

DRAFT Minutes ASHRAE MEETING – Dallas**TC 2.3 - Gaseous Air Contaminants/Removal Equipment
Main TC Meeting**

Tuesday – June 29, 2013
 13:00 - 15:30 (1:00 – 3:30 PM)
 San Antonio Ballroom A (CC3)

The meeting attendee list is as follows:

Last Name	Name	Member Status	Position	Present
Total Voting Members = out of 14 in attendance				
Bayer	Dr. Charlene W. Bayer, PhD	V	Secretary	P
Flom	Mr. Michael C. Flom	V	Member	-
Grzywacz	Ms. Cecily M. Grzywacz	V-NQ	Member	P
Hafendorfer	Mr. Brian J. Hafendorfer	V	Member	P
Kerr	Dr. Caroline M. Kerr, PhD	V	Handbook Chair	P
Lau	Dr. Josephine Lau, PhD	V	Member	P
Lee	Dr. Chang-Seo Lee, PhD	V	Member	P
Lull	Mr. William P. Lull	V	Member	P
Middlebrooks	Mr. Matt Middlebrooks	V	Chair	P
Owen	Ms. Kathleen Owen	V	Research Chair	P
Schaaf	Mr. David A Schaaf, Jr	V	Program Co-Chair	P
Stanley	Mr. W. Brad M. Stanley	V	Vice Chair	P
Tronville	Dr. Paolo M. Tronville, PhD	V-NQ	Standards Chair	P
Zhang	Dr. Jianshun S. Zhang, PhD	V	Member	-
Total Non Voting Members = (1 provisional)				
Agopian	Mr. Nick Agopian	NV		-
Baker	Mr. Wane Baker	NV		-
Burroughs	Mr. H.E. Burroughs	NV	ALI Coordinator	P
Britt	Mr. Monroe A. Britt	None		P
Campion	Dr. Christopher L. Campion, PhD	NV	Member	P
Choi	Dr. Kyung-Ju Choi, PhD	NV	Program Co-Chair	P
Krafthefer	Mr. Brian Krafthefer	NV	Provisional Member	P
Listvan	Dr. Marilyn A. Listvan, PhD	NV	Publications Chair	P
Mathur	Mr. Ashish Mathur	NV	Member	P
Muller	Mr. Chris Muller	NV		P
Roseberry	Mr. Jeffrey Roseberry	NV	Webmaster	P
Sherwood	Mr. Scott Sherwood	NV		P
Total Visitors =				

Last Name	Name	Member Status	Position	Present
Alfiler	Mr. Rupert Alfiler	None		P
Chesson	Mr. Kam Chesson	None		P
Crosby	Mr. Geoff Crosby	None		P
Girard	Ms. Jean Girard	None		P
Haas	Mr. Daniel Haas	None	-	P
Hingorani	Mr. SanJeev Hingorani	None		P
Lamping	Mr. Jerry Lamping	None		P
Largent	Mr. Don Largent	None		P
Leusasseur	Ms. Paula J. Leusasseur	None	-	P
Mayer	Mr. Florian Mayer	None	-	P
McKinney	Mr. Peter McKinney	None		P
Nyoto Setiadi	Ms. Melvina Nyoto Setiadi			P

Summary Motions

#	Motion	Vote
1	Cecily Grzywacz moved to accept the San Antonio minutes. Brad Stanley seconded.	PASSED: CNV 10-0-0 Chair not voting
2	Bill Lull moved to accept the website layout. Cecily Grzywacz seconded.	PASSED: 10 CNV 10-0-0 Chair not voting
3	Brad Stanley moved to nominate Chris as our primary and Brian Hafendorfer as the secondary to MTG-EEC. Cecily Grzywacz seconded.	PASSED: CNV 10-0-1 Chair not voting
4	Cecily Grzywacz moved that TC2.3 co-support that the GPC be formed. Gemma Kerr seconded.	PASSED: CNV 11-0-0 Chair not voting
5	Cecily Grzywacz moved for adjournment. Marilyn Listvan seconded.	PASSED: CNV 11-0-0 Chair not voting

Summary Action Items

#	Action Item	Owner
1	Mailing to Marilyn Listvan copies of the ASHRAE IAQ Proceedings from 1988 and 1998 for Marilyn Listvan to copy and return	Charlene Bayer
2	Copies of all minutes, including the older ones need to be submitted to	All

#	Action Item	Owner
	the secretary in doc format and not pdf for posting on the website.	subcommittee chairs

Meeting Minutes Begin

1. Call to order. Introduction of guests and members. Identify & Reporting from ASHRAE liaisons.
 - a. Meeting called to order by Matt Middlebrooks at 1:00 PM.
 - b. Introductions of guests and members.
 - c. ASHRAE has added a new field for bio named “employment discipline”. Update before June 2013 meeting.
 - d. Chairs asked to review ASHRAE code of ethics. Matt read the code to the committee. A legal seminar will be presented at each conference.
 - e. ASHRAE is beta testing web meetings as part of the physical meeting. Generally applicable to committees that have difficulties meeting the quorum. Must designate a person to operate the web meeting. We did not set this up because we do not have a problem meeting quorum. The soonest we will get WiFi will be Orlando 2016.
 - f. **12** voting members present not including the Chair.
2. Review as needed and Approval of previous meeting minutes from San Antonio, TX
 - a. **Cecily Grzywacz moved to accept the minutes**
 - b. **Brad Stanley 2nd**
 - c. **Passed 10-0-0 CNV, Chair not voting**
3. Subcommittee Reports
 - a. Handbook - *Subcommittee Chair Gemma Kerr*
 - i. Two handbook chapters: 11 and 46. This year we are submitting Chapter 11, which was submitted on time last year. Chapter 46 due between January and June meetings in 2014. We started working on this chapter.
 - ii. Brian Krafthefer has agreed to be the Vice Chair.
 - b. Membership - *Subcommittee Chair Matt Middlebrooks*
 - i. 14 voting members: 12 standard and 2 voting-non-quorum
 - ii. 52 corresponding members and 4 provisional corresponding members
 - iii. Updated roster to be submitted following this meeting
 - iv. Three members will rotate off June 3: Middlebrooks, Owen, and Zhang. We will add Choi, Krafthefer, and Campion as voting members. Middlebrooks will maintain voting term for two years. Committee will have 15 voting members starting July 1, 2013.
 - v. Officers: Stanley, Chair; Bayer, VC; and Grzywacz, Secretary July 1, 2013.
 - c. Planning - *Subcommittee Chair Brad Stanley*
 - i. Outcomes and Recommendations from Planning Subcommittee Meeting

