



1791 Tullie Circle, N.E./Atlanta, GA 30329
404-636-8400

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. TC8.5 DATE 1/19/2021

TC/TG/MTG/TRG TITLE Liquid to Refrigerant Heat Exchangers

DATE OF MEETING 1/19/2021 LOCATION On-Line

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE	
Joseph B Huber ('22)	7/1/2020			Nicholas Zupp	Eric Mencke
Adnan H Ayub ('22)	7/1/2018			Andreas Knoepfler	Pratik Deokar
Minoo Mehdizadeh ('24)	7/1/2020			Lorenzo Cremaschi	Ken Schultz
		Kashif Nawaz ('21)	7/1/2017	Joshua Meyer	Larry Smith
Vikrant C Aute ('23)	7/1/2019			Jim Bogart	Pratik Deokar
Pedro Perez ('24)	7/1/2020			Chris Keinath	Neil Lawrence
Evraam Gorgy ('22)	7/1/2018			Ali Behfar	Ben Dingel
Achim Gotterbarm ('21)	7/1/2017			Lokanth Mohanta	Ahmed Elatar
Icksoo Kyung ('24)	7/1/2020			Satheesh Kulankara	Khaled Salah
Stanislav Perencevic ('23)	7/1/2019			Yirong Jiang	Zahid Ayub
Michael Wilson (21)	7/1/2017			Dhruv Hoysall	Liping Liu
					Chris Seeton

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

TAC Section Head: Kevin Mercer	SH8@ashrae.net
Research Liaison: Christopher J Seeton Standard Liaison: Srinivas Katipamula Staff Liaison: Steven J Hammerling	cseeton@shrieve.com srinivas.katipamula@pnnl.gov shammerling@ashrae.org
Mike Vaughn, Manager Of Research & Technical Services	MORTS@ashrae.net

TC 8.5: Liquid to Refrigerant Heat Exchangers
ASHRAE 2020 Winter Meeting
Tuesday, Jan 19 2021, 10:00 AM – 12:00 AM US EST

1. Call to order at 10:05 and TC 8.5 scope read by J. Huber:

- *TC 8.5 is concerned with the thermal and mechanical design, performance, and application of devices for accomplishing heat transfer between refrigerants (including secondary refrigerants) and liquids.*

2. Introduction of members and guests

- All participants introduced themselves
- Chair requested that all participants e-mail the Vice Chair to confirm their attendance
 - Vice chairs ASHRAE e-mail alias is TC0805.VCH@ashrae.net

3. ASHRAE Code of Ethics Commitment read by J. Huber

"Commitment to the ASHRAE Code of Ethics – In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, integrity and respect for others, and we shall avoid all real or perceived conflicts of interests.

(See full Code of Ethics: <https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics>)

4. Establish quorum requirements (J. Huber) - 9 present (at start), 1 joined late, 1 absent, see cover sheet

- Chair presented TC8.05 e-mail aliases to the membership
 - Chair: TC0805@ashrae.net
 - Vice Chair: TC0805.VCH@ashrae.net
 - Secretary: TC0805.SEC@ashrae.net
 - Handbook: TC0805.HBK@ashrae.net
 - Program: TC0805.PRO@ashrae.net
 - Research: TC0805.RES@ashrae.net
 - Standards: TC0805.STD@ashrae.net
 - Webmaster: TC0805.WEB@ashrae.net

The full list of aliases can be found on the Technical Committees page on the ASHRAE website.

5. Review/approve minutes from previous meeting (J. Huber)

- Votes: For 9 / Against 0 / Abstain 0 (previous to late member joining)
- Vikrant Aute motioned to approve
- Mike Wilson seconded
- Discussion
 - No discussion

6. Section Head comments (K. Mercer)

- Not present

7. Liaison comments

Research Liaison: Christopher Seeton

TC 8.5: Liquid to Refrigerant Heat Exchangers
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- Participated in discussions during Chair's report

Standards Liaison: Srinivas Katipamula

- Not present

Staff Liaison: Steven Hammerling

- Not present

8. Membership subcommittee report (S. Kulankara)

- 2021-2022 Roster Review
 - After summer meeting 2 new members will be rolling on
 - Adnan Ayub will take on Vice Chair after summer meeting
- We have 9 Provisional Corresponding Member on roster at this time
 - If you would like to move from a provisional corresponding member to a full corresponding member please e-mail chair or vice chair
- We will have 10 members in 2021, we could have at least 1 additional member
 - Need 1-2 more voting members
 - We are light on academic members
- Officer Review
 - Chair
 - Joe Huber
 - Vice Chair
 - Sateesh Kulankara until Summer Meeting 2021
 - Adnan Ayub after Summer Meeting 2021
 - Secretary
 - Nick Zupp

9. Handbook subcommittee report (A. Ayub)

- Systems and Equipment: Condensers, Liquid Coolers
 - Now in beginning phase of the Systems & Equipment Handbook
 - TC is in good shape right now since we have just started a new cycle

10. Program subcommittee report (M. Mehdizadeh)

- Winter Conference
 - Special sessions covering the latest on the COVID-19 pandemic
 - 8 Program Tracks
 - 40 live sessions scheduled between February 9th and 11th
 - 90+ on demand sessions (available for 18 months)
 - Virtual Social Events
 - Escape Room

TC 8.5: Liquid to Refrigerant Heat Exchangers
ASHRAE 2020 Winter Meeting
Tuesday, Jan 19 2021, 10:00 AM – 12:00 AM US EST

