

**MINUTES (DRAFT) - ASHRAE MEETING– NYC**  
**TC 2.3 - Gaseous Air Contaminants/Removal Equipment**  
**TC Meeting**

Tuesday – 21-Jan-2014, 1:00 – 3:30 PM  
 New York Hilton, Concourse Level, Concourse B

The meeting attendee list is as follows:

Last Name	Name	Member Status	Position	Present
<b>Total Voting Members = 9 out of 15 in attendance</b>				
Bayer	Dr. Charlene W. Bayer, PhD	V	Vice Chair	P
Choi	Dr. Kyung-Ju Choi, PhD	V	Program Chair	P
Campion	Dr. Christopher L. Campion	V		-
Flom	Mr. Michael C. Flom	V	Member	-
Grzywacz	Ms. Cecily M. Grzywacz	V-NQ	Member	-
Hafendorfer	Mr. Brian J. Hafendorfer	V	Member	P
Kerr	Dr. Caroline M. Kerr, PhD	V	Handbook Chair	P
Krafthefer	Dr. Brian C. Krafthefer, PhD	V	Handbook Vice Chair	P
Lau	Dr. Josephine Lau, PhD	V	Member	-
Lee	Dr. Chang-Seo Lee, PhD	V-NQ	Member	-
Lull	Mr. William P. Lull	V	Member	-
Middlebrooks	Mr. Matt Middlebrooks	V	Membership Chair	P
Schaaf	Mr. David A Schaaf, Jr	V	Program Co-Chair	P
Stanley	Mr. W. Brad M. Stanley	V	Chair	P
Tronville	Dr. Paolo M. Tronville, PhD	V	Standards Chair	P
Owen	Dr. Kathleen Owen	NV	Research Chair	P
Roseberry	Mr. Jeff Roseberry	NV	Webmaster	-

**Summary Motions**

#	Motion	Vote
1	Motion to approve minutes. Gemma Kerr 1 <sup>st</sup> , David Schaaf 2 <sup>nd</sup>	PASSED: 8-0-1-6 CNV Chair not voting
2	Motion to co-sponsor with 62.1 of Chris Muller's IAQP seminar for Seattle. Matt 1 <sup>st</sup> , David Schaaf 2 <sup>nd</sup>	PASSED: 9-0-0-6 CNV Chair not voting
3	Motion to co-sponsor with 2.4 of Brian Krafthefer's seminar for Seattle "In	PASSED: 9-

	the Year 2025 will filtration be alive?" Charlene Bayer 1 <sup>st</sup> , Gemmar Kerr 2 <sup>nd</sup>	0-0-6 CNV Chair not voting
4	Motion to co-sponsor with TC4.10 an RTAR on "Sorption of gases by particulate media in the duct stream". Brian Krafthefer is the primary author. Gemma Kerr 1 <sup>st</sup> Matt Middlebrooks 2 <sup>nd</sup>	PASSED: 9-0-0-6 CNV Chair not voting

### **Summary Action Items**

#	Action Item	Owner
1	Title purpose, and scope for GPC to be developed on carbon rating system. Workshop to be submitted for Seattle.	Ashish
2	Need to determine from ASHRAE if TC2.9 is supposed to be working with TC2.3 on the chapter. Topic biological aerosols. More appropriate for TC2.4 so probably an error. Gemma needs to pursue with Steve Martin, 2.9 Handbook Chair.	Gemma Kerr and Brian Hafendorfer
3	Make a slot for Publications and use it for a forum, 3-4 on Mondays as shared slot with TC 2.4. TC2.4 needs to be contacted.	Brad Stanley
4	Send emails on what we have volunteered to do for programs and the due dates	KJ Choi
5	RP-1457 (UV-PCO) PI to give TC2.3 a cost per cfm	Kathleen Owen

### **Meeting Minutes Begin**

1:00 pm

1. Call to order.
  - a. As requested by the Society the "The ASHRAE Code of Ethics was stated.
  - b. Introduction of guests and members.
  - c. Opening remarks by Chair about the subcommittees and how TC works. Voting members roll-call.

Chair's breakfast report. Hightower Award awarded each year. Outstanding TC award is new award as of this year. We want to improve our webpage and the timing of posting. There is a TC Master Calendar as a Google Calendar, which can be synced with committee members' calendars. All members are to update their bio and update his/her affiliation. This will help ASHRAE to monitor the committee's balance. If a speaker's rating is 3.5 or below, then the speaker must present evidence that he/she has had training prior to being allowed to speak at another ASHRAE conference.

