

Minutes
TC 2.3 - Gaseous Contaminants/Removal Equipment
Research Subcommittee Meeting
Virtual, Tuesday January 19th 2:00-4:00pm EST

Access Information:

Link for Attendees: <https://ashrae-org.zoom.us/j/91925818365?pwd=eG1YN2hmTzFPNldpNTBqcmRvTjhZQT09>

- 1 Meeting call to order at 2:02
- 2 Introductions and Recording Attendees
Enter Name, affiliation and email in Chat
- 3 Review of Minutes from Summer Virtual Meeting- no comments or corrections, vote to approve (Gemma)
- 4 Chair comments- Chair breakfast in Feb, last time told that if AHR was not held, it would significantly reduce funding for research projects. Even though it may reduce funding, we should still be moving forward- RTARs, work statements, etc. so when funding comes back, we will be ready.
Chair's breakfast (from Sanjeev) - only going to support ongoing commitments, no new projects for 2020 and 2021, RAC will be accepting new projects, RTAR, work statements- nothing going out for bidding. Continue what you are doing, but don't expect any funding until a "normal" ASHRAE/ AHR.
- 5 RAC report (Liaison TC2.3- Bill Hutzel)- Congrats- 2.3 and 2.4 by far the most active in submitting RTAR and work statements. RAC met last week, the RTAR and work statements submitted in Dec were reviewed. Told in the RAC meeting that they anticipate sending out some solicitations for 2021 (time TBD)- continuing current projects, expect to fund some solicitations later in 2021- there is a pause but not a complete stop. The research subcommittee meeting isn't until Feb. Next window for RTAR or work statement- March 15th deadline. To our advantage to work on it now and co-sponsorship strengthens the case. Shown as a sign of strength, closer scrutiny. Another good strategy if due March 15, there is a week or so prior where Bill can see the comments prior to meeting- if he can have a meeting with the authors prior to RAC meeting where they can discuss and get information.

Paula- reminder that Bill needs to see the RTARs prior to sending to RAC. Cannot send directly to ASHRAE- committee needs to vote on it and Bill needs to see it. There must be a vote from the technical committee (on the cover of the RTAR)- recently there was one sent directly to ASHRAE without TC 2.3 knowing about it (even though listed as a sponsor).
- 6 Active Projects- all active projects had meetings yesterday- brief overview in this meeting
 - a. **1720-RP Validation of gas-phase air-cleaner performance test method (Standard 145.2) by laboratory testing of commercially available filtration devices** – PMS: Gemma Kerr, Paula Levasseur, Chris Muller, Nick Agopian, Marilyn Listvan. PI: Kathleen Owen.
Gemma- This project has been impacted significantly by COVID- no cost extension for August 2021 and should be on track to finish by this time.
Kathleen- Looking to do repeat testing with ozone and toluene, trying to get 5-6 labs, ozone from

5 labs- data inside each lab good repeatability, across labs more variability but not terrible. For all tests the data looks rational, so far so good. Some of the QA instructions in the standard are not as obvious to the labs- may need some rewriting. Have toluene data from 1 lab, one additional lab will be able to do testing, other labs have ability, but may not be able to get time to do testing. Will start doing the statistics and filling in the final report- current data is workable.

- b. **1579-RP Testing and Evaluation of Ozone Filters for Improving IAQ**— PMS: Sanjeev Hingorani, Kevin Kwong, Matt Middlebrooks, Nick Agopian, Thad Ptak, Hoy Banohan (EHC). PI - Atila Novoselac; Jeff Siegel, Consultant.

Evaluation of removing ozone using filters- 2 hours presentation session, the final presentation from PI before providing final report. Will have presentation and write up in ASHRAE journal. Mengjia- have finished most of the project- identify filters on the market- activated carbon, UV-PCO. Second task- development of test protocol, found that the initial test was too short, proposed a 22 hr prolonged test for ozone removal. Investigate the impact of environmental conditions- Temp and RH%

William Lull- comments RE economic analysis viability and temp not reflecting real world HVAC (also deep discussion during PM meeting)

- c. **1780-RP, Test Method to Evaluate Cross-contamination of Gaseous Contaminant within Total Energy Recovery Devices**; Responsible Committee: TC 9.10 (Laboratory Systems); Co-Sponsors: TC 2.3. Nick Agopian on PMS. Awarded to University of Saskatchewan.