- Technical tour of new ASHRAE headquarters building
- Tour of STACK infrastructure data center
- Winter Conference 2021
 - TC8.05 submitted two seminars for the conference as the main sponsor, both of which were rejected
 - Experimental study on the effects of enhanced tube characteristics on fouling behavior and fouling prediction model (ASHRAE RP-1677)
 - Advances in modeling of plate heat exchanger performance
 - TC8.05 co-sponsored a seminar with TC1.3 which was accepted
 - Performance of Alternative Low GWP A2L Refrigerants in Condensers
 - Will take place on February 11th from 3:00 to 4:00 PM EST
- Program Subcommittee Chair, Minoos Mehdizadeh, made a motion to resubmit the two seminars proposed for Summer 2021
 - Discussion
 - A third presenter for the Seminar session may improve chances of acceptance
 - If anyone can come up with an idea or someone to contact for a third speaker send an e-mail to Minoos (TC0805.PRO@ashrae.net)
 - Vote on resubmitting both seminars proposed by TC8.05 for the next meeting
 - Mike Wilson seconded
 - Votes: For 10 / Against 0 / Abstain 0
- 2021 Summer Conference in Phoenix AZ
 - Tracks
 - Fundamentals and Applications
 - HVAC&R Systems and Equipment
 - Research Summit
 - Professional Development
 - Design, Control and Operation of Critical Environments
 - HVAC&R for Indoor Plants and Animals
 - Future proofing – Renewable, Regenerative and Resilient
 - Hot, Hot, Hot
 - TBD (Mini-track)
 - Deadlines
 - Revised Conference Papers/Final Technical Papers Due 13 January 2021
 - Extended Abstracts Due 15 February 2021
 - Papers Final Accept/Reject Notifications 18 February 2021
 - Program Submissions Due 22 February 2021
 - Extended Abstract Accept/Reject Notifications 19 March 2021
 - Program Submissions Accept/Reject Notifications 2due 2 April 2021

TC 8.5: Liquid to Refrigerant Heat Exchangers
ASHRAE 2020 Winter Meeting
Tuesday, Jan 19 2021, 10:00 AM – 12:00 AM US EST

- Discussion on ideas for additional programs for Summer 2021
 - No discussion
 - If anyone has an idea send an e-mail to Minoo (TC0805.PRO@ashrae.net)
- Discussion on ideas for additional programs for Winter 2022
 - No discussion
 - If anyone has an idea send an e-mail to Minoo (TC0805.PRO@ashrae.net)

11. Standards subcommittee report (J. Huber)

- Committee responsible for
 - ANSI/ASHRAE Standard 22-2018 Methods of Testing for Rating of Liquid Cooled Refrigerant Condensers
 - ANSI/ASHRAE Standard 24 2019 Methods of Testing for Rating Evaporators Used for Cooling Liquids
 - ANSI/ASHRAE Standard 181 2018 Methods of Testing for Rating Liquid to Liquid Heat Exchangers
- Standards 22 & 181 are up for re-affirmation, revision or withdrawal
 - Standard 22 and Standard 181 both reference ASHRAE Guideline 2
 - ASHRAE Guideline 2 has been withdrawn by oversight technical committee
 - Guidelines should not be referenced in a normative manner as is done in both standards
 - Neither standard can be fixed via the ASHRAE Standards Revision Subcommittee due to changes being more than editorial
 - We can re-affirm the standards as they are or recommend that ASHRAE form an SPC
 - Discussed reforming the committees since most of the members are still active
 - Joe Huber motioned to form SPCs to fix Standards 22 & 181
 - Stanislav seconded
 - Votes: For 10 / Against 0 / Abstain 0
 - If you are interested in serving on the SPCs please let Joe know in the next few weeks
 - Chair makes recommendation to ASHRAE to form the SPCs
 - Standard-24
 - No discussion

11. Webmaster report (P. Perez)

- Web page is up to date with latest minutes and information for this meeting

12. MTG Liaison (Satheesh Kulankara)

- MTG did not meet until November 2020
 - MTG voted to have a seminar for the summer meeting

TC 8.5: Liquid to Refrigerant Heat Exchangers
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- Codes and Standards
 - Results of two completed research projects, RP-1807 and RO-1808, intended to support Standard 15 updates
 - Research reports forwarded to ASHRAE
 - Focus on technical documentation dissemination to state and local jurisdictions
 - Preparing a slide deck addressing code related issues
 - Preparing a stake holder list for code related issues
- Research
 - RP-1806 Flammable Refrigerants Post-Ignition Simulation and Risk Assessment Update
 - Long running project still going on
 - Additional work plan approved by the PMS
 - Added validation work
 - Added simulations of results from other published research results
 - Revised work scope has been delayed by the pandemic
 - Will make decision on pursuing added work after completion of currently approved work
 - Expected early 2021
 - RP-1855 Determination of the Impact of Combustion Byproducts on the Safe Use of Flammable Fluorinated Refrigerants
 - Literature review project
 - Principal Investigator reviewing comments from PMS on draft of report
 - WS-1884 The Incorporation of Odorants in Refrigerants to Improve Leak Detection – Phase II Experimental Study
 - Phase 1 funding from US Consumer Product Safety Commission
 - Initiated late 2020
 - ASHRAE will need to co-sponsor any future phases

13. Research subcommittee report (Kashif Nawaz)

- Update from the Research Sub-Committee Breakfast Meeting
 - Research Chair not present
 - Research breakfast has not taken place yet
- Various committee members provided information on research below
 - RP-1677: “Measurement and prediction of waterside fouling Performance of Internally Enhanced condenser Tubes Used in Cooling tower Applications” (Ben Dingel)
 - Update on final report
 - Final report complete, approved by Project Oversight committee
 - Vote: For 9 / Against 0 / Abstain 0/ Chair not voting
 - Final report is available through ASHRAE