1. Discussed the website
 2. Task management: research summary spreadsheet released
- d. Professional Development Coordinator - *Barney Burroughs*
- i. Negotiating to develop an ALI filtration course
 - ii. IAQ Design Guide is two years old and needs to be updated. By at least New York meeting (7.5 and 8.5) to be updated or additions submitted. Additionally the CD needs to be fixed so that it will run on MAC computers and not just on Windows computers.
- e. Program - *Subcommittee Chair Kyung-Ju Choi*

2.3 had one seminar accepted at Dallas meeting; two not accepted	Title	CoSponsor	Chair	When	Status
Forum	Filtration and Air Cleaning Position Paper	TC 2.4	Barney Borroughs	San Antonio	Not Submitted
Seminar	Is the filter performance related to your life?	TC 2.3 cosponsor	KJ Choi	San Antonio	Not Accepted
Seminar	Filter performance for Ozone	EHC, 62.1	Brad Stanley	San Antonio	Not Submitted
Conf Paper	Contaminants in Hotel Room Exhaust Air	TC 2.4	Brad Stanley	Wednesday Noon	Accepted
Type	Title	CoSponsor	Chair	When	Due Date
Forum	Filtration and Air Cleaning Position Paper	TC 2.4	Barney Borroughs	Dallas	Aug 13, 2012
Seminar	Filtration: Friend or Foe	TC 2.3 cosponsor	KJ Choi	Dallas	Aug 13, 2012
Seminar	Filter performance for Ozone Jeff Siegel, Kathleen Owen, Jensen Zhang, Chris Muller Brad Stanley	EHC, 62.1	Brad Stanley	Dallas	Aug 13, 2012
Seminar	Air Cleaning Standards Update 145.1/2 Update -	2.4, 2.9	Chris Muller	Dallas	Aug 13 2012

	Chris Muller 2.9 Standard Update – Matt help 2.4 Standard Update – Charlie help ISO TC 142				
Seminar	Cross Contamination in Energy Wheels	5.5, 8.12	Charlene Bayer	Dallas	Aug 13, 2012
Seminar / Conference Paper	Research Mini- conference: Ongoing research on 145.1 by Jensen Zhang By-products from PCO by Ramses Kropp		Matt Middlebro oks	Denver	
Seminar	Air Cleaning Standards – Example Test Results	2.4, 2.9	Chris Muller	Denver	
Forum	Should the VRP be Held to the Same Standards as the IAQP?	62.1	Charlene Bayer	Denver	Chris to ask 62 for co- sponsorship
	Below ones slated for later or discard				
Seminar	Desiccant wheel Odor Removal		Nick Agopian	Later	
Seminar	Sorbents as Air Cleaners			Later	
Conference Paper	IAQP Case Study Documentation	TC 2.4	Barney Burroughs & Charlene Bayer	Later	
	UVPCO (Hugo Destail..., LBL) 1457 Report (Ramses, U of W)			Later	
	TG 2 (Building		Matt	Later	Later

	Security) – Where does filtration fit in		Middlebrooks		
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- f. Publication – *Subcommittee Chair Marilyn Listvan*
- i. IAQ papers on CD. Krafthefer has been working on front matter. Two volumes are missing of papers are being scanned. 1989 and 1998 IAQ conference still needs to be scanned.
ACTION: Bayer will mail to Listvan to scan and then will return.
 - ii. Green Guide to be released soon.
 - iii. Dedicated Outdoor Air Systems Design Guide to be published and ongoing. Contributors may be needed for gas-phase and particle filtration. Lull to be added as a reviewer. Probable publication 2015.
 - iv. Please send bibliographies to Charlene Bayer so we can compile a list of papers for TC 2.3.
- g. Research - *Subcommittee Chair Kathleen Owen*
- i. Research Chair Breakfast:
 1. Projects under \$200K may be approved by RAC.
 2. RTARs will have shorter approval time period. On RTARs please the current 2010-2015 Research Plan.
 3. Denver a forum on “How Can I Participate in ASHRAE Research”
 - ii. Zhang presented on his research project.
 - iii. Ramsey did not come to the meeting to present his project update. Has requested a three-month NCE. Final report due in February with the new NCE.
 - iv. WS-1579 waiting for EHC RP-1491 project to be completed.
 1. RP-1491 is a literature review and modeling of information obtained from manufacturers.
 - v. New RTAR being developed on Round-Robin for 145.2 for submission in May. Looking for co-sponsorship with 62.
 - vi. Spreadsheet being developed to send to manufacturers about how filters are used to help 2.3 develop research directions.
 - vii. New ideas under development
 1. SVOCs
 2. Residential IAQ
 - viii. Research summary spreadsheet has been developed.
 - ix. Retail “Big-Box” research project found that formaldehyde levels were the primary problem. The formaldehyde levels were greater than acceptable levels and ventilation increased the formaldehyde levels. Recommendations will not be made to 62 since ventilation did not appear to be important in this case.
 - x. Barney stated that there is very little information linking filtration/air cleaning as well as ventilation with health impacts. Barney needs us to send references, particularly peer-reviewed, to him as quickly as

possible, particularly for commercial buildings. These are needed for the position paper.

- h. Standards - *Subcommittee Chair Paolo Tronville*
 - i. Updated standards within scope of 2.3. (Outlined in Standards Subcommittee minutes attached to the 2.3 Main Subcommittee minutes).
 - ii. Bayer reported a summary the LEED IAQP pilot credit. Need for 145.2 testing data. Air sampling two times per year. CoC list is health-based.
 - iii. Stanke will not include the IAQP in 189 prior to 2016 version due to lack of knowledge.
 - iv. We need better participation in the Standards Subcommittee. We need international members to provide information about international standards activities.
- i. Website - *Subcommittee Chairs Jeff Roseberry and Paula Levasseur*
 - i. The temporary website is up and functioning on Levasseur's server. Rosebury is working to have hosted by ASHRAE. It is not fully populated. Cannot go public until the committee votes on the design. No phone numbers or emails are allowed. Everything is in pdf format so that all documents are secure. Listvan would like a publications tab. We will keep back up copies so that we do not have an issue as previously that if the website disappears, we lose everything. Bill suggests using Slide Share for documents (minutes, etc.) since it would be searchable.