Nick- Running into COVID issues- they've had labor issues related to PhDs visas that were either delayed or canceled. Able to secure some of the wheels, happy with the protocol established. Haven't been able to get the project off the ground thus far, they have requested a long extension and has already been approved. They have identified a PhD and Masters student to do the work. Need to identify the wheels they need to do the study. Confident they can complete by the end of the extension requested.

- d. **1838-RP Inclusion of Electronic Air Cleaners** – PMS: Kevin Kwong, Jeff Roseberry, Tony Abate, Nick Agopian, Ashish Mathur, Paula Levasseur. PI: Dean Tompkins; co-PI Kathleen Owen. Start Date: Nov 2019.

Kevin- study the inclusion of electronic air cleaners into 145.2 standard reviewed a draft of the edited standard in meeting. This doc has also been shared with the 145.2 committee. Expecting the PMS to review the final report by mid May and by June expect the manuscript to be submitted to ASHRAE.

Kathleen- the big take away- revisions to PMS and released to the 145.2 committee.

The forward needs to be revised. QA checks, sampling for by projects, addition of ozone measurements, pull samples. Reviewed a lot of literature on electronic air cleaners, to determine what by products to measure at measurable concentrations. Same basic initial efficiency test with by product testing and then branch to adsorbent test for capacity vs. running for removal at longer periods of time.

7 Work statements and RTARs – Updates

- a. ~~**1867-RTAR: Development and validation of a model for assessing the corrosion risk of Datacom equipment under different pollution and thermal environmental conditions.**~~ TC 9.9 Will be resubmitted from TC 9.9 (counter to what was previously told) from Chris Muller- will get copy of Roger's presentation- the use of free cooling, assess the risk of using free cooling in marine environments as well as what level of filtration would be required if the corrosion rate is high. Chris is the representation/ liaison for TC 2.3

Paulo- wanted to submit as work statement, what happened TC 2.4 submitted as an RTAR- RAC had rejected, so decided to cancel as an RTAR and RAC received a work statement (different from the RTAR). The basic idea was 1. Study how corrosion in marine environment 2. What kind of particle filtration would be more suitable? For the first part it is hard to believe that corrosion that has not been studied enough- RAC maybe have the big tech giants study this corrosion. On the other side it is ASHRAE business to have good energy efficiency for these server farms.

- b. **1869-RTAR:** Evaluation of Indoor Air Contaminants with respect to Development of a Revised Indoor Air Quality Procedure (IAQP) Design Compound and Design Target Lists for Standard 62.1. Champion: Gemma Kerr. WG: James Dennison, Dean Tompkins, Marwa Zaatari, Hoy Bohanon, Wayne Thomann.
Jim has been working on this for awhile, has sent something at the end of last week to Gemma. Gemma will put it on her to do list, shooting for March 15 submission.
- c. **1846-RTAR:** Real Time Small sensors: Brian K., Fuoad Parvin, Thad Ptak, Jeff Roseberry, Sanjeev H., Jensen Zhang, Jordan Clark. No Update – waiting on the 2.4 sensor study (has been completed). Sanjeev will reach out (will be after March deadline)
- d. **1858-RTAR:** sVOCs including how SVOC emissions change with temperature - Sanjeev Hingorani, Kevin Kwong, Brandon Boor, Brent Stephens, Vivek Gaur, Chang-Seo Lee (updated) - RTAR as approved. Due to COVID it came back with comments. Doesn't talk about air mixing, budget is too high. Shooting for March 15 deadline. One comment to get TC 4.3 involved or a member.
The cover letter will say if it was rejected or conditionally approved. If it says if you only have to get changes approved by liaison. "return with comments" means you have to resubmit.
- e. **1895-RTAR** Effect of particles on loading on gas filters, with possible interest in looking at other combinations of technologies in the same air cleaner (Matt, Brian, Paula, VJ). TC 2.4 and GPC 35 co-sponsored.
Matt- right now we are trying to regather the group and get it in the work statement form. Got conditionally approved. Had a meeting last week just to catch up, Matt will send something out to the group once have things transferred over to the work statement. Were going to target the March 15 deadline.