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- RP-1800: “Spray Evaporation on Enhanced Tube Bundles with Low GWP Pure Refrigerants and Refrigerant/Miscible Oil Mixtures” (Zahid Ayub)
 - TC1.3 has the lead, TC8.5 is a co-sponsor
 - Due to COVID things have been moving slowly
 - Initially had some trouble with the fabrication of the test apparatus
 - Problems have been worked out
 - Tests are up and running
 - Investigator has not yet presented any test data
 - Investigator has asked for a one-year extension to finish work
- Other RTARs and Work Statements
 - There are 4 RTARs in process of being written
 - Heat transfer measurements & correlation development for tube in tube fluted / coaxial HXs
 - Making progress and RTAR preparation is active
 - External condensation on tube bundle with lower GWP refrigerants.
 - Potentially include impact of non-condensable at concentrations above, at and below AHRI allowable limits
 - Did meet and discuss, created basic outline
 - No update on actual RTAR status
- Potential RTARs:
 - In tube evaporation of low GWP refrigerants - No update
 - RTAR for CO₂ condensation on tubes applicable to cascade systems – No update
- New topics for research
 - Please send any ideas for future research to Kashif Nawaz (TC0805.RES@ashrae.net) so they can be considered by the TC

14. Confirmation of continuation of TC

- The TC Manual of Procedures requires that once a year the TC confirms that it is accomplishing the purpose for which it was formed
 - Brief discussion ensued with all commenters indicating that TC8.5 is accomplishing the purpose for which it was created
 - Motion made by Sateesh Kulankara to continue as a TC
 - Seconded by Stanislav Perencevic
 - Vote: 10 for / 0 against / 0 abstain

15. Chairman’s report (J. Huber)

- TAC breakfast Information
 - TC Re-organization Committee issued a final report

TC 8.5: Liquid to Refrigerant Heat Exchangers
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- TAC has formed an implementation sub-committee headed by Larry Smith for the purpose of incorporating the TC Re-organization Committee recommendations
 - So far TAC has approved the following TC mergers
 - 3.2 & 3.3, 7.3 & 7.8, 8.10 & 8.12, 9.4 & 9.8
 - Additionally TC's 10.1 & 10.3 have approved a merger
 - More TC mergers are being considered
 - The annual re-affirmation procedure required by the TC MOP is being enforced
- Hightower Award
 - Six nominations made for the 2020-2021 Award
 - Recognizes exceptional service in the area of technical leadership over the last 4 years
 - See details in Chairs slides attached to the minutes
- Interim Meetings
 - TC's are required to meet at least twice a year
 - If needed to maintain progress ASHRAE recommends that TCs meet more often
 - Interim meetings will soon be listed on the Technical Committee Web page (<http://www.ashrae.org/technical-resources/technical-committees>)
 - Interim meetings should be posted
 - E-mail to TCmeetings@ashrae.net
 - At least two weeks before on-line meetings
 - At least 4 weeks before in person meetings
 - Include the meeting call-in / link / location information in e-mail
- ASHRAE would like to have TC members speak more at local chapter meetings
 - Explain what TCs do for the society and how the work benefits local ASHARE chapters
- 2019 to 204 Strategic Plan reviewed
 - Mission – To serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration and their allied fields.
 - Vision – A healthy and sustainable built environment for all.
 - Values – Excellence, Commitment, Integrity, Collaboration, Volunteerism, Diversity
 - Goals
 - Position ASHRAE as an Essential Knowledge Resource for a Sustainable, High-Performance Built Environment

TC 8.5: Liquid to Refrigerant Heat Exchangers
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- Maximize Member Value and Engagement
- Optimize ASHRAE's Organizational Structure to Maximize Performance
- Strategic Plan Areas and Initiatives
 - Built Environment of the Future
 - Resilient Buildings and Communities
 - Indoor Environmental Quality
 - Organizational Streamlining
 - Improve Chapter Engagement , Capacity and Support
- Technology Council
 - Building on Epidemic Task Force (ETF) Momentum
 - Developing a Strategy for the ETF once the pandemic subsides
 - Ensure momentum and reputation preserved
 - Develop and implement a monetization plan
 - Due FY Q3 (3/31/2021)
 - Integrating Carbon as a Metric
 - Provide a recommendation to ExCom if/how a carbon metric can be used in the Society's technical content
- Upcoming conferences
 - 2021 ASHRAE Virtual Design and Construction Conference, March 8th to 10th, 2021
 - Ventilation 2021: 13th International Industrial Ventilation Conference for Contaminant Control, August 13th to 18th, 2021, Toronto, Canada
 - Indoor Environmental Quality Performance Approaches: Transitioning from IAQ to IEQ, September 13th to 15th, Athens Greece
- Refrigeration Technology Committee for Comfort-Process-Cold-Chain
 - New committees formed to bring a greater focus on the refrigeration in ASHRAE and provide a new way for communication and collaboration within ASHRAE
 - For more information on each new REF-CPCC subcommittee contact Mike Vaughn at MORTS @ashrae.net
- Research Strategic Plan Development
 - Kicked off by RAP in November 2019
 - Updated to coordinate with ASHRAE Strategic Plan
 - Held 8 meetings
 - Conducted a survey with 700+ responses between mid-January and mid-February
 - See chair's slide for membership
 - Derived 6 initiatives

