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**DRAFT**

**TC/TG/MTG/TRG MINUTES COVER SHEET**

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

TC/TG/MTG/TRG No. 8.4 DATE Aug 21, 2018

TC/TG/MTG/TRG TITLE Air-to-refrigerant heat transfer equipment

DATE OF MEETING Jun 26, 2018 LOCATION Houston, TX

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Dr. Sankar Padhmanabhan	2016	Mr. Shenghan Jin	2016	Please see attached
Dr. Kashif Nawaz	2016	Mr. Matthew Richard		
Dr. Chad Bower	2014	Mr. Stanislav Perencevic		
Dr. Kishan Padakannaya	2017	Dr. Yang Zou		
Prof. Man-Hoe Kim	2014			
Dr. Vikrant Aute	2017			

**DISTRIBUTION: All Members of TC/TG/MTG/TRG plus the following:**

TAC Section Head: Dustin Meredith	SH0804@ashrae.net
All Committee Liaisons As Shown On TC/TG/MTG/TRG Rosters (Research, Standards, ALI, etc.)	See ASHRAE email alias list for needed addresses.
Mike Vaughn, Manager Of Research & Technical Services	MORTS@ashrae.net

Note: These draft minutes have not been approved and not the official, approved record until approved by the TC.

**I. CALL TO ORDER and APPROVAL OF MEETING MINUTES**

Sankar Padhmanabhan, the Chair of TC 8.4, called the meeting to order at 3:30 p.m. The title, purpose and scope of the TC were read. Kashif Nawaz moved to approve the minutes of the Chicago meeting and seconded by Vikrant Aute. Committee voted to approve 6-0-0-CV. Minutes approved as submitted.

**II. SELF INTRODUCTIONS AND ATTENDENCE:**

Everyone present introduced themselves, and signed the roster sheet. Several YEA members (4) were present and welcomed. Chair identified 6 out of 10 voting members. Quorum was met.

Voting Members at this meeting in Chicago are as follows:		End of term (Jun 30 of...)	Present
1.	Dr. Sankar Padhmanabhan (Chair)	(2019)	Yes
2.	Mr. Shenghan Jin (Vice-chair)	(2019)	No
3.	Dr. Kishan Padakannaya	(2021)	Yes
4.	Dr. Kashif Nawaz (handbook sub. Chair)	(2019)	Yes
5.	Mr. Matthew Richard Baker	(2021)	No
6.	Mr. Stanislav Perencevic	(2021)	No
7.	Dr. Yang Zou	(2021)	No
8.	Dr. Vikrant Aute	(2021)	Yes
9.	Dr. Chad Bower (research sub. chair)	(2018)	Yes
Voting Member non-quorum in this meeting			
10.	Prof. Man-Hoe Kim	(2018)	Yes
11.	Dr. Hyunyoung Kim	(2017)	No
Total Present			6 out of 10 VMs
Quorum			YES

**I. PROGRAM SUBCOMMITTEE REPORT**

Program Sub-committee chair, Omar Abdelaziz, presented the report. Following are the highlights.

- As approved in Chicago minutes, the Atlanta Meeting will have a seminar track related to the “Design of components with low GWP refrigerants.” Pega Hrnjak agreed to Chair the session and Kashif Nawaz volunteered to be the assistant. Section 8.1 & 3.1 also showed interest and potential collaboration with them will be explored.
- Chad Bower suggested that one of the heat exchanger air-side fouling RP is wrapping up and the PI is willing to contribute two seminar papers. And if one more speaker could be identified a new program session can be proposed for the Atlanta Meeting. He also suggested to contact section 8.5 for potential contribution from the intube fouling RP. The proposed seminar title is “Recent Ashrae research on HX fouling.” Chad agreed to chair the session. Vikrant Aute moved to approve. Kashif Nawaz seconded. 6-0-0-CV. Motion passed.
- Further discussions took place on committees’ agreement to support the TC1.13 Optimization track at Kansas City Meeting in June 2019. The committee agreed to co-sponsor the track and include topic like heat exchanger optimization for charge minimization and low-GWP A2L refrigerants. Vikrant Aute agreed to Chair the session. The committee decided to wait till Atlanta meeting for voting as all details were not available.

