TC 08.05 RESEARCH REPORT – JAN 1012 / CHICAGO

The joint TC 1.3/8.5 Research Review Meeting was held on Sun 22 Jan, roughly 4:30pm-5:30pm, following the forum titled "Low GWP Refrigerants: Current Status & Future Path". The TC 8.5 Main Committee Meeting was held on Mon 23 Jan, 4:15pm-6:30pm, during the 2012 ASHRAE Winter Meeting in Chicago.

PROPOSED MTG – ALTERNATIVE LOWER GWP REFRIGERANTS

Omar Abdelazziz has taken the initiative to submit a proposal to MORTS/RAC for a Multi-Disciplinary Task Group to coordinate TC/TG/TRG technical activities to help transition the HVAC&R industry to sustainable lower Global Warming Potential (GWP) alternative refrigerants. RAC was to discuss this proposal at the Chicago meeting.

A forum titled "Low GWP Refrigerants: Current Status & Future Path" was organized and held during the first part of our usual research meeting, Sun 23 Jan, 3:00pm-4:00pm. The forum was heavily attended (note to the Program Committee?). The forum was moderated by Lorenzo Cremaschi and Omar Abdelazziz. Xudong Wang opened the forum by presenting an overview of the AHRI Low GWP Alternate Refrigerant Evaluation Program (AREP). Samuel Yana Motta then presented an overview of applications and areas for possible work. The forum was then opened to the attendees for questions and comments.

Several participants questioned why CO_2 and other natural refrigerants appear to be marginalized in the AHRI Low GWP AREP. It was noted that we need to be aware of ASHRAE's position on natural and synthetic refrigerants.

There are a number of parties that are very interested in pursuing sustainable facilities ("zero" ODP, GWP, emissions, etc.). These parties might have financial resources to direct toward development activities.

It was noted that IIR has started a working group to harmonize/standardize the definition(s) and calculation of Life Cycle Climate Performance (LCCP) and/or Total Equivalent Warming Index (TEWI). This could serve as a common basis for comparing and ranking alternatives.

It was also emphasized that a strong program is needed to determine the long-term stability and compatibility of the new refrigerants, as was learned in the previous transition to today's refrigerants. Xudong had noted earlier that initial work in this area under AHRTI Project 9004 is nearing completion.

ACTIVE PROJECTS

1316-RP: Experimental Evaluation of the Heat Transfer Impacts of Tube Pitch on a Highly Enhanced Surface Tube Bundle. *PI: Steve Eckels, Kansas State Univ. PMS: Petur Thors (chair), Ben Dingel, Satheesh Kulankara, Axel Kriegsmann. Status: active (start date: Jan-2006. original target completion date: Jul-2008. extension #1 granted Salt Lake City mtg, Jun08: Jul-2009. extension #2 granted Louisville mtg, Jun09: Jul-2010. extension #3 granted Albuquerque mtg, Jun10: Apr-2011. extension #3B granted Las Vegas mtg, Jan11: Jun-2011.)*

The final report was approved by the Committee *via* email ballot on 14-Oct-2011. The "Disposition of ASHRAE Research Form" was submitted to MORTS on 12-Dec-2011. 1316-RP is now completed and closed.

To date, one paper has been published out of this work:

> Gorgy, E. and Eckels, S., 2010, "Average Heat Transfer Coefficient for Pool Boiling of R-134a and R-123 on Smooth and Enhanced Tubes (RP-1316)", *HVAC&R Research*, vol 16, no 5, pp 657-676.

1345-RP: Waterside Fouling Performance of Brazed-Plate Type Condensers in Cooling Tower Applications. *PI: Lorenzo Cresmaschi, Oklahoma State Univ. PMS: Jim Bogart (chair), Art Fovargue, Axel Kriegsmann, Ken Schultz, Xudong Wang (ARTI cofounding). Status: active (start date: May-2008. original target completion date: Oct-2010. extension #1 granted Albuquerque mtg, Jun10: Oct-2011.)*

A draft final report was submitted by the PI to MORTS and the PMS on 07-Nov-2011. The PMS has suggested several small revisions and the PI has responded. At the time of the Chicago meeting, the PMS was in consensus to recommend the final report for approval, but had not yet formally compiled that approval. This will be done ASAP post-meeting and an email ballot will be conducted to request approval of the final report.

[Post-meeting: The PMS recommendation to approve the final report was formalized. An email ballot with the motion to approve the final report dated 12-Jan-2012 was sent out on 31-Jan-2012. The vote tally was 13 yes, 0 no, and 1 abstain (PI). The vote count and final report were submitted to MORTS on 07-Feb-2012. Disposition of ASHRAE Research form will be submitted shortly.]