TC 8.5: Liquid to Refrigerant Heat Exchangers
ASHRAE 2020 Winter Meeting
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- Resilience for buildings and communities
- Understanding IEQ and Impact on Productivity, HVAC airborne pathogen transmission and control
- Sustainability – Energy and Resources
- Tools and Applications
- HVAC components including new refrigerants
- Education and Outreach
- Drafting Research Strategic Plan in process
- Final committee vote expected in February 2021
- Research Budget
 - Typical year
 - \$2.6M to \$2.7M per year
 - 12 – 15 new projects per year
 - Funds collected in a given society year (SY) become RAC budget in next SY
 - Projects / Grants include commitment for multiple years
 - Funding currently reduced due to cancelation of meetings/show general reduction in fundraising
 - Currently funding is supporting ongoing commitments only, no new projects being awarded for the 2020/2021 SY
 - RAC is still accepting new projects from TCs (RTAR and WS)
 - Suggests that TCs/MTGs/Etc. continue to develop and put forth project proposals
 - Project justification should mention, if appropriate, that the research addresses the HFC phase-out legislation currently working its way through the US Congress.
 - RAC will review and prioritize based on the normal process
 - Best TC strategy is for Research Subcommittee chairs to work closely with section research chairs
 - Quality over Quantity, plan, prepare, collaborate with other TCs where appropriate (now more than ever)

16. New Business

- ASHRAE asked if the TC need a Basecamp site
 - Note that Chair or designee has to set up the membership etc.
 - Joe Huber will investigate further

17. Schedule Next meeting:

- ASHRAE is hoping to be able to meet in person in Phoenix

TC 8.5: Liquid to Refrigerant Heat Exchangers
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- Proposed meeting time: Monday, June 28 2021, 4:15 PM to 6:30 PM – Phoenix, AZ

18. Adjourned by chair at 11:38 PM

Attachments:

1. Presentation from TC8.05 Meeting
2. TC Chairs breakfast Winter 2021 Presentation

Welcome! TC 8.5 Liquid to Refrigerant Heat Exchangers

Welcome!

No need to say “Hello!”

We will begin at **10:00 AM EST**

Housekeeping

Audio

- Attendees are muted upon entry
- Do not un-mute your line
- If you are joining via computer and phone line, ensure both are muted

Video

- You are welcome and encouraged to share your webcam
- Be mindful that you are on display! Turn off your video when needed.

Q&A

- Use the chat function to ask questions
- Our speaker will pause throughout the presentation to answer questions from the chat box.

 **Joe Huber**
Chair, Facilitator for this virtual meeting



TC 8.5 Call to Order and Reading of Scope

ASHRAE Technical Committee 8.5 Liquid to Refrigerant Heat Exchangers

TC 8.5 is concerned with the thermal and mechanical design, performance, and application of devices for accomplishing heat transfer between refrigerants (including secondary refrigerants) and liquids.

 **Joe Huber**
Committee Chair



TC 8.5 Introduction of Members and Guests

Introduction of our members and guests...

- Please give your name and affiliation, and any TC 8.5 committee duties you have.
- Wait for a brief pause, and then speak.
- Remember to unmute before speaking, and then mute again after you have finished speaking.
- Please send an email to TC0805.VCH@ashrae.net so we can log your attendance. Please indicate if you are a YEA member.

Joe Huber
Committee Chair



ASHRAE Code of Ethics Commitment

- Our TC meeting will abide by the ASHRAE Code of Ethics:
- *Commitment to the ASHRAE Code of Ethics – In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, integrity and respect for others, and we shall avoid all real or perceived conflicts of interests.*
- Full Code of Ethics:
<https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics>

Joe Huber
Committee Chair



TC 8.5 Establish Quorum – Current Voting Members

- Joe Huber (Chair, Standards) '22
- Vikrant Aute '23
(MTG LGWP Alt 1)
- Adnan Ayub (Handbook) '22
- Evraam Gorgy '22
- Achim Gotterbarm '21
- Icksoo Kyung '24
- Minoo Mehdizadeh (Program) '24
- Kashif Nawaz '21
(Research, MTG LGWP Alt2)
- Stanislav Perencevic '23
- Pedro Perez (Webmaster) '24
- Michael Wilson '21



Joe Huber
Committee Chair

Voting Members roll off after June 30 of the year indicated



Other TC 8.5 Positions

- Satheesh Kulankara: Vice Chair, Membership, MTG LGWP
- Nicholas Zupp: Secretary



Joe Huber
Committee Chair



TC 8.5 Email Addresses

- Chair: TC0805@ashrae.net
- Vice Chair: TC0805.VCH@ashrae.net
- Secretary: TC0805.SEC@ashrae.net
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The full list of aliases can be found on the Technical Committees page on the ASHRAE website



Joe Huber
Committee Chair



TC 8.5 Membership

Membership Housekeeping

- Gotterbarm, Nawaz, Wilson rolling off as Voting Members after June 30
- Knoepfler, Zupp rolling on as Voting Members after June 30
 - Need 1-2 more VM (we are light on academic Voting Members)
- Adnan Ayub will take the Vice Chair position



Sattheesh Kulankara
Membership Subcommittee Chair



TC 8.5 Membership

Provisional Corresponding Members

- Membership will expire
 - Please send email ASAP if you wish to become a Corresponding Member
TC0805@ashrae.net or TC0805.VCH@ashrae.net
- | | |
|---------------------|-----------------------|
| • Daniel Almeida | • Rick A Larson |
| • Kunal Bansal | • Gurunarayana Ravi |
| • Alireza Behfar | • Saad Saleem |
| • Antoine BOU ABOUD | • Khaled Hassan Saleh |
| • Dhruv Hoysall | |