ACTION: Subcommittee chairs need to submit in doc format to secretary and not in pdf format, and without emails and contact information to the secretary. The issue with hosting by ASHRAE is the website size.

ACTION: Send in copies of old minutes to Bayer in doc form.

Vote needed to approve layout of website.

Bill Lull motioned to approve the website layout.

Cecily Grzywacz 2nd

Passed 11-0-0 CNV, Chair not voting

- ii. NAFA has offered to host the website as they do for 2.4.
- iii. Once hosted, it will be linked to ASHRAE.
- j. MTG-EEC Report
 - i. Brad Stanley reported.
 - ii. Focused into becoming a guideline document committee producing documents for gas and particle filters energy usage.
 - iii. Chair for GPC is Jeff Crosby. Committee being formed.
 - iv. The MTG will continue for now. 2.3 need so to vote who is their representative and alternate representative. The Brad will be the Vice Chair and will not count as the 2.3 representative. Brad is the current alternate representative for 2.3. Agopian is the current representative.

The representative only serves a one-year term. 2.3 needs to elect a new representative to serve on the MTG.

- v. Chris Campion and Brian Hafendorfer have volunteered to serve in that capacity. Chris will be primary and Brian secondary.

Vote needed to elect a representative.

Brad Stanley moved to nominate Chris as our primary and Brian Hafendorfer as the secondary to MTG-EEC.

Cecily Grzywacz 2nd

Passed 10-0-1 CNV, Chair not voting

Cecily Grzywacz moved that TC2.3 co-support that the GPC be formed

Gemma Kerr 2nd

Passed 11-0-0 CNV, Chair not voting

- 4. Report from TC liaisons.
 - a. No liaisons reported.
- 5. New Business
 - a. Letters of appreciation will be sent if requested
 - b. Middlebrooks made a final plea for new members. You do not have to be an ASHRAE member to join a committee, and ASHRAE will assign you an ASHRAE number. Two YEA members attended: Josephine Lau and Brian Hafendorfer.
- 6. Agenda suggestions for the Summer Meeting in Denver
- 7. Adjournment
 - a. **Cecily Grzywacz moved for adjournment**
 - b. **Marilyn Listvan 2nd**
 - c. Meeting adjourned at 3:00.

ASHRAE MEETING MINUTES – DALLAS

TC 2.3 - Gaseous Contaminants/Removal Equipment

Handbook Sub-Committee Meeting

Monday, January 28, 2013

4:15-6:00 p.m.

Convention Center, Dallas Ballroom A1 (Level 1)

The meeting was chaired by Gemma Kerr (Handbook Chair for TC 2.3). Participants introduced themselves. Present were:

Name

Charlene Bayer
Cecily Grzywacz
Gemma Kerr
Brian Krafthefer
Paula Levasseur
Chang-Seo Lee
John Lloyd
Bill Lull
Ashish Mathur
Kartik Potukuchi
Jeff Roseberry
David Schaaf

TC 2.3 is presently responsible for 2 Handbook chapters:

- Fundamentals Chapter 11 – *Air Contaminants* (2013)
- HVAC Applications Chapter 46 – *Control of gaseous indoor air contaminants* (2015)

Chapter 11

Gemma confirmed that the chapter was submitted to ASHRAE in July 2012. The galley proofs have been received and she will deal with them in February.

Chapter 46

Changes agreed in Chicago and San Antonio were discussed, and action items were identified as follows:

1. Re: Checking the equations that allow contaminant concentrations to be calculated from emission, ventilation and filtration rates, **Brian and Chang-Seo will review equations 1-7 and decide whether to keep, revise or replace them by March 31.**
2. Re: the circulated breakthrough test graph from 145.1, it provides different information from the present Figures 3A and 3B, which are poorly labeled and difficult to understand. However, the graph by itself does not provide adequate information.

Discussion of what facts an uninformed engineer needs to know suggested the following:

- (1) that the more grams of media/cfm a filter contains, the more efficient and long-lasting it will be;
- (2) that higher concentrations of contaminant will result in shorter filter life whatever the efficiency of the filter;
- (3) that contaminant carryover or breakthrough will occur if the contaminant concentration is too high or the exposure time of the filter too long.

Jeff felt that Figure 3A would be easier to understand if the curves were for different bed depths rather than the current units. Contaminant loss and retentivity should be discussed for physical adsorbents.

Bill will take the lead on this, assisted by Ashish, Chang-Seo, Jeff and Paula. The new Figure(s) and supporting text are due March 1.

3. Re: revision of the Installation, Startup and Commissioning section, and of the Operations and Maintenance section, **Bill and David will work on this and provide revisions by the June meeting.**
4. Re: defining and discussing clean air delivery rate (CADR) as a measure of air cleaner performance, **Gemma agreed to prepare a paragraph by March 31.**
5. Re: adding text referring to contaminant exposure standards in EHC Chapter, **Gemma agreed to do this by March 31.**
6. Re: HVAC Applications liaison Sheldon Jeter saying that he would like to see us add example calculations of concentration to the chapter (in both sets of units), this action item was postponed until review of the equations has been completed.
7. Re: the control material (and associated references) removed from Chapter 11, **Ashish agreed to review the material by March 31 and determine whether any of it should be incorporated into Chapter 46.**

8. Re: Brian's review of the Chapter (distributed before the meeting), Brian said that he had sent a marked up copy of Chapter 46 to ASHRAE with his review, but Gemma reported that she had not received it. **Brian will send his marked-up file to meeting attendees ASAP, and it will be used as the current working draft of the Chapter.**

There were eight items for discussion in the review, which were dealt with as follows:

- (1) include discussion of heat exchangers and desiccant wheels which can either be system sources of contaminants or removal devices, also fan leaks as sources. No action item was specified;
- (2) there is no discussion of byproduct release from chemisorption or PCO or ozone reactions. RP-1491 might provide useful information on ozone. No action item was specified;
- (3) Table 1 on cigarette emissions, see comments in marked-up file, deal with at next meeting;
- (4) Table 5 on typical outdoor concentrations of contaminants, see comments in marked-up file, deal with at next meeting;
- (5) Equation 1, action items already identified above;
- (6) add example calculations, defer this item until other changes have been made.
- (7) Figure 1 only shows human sources of contaminants, no materials or system sources. **Brian will redo Figure 1 by March 31;**
- (8) Figure 3 deficiencies, action items already identified above.