- d. Identify & Reporting from ASHRAE liaisons.

No liaisons present at this time.

2. Review as needed and Approval of previous meeting minutes from Denver  
Gemma Kerr moved to approve minutes and David Schaaf seconded. 7-0-1-6 CNV

- a. Status of action items agreed upon at last Main TC2.3 meeting (as listed in the Denver minutes)

#	Action Item	Owner
1	Need to determine from ASHRAE if TC2.9 is supposed to working with TC2.3 on the chapter. Not done yet – Topic biological aerosols. Should be TC2.4 so probably an error. Gemma needs to pursue with Steve Martin, 2.9 Handbook Chair	Gemma Kerr
2	To send a note to Christine Sun, chair of the MTG that Brian Hafendorfer is primary and Dan Haas is secondary representatives from TC2.3 to the MTG. MTG has been disbanded, so mute point	Matt Middlebrooks
3	Making a slot for Publications and use it for a forum Not done. 3-4 on Mondays as shared slot with 2.4 – need to contact them.	Brad Stanley

Discussion by Ashish Mathur: Need a test for multiple gas testing for carbon rating system. 145 is a single gas test. If we just use one gas, which gas should be used -- possibly ozone. Who is going to pay for this? Is there any substance for the TC to continue working for this? This is very similar to what ISO is working on. Another challenge is concentration – high and low. What are the performance criteria: breakthrough and/or capacity? Should we wait for 145.3 or proceed with new standard with multiple gas challenge? We need industry and users input to see what they need or want. We will submit this topic as a Workshop for Seattle. Paolo suggested that a title/purpose/scope be prepared and be submitted to TC.

### 3. Subcommittee Reports

#### a. Handbook - *Subcommittee Chair Gemma Kerr*

Handbook on-line to be offered as member benefit to be offered next year. The on-line can be accessed on any computer. There is still a complaint that the on-line version does not work as well as the CD version. Any document that you download from ASHRAE can only be used on only one computer and still does not work on MAC computers. TC2.3 is responsible for two chapters. See the attached minutes from the subcommittee meeting for complete minutes from this meeting. An email vote will have to taken prior to the June 2014 meeting to approve sending the chapter due in 2015 by the due date.

Minutes attached.

#### b. Membership - *Subcommittee Chair Matt Middlebrooks*

There are 15 voting members on the roster. One voting member will no longer attend due a change in his employment. Charlene Bayer, Cecily Grzywacz, and Bill Lull will roll off at in June 2014. Paula Levasseur, Ashish Mathur, Marilyn Listvan, and Kathleen Owen will roll on. We have a good balance among the affiliations. All is in place with the officers and their successions. We need ASHRAE member numbers if want to rolled on as a corresponding member.

#### c. Planning - *Subcommittee Chair Charlene Bayer*

Minutes attached.

#### d. Professional Development Coordinator - *Barney Burroughs*

We have an opportunity to put together a course on filtration. Barney Burroughs has an invitation to do it. Under ALI they set programs not just at ASHRAE but also all over the world.

A presentation has been started. It does not have to be a single person. The course can be either four hours or a full day.

e. Program - *Subcommittee Chair KJ Choi*

We submitted two seminars, both of which were accepted at this meeting. The forums are now Workshops on Sundays at 8:00-9:00. At least two speakers speaking for 15 minutes is the maximum and using the rest of time for discussion.

Vote on 62.1 co-sponsorship of Chris Muller's IAQP seminar for Seattle. Matt Middlebrooks moved that we co-sponsor the seminar on the IAQP. David Schaaf 2<sup>nd</sup>. 8-0-0-6 CNV

Vote on co-sponsorship with TC2.4 of Brian Krafthefer's "In the Year 2025 will filtration be alive?"

Motion to co-sponsor by Charlene Bayer, Gemma Kerr 2<sup>nd</sup> 8-0-0-6 CNV

Minutes attached.

f. Publications - *Subcommittee Chair Marilyn Listvan*

Subcommittee meeting not scheduled

Working on IAQ CD Archives. Fred Turner looking for articles for IAQ articles for Insight for us to communicate with ASHRAE in addition to Journal articles. If you have written articles, please send Marilyn Listvan the bibliographies so that they can be put on the website.

g. Research - *Subcommittee Chair Kathleen Owen*

One research Project 1457 completed and final report submitted. 1457 has submitted a draft final report and did present a report at this meeting. At TC2.9 there was interest conveyed that a research project be brought forward on devices that are effective.