 **Sattheesh Kulankara**
Membership Subcommittee Chair



TC 8.5 Handbook

 **Adnan Ayub**
Handbook Subcommittee Chair





TC 8.5: Liquid to Refrigerant Heat Exchangers

Program Subcommittee Updates

Minoo Mehdizadeh

Program Subcommittee Updates



- Special sessions covering the latest on the COVID-19 pandemic
- 8 Tracks with 40 live and 90+ on-demand sessions, available for 18 months
- Seminars, Paper Session, Forum, Workshop, Round Tables
- Live sessions are scheduled between February 9th-11th
- Q&A sessions for Paper sessions are scheduled on February 12th
- Social Events
 - Virtual escape room
 - Virtual technical tour of the new ASHRAE headquarter building
 - Virtual tour of STACK infrastructure data center

Program Subcommittee Updates



TC 8.5 submitted the following seminar sessions for the Winter conference

- Main Sponsorship
 - Experimental study on the effect of enhanced tube characteristics on fouling behavior and fouling prediction model, ASHRAE RP-1677 ❌ Rejected
 - Advances in modeling of plate heat exchanger performance ❌ Rejected
- Co-sponsorship, TC 1.3
 - Performance of Alternative Low GWP A2L Refrigerants in Condensers ✔ Accepted
 - Feb 11, 2021, 3:00 PM – 4:20 PM EST

Program Subcommittee Updates

2021 Summer Conference, Phoenix, AZ, June 26-30, 2021

Tracks:

- Fundamentals and Applications
- HVAC&R Systems and Equipment
- Research Summit
- Professional Development
- Design, Control, and Operation of Critical Environments
- HVAC&R for Indoor Plants & Animals
- Future Proofing - Renewable, Regenerative, and Resilient
- Hot, Hot, Hot
- TBD (Mini Track)

Deadlines:

- January 13, 2021
Revised Conference Papers/Final
Technical Papers Due
- February 15, 2021
Extended Abstracts Due
- February 18, 2021
Papers Final Accept/Reject Notifications
- February 22, 2021
Program Submissions Due
- March 19, 2021
Extended Abstract Accept/Reject
Notifications
- April 2, 2021
Program Submissions Accept/Reject
Notifications

Program Subcommittee Updates

Future Programs

- **Vote on resubmitting following seminar sessions for the Summer conference**
 - **Seminar Session 1#**
Experimental study on the effect of enhanced tube characteristics on fouling behavior and fouling prediction model, ASHRAE RP-1677
 - **Seminar Session 2#**
Advances in modeling of plate heat exchanger performance
- **Discussion on ideas for additional programs for Summer 2021 or Winter 2022**

Program Subcommittee Updates

Appendix: Details of proposed seminar sessions for the Summer conference

Seminar Session #1

Session Title: Experimental study on the effect of enhanced tube characteristics on fouling behavior and fouling prediction model

Implementation of enhanced tubes in heat exchangers design has led to the improvement of the thermal efficiency of refrigeration, heating, and air conditioning systems. However, current available fouling prediction models are not accurate enough to predict the effect of tube enhancement and water quality on fouling progression inside the tube. This seminar will highlight the result of an experimental study conducted as part of ASHRAE RP-1677 on evaluating the effect of enhanced tube characteristics and water quality on the fouling behavior, and consequently, propose a model that can predict the fouling by considering the sticking probability and deposit bond strength inside different tube geometries.

Presenter #1 Dr. Chao Shen

Investigation on fouling of enhanced tubes used in a cooling tower water system based on a long-term test

In order to investigate the impact of water quality on fouling process of enhanced tubes, two continuous fouling tests on eight enhanced tubes (with different internal and external tube geometries) and one plain tube (with a plain inside surface and an enhanced outside surface) were carried out in duration of 98 days, using cooling water with medium and low fouling potential respectively at a water velocity of ~1.6 m/s. Compared with the medium fouling potential water, the introduction period of fouling on a plain tube in low fouling potential water test was much longer than enhanced tubes. Test results suggested that the influence of water quality on fouling development was much larger than geometry of heat transfer tubes when the water quality changed from low to medium fouling potential. For one heat transfer tube, the asymptotic fouling resistance was continuously increasing with the increase of fouling potential of water. In this study the length index (γ) determined by the geometry of enhanced tube was introduced to improve the accuracy of previous fouling model. Finally, an improved fouling prediction model considering the effect of water quality was developed, which had a maximum error of 22.94%.

Presenter #2 Dr. Chao Shen

Experimental study on the fouling prediction model, sticking probability and deposit bond strength of fouling in enhanced tubes

Sticking probability (P) and deposit bond strength (ξ) are two of the most important factors that determine the fouling process, but no calculation correlations for both P and ξ could be found in current models. Thus, the fouling process could not be described by specific formulas. This paper analyzed each parameter in the Kern-Seaton fouling model, and a correlation of dry matter concentration (C_b) was developed, depending on the water quality test. Test data suggested that the sticking probability (P) in such combined fouling ranged from 0.96445×10^{-3} to 6.20781×10^{-3} . The deposit bond strength (ξ) of fouling ranged from 0.99953×10^{-7} N-s/m² to 3.51186×10^{-7} N-s/m². Furthermore, the calculation correlations of P and ξ in types of $f([Re, N]_{s, \alpha, e/D_i})$ and $f(f, j)$ for two-dimensional enhanced tubes were developed, respectively, based on long-term fouling data. Results indicated that the sticking probability (P) was consistently decreasing in both the j -factor and frictional factor (f), but it was consistently increasing in the temperature of heat transfer surface (T). Both the sticking probability (P) and deposit bond strength (ξ) were more affected by frictional drag performance of the tubes than the heat transfer performance. The sticking probability (P) was negatively related to the specific geometric parameters ($N_s, \alpha, e/D_i$) of the tubes, but positively related to the Reynolds number, Re , which was completely opposite to the deposit bond strength (ξ). The parameters of e/D_i and α affected both the sticking probability (P) and the deposit bond strength (ξ) more than the starting number of N_s .