General comments about the Chapter included the following:

- ÿ We should use the phrase "reduce exposure to" rather than the word "control" when talking about contaminants, because engineers typically use "control" to mean something quite different;
- ÿ When discussing radon, use the full name not the chemical symbol Rn;

All completed action items should be sent to Gemma. New material can be sent either in a separate file or as Track-Edit changes in the current draft file. If using the current draft file, please send it with a new name, preferably including your full initials as identifier.

Gemma will send out a new draft of the Chapter by April 30. Everyone is asked to review the new draft and send back comments or suggested changes in Track-Edit to Gemma by June 12. Gemma will then prepare and distribute a new draft for discussion in Denver.

New business

Brian suggested that we should have the chapter reviewed by people outside the TC. This could include both Chapter members and people outside ASHRAE (this is permitted). We should prepare a list of suitable reviewers.

The meeting was adjourned at 5:45 pm.

TC 2.3 Gas-Phase | Planning
Tuesday 6:30-8:00am, State Room 3 (CC3)

Agenda

Actions from Last Meeting

- Whitepapers - no action
- Website
 - Paula Levasseur has been able to develop a website using one of her IT contacts. It contains past minutes, agendas, and other typical ASHRAE information.
 - This website link has been distributed to the voting members for review to vote on approving the website content
- Liaisons
 - last Planning meeting discussed getting liaisons to participate in areas where we may need to make sure we have covered. No action has been taken.
 - Do we want to have reports from committee liaisons during the meeting?
 - Time constraints and value of the information?
- Task Management & Record Keeping
 - Research Project Table has been developed (distribute) - "Research Summary_RevB.xlsx"

Topics for Current Meeting

- Website Discussion (if not covered in above website discussion)
 - where hosted
 - etc.
- Potential Website Updates Needed
 - Gas-phase Basics Presentation?
 - Research Status Table?
 - Links to Linked-In?
- MTG-EEC future

- Discuss if a vote is needed for MTG-EEC representative at each meeting to reconfirm.
- brainstorm possibilities for leadership of the GPC
- USGBC IAQP pilot credit
 - summary of status for group
 - discuss if TC 2.3 needs to do anything

Adjourn

TC 2.3 Research Summary Spreadsheet

Research Stage	#	TC	Title	Status	Researcher	PMC / PES	Champion
RP	1557	2.3	Evaluation Lab Comparison of Relative Performance of Gas Phase Filtration Media at High and Low Challenge Concentrations	28-Jan-2013 - formaldehyde - 100% - toluene - 100% - ozone - 100% - nitrogen dioxide - 0%	Syracuse University, Jensen Zhang	Matt Middlebrooks (chair), Bill Lull, Nick Agopian, and Paolo Tronville	Matt Middlebrooks
RP	1457	2.3	By-product Production from Photocatalytic Oxidation Associated with Indoor Air cleaning Devices	28-Jan-2013 - report is under construction	University of Wisconsin, Marc Anderson	Kathleen Owen (Chair), Gemma Kerr, Matt Middlebrooks, Marilyn Listvan, Charlene Bayer	Kathleen Owen
WS	1579	2.3	Testing and Evaluation of Ozone Filters for Improving IAQ	28-Jan-2013 - in rewrite - discussions with RAC taking place on timing - was hopeful for acceptance by 15-Feb-2013	-	Nick Agopian (PES chair), Bill Lull, Afzal Rahmattullah, Ashish Mathur, and Gemma Kerr	Nick Agopian
RTAR	1625	2.3	Application of Indoor Air Quality Procedure	28-Jan-2013 - on hold	-	Charlene Bayer, Nick Agopian, Paolo Tronville	Charlene Bayer
RTAR	-	2.3	Field Service Life of Typical Gas-Phase Air Cleaning Technologies	28-Jan-2013 - spreadsheet developed - committee members reviewing for modifications	-	Bill Lull, Brad Stanley, Paula Levasseur, Ashish Mathur, and Marilyn Listvan	Brad Stanley
RTAR	-	2.3	Cost of Ownership – ventilation vs IAQ.	28-Jan-2013 - on hold	-	Paula Levasseur with Nick, Jeff, Paolo	Paula
RTAR	-	2.3	Evaluating air cleaner technologies/devices for treating formaldehyde	28-Jan-2013 - needs champion	-	Jeff, Chang Seo Lee, Bill Lull, Paula Levasseur, Gemma Kerr	Jeff
RTAR	-	2.3	Round Robin Testing of ASHRAE 145.2	28-Jan-2013 - draft is complete - seeking cosponsorship of 62.1 - minor revisions being made to draft	-	Chang-Seo Lee, Gemma, Chris Campion	Chang-Seo?
?	-	5.10	5.10 UV project - may already be a WS, we were trying to work with them, should be on the PES/PMS (Brian K)	28-Jan-2013 - we are finding out - not really 2.3, but of interest	-	Russ Robison (5.10)	Russ Robison (5.10)
TRP	1491	EHC	Literature and Product Review and Cost Benefit Analysis of Commercially Available Ozone Air Cleaning for HVAC Systems	Awarded	University of Texas	-	-
RTAR	2-3	-	Sorbents as Air Cleaners	dropped	-	Matt Middlebrooks, Nick Agopian, Deepak Barney, Charlene, and Paula (looking for cofunding)	Matt Middlebrooks Barney
RTAR	2-3	-	Conduct a demo of the IAGP in a highly monitored and high-profile facility	dropped	-	-	-

DRAFT MEETING MINUTES
TC 2.3 - Gaseous Contaminants/Removal Equipment
Research Subcommittee Meeting
Dallas, TX Sunday 5:00-7:00 pm