To date, the following papers have been published out of this work:

> Cremaschi, L., Barve, A., Wu, X., 2012, "Effect of Condensation Temperature and Water Quality on Fouling of Brazed-Plate Heat Exchangers", *ASHRAE Transactions*, vol 118 (Part 1).
>
> Cremaschi, L., Spitler, J., Lim, E., and Ramesh, A., 2011, "Waterside Fouling Performance in Brazed-Plate Type Condensers for Cooling Tower Applications", *HVAC&R Research*, vol 17, no 2, pp 198–217.

FUTURE PROJECTS

The completion of the above projects leaves TC 8.5 with no on-going research projects. (TC 1.3 is in a similar position. 1556-TRP went out for bids in Fall 2011. One bid was received. The PES evaluation concluded that the proposal did not fully meet the intent and scope of the work statement. The next step is for MORTS and the bidder to negotiate revisions to the proposal to better meet the WS requirements.]

Several topics were proposed during discussion at the Sun research meeting. Two relevant to TC 8.5 were chosen as best candidates for moving forward quickly.

Jim Bogart has drafted an RTAR entitled "Waterside Fouling Performance of Coiled-Tube Type Condensers in Cooling Tower Applications". We ran into a hurdle when trying to come up with some measure or indicator of the importance of fouling to the performance of equipment using coiled coaxial heat exchangers. It was suggested that reference to a wider range of applications, eg, geothermal systems and heat pump water heaters, be included in the RTAR, however, the scope of work would still be limited to water qualities used in

1345-RP. Ken Schultz volunteered to push this forward. Evraam Gorgy and Andreas Knöpfler volunteered to assist.

There continues to be interest in revisiting fouling in enhanced chiller tubes. In addition to making another attempt to collect a full range of fouling data, this project would also look at how the fouling resistance is modeled/described for use in design and performance rating. A URP (1660-URP) was submitted on this topic. However, RAC recommended that because of the TC's interest, the work would be better pursued through the competitive bidding process. Our liaison noted that, with the URP author's permission (granted), we could use the URP as a starting point for writing a work statement. Ben Dingel volunteered to lead this effort with assistance from Satyam Bendapudi, Justin Kaufmann, Satheesh Kulankara, Justin Piggush, and Andreas Knöpfler. TC 8.2 would like to cosponsor this work. TC 3.6 might also be interested to cosponsor.

Other topics include heat transfer performance of low GWP refrigerants (will wait for results from AHRI AREP to help narrow number of candidate refrigerants, coordinate with MTG as appropriate), CO_2 gas-coolers in hot water heat pumps, and propane in brazed plate heat exchangers.

The next RTAR/WS submission deadlines are 15-Feb and 15-May-2012. If a WS receives approval by RAC during the Summer Meeting in San Antonio, it could go out for bid in Fall 2012. Make sure to involve our research liaison, David Yashar (rl8@ashrae.net, david.yashar@nist.gov) in the process.

MISC NOTES

RAC received an unusually high number (5) of URP's in the last period. The URP route is considered acceptable only in exceptional cases; RAC will clarify what may be considered as exceptional.

2011-2012 began with 71 research projects. 16 projects were completed and another 12 projects are near completion. 10 TRP's were released for bids in Fall 2011. 5 WS's are (nearly) ready for bid in Spring 2012. If all these projects move forward, there would still only be 58 active projects during 2012-2013. On top of this, there are only 37 upcoming topics in the RTAR and WS state. Funding levels remain good. Therefore, there is good likelihood of WS's going out for bid with little delay.

Note that there is a new RTAR coversheet. This can be obtained from the Research Handbook, http://ashrae.org/File%20Library/docLib/Research/RAC-Research-Manual-A11-v1.pdf, as can formats and instructions for RTAR's and WS's. Files in Word format can be found on ASHRAE's Research webpage, http://www.ashrae.org/standards-research--technology/research

Additional information from the Research Subcommittee Chairs' Breakfast is attached.