Program Subcommittee Updates

Seminar Session #2

Session Title: Advances in modeling of plate heat exchanger performance

Plate heat exchangers are extensively adopted in HVAC systems due to their smaller footprint, limited refrigerant charge, higher efficiency, and lower cost. This seminar will highlight the experimental and theoretical work carried out on the condensation and boiling of low GWP refrigerants inside a plate heat exchanger and will provide the heat transfer and fluid flow analysis by comparing the two conventional prediction approaches. Moreover, the effect of different parameters such as fouling, corrosion, and particle aggregation on the extended performance of a plate heat exchanger will be discussed. Lastly, a comprehensive performance correlation for plate heat exchangers will be presented.

Presenter #1 Dr. Kashif Nawaz

An overview of the long-term performance degradation of heat exchangers

Heat exchanger are important components of HVAC&R infrastructure. The overall system performance heavily depends on their performance. The current study presents a critical overview of various degradation phenomena including fouling, corrosion and particulate aggregation which can impact the thermal-hydraulic performance of heat exchangers over extended period of performance. The focus includes air to liquid, liquid to liquid and gas to gas devices. The study also includes cases where solid to fluids interaction is important.

Presenter #2 Dr. Simone Mancin

Low-GWP heat transfer and fluid flow in plate heat exchangers

Plate heat exchangers are currently one of the most important types of heat exchangers for refrigeration and air conditioning because they present high heat transfer capabilities while limiting the refrigerant charge inventory. This lecture presents the heat transfer and fluid flow experimental and theoretical work carried out at the laboratory of the University of Padova during both condensation and boiling of low-GWP refrigerants inside brazed plate heat exchangers. Moreover, the assessment of two different predicting approaches: traditional semi-empirical correlations and machine learning methods is discussed in order to accurately evaluate the two-phase heat transfer coefficient and pressure drop of the low-GWP inside brazed plate heat exchangers. Finally, guidelines for the performance assessment of the different new refrigerants are also presented.

Presenter #3 Dr. Tariq Saeed Khan

Development of generalized performance correlation for thermal-hydraulic performance of plate heat exchanger.

Plate heat exchangers have been extensively deployed in air conditioning and refrigeration applications. The operating conditions, fluid selection and the geometry of the heat exchanger establish the total pressure drop and capacity of the device. Over past several decades, multiple researchers have worked on the performance evaluation of plate heat exchangers. Most of these studies are case specific and the results can't be generalized. The current study presents a comprehensive effort to develop comprehensive performance correlations which can be used by industry with reasonable accuracy.

TC 8.5 Standards

TC 8.5 is responsible for the following Standards:

- ANSI/ASHRAE Standard 22-2018
Methods of Testing for Rating Liquid-Cooled Refrigerant Condensers
- ANSI/ASHRAE Standard 24-2019
Methods of Testing for Rating Evaporators Used for Cooling Liquids
- ANSI/ASHRAE Standard 181-2018
Methods of Testing for Rating Liquid to Liquid Heat Exchangers

Joe Huber
Standards Subcommittee Chair



TC 8.5 Standards

Standards 22 and 181 are due for re-affirmation, revision, or withdrawal.

Both Standards:

1. Normatively reference ASHRAE Guideline 2 (Engineering Analysis of Experimental Data)
 - A. Guideline 2 has been withdrawn, but is still for sale in the ASHRAE bookstore
 - B. Guidelines should not be referenced normatively, since they suggest practices and procedures, not mandate them
2. Have two other out-of-date references

Joe Huber
Standards Subcommittee Chair



TC 8.5 Standards

Item 1 requires revision, and cannot be fixed by ASHRAE Standards Revision Subcommittee (SRS); an SPC must be formed.

TC 8.5 can:

- Re-affirm the standard as-is
- Recommend that ASHRAE form Standards Project Committees (SPC)s to revise the Standards

Joe Huber
Standards Subcommittee Chair



Low Global Warming Potential Multidisciplinary Task Group



Sathesh Kulankara
MTG Representative



MTG.Low GWP Refrigerants - Programs

- Programs at virtual conference
 - No Program in 2021 Virtual Winter Conference
- Programs for future conferences
 - Seminar proposal based on MTG research projects for Phoenix approved



Sathesh Kulankara
MTG Representative



MTG.Low GWP Refrigerants – Codes and Standards

- RP- 1807 and RP-1808 research reports forwarded to ASHRAE SSPC 15 for consideration for inclusion in STD 15
- Focus on technical documentation to disseminate to state and local jurisdictions
- Slide deck for advocacy plan for code related issues
- Stakeholder list for code related issues

Satheesh Kulankara
MTG Representative



MTG.Low GWP Refrigerants - Research

- RP-1806 Flammable Refrigerants Post-Ignition Simulation and Risk Assessment Update
 - New work plan approved by PMS with some additional validation work and simulating results from other published research results
 - Revised work scope delayed by pandemic
 - Decision on further steps after completion of the currently approved work expected early 2021
- RP-1855 Determination of the Impact of Combustion Byproducts on the Safe Use of Flammable Fluorinated Refrigerants
 - Literature review project
 - PI reviewing PMS comments on draft report