1. Welcome
2. Introductions
 - A. Sign-In: Attendees listed at end of minutes.
3. Review of Minutes from Chicago – no comments received before or at the meeting.
4. RAC Report (Liaison TC 2.3 – David John) – David introduced himself, encouraged us to submit RTARs, and promised to help us out if we ask for help. RAC is trying to simplify RTARs; there should be a new form relatively soon. RTARs are not limited to two submissions. Co-sponsorship “wouldn’t hurt.”
5. Presentations/Up-Dates on Current Research Projects
 - A. 1557-RP “Evaluation Lab Comparison of Relative Performance of Gas Phase Filtration Media at High and Low Challenge Concentrations.” [PMC - Matt Middlebrooks (chair), Bill Lull, Nick Agopian, and Paolo Tronville] PI – Jensen Zhang, short talk: Jensen gave a quick overview of the project including details on recent work. Work has been completed up to the NO_x testing. Good correlation has been seen between high and low concentration challenges of media. Suggestions from PMS: background levels, and how to manage them. Question about O₃ generation by a UV light and level controlled by exposure to the air stream. There is a conference paper submitted for the Research Centered program in Denver – everyone should attend.
 - B. 1457-RP “By-product Production from Photocatalytic Oxidation Associated with Indoor Air cleaning Devices” – Marc Anderson, University of Wisconsin. [PMC- Kathleen Owen (Chair), Gemma Kerr, Matt Middlebrooks, Marilyn Listvan, Charlene Bayer] Ramsey Kropp (PhD student actually doing the research) did not attend this meeting. Final report has not been submitted. He has asked ASHRAE for a 3 month extension (he needs this data for his dissertation, so we still do hope it will be forthcoming). Bill motioned to suggest to the TC to support the extension, and it was approved by the room. Co-sponsorship for a seminar was suggested by Sam Guzman, TC 2.9 programs chair: Kathleen will provide Ramsey’s contact information so that the discussion could involved him – most likely it won’t be ready for Denver.
6. What is an RTAR? Kathleen presented a summary of what is expected of an RTAR champion. Described the importance of alignment with the ASHRAE strategic plan. She

then enumerated the separate portions of the RTAR and how to fill them in. Value of Co-Sponsorship. Jensen reminded us that RAC had a presentation on how to create an RTAR. This ppt file is under Training here: <https://www.ashrae.org/standards-research--technology/research> Also note the other research information, forms, history, etc.

7. Work statements & RTARs: status updates
 - A. 1579-WS Testing and Evaluation of Ozone Filters for Improving IAQ. Nick Agopian (PES chair), Bill Lull, Aflal Rahmathullah, Ashish Mathur, and Gemma Kerr volunteered to serve on the PES. Pawel Wargocki will represent EHC on the PES/PMS as they will co-sponsor. This will continue. PES has determined a path; the plan is to pick up where 1491 stops, using study outputs as the starting point to measure actual O₃ levels. Reminder: 1491 has NO LAB WORK, and this project would address that. [note added after meeting: from 1491 meeting, looks like only 2 more meetings, so results should be available fairly soon.] Bill and Kathleen have spoken to the liaison. David will find out whether we can put the WS on hold or if we need to get 1579 dropped as the number and submit as a new WS after 1491's data is available.
 - B. 1625-RTAR Application of Indoor Air Quality Procedure: Charlene Bayer, Nick Agopian, Paolo. [on hold] Relevant data is being taken by someone else. There is now significant interest in the issues in SSPC 62, so additional support may come from there. We still have INTEREST.
8. Proposed RTARS: status updates (Brad Stanley has put together a spreadsheet of our current status. See Attachment 1)
 - A. Round Robin Testing of ASHRAE 145.2. New Champion: Gemma, Chang-Seo Lee, Chris Campion: ASHRAE is requesting that RTARs be shorter, idea based. Several labs that are or will be likely to be running 145.2. For a RR, they can be manufacturers' labs. Brad Stanley will contact Roger Hedrick, Chair of 62.1, about co-sponsorship. Charlene mentioned possible co-funding/co-sponsorship which she will look into.
Liaison arrived during discussion (report above). He took a copy of our draft RTAR.
 - B. Field performance of typical gas-phase air cleaning technologies over service life". Working Group to work on this: Bill Lull, Brad Stanley, Paula Levasseur, Ashish Mathur and Marilyn Listvan.
 - 1) Brad - spreadsheet to collect information from manufacturers as to what they know about lifetime. (Bill Lull called it a Standardized Database – available for cross comparison – described how more fact finding (survey customers) is needed before generating an RTAR). See Attachment 2.
 - 2) COMMENTS: drop down menus to choose parameters, additional parameters include: 1.media change out method, 2.rationale for media change (budget, efficiency, complaints, calendar, testing), 3.concentration of media. Bill reminded us that this is an activity of the committee. Then when we have the output we can use that to guide us to write an RTAR to investigate further. The spreadsheet is not likely to be published; however,

if enough data arrives a range could be generated. Jensen suggests a name change to “**Field Practice...**” ML suggests: putting a comment onto the spreadsheet to alleviate participants concerns. Brad will distribute and seek additional information from his team.

- 3) RTAR to do the fact finding portion or as a Phase I. not yet ready for discussion.
 - C. Cost of Ownership – ventilation vs IAQ. A big buzz word is cost of ownership, do we want to look at this with regard to cost savings, IAQP? What is the value of the energy savings (ROI) and the total cost of ownership for gas-phase filters in an implementation of the IAQP? Champion: Paula Levasseur with Nick, Jeff, Paulo. [*on hold* for Charlene’s project on IAQP and on 1491]
 - D. Evaluating air cleaner technologies/devices for treating formaldehyde. Champion – Jeff with help of Chang Seo Lee, Bill Lull, Paula Levasseur, Gemma Kerr – needs new champion Jeff will remain champion and will turn to Paula for assistance / cross pollination.
 - E. Kitchen Hood – went through out of 5.10. Brian Krafthefer is our representative. Bill has a copy of the RTAR, made comments and has agreed to be on the PMC. TC 2.9 was approached to put together a presentation. Bill will follow up at the main TC meeting. Note added after meeting: Bill went to the 5.10 meeting, got added to the PES. This RTAR was submitted and rejected. They are working on a rewrite.
9. New Ideas for RTARs:
- A. Jensen mentioned the EHC research list: sVOCs (lighter ones may be similar to VOCs), sVOCs stick to particles, what is the mechanism (T, RH etc...) there is an RTAR to mitigate the sVOC exposures in their queue, but was not ranked highly (their interest was focused on infectious disease) – may couple well with 2.4 and 2.3. EHC is looking for additional exposure routes than simply inhalation. Charlene reminded us that some of the sVOCs are not volatile enough to be picked up by the ventilation system, but many are, and they can attach to other particles. Some of this analysis has been done by dust analysis. Many of these are endocrine disruptors so there is definitely interest from many other committees. Charlene is willing to work with Jensen as long as it is a testing or measurement project. Jensen suggested Ying Xu from UT-Austin, who has done related work. Idea left for us to think about.