- Vikrant Aute volunteered to support a seminar for Atlanta Meeting related to “Additive Manufacturing for A2L Heat Exchangers.” Vikrant also identified Ratnesh Tiwari and Michael Ohadi as potential speakers. Omar Abdelaziz volunteered to explore potential interest from University of Wisconsin – Madison and find a speaker from ORNL. Omar also volunteered to Chair the session.

## II. MEMBERSHIP REPORT

Membership Sub Committee Chair, Kishan Padakannayya, reported on the TC’s membership.

The committee has a total of 120 members on the roster with 10 voting members and 2 non-quorum members. Members were encouraged to update their Ashrae profile.

In the upcoming Society year effective July 1<sup>st</sup>, 2018, the following changes are planned:

- Vikrant Aute suggested that Ratnesh Tiwari will take on the Membership Subcommittee Chair.
- Kishan Padakannayya volunteered to serve as Research Sub Committee Chair and he will take over this role from Chad Bower.
- The Vice-Chair has moved on and Chad Bower consented to take over the Vice-Chair role.
- Arindom Joardar, Jun Wang, Bill Fox and Christian Bach will roll-on as Voting Members (VM). Man-Hoe Kim, Yang Zou and Shenghan Jin will roll-off as Non-Voting Members (NVM).
- Zhiwei Huang volunteered to take over as Programs Sub-Committee Chair going forward.

## III. CHAIRS REPORT

Chair presented highlights from the Chair’s breakfast. Report is appended to these minutes.

## IV. SECTION HEAD REPORT

The Section 8 Head Dustin Meredith commented that the meeting is well attended. No new announcement was made from the board.

## V. HANDBOOK SUBCOMMITTEE REPORT

Handbook Sub-committee chair, Kashif Nawaz, reported that TC 8.4 is responsible for the following chapters

1. Chapter 23 air cooling & dehumidification coils (Fundamentals)
  2. Chapter 27 air heating coils (Fundamentals)
  3. Chapter 39 condensers (Fundamentals)
  4. Chapter 14 Forced circulation in coolers (Refrigeration)
- First three chapters were updated and revised about a year ago and have been published in ASHRAE Fundamentals (2017). The typical review cycle is 4 years and the first three chapters are scheduled to be updated in 2021.
  - The fourth chapter above (Chapter 14 in Refrigeration) has been updated and the review shared with handbook liaison. The next review of this chapter is scheduled in 2022.
  - Suggestion for improvements were sought and it was brought out that chapter references and interlinking can be improved. Also citing relevant sections of other handbooks can be

improved. Chad Bower and Arindom Joardar volunteered for assistance with any improvement activities.

In terms of ideas for new content or chapters, Arindom Joardar suggested expanding the microchannel heat exchanger (MCHX) section to include the evaporator applications. It was decided to aim for a draft by summer of 2020. Arindom Joardar, Chad Bower and Sankar Padhmanabhan volunteered. Vikrant Aute also suggested Ratnesh Tiwari for participating in the effort

#### **VI. WEBMASTERS REPORT**

Christian Bach relayed that the website was up to date. Research Project reports sponsored by this Committee are available online.

#### **VII. MTG LIAISON REPORT**

Vikrant Aute, TC 8.4 liaison for low GWP refrigerants provided an update on the activities. There are 3 research projects and 2 work statements that are currently being pursued. Some highlights are as below.

RP 1806: Scott Davis, Gexcon

Contract was extended to include additional work.

Previous work looked at mostly vapor leaks in the system. Most models can handle pure vapor leak. AHRTI case had release of flashing liquid (as opposed to pure vapor), but the dispersion characteristics are very different. Additional effort was to conduct tests to validate the models. T1: Model development, calibration and validation, T2: Simulation of ignition events to calculate severity; T3: Use data to come up with updated risk assessment. Additional task was to model impact of moisture - it changes flame velocity significantly.

Contractor was doing burning velocity tests, adding humidity effect tests led to additional tasks and hence some delay in project (one of the causes)

The project report is with PMS and is under review

RP 1807:

PI (Goetzler Bill),

Conducted thorough analysis and collected data from EU, JP, CN, and AU and summarized codes, standards, regulations etc. PMS has an interim reports that was under review, as well as by AHRI et al. PMS will vote on the final report.

RP 1808: Stefan E.

About 85% complete, scheduled for completion early March (first draft of report).

Focus is to evaluate different fitting types (see previous notes).