Slides from Research Breakfast begin on next page -->

Research Subcommittee Chairs' Breakfast

Winter Meeting 2012 – Chicago
Jaap Hogeling, Vice Chair, RAC

Monday, January 23, 2012

Agenda

- 1. Service to **ASHRAE Research Award** presentation to **Dru Crawley**
- GPIC-HUB – a new opportunity for TC's to get research sponsored
- Awards
- Current projects and and TRP Status
- Why are my RTARs and WSs being returned?
- Meet with Research Liaisons

Service to ASHRAE Research This year's awardee:

Drury B. Crawley, PhD, F ASHRAE

- Nominated by TC 4.2 – Climatic Information
- Dr. Dru Crawley joined ASHRAE in 1979. active in 16 PES for research in TCs 4.2 and 4.7 and the Energy Targets Implementation MTG.
- Chair of 6 PES, participated in 14 PMS (4 times as Chair), Research Chair for TC 4.2 for 16 years
- Research Chair for TC 4.7 for 2 years.
- A 4-year tour on RAC, as RL to Section 9

GPICHUB

Greater Philadelphia Innovation Cluster (GPIC)
for Energy-Efficient Buildings

A U.S. DOE Energy Innovation Hub
The Navy Yard, Philadelphia
http://gpichub.org

The GPIC Great Philadelphia Innovation Cluster

The U.S. Department of Energy's HUB for Energy Efficient Buildings
Strategic focus of the GPIC is on full-spectrum retrofit of average size commercial, multi-unit residential, and mixed (commercial and multi-unit residential) buildings.

The location for the GPIC the 1,200 acre Navy Yard in Philadelphia which includes 270 existing and new buildings that can be utilized as test beds, and an independent unregulated micro-grid.

The goals of the GPIC are to transform the delivery process of the building retrofit industry in the Greater Philadelphia region from a serial fragmentation to an integrated product design and delivery method that optimizes whole building system efficiency and performance. This requires:

1. Improving system design tools
2. Integrated building component and subsystem technologies
3. Supportive public policies and market and behavioral incentives
4. Customer value propositions focused on systems performance benefits
5. Business models that quantify profits realized by the integrated systems approach
6. A skilled workforce to insure optimal performance of integrated subsystems

GPIC Opportunity Research Fund (ORF)

- About $10 million over five years allocated for ORF
- Grants of between $100,000 and $250,000 to support research, development, demonstration, and deployment of technologies, policies, business models, and training programs that advance GPIC goals.

GPIC Opportunity Research Fund

- Primary proposal evaluation criteria: Degree to which the ORF funding is critical in advancing an opportunity to wide scale deployment
- Teams must include at least one of the 24 GPIC member organizations and must also include at least one non-member organization
- Seven projects awarded in 2011 totaling $1.3 million of DOE funding

GPIC Opportunity Research Fund 2012

- Two ORF RPS will be issued
- Spring of 2012
- Summer of 2012
- **Michael Vaughn will be notified when each RFP issues and will inform TC Research Chairs**

See www.gpichub.org or meet Rich Sweetser who is the GPIC consultant in RAC

GRANTS-IN-AID

- A letter announcing the availability of ASHRAE Grants-In-Aid for Graduate students was sent to over three hundred colleges in October 2011.
- 65 candidates applied for a grant and will be evaluated by the Research Planning Subcommittee at the winter meeting. (last year we had 66 applicants)

- 22 awards expected

NEW INVESTIGATOR AWARD

- 5 new researchers have been nominated for the award.
- The Research Planning Subcommittee will review the applications at this Winter Meeting for the Society year 2011-2012 award.

Current projects

- The 2011-2012 fiscal year began with 71 projects under contract. 13 new projects awarded for the year so far include: 1410-RP, 1413-RP, 1458-RP, 1495-RP, 1499-RP, 1504-RP, 1550-RP, 1557-RP, 1564-RP, 1584-RP, 1592-RP, 1604-RP, and 1606-RP.
- 16 projects were completed. The completed projects are as follows: 1235-RP, 1316-RP, 1320-RP, 1332-RP, 1333-RP, 1335-RP, 1339-RP, 1365-RP, 1387-RP, 1388-RP, 1390-RP, 1418-RP, 1444-RP, 1466-RP, 1472-RP and 1486-RP.
- Of the71 active projects under contract 12 projects (1180-RP, 1322-RP, 1339-RP, 1344-RP, 1345-RP, 1356-RP, 1416-RP, 1431-RP, 1448-RP, 1476-RP, 1487-RP, and 1522-RP) are currently being evaluated to determine if they can be closed

Research Funding Status

- TENTATIVE RESEARCH PROJECTS

10 TRPs were released for bid in fall 2011.

- WORK STATEMENTS

5 approved "on hold" or "pending" ready for bid or rebid in spring 2012 provided sufficient funding.

UNSOLICITED RESEARCH PROPOSALS

5 URP's will be discussed for funding by the reviewing TC/TG/SSPCs and will be considered by RAC and Tech. Council in Chicago if recommended for funding by a TC/TG/SSPC5.