B. Residential IAQ? (mostly danders and molds, but there may be interest in gas-phase). Gemma mentioned that source control is the most realistic approach for residential customers. Bill suggested checking out looking at Linked In for the IAQPI group for evidence of the level of understanding of the issues (or go to LinkedIn’s [ASHRAE - an International Society](#) for some good discussion. Wenhao Chen with the Department of Public health will be willing to champion by bringing together like minded folks (Frank Hammes, Jeff Roseberry, and Ashish Mathur offered to brainstorm with her).

10. New Business: None at this time.
11. Break into Working Groups. Time did not permit.
12. Updates from Research Subcommittee Chairs Breakfast – This breakfast takes place on Monday so notes added for information but not discussed at meeting.
 - Projects under \$200K can be approved by RAC; more \$ need higher level approval
 - 7 TRP are currently ready to go out to bid; 0 WS waiting to be released (so WS would go out quickly if approved next time)
 - URPs are only accepted if exceptional; 9 were submitted this time; 3 let through. It is strongly recommended that cognizant TC makes URP into WS and submit it for bidding
 - Please use the current ASHRAE Research Strategic Plan 2010-2015 for your RTARs, not the non-Research or the older version.
 - Denver will have a seminar/forum on “How can I participate in the ASHRAE Research Program?” Please come and learn.
 - RAC needs nominations for RAC
 - Any SSPC that submits RTARs need a research chair or someone to deal with the research liaison. Not clear what the exact rules are. David should find out.
13. Dinner plans
14. Meeting adjourned

Attendees			
Name	Affiliation	Name	Affiliation
Henry Greist	Lennox Industries	Christine Stanfel	Freudenberg Filtration
Sanjeev Hingorani	Lennox Industries	Volker Haendler	Freudenberg Filtration
Chang-Seo Lee	Concordia Univ.	Paula Levasseur	Cameron Great Lakes
Steve Zitine	Bioclimatic Air System	Keith Chesson	Clarcor Air Filtration

Thad Ptak	CI	Florian Mayer	Frannhofer IBP
Wenhao Chen	IAQ Program; California Dept of Public Health	Charlene Bayer	GA Tech/ Hygieia Sciences
Al Vatine	LMS Technologies	Geoff Crosby	Lydall
Brad Stanley	AAF Intl.	Jensen Zhang	Syracuse Univ.
Jeff Roseberg	ProMark Associates, Inc	Will Lull	Garrison/Lull
Deepak Pahwa	Bry Air (Asia)	Brian Hafendorfer	Trane
Kathleen Owen	RTI	Peter Freeman	Jacobi Carbons
Frank Hammes	IQAir	Sam Guzman	American Ultraviolet
Kyung-Ju Choi	Clean & Science	Zuraimi Sultan	NRC Canada
Stephany Mason	Eurofins Air Toxics	Sarah Taylor-Lange	Univ of Texas
Elina Nirlo	Univ Texas at Austin	Ashish Mathur	UVDI
David Mathur	Freudenberg	Kartik Potukuchi	Freudenberg
Peter Hoekstra	IBR Laboratories	Matt Middlebrooks	Filtration Groups
Christopher Campion	H&V		

Attachment 1: TC.2.3 Research Summary File

TC 2.3 Research Summary Table

Research Stage	#	TC	Title	Status	Researcher	PMC / PES	Champion
RP	1557	2.3	Evaluation Lab Comparison of Relative Performance of Gas Phase Filtration Media at High and Low Challenge Concentrations	28-Jan-2013 - formaldehyde - 100% - toluene - 100% - ozone - 100% - nitrogen dioxide - 0%	Syracuse University, Jensen Zhang	Matt Middlebrooks (chair), Bill Lull, Nick Agopian, and Paolo Tronville	Matt Middlebrooks
RP	1457	2.3	By-product Production from Photocatalytic Oxidation Associated with Indoor Air cleaning Devices	28-Jan-2013 - report is under construction	University of Wisconsin, Marc Anderson	Kathleen Owen (Chair), Gemma Kerr, Matt Middlebrooks, Marilyn Listvan, Charlene Bayer	Kathleen Owen
WS	1579	2.3	Testing and Evaluation of Ozone Filters for Improving IAQ	28-Jan-2013 - in rewrite - discussions with RAC taking place on timing - was hopeful for acceptance by 15-Feb-2013	-	Nick Agopian (PES chair), Bill Lull, Afzal Rahmethullah, Ashish Mathur, and Gemma Kerr	Nick Agopian
RTAR	1625	2.3	Application of Indoor Air Quality Procedure	28-Jan-2013 -on hold	-	Charlene Bayer, Nick Agopian, Paolo Tronville	Charlene Bayer
RTAR	-	2.3	Field Service Life of Typical Gas-Phase Air Cleaning Technologies	28-Jan-2013 - spreadsheet developed - committee members reviewing for modifications	-	Bill Lull, Brad Stanley, Paula Levasseur, Ashish Mathur, and Marilyn Listvan	Brad Stanley
RTAR		2.3	Cost of Ownership – ventilation vs IAQ.	28-Jan-2013 - on hold		Paula Levasseur with Nick, Jeff, Paolo	Paula
RTAR		2.3	Evaluating air cleaner technologies/devices for treating formaldehyde	28-Jan-2013 - needs champion		Jeff, Chang Seo Lee, Bill Lull, Paula Levasseur, Gemma Kerr	Jeff
RTAR		2.3	Round Robin Testing of ASHRAE 145.2	28-Jan-2013 - draft is complete - seeking cosponsorship of 62.1 - minor revisions being made to draft		Chang-Seo Lee, Gemma, Chris Campion	Chang-Seo?
?		5.10	5.10 UV project - may already be a WS, we were trying to work with them, should be on the PES/PMS (Brian K)	28-Jan-2013 - we are finding out not really 2.3, but of interest		Russ Robison (5.10)	Russ Robison (5.10)
TRP	1491	EHC	Literature and Product Review and Cost Benefit Analysis of Commercially Available Ozone Air Cleaning for HVAC Systems	Awarded	University of Texas		
RTAR		3.2	Sorbents as Air Cleaners	dropped		Matt Middlebrooks, Nick Agopian, Deepak	Matt Middlebrooks
RTAR		3.2	Conduct a demo of the IAQ in a highly monitored and high-profile facility	dropped		Barney, Charlene, and Paula (looking for cofunding)	Barney