Satheesh Kulankara
MTG Representative



MTG.Low GWP Refrigerants - Research

- WS-1884 The incorporation of odorants in refrigerants to improve leak detection – Phase II experimental study
 - Initial funding from US CPSC
 - Project initiated late 2020
 - ASHRAE to co-sponsor future phases (if any)



Satheesh Kulankara
MTG Representative



TC 8.5 Webmaster



Pedro Perez
Webmaster



TC 8.5 Research

Kashif Nawaz
Research Subcommittee Chair



Confirmation of TC 8.5 Continuation

From TC Manual of Procedures

1.5. Review

1.5.1. Once a year, preferably at, or prior to, each Annual meeting, the Committee Chair and Committee Membership shall evaluate their progress in accomplishing the purpose for which they were constituted and recommend one of the following actions to their Section Head:

- a) Continue as a TC, TG, MTG, or TRG
- b) Convert from a TG to a TC
- c) Convert from a TRG to a TG or TC
- d) Merge with a TC/TG/TRG and submit a revised scope for the merged committee
- e) Dissolve the TC, TG, MTG, or TRG.

Joe Huber
Committee Chair



TC 8.5 Chair Report



Joe Huber
Committee Chair



Concluding Remarks

- **New Business:**
 - Does TC 8.5 need a Basecamp site?
- **Schedule Next meeting:**
Monday, Jun 28 2021, 4:15 PM to 6:30 PM – Phoenix, AZ ???
- Adjourn



Joe Huber
Committee Chair





TAC

TC Chair - Vice Chair Breakfast

Virtual Winter 2021 Meeting

TC Reorg

- The TC ReOrg committee issued a final report.
- An implementation subcommittee of TAC, led by Larry Smith, is working to incorporate recommendations
 - So far, TAC has approved numerous TC mergers – 3.2 & 3.3, 8.10 & 8.12, 9.4 & 9.8, 7.3 & 7.8. TC's 10.1 and 10.3 have approved a merger as well.
 - Many more being considered
 - **Annual reaffirmation process being enforced**



George B Hightower Technical Achievement Award

- **ASHRAE GEORGE B. HIGHTOWER TECHNICAL ACHIEVEMENT AWARD NOMINATION FORM**
- **Six** nominations received for the 2020-2021 Award!!!! Thank you!
- In recognition of exceptional service in the area of technical leadership and technical contribution **in the past four years.**
- Eligibility Points: While this award is given on the basis of service **in the past four years** as described in the nominator's statement, nominees must have earned a minimum of 10 points for career service on the nominating TC/TG. Eligibility points are defined in the form.
- Next Due date – September 1



Interim Meetings – New Announcement Procedure

- TC's must meet twice per year and are encouraged to meet more frequently (quarterly or more) to keep work moving forward
- We will initiate a listing of any interim meetings on the Technical Committees webpage (<https://www.ashrae.org/technical-resources/technical-committees>), similar to the listing currently done for Standards
- TC interim meetings should be **posted** (by emailing the alias TCmeetings@ashrae.net) **two weeks before an online meeting** and **four weeks before a face-to-face meeting**. The person emailing should also include the meeting call-in info/ link for posting.



TAC Presentation Templates

- Available for TC members to use with local Chapter that TC members can use
- Help to explain what TCs do for the Society and how that work benefits members in your local ASHRAE Chapter.
- www.ashrae.org/tcs under the heading **General TC Information**
- The presentation material is now also available in both English and Spanish.



2019–2024 ASHRAE Strategic Plan

- Mission – To serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration and their allied fields.
- Vision – A healthy and sustainable built environment for all.
- Values – Excellence, Commitment, Integrity, Collaboration, Volunteerism, Diversity



2019–2024 ASHRAE Strategic Plan

Goals:

1. Position ASHRAE as an Essential Knowledge Resource for a Sustainable, High-Performance Built Environment
2. Maximize Member Value and Engagement
3. Optimize ASHRAE's Organizational Structure to Maximize Performance



2019–2024 ASHRAE Strategic Plan

Strategic Plan Areas and Initiatives:

Initiative Area: Built Environment of the Future

1. Resilient Buildings and Communities
 - TC 2.10 working to develop a work plan. Will seek help from various TCs.
2. Indoor Environmental Quality
 - EHC working to develop a work plan. Will seek help from various TCs.
3. Organizational Streamlining
 - TAC working to develop a work plan. Will work closely with TCs.
4. Improve Chapter Engagement, Capacity and Support



Technology Council MBOs- Overview

- Building on ETF Momentum
 - Develop a strategy of what to do with the Epidemic Taskforce once the pandemic subsides. Ensure that the momentum and reputation are preserved and that ASHRAE identifies and implements a monetization plan. FY Q3 (3/31/2021)
- Integrating Carbon as a Metric
 - Provide a recommendation to ExCom regarding if/how carbon as a metric can be used in the Society's technical content. FY Q4 (6/30/2021)
- MBO – Management By Objective



