Studies Atlanta, 2001 Thermal Performance of Flooded Evaporators, Part 2: Review of Void Fraction, Two-Phase Pressure Drop, and Flow Pattern Studies Atlanta, 2001					
TC/TG Sponsored Symposia-Title, when presented (past 3 yrs. present & planned)					
Advances in Thermal and Fluid Characteristics in HVAC and Refrigeration Processes Chicago, 1999 Advances in Thermal and Fluid Aspects of Alternative Refrigerants/Refrigerant Mixtures Seattle, 1999 Advances in Thermal and Fluid Flow Characteristics of HVAC and Refrigeration Processes Dallas, 2000 Advances in Thermal and Fluid Flow Characteristics of HVAC, Refrigeration, and AC Processes Minneapolis, 2000 Advances in Thermal and Fluid Flow Characteristics of HVAC, Refrigeration and A/C Processes Atlanta, 2001 Advances in Thermal and Fluid Flow Characteristics of HVAC, Refrigeration and A/C Processes Honolulu, 2002					
TC/TG Sponsored Seminars-Title when present (past 3 yrs. present & planned)					
Heat Transfer and Fluid Flow in Visualization of HVAC and Refrigeration Processes Atlanta, 2001					
TC/TG Sponsored Forums-Title, when presented (past 3 yrs. present & planned)					
JOURNAL PUBLICATIONS, when published (past 3 yrs. present & planned)					
<u>RP-984</u> An Investigation of Condensation Heat Transfer Performance of HFC-134a on Single Enhanced Tubes <i>International Journal of HVAC&R Research</i> Volume 9, Number 1/January 2003					

Submitted By: Ben Dingel