Attachment 2: TC2.3 Research Summary File

"Field performance of typical gas-phase air cleaning technologies over service life"

Commercial / Industrial	Application Site	Application Category	Target Gases 1	Target Gases 2	Target Gases 3	Gas-Phase Air Cleaning Device
Commercial	Hospital	Helipad	VOC's	Aldehydes	Acid Gases	Cassette - 1" bed

<u>Commercial / Industrial</u>	<u>Application Site</u>	<u>Application Category</u>	<u>Target Gases 1</u>	<u>Target Gases 2</u>	<u>Target Gases 3</u>	<u>GPACD</u>
Commercial	<u>Commercial</u>	<u>Commercial</u>	Acid Gases	n/a	n/a	Canister
Industrial	Hospital	Urban Air	Aldehydes	Acid Gases	Acid Gases	Cassette - 1" bed
	Office Building	Helipad	Basic Gases	Aldehydes	Aldehydes	Cassette - 3" bed
	Ozone	Basic Gases	Basic Gases	Deep Bed Scrubber
	<u>Industrial</u>	<u>Industrial</u>	VOC's	Ozone	Ozone	Pleated Media
	Industrial Plant	Control Room	Warfare	VOC's	VOC's	...
	Refinery	Odor Control		Warfare	Warfare	
				

MEETING MINUTES - DRAFT
TC 2.3 - Gaseous Contaminants/Removal Equipment
Standards Subcommittee Meeting

Monday, January 28th 2013, 6:00-8:00 p.m.
Sheraton Conference Center, Lone Star Ballroom C2, Dallas, TX, USA

The meeting was called to order by Chair Paolo Tronville. Present were:

Name

- 1) Paolo Tronville (Chair)
- 2) Christopher Campion
- 3) Kyung-Ju Choi
- 4) Dan Haas
- 5) Volker Haendler
- 6) Gemma Kerr
- 7) Paula Levasseur
- 8) Shichao Liu
- 9) Bill Lull
- 10) Matt Middlebrooks
- 11) Kathleen Owen
- 12) Kartik Potukuchi
- 13) Jeff Roseberry
- 14) Brad Stanley
- 15) Melvina Nyoto Setiadi

1) Update on standards within scope of ASHRAE TC 2.3

- a) GPC 27P “Procedures for measurement of gases in indoor environments” - *Bill Lull*
- Not much progress since San Antonio, but a detailed plan is now in place for writing new sections before Denver, including a teleconference. The document is about half complete.
- b) ASHRAE Std. 145.1-2008 “Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Loose Granular Media” – *Kathleen Owen*
- The committee is in the process of rewriting, a big revision which will mean public review of the whole document. Most of the text has been discussed. No change in title, purpose and scope is planned.
- c) ASHRAE Std. 145.2-2011 “Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Air Cleaning Devices” - *Kathleen Owen*
- No recent action. None planned if no comments are received. There will be some testing done, and possibly ASHRAE research to get data from use of the standard. It is hoped that this will increase usage and feedback on efficacy. Scheduling a forum during the SSPC 145 meeting was discussed.

2) ASHRAE SPCs/SSPCs/TCs/TGs/TRGs activities

- a) MTG Energy Efficiency Classification of General Ventilation Air-Cleaning Devices – *Brad*

Stanley

- Not much has happened recently. There is a proposal to prepare methods for measuring energy performance of particulate and gas phase filters. The MTG is proposing a GPC to publish these methods. Once this is approved the MTG will be dissolved.

- b) TC 2.4 “Particulate Air Contaminants and Particulate Contaminant Removal Equipment” – *Gemma Kerr*
 - This is an active committee. The TC did some brainstorming at the Planning Sub-committee. They want to generate new research projects, get more program sessions approved, and encourage more participation by young people.
- c) TC 2.9 “Ultraviolet Air and Surface Treatment” – *Matt Middlebrooks*
 - i) SPC 185.1 “Method of Testing UVC Devices for use in air handling units or air ducts to inactivate airborne microorganisms”
 - Revision of the Standard is complete but ASHRAE says it needs a second public review to be conducted soon. This is an in-duct test.
 - ii) SPC 185.2 “Method of Testing Ultraviolet Lamps for Use in HVAC&R Units or Air Ducts on Irradiated Surfaces”
 - The draft Standard is complete and ready for public review. This is a lamp test to determine how much light hits the problem surface, not a test of the kill efficacy.
 - iii) – The TC is thinking of investigating PCO impact on bio-aerosols, and is writing an RTAR.
- d) TC 9.11 “Clean Spaces” – *Matt Middlebrooks*
 - i) The TC is still trying to get a design guide prepared. ASHRAE is funding the writing. Matt offered to review but has not seen anything yet.
- e) SSPC 62.1 “Ventilation and IAQ High Rise Buildings” – *Chris Muller*
 - i) Very busy committee. Two important items were approved this meeting. They have issued a note to be appended to a Table to allow toilet exhaust to be cleaned and used as class 1 air. Also there is a revision to the IAQ procedure to require use of mixtures. The language allows easy implementation. It appears that filtration is gaining more acceptance.
- f) SSPC 62.2 “Ventilation and IAQ Low Rise Buildings” – *Barney Burroughs*
 - i) There was no report.