Total 325 combinations; 25 brazed connections are used as baseline.

The report has been received by the PMS

#### **VIII. RESEARCH SUBCOMMITTEE REPORT**

Research Sub-committee Chair, Chad Bowers, presented a report from the Research chair's breakfast. Research Sub-committee chair, Chad Bower, presented a report from

the Research chair's breakfast. 3 RTAR's are reviewed by the RAC. One was approved, the second was conditionally approved and third was rejected. There were 3 WC's in the pipeline and all conditionally accepted. In general the Ashrae annual operating budget for research amounts to about \$3.2M. Currently low on projects and TC's are encouraged to focus on channeling more RTARs. Ashrae is also mandating milestones on Work Statements and adopting stage payment process linked to the milestones. In another initiative, Ashrae is focusing on improving the marketability of Ashrae Research and going forward Abstracts will be needed for all Work Statements including some of the earlier ones in the pipeline. Following are the highlights. Also detailed notes attached.

- RP 1705 (Fouling of Outdoor Residential Condensers): Residential outdoor condensers were collected from the field and the fouling matter was analyzed in the Lab to be able to characterize the fouling properties and develop equivalent fouling material for conducting fouling tests in the Lab environment. The field condensers were tested before and after cleaning to investigate impact on thermal-hydraulic performance of the heat exchangers. A new fouling method was also developed in the Lab to mimic the actual field fouling using a mixture of organic material (feathers) with quartz dust. The mix was controlled to allow same performance of coils as the field ones. The tests were performed both, with constant CFM and varying CFM depending on the fan curve. The project is nearing completion and the current focus is on developing the new Lab test standard for fouling characterization of outdoor condensers related to residential applications. The final report is expected to be made available to the PMS by Aug 2018.
- RP 1645 (Accelerated Corrosion Test Protocol): The final report has been reviewed extensively by the PMS and getting voted on 6/26/2018.
- RP 1807 (Guidelines for handling flammable refrigerants): This is paper study to conduct thorough analysis with data collection from EU, JP, CN, AU and summarized codes, standards, regulations etc. The major outcome is recommended best practices from other countries. The final report has been completed and report received by PMS.
- RP 1785 (Refrigerant charge modeling in residential split systems): Heat exchanger samples procured from one of the OEMs. The next steps are measuring charge and oil in both cooling and heating modes. The data is expected to support charge modeling and validation. The first set of test data is expected to be available by next meeting.
- TRP 1683 (Pressure drop in U-bends with Ammonia; co-sponsor TC1.3): Work statement is being evaluated and more information was sought on how the measurements will be done. Presently no oil is being considered. Some flow visualization is needed. Work statement is being re-written and no voting is needed. Steve Eckels will chair the PMS.
- List of RTAR ideas:
  - Oil retention in MCHX coils
  - Small diameter tube heat exchangers (2-5 mm) correlation validation
  - Performance degradation for aged coils (energy penalty and LCCP impact)

- Impact of coil forming and ending on performance for MCHX
- Fouling of indoor condensers (e.g., HPs for hot water, dryers etc.)
- Improved HALT testing for heat exchangers (Corrosion, TMF, holistic, all coil types)
- Adaptive coils (more suited or Innovation Research Grant)
- Charge modeling and minimization on heat exchangers and system

## **IX. STANDARDS SUBCOMMITTEE REPORT**

Standards Sub-committee Chair, Bill Fox, provided an update on activities. There are 3 SPC's namely 20, 25 and 33 that are under the purview of TC 8.4.

SPC 20 voted to approve unanimously the revised standard for public review in early December and it was submitted to ASHRAE on 12/8/17. Thanks to the PC committee members for all their hard work (Ron Wood, Gordon Struder, Ted Wayne , Zan Liu, Konrad Chmielewski, and Ray Rite). Currently out for first public review.

SPC 25 committee has completed the technical content portion regarding this method of test. It is in "clean-up" mode, ensuring mandatory language is used (throughout), appropriate references are cited and overall the document is clean. Currently out for public review and no comments yet.

SPC 33 is up to date and no current activity.

## **VII OLD BUSINESS**

None.

## **XI NEW BUSINESS**

None.

## **XII ADJOURNMENT**

At 5.50pm, Chad Bower moved to adjourn. Vikrant Aute seconded. 6-0-0-CV. Meeting adjourned.



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- 2003 Document