Action item for Kathleen Owen to ask PI to give us a cost per cfm.

WS 1579 was on hold until the EHC project was completed. We are now moving forward on the work statement.

RTAR 1720 has a work statement in progress.

The PES is set by the committee, but if any discussion or requests for additional members, a closed session with only voting members present needs to be held.

TC4.10 is putting together an RTAR on "Sorption of gases by particulate media in the duct stream". This is a modeling project. Brian Krafthefer is the primary author and is requesting TC2.3 involvement. Gemma 1<sup>st</sup> Matt 2<sup>nd</sup> 8-0-0-6 CNV

Minutes attached.

h. Standards - *Subcommittee Chair Paolo Tronville*

Minutes attached. September 25, 2014 will be the next ISO plenary meeting in London.

i. Website - *Co-Subcommittee Chairs Jeff Rosebury*

Summary provided from discussion in the Planning Subcommittee report.

Refer to the Standards Subcommittee report.

4. Report from TC liaisons.

Chris Muller discussed 62.1-2013 is being published with the chemicals additive effects language for the IAQP.

5. New Business

No new business discussed.

6. Agenda suggestions for the Summer Meeting in Seattle, Washington.

No agenda suggestions.

7. Adjournment

Gemma Kerr moved to adjourn. Brian Hafendorfer 2<sup>nd</sup>.

Meeting adjourned at 3:30.

## ASHRAE MEETING MINUTES – DENVER

### TC 2.3 - Gaseous Contaminants/Removal Equipment

#### Handbook Sub-Committee Meeting

Monday, June 24, 2013

4:15-6:00 p.m.

Sheraton Hotel, Tower Building, Terrace Room (Terrace Level)

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

<u>Name</u>	<u>E-mail</u>
Charlene Bayer	
Henry Greist	
Dan Haas	
Gemma Kerr	
Paula Levasseur	
Bill Lull	
Ashish Mathur	
David Schaaf	
Sheldon Jeter (Liaison)	

Sheldon Jeter, the ASHRAE Liaison for Applications Chapter 46 *Control of Gaseous Indoor Air Contaminants (2015)*, told us that the checklist that we need to submit along with the Chapter is changing. He will forward a copy of the new version to us. The Chapter is due to be submitted to ASHRAE March 15, 2014.

Henry Greist commented that TC 2.9 (UV) have expressed an interest in Chapter 46. Gemma said that she would have expected them to be more interested in TC 2.4's air cleaner chapter which does devote space to UV disinfection of air and surface microbiological contaminants. Chapter 46 deals with photo-catalytic oxidation (PCO) air-cleaning only.

The remainder of the meeting dealt with revision of Chapter 46. Some changes were agreed in Dallas, and others have been proposed since then using TrackEdit and inserted Comments, and appear in Draft 2. It was agreed that we should review progress on the items agreed in Dallas first, as shown below.

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.** This item has not been completed. It is a revision that we need to do for the 2015 edition. Gemma will contact Brian and Chang-Seo about progress.
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.

**Ashish, Jeff and Paula will take care of this item. The new Figure(s) and supporting text are due October 31.**

3. Re: revision of the Installation, Startup and Commissioning section. **David Schaaf has completed a revision. Most of this was reviewed and changes approved. Gemma agreed to send the un-reviewed parts to Bill, who will review them. Bill will also revise the Operations and Maintenance section by October 31. Gemma will remind Bill periodically about what he said he will do.**
4. Re: defining and discussing clean air delivery rate (CADR) as a measure of air cleaner performance, **Gemma has prepared a paragraph and it is included in Draft 2.**
5. Re: adding text referring to contaminant exposure standards in EHC Chapter, **Gemma has determined where this needs to go and will add the text by October 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 reviewed this material and recommended that none of it 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. **The marked-up file was distributed to meeting attendees and was used as the basis for Draft 2.**

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, **comments are minor and recommended changes appear in Draft 2.**

(4) Table 5 on typical outdoor concentrations of contaminants, see comments in marked-up file, **comments are minor and recommended changes appear in Draft 2;**

(5) Equation 1, action items already identified above;

(6) add example calculations, action items already identified above.