8 Proposed RTARS and other work:

- a. Bipolar Ionization/Reactive Air Cleaner performance chamber test method for VOC etc. removal and testing a variety of commercially available ionization devices. Tony Abate champion, Scott Sherwood, Jensen, Dean Tompkins, Charlie Waddell, Chang-Seo, Marilyn Listvan, Ashish. Hold until we hear results of ISO/IEC.
Tony- it is kind of nowhere. A number of things have happened since it was first introduced. In favor of not pursuing- dropping (Marilyn and Chang-Seo agree)
This has several people have decided if they are not interested, if anyone would like to take it over and champion they can take over.
Kathleen- a good and interesting topic, the question is, is it an RTAR or a new group to write a standard
Chris Muller- if any of the companies have chamber tests that they are using, if they could provide the test method what they are using as a starting point.
AHAM is already working on developing a chamber test, 185 also working on a chamber test method, also idea e

Ashishi Mathur- 185.3 for a chamber test, with focus on microorganisms, no duct, just in room devices in a chamber

- b. The effects of filtration on health. Dean Tompkins, Nick Agopian, Lexuan Zhong, Caitlin with EHC interest. Keep on the list Nick Agopian.
Kathleen and Sangeev could help fill in forms, Marilyn also willing to join for brain storming
Paula- someone from 2.4 should be involved (Marilyn and Kathleen are on 2.4)
Brian- has anyone contacted EHC on this? Kathleen doesn't remember-
Who is on EHC? Charlene and potentially Marwa. Max Sherman- focus on particles.
Caitlin will take on champion/ organize a meeting
- c. Acceptable VOC types and concentrations for inclusion in multi contaminant test gases - **on hold**. Ashish to champion, Kathleen, Gemma, and Paula. (Orlando) **Interest remains**.
Maybe some learning from 1838- see what are the gaps that need to be addressed
Cheng-Seo Lee also interested, add
- d. Venting for 3D Printers: needs champion (Paula, Gemma, Marwa, Dan, Joel Foster (2?.9), Wayne Tomann (EHC), Marilyn, Matthew Stiegel, and Courtney Stanion with Brent talking to 2.4). **Needs champion**. Leave on the list, without a champion it is not going to move
Brian- are we looking at the materials coming off the 3D printers VS the venting
Gemma- There is a test method developed from UL (published)- for determining what is coming off- would need to team up with whatever committee deals with exhaust/ ventilation systems
Brian- not the ventilation but how it is applied to the 3D printer
Kathleen- there may be several names on the list that are from ventilation group
Paula will reach out to 5.8- ventilation group- so see who is interested in working on this
- e. Combination duct and chamber test. Jeff Siegal suggested. Matt, Gemma, Christine and Kathleen, Sanjeev, ~~Paula~~, Atila N, Peter McKinney, KJ, Kevin.
Matt- Had a large brainstorming meeting back in the fall- lost computer, put some thoughts together based on the comments and discussion and put into RTAR. Went back to that larger group and looking for some participants to help with working on the RTAR.
Matt shared draft of RTAR
Brian- how far down in particle size included? Matt- ultrafine particles included in by products
Tony, Cheng-Seo, Gemma, Sanjeev all confirmed to help- Matt also has several others to help
Matt- 2.9 or 2.4 co-sponsorship due to the focus on the biological
- f. RTAR on 62.2 unvented combustion devices (Nick brought up). They are writing RTAR on this for huge project (millions). We need to be in it. Needs a chemist.
Nick- very big project, funded by ASHRAE and special interest groups. They haven't gotten very far with it due to it being a sensitive issue. 62.2 hasn't met yet- nothing new
- g. Transformation of indoor pollutant due to devices applied for COVID – are newly improved systems (adding UV, other air cleaners, hand sanitizers, ozone, cleansers) changing the IAQ
WG: Chang-Seo, Paula, Marilyn
Chang-Seo- too ambitious? Reduce down to what are the emissions from the hand sanitizers and cleaners used indoors now. Maybe later tackle the transformation aspects?
Regular buildings are not like hospitals (hand sanitizers, cleaners, etc.)
Marilyn- different places will have large quantities of hand sanitizers, some spraying , also a large number of products with different
Brian- are part of them going into the air as aerosols, breathing in, is it harmful?
Ashish- can provide info in what is used in hospitals- there is a EPA standard, no aware of what the testing is

Organize a meeting in March/ April timeframe
Add Kathleen to topic

- h. Gases to dimers, where is the dividing line between particles and gases, nucleation. And how to remove them? Brian's idea, Gemma, Chang-Seo, Marilyn
Brian- started a literature search for the formation of dimers- groundwork for the formation of aerosols. A lot of information for outdoors, but not a lot for indoors. Can send out the information that was found and discuss if they want to have a meeting.
- i. New Ideas:

William Lull Comments:

1. LIFE OF GAS PHASE FILTRATION. While the RP1578 research and presentation was quite interesting, the TC is still lacking meaningful information on the performance over typical service life. (You cannot do an economic comparison with 22 hours - you need 22 weeks.)