3) Information Exchange

- a) USGBC
 - A pilot program has been introduced for new and existing buildings that allow LEED points for using IAQP. Monitoring will allow data collection to assess effectiveness and drive improvements. The contaminant concentration limits are health-based. The requirements are quite stringent. This is a good start, but not perfect.
- b) AFS – *KJ Choi*
 - Management has changed and the new people intend to do better outreach.
 - The Annual Technical Conference will be held May 6-9 2013 in Minneapolis MN.
 - The Fall Topical Conference “Innovations in Filter Media and Membranes” will be held October 14-16 2013 in Cincinnati OH.
- c) ASTM D22.05 “Air Quality” SC “Indoor Air” – *Chris Muller*
 - There was no report.
- d) ASTM D28.04 “Activated carbon” SC “Gas Phase Evaluation Tests” – *Chris Muller*
 - i) D6646 - 03(2010) “Standard Test Method for Determination of the Accelerated Hydrogen Sulfide Breakthrough Capacity of Granular and Pelletized Activated Carbon”
 - No changes to this since 2008.
- e) CEN/TC144 “Tractors and machinery for agriculture and forestry” – *Paolo Tronville*
 - i) EN 15695-2:2009 “Agricultural tractors and self-propelled sprayers - Protection of the operator (driver) against hazardous substances - Part 2: Filters, requirements and test procedures”

- This is being reviewed because of a mistake. The method specified a wrong upstream concentration, and qualified some products that would not pass with the correct challenge concentration.
- f) CEN/TC 195 “Air filters for general air cleaning” WG 5 “Gas phase filters”– *Paolo Tronville*
 - i) EN ISO/FDIS 10121-1 “Test methods for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 1: Gas Phase Air Cleaning Media (GPACM)”;
- According to the Vienna agreement, when the ISO document with same name is accepted by CEN members, the EN document will automatically be accepted as a national standard for EU countries.
 - ii) EN ISO 10121-2 “Test methods for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 2: Gas Phase Air Cleaning Devices (GPACD)”
- This standard has already been accepted in the same way as 10121-1.
- g) CEN/TC 346 “Conservation of cultural property” WG 4 “Environment”– *Chris Muller*
- There was no report.
- h) CEN/TC 386 “Photo-catalysis” – WG2 “Air Purification” – *Paolo Tronville*
- There was no report.
- i) ISO/TC 22/SC7/WG3 “Air and oil filters” – *Paolo Tronville*
 - i) ISO standard 11155-2: 2009 “Road vehicles - Air filters for passenger compartments - Part 2: Test for gaseous filtration”
- The standard has been confirmed as is. The test gases are toluene, sulfur dioxide and butane.
- j) ISO/TC 142 “Cleaning Equipment for Air and Other Gases” WG8 “Gas-phase air cleaning devices” – *Matt Middlebrooks*
 - i) FDIS 10121-2 “Test methods for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 2: Gas Phase Air Cleaning Devices (GPACD)” (FDIS vote ends January 29th 2013, i.e. tomorrow)
- Expect this to be accepted for publication as a Standard.
 - ii) DIS 10121-1 “Test methods for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 1: Gas Phase Air Cleaning Media (GPACM)” (FDIS due April 1st 2013)
- The Draft International Standard has been approved with comments which will be addressed. Then it will go forward as an FDIS.
 - iii) US Technical Advisory Group (TAG) to ISO/TC 142
- They voted to approve Part 2, provided some comments for Part 1, and discussed Part 3 and Part 4 (see under New Business)
- k) ISO/TC146 “Air quality” /SC6 “Indoor air” – *TBD*
- There was no report.
- l) ISO/TC 205 “Building environment design” – *TBD*
 - i) ISO 16814:2008 “Building environment design - Indoor air quality - Methods of expressing the quality of indoor air for human occupancy”
- ASHRAE holds the Secretariat for this committee. There is some doubt about this being a practical and useful document.
- m) ISO/TC 206 “Fine ceramics”/WG 37 “Test methods for photo-catalytic materials”
 - i) ISO 22197-x:2007 “Fine ceramics (advanced ceramics, advanced technical ceramics) - Test method for air-purification performance of semiconducting photo-catalytic materials
 - (1) Part 1: Removal of nitric oxide (2007)
 - (2) Part 2: Removal of acetaldehyde (2011)
 - (3) Part 3: Removal of toluene (2011)
 - (4) Part 4: Removal of formaldehyde (FDIS)
 - (5) Part 5: Removal of methyl mercaptan (FDIS)

- The TC is progressing through the list of important contaminants, and is now working

on the sixth in the series.

- ii) ISO/CD 18560-1 “Fine ceramics (advanced ceramics, advanced technical ceramics) -- Test method for air-purification performance of semiconducting photo-catalytic materials by test chamber method under indoor lighting environment -- Part 1: Removal of formaldehyde”
- This is a new series of test methods.
- n) ISO/TC209 “Cleanrooms and associated controlled environments” – *Chris Muller*
 - i) ISO 14644-8:2006 “Classification of airborne molecular contamination” (under revision)
- There was no report.
 - ii) ISO 14644-10:2013 “Cleanrooms and associated controlled environments - Part 10: Classification of surface chemical cleanliness”
- This was published last week.
- o) ITRI (Taiwan) – *Chris Muller*
- There was no report.

4) Old Business

- a) Life Cycle Cost Calculation Guideline/Standard
- There is an ISO TC 142 WG 3 document for particulates, but no equivalent gas phase document. There has been discussion about writing an RTAR, and perhaps collecting some data informally by T2.3 members to see if a method is feasible.

5) New Business

- a) The ISO TC 142 Plenary meeting and Working Group meetings will be held in Atlanta at ASHRAE Headquarters on September 16-19 2013.
- b) Information exchange and coordination between ASHRAE SSPC 145 and ISO/TC142/WG8
 - i) ISO/PWI 10121-3 “Test method for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 3: Classification system for assessing the performance of gas-phase air cleaning devices for general filtration”
- The US TAG offered comments. There was no US attendance at the Zurich meeting, so the current status is not known. Input is welcome.
 - ii) ISO/PWI 10121-4 “Test method for assessing the performance of gas-phase air cleaning media and devices for general ventilation - Part 4: Field equivalent test method(s) for assessing the performance of gas-phase air cleaning devices for general ventilation”
- This is an in-situ test method (like the discontinued Standard 145.3). The Convener is planning a teleconference to discuss. There is concern about possible misunderstandings due to language difficulties. The base document for the Preliminary Work Item originated in Japan.

6) Adjourn

The meeting was adjourned at 7:45 pm.