2021 Annual Conference - June 26–30, Phoenix

Track #	Track	Track Chair
1	Fundamentals and Applications	Sonya Pouncy sonyapouncy@gmail.com
2	HVAC&R Systems and Equipment	Rupesh Iyengar rupesh_iyengar@yahoo.com
3	Research Summit	Kristen Cetin cetinkri@msu.edu
4	Professional Development	Marites Calad mcasad@norman-wright.com
5	Design, Control, and Operation of Critical Environments	Raul Simonetti raul.simonetti@carel.com
6	HVAC&R for Indoor Plants and Animals	Ryan MacGillivray ryan.macgillivray@dwel.com
7	Future Proofing – Renewable, Regenerative, and Resilient	Andy Cochrane acochrane@industrialairinc.com
8	Hot, Hot, Hot	Nohad Boudani nohadb@inco.com.lb



2021 Annual Conference - Phoenix

Deadlines:

Monday January 4, 2021: Conference Paper Accept/Revise/Reject Notifications

Wednesday January 6, 2021: Website Opens for Seminar, Workshop, Forum, Debate, and Panel Proposals

Wednesday January 13, 2021: Revised Conference Papers/Final Technical Papers Due

Monday February 15, 2021: Extended Abstracts Due

Thursday February 18, 2021: Conference and Technical Paper Final Accept/Reject Notifications

Monday February 22, 2021: Program Submissions Due

Friday March 19, 2021: Extended Abstract Accept/Reject Notifications

Friday April 2, 2021: Program Submissions Accept/Reject Notifications



Upcoming Topical Conferences

Date	Conference	Location
March 8-10, 2021	2021 ASHRAE Virtual Design and Construction Conference	Virtual
August 15-18, 2021	Ventilation 2021: 13 th International Industrial Ventilation Conference for Contaminant Control	Toronto, Canada
September 13-15, 2021	Indoor Environmental Quality Performance Approaches: Transitioning from IAQ to IEQ	Athens, Greece

<https://www.ashrae.org/conferences/topical-conferences>



Key Coordination Items

Phoenix Conference Paper Reviews:

- First deadline quickly approaching
- Watch for communications with specific requests to review papers

Extended Abstracts for Research Summit:

- Consider submitting - allows for submission of in-progress research
- Cataloged with abstracting services like conference papers

Flexibility:

- Upcoming conference logistics remain uncertain
- Planning for multiple scenarios
- Your help is greatly appreciated



TAC

TC Chair - Vice Chair Breakfast

2021 Virtual Winter Meeting

Refrigeration Technology Committee
Comfort – Process – Cold-Chain

New REF-CPCC Subcommittee Structure

- New REF-CPCC Subcommittees:
 - In order to better collaborate with TCs & others 7 new subcommittees were created as follows:
 - Awards Subcommittee - Chair: Ayman Eltalouny
 - Cold-Chain Subcommittee – Chair: Dustin Lilya
 - HVAC Subcommittee – Chair: Walid Chakroun
 - Program Subcommittee – Chair: Steven Gill
 - Research Subcommittee – Chair: Kashif Nawaz
 - R in ASHRAE Subcommittee – Chair: Didier Coulomb
 - Ref. Tech Report Subcommittee – Chair: Martin Dieryckx
 - All subcommittee meetings have been held via web meetings and held between Society meetings in order to allow for easier participation.



Refrigeration Technology Committee for Comfort – Process – Cold-Chain – REF CPCC

It is our hope that these new subcommittees will **bring a greater focus on the R in ASHRAE issues and opportunities** and provide a new communication and collaboration vehicle between Society level TC members, Regions, and Chapters.

More information on each new REF-CPCC subcommittee, their scope, objectives, and upcoming meetings dates and times can be obtained from REF-CPCC staff liaison – Mike Vaughn via e-mail at MORTS@ashrae.net





TAC

TC Chair - Vice Chair Breakfast

2021 Virtual Winter Meeting

Research Advisory Panel

ASHRAE Research Strategic Plan Development

- Research Advisory Panel kick-off November 2019
- Update to coordinate with ASHRAE Strategic Plan
- 8 Meetings held
- Survey conducted and evaluated
- Survey had 700+ responses, ran mid January through mid February

RAP Membership	
Reinhard Radermacher (Chair)	Chris Wilkins (RAC VC)
Larry Markel (past RAP)	Pawel Wargocki (Intl)
Eckhard Groll	Kishor Khankari
Allen Chad Kirkwood	Dawen Lu
Chun-cheng Piao	Agami Reddy



Current Status

- Derived 6 Initiatives (Working Titles)
 - Resilience for buildings and communities
 - Understanding IEQ and Impact on Productivity, HVAC airborne pathogen transmission and control
 - Sustainably – Energy and Resources
 - Tools and Applications
 - HVAC Components including new refrigerants
 - Education and Outreach
- Drafting in Progress
- Final Committee Vote expected in February 2021



TAC

TC Chair - Vice Chair Breakfast

2021 Virtual Winter Meeting

Research Administration Committee

Research Budget

- Typically \$2.6M - \$2.7M per year
- Research Projects: 12-15 new projects per year typically
- Funds collected in a given SY become RAC budget in next SY
- Project/Grants include commitments for multiple years
- Available funding reduced due to cancelation of Meetings/Show and general reduced fundraising
- Funding is supporting ongoing commitments only, no new projects being awarded so far in 2020/21 Society year



RAC Plan Moving Forward

- RAC still accepting new project requests from TCs (RTAR and WS)
 - Suggest TCs/MTGs/Etc. continue to develop and put forth projects
- RAC will review and prioritize based on our normal process
- For now, "approved" project are not able to be released for bidding
- As with any RAC business, best TC strategy is for the Research Subcommittee Chairs to work closely with section research liaisons
- As always, quality over quantity; plan, prepare, collaborate with other TCs where appropriate (more now than ever)