(7) Figure 1 only shows human sources of contaminants, no materials or system sources. **Brian has redone Figure 1 and it is included in Draft 2;**

(8) Figure 3 deficiencies, action items already identified above.

General comments about the Chapter included the following:

- 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;
- When discussing radon, use the full name not the chemical symbol Rn;

**Gemma will check occurrences and change as appropriate.**

Two new action items were identified:

1. Paula will replace some definitions at the start of the Chapter with those agreed upon at the SSPC 145 meeting;
2. Gemma will update references to 145.2 to reflect the fact that the Standard has now been published.

**Gemma will incorporate all agreed items and new submissions and send out Draft 3 to the Committee in November.**

There was no other business.

The meeting was adjourned at 5:55 pm.



## ASHRAE MEETING MINUTES – NEW YORK

### TC 2.3 Planning Subcommittee Meeting

Tuesday January 21 2014, 6:30 a.m. – 8:00 a.m.  
Hilton Boardroom (4<sup>th</sup> floor)

The meeting was called to order at 6:35 am by Planning Subcommittee Chair Charlene Bayer. Everyone introduced themselves. Present were:

**Name**

Charlene Bayer (Chair)  
Barney Burroughs  
KJ Choi  
Brian Hafendorfer  
Gemma Kerr  
Paula Levasseur  
Marilyn Listvan  
Ashish Mathur  
Matt Middlebrooks  
Kartik Potukuchi  
Kathleen Owen  
Brad Stanley

Action items are shown in **BOLD**.

1) Current Items

a) Membership Discussion

Four members will be rolled on to account for four roll-offs, maintaining 15 voting members on the TC. There is currently 1 Voting-Non Quorum member, two are allowed. We propose to change Chang-Seo Lee and Mick Flom from VM to V-NQM, and Cecily Grzywacz from V-NQM to VM. Charlene Bayer, Chris Campion and Bill Lull will roll off. Paula Levasseur, Marilyn Listvan, Kathleen Owen, and Ashish Mathur have agreed to roll on.

b) Website Discussion

i) Address is <http://tc23.ashraetcs.org/activities.html>. Jeff Roseberry is the Webmaster, but Paula is an important contact because the site is hosted by her company.

ii) **Note: Need to have draft Minutes posted no later than 60 days after the meeting**

iii) **Note: Draft Agenda for upcoming meeting needs to be posted no later than 30 days prior to meeting**

iv) Activities Tab

(1) Include a list of TC 2.3's research projects (get from ASHRAE Summary Table). Can we also do final report summaries? A link to ASHRAE research report repository?

- (2) Include info on TC 2.3's Standards and draft Guideline
  - (3) Include info on TC 2.3's Handbook Chapters (**Gemma will find and submit the Chapter abstracts previously approved**)
  - v) Published Content Tab
    - (1) There is currently nothing posted there. **Jeff will work with Marilyn Listvan to get papers and bibliography.** Material that could be posted includes:
      - Chris Muller's presentation that he gives to ASHRAE Chapters on IAQP and LEED
      - Barney's paper on IAQP
  - vi) News Tab
    - (1) There was discussion about removing this Tab, but it was decided to retain it. Suggestions for material that might be posted there included RTAR titles, pictures from the Particle Party, and educational presentations. However, discussion later in the meeting was strongly in favor of converting this Tab to a Blog to be updated monthly. Charlene, as part of being a USGBC Fellow, is posting monthly educational Blogs on the USGBC website, and this was regarded as a good model to follow. Action items were agreed as follows:
      - **Charlene will send the meeting attendees the USGBC link so that we can check out the length, language and general approach required**
      - **Barney will supply the first two blogs, one historical and the other on IAQP. He will send his material to Charlene**
      - **Everyone will think about possible Blog topics, and will send ideas to Charlene**
  - vii) Links Tab
    - (1) It was suggested to add the ASHRAE LinkedIn link
- 2) Looking Forward
- a) FOCUS: Continue to push to get things done and make things cohesive
    - i) Charlene stressed that we need to be more responsible for our action items. The TC is going to start discussing action items during the Main Committee meeting in the hopes that this can improve implementation.
    - ii) Research ties into Programs ties into Publications
      - (1) RTAR 1720 very important because LEED IAQP Pilot Credit is being applied by several firms. **Gemma was urged to work fast on preparing the work statement.** For gas phase filtration to be applied in addition to particulate filtration on these projects, 145.2 data must be available for any gas phase filtration device to be used in the LEED IAQP pilot credit application. Currently there is no reliable independent data out there, and there will continue to be none because no-one will use Standard 145.2 until project 1720 is completed (note: it needs to test performance of filters that are likely to be effective). Barney would like to see gas-phase filter manufacturers contribute to the cost of this project
      - (2) RP-1491, the ozone filter use project that we are co-sponsoring with EHC, has proved problematic as the PMS has refused to share with us data that will assist in preparing the scope for the TC's WS-1579 on performance of ozone filters. The good news is that we now have the requested information and can build on it. This is a good project, nearly complete, with cost/benefit on use of ozone filters