The TC should consider a new field study RP with the following features:

- a. Over 18+ months, continuously monitor the inlet and outlet conditions for existing gas-phase filtration that has been operating for more than 3 years. The GPAF maintenance should be normalized and done by the same personnel.
- b. Choose one or more buildings with multiple types of filtration consistent with RP1578 located in the same outside air contamination levels, and consistent or minimal inside contaminant loads.

Typical buildings would be found in university settings. One example is the Harvard Depository in Southboro, MA.

2. OPERATING CONDITIONS FOR RESEARCH AND STANDARDS. As per my comments, I am very concerned that the RP1578 work was at operating temperatures (77-95°F) that are rarely found in AHU applications for general building applications. The research in fact shows that the GPAF may work better at higher temperatures, as typical chemical chemistry would suggest ($PV=n/RT$). While these temperatures may suit the needs of manufacturers, it reduces the applicability to typical building applications. As I have done before, I may find the need to ward off users from using RP1578.

The solution to this is to have a minimum number of people on each project subcommittee that are not affiliated with manufacturers but are very familiar with field applications.

- 9 AHAM Presentation on Chamber test with Randy Cooper VP of technical standards at AHAM and head of the project at AHAM.

AC-1 the oldest standard (1983) new version came out at the end of 2020- increased CADR values for smoke and dust and creation of PM 2.5 CADR measurement based on the dust particle and the smoke particle. (clean air delivery rate)

New test method for portable air cleaner- similar to the smoke dust and pollen test method. Will become AHAM AC-4. Looking at testing more than one chemical at a time. Formaldehyde, D-limonene, toluene, N-heptane, and ammonia.

Currently looking at c-CADR and a determination if bi-products are products. AHAM will start to refine the DRAFT test method to get read to ballot it among members.

Hope to have refinement complete by July 1, with ANSI process start in Q3

Chris Muller- is this intended to be a national standard vs internationally? Would be used internationally as

well. Right now AHAM is further ahead of IEC, not out of alignment (will be essentially an earlier version). Working with Korea and China so they will be similar.

Gemma- Can see that the five chemicals were chosen- commonly found in the indoor environment (Gemma didn't think it would have been a good idea to put all 5 in a test at the same time).

Won't be doing all five at the same time, but at least a couple at the same time to be able to reduce the number of tests.

Bill Lull- toluene the most commonly

KJ Choy- any ozone testing?

Randy- this test was a test method agnostic for the type of air device- have not seen a device that is ozone related.

Microbiological reduction- AHAM AC-5 Currently looking at m-CADR, but may also look at a time to 4 log reduction for a fixed chamber size. Various microbes listed in the method- gram positive bacteria, gram negative bacteria, spore forming bacteria, virus (enveloped or un-enveloped bacteriophage), mold spores FDA put out guidance document- to make any claim- specific to air purifiers, must have a 4 log reduction (Randy can provide the link to the document).

Brian- looking at the removal from the space, are you looking at what happens to in on the filter?

Randy- looking at a test method from Japan, are looking at this.

Will be open to comments

Comparing manufacture A to manufacture B, some companies want to be able to get the FDA endorsement (4 log reduce) in addition to the m-CADR.

Validation and review of the method is not as far along, refinement by April 1, start ANSI in Q2 or Q3

Will share the presentation and provide contact information.

<https://www.fda.gov/media/136533/download> is the FDA link

10 Adjourn at 3:56

Section 2 Research Chair meeting occurred 2/8/21 (after 2.3 research meeting). Next deadline for submission to RAC is March 15th with the next RAC meeting ~April. RAC will continue to review submissions and collect new work statements. Won't know the budget until the board meets in July. Can't put any projects out for bid but will put work statements out in the order they are received by RAC.