- **RAC received an unusual number (5) of URP's**
- **Some PI's and TC's may consider this as shortcut**
- **However this URP route is considered only acceptable in exceptional cases**
- **RAC will clarify in more detail what may be considered as exceptional.**

23-01-2012 13

RESEARCH IMPLEMENTATION PLAN

- The Society Research Implementation Plan currently consists of 53 research topics in various stages of development prior to contract award (23 RTARs, 14 WSs, and 16 TRPs).
- Last year at this time we had 64 topics.

6 RTAR's submitted prior to this meeting.

23-01-2012 14

TC's are encouraged to produce more projects

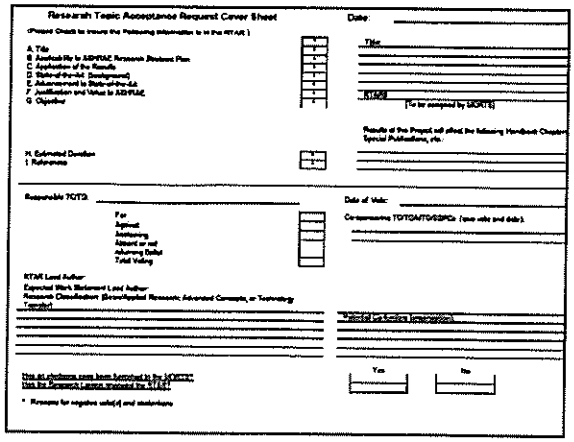
- the current number of RTARS (6) and WS (2) for RAC to evaluate is quite low which may cause a shortage of promising research projects in the near future!
- It takes between 1-2 years before a WS (Work Statement) is accepted and a TRP (Tentative Research Proposal) is ready for bidding.
- If we don't receive enough proposals during 2012/13 we will run out of projects.

23-01-2012 15

New RTAR coversheet

- Be aware to use this new coversheet
- Improved layout and easy to fill in fields in the word template
- -the questions :
  - Has an electronic copy been furnished to the MORTS?
  - Has the Research Liaison reviewed the RTAR?
- helping to remind that it is beneficial to consult your RL before sending the RTAR.

23-01-2012 16


Research Topic Acceptance Request Cover Sheet

Date:

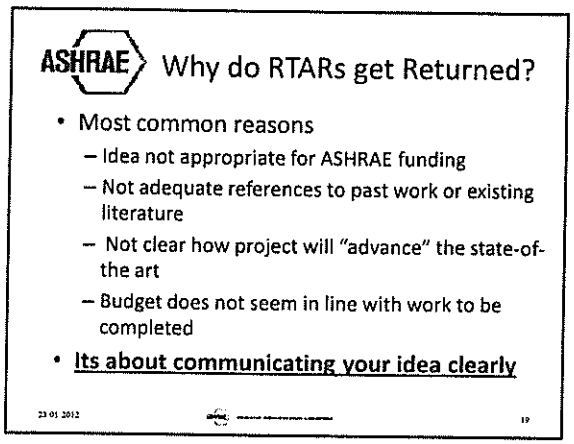
Title:

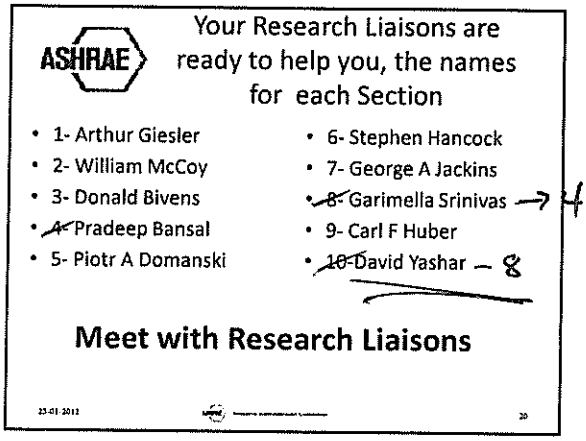
Use Your Liaison

- Your Liaison should read your RTARs and WSs before you submit them.
  - But give him more than a couple days before the deadline
- Your Liaison has the Answers and can help you interpret RAC comments and Manual
- Your Liaison is your champion!
  - He can advocate for you, if he is involved

23-01-2012 18

Budget looks good. Money available.





Next deadline: 15-Feb
for review at Spring meeting.

Next deadline: 15-May
for review at Summer meeting.

URP-1660

Tube Fouling — interest to cosponsor by TC 8.2.
check with TC 3.6 Water-Treatment