included, and modeling software already delivered to ASHRAE. Barney noted that EHC is sometimes a difficult committee to deal with, and that we need in future to ensure that we have a representative on the PMS for all co-sponsored projects managed by other committees.

- iii) We need to continue let old ideas without traction drop, and pursue items that we can put energy behind.
  - iv) We should continue to limit individuals to contributing to one Research Item (RTAR Leads or PMS participation/ lead). Encouraging people not to over-commit should improve their ability to deliver what they have committed to. Also, individuals should not volunteer if they are not going to actually do things in a timely manner -- normally before the next meeting. Points arising during discussion included:
    - 1. Target Reminders by the Subcommittee Chairs between meetings will help;
    - 2. Review of the previous meeting's action items at the start of a Sub-committee meeting is also a good idea;
    - 3. Use task-splitting where the commitment is large or the volunteer inexperienced;
    - 4. Some people may need advice on how to proceed with their task;
    - 5. Avoid discussing items twice or after the action has been completed.
  - b) Focused Research Area Suggestions
    - i) This is to look at New Specific Topics that may not have been discussed in the Research Subcommittee meeting. Charlene is particularly interested in promoting metrics i.e. testing methodology and collecting useful data.
      - (1) General Categories
        - (a) Performance Data (Projects 1579 and 1720 are important here)
        - (b) Environment
        - (c) Sensors (IAQ, Filter Performance)
        - (d) Effective Measurement metrics. Producing a Gas-phase Air-cleaning Device Manual to help users select appropriate filters was discussed. Barney noted that he has been writing a position paper on this subject for EHC, though it is currently held up by conflict relating to health concerns
- 3) The meeting was adjourned at 7:45 am.

**ASHRAE MEETING Minutes – New York  
TC 2.3 Program Subcommittee Meeting  
Tuesday, 21-January-2014, 12-12:45p  
Concourse B (HC)**

**Seattle, June 28 – July 2, 2014, [www.ashrae.org/seattle](http://www.ashrae.org/seattle)**

**Chicago, Jan 24-28, 2015, Atlanta, June 27-July 1, 2015, Orlando, Jan 23 – 27, 2016, St. Louis.  
June 25-29, 2016**

**Conference Paper 2:** Sunday 9:45-10:45, Sutton North – “Filter Media Performance” 2.3, Chair: H Becker, Ozonation air purification technology in HVAC application by L Zhong, Concordia Univ. 145.2 efficiency and capacity test results for 5 gas-phase air cleaners by K Owen, Testing and evaluation of filter media performance: correlation between high and low challenge concentration tests for toluene and formaldehyde (RP 1557) by C He. Track: Environmental Health

**Seminar 28:** Tuesday 8:00-9:30, Sutton North – “Comprehensive Look at Infectious Disease and Air Filtration in Healthcare Facilities: Energy Saving, IAQ Performance, and What makes You Sick” 2.4 & 2.3, Chair: Z Driss, Speakers: R Olmsted, J Ellis, P Maybe, M Middlebrooks, B Stephens. Track: Environmental Health

**Seminar 37:** Tuesday 9:45-10:45, Sutton North – “Real Co\$ of Filtration” 2.4 & 2.3, Chair: K Choi, Speakers: T Ptak and J Siegel  
Track: Environmental Health

**Poster Session:** Tuesday 11:00-1:00, American Hall 1 – K Owen “RP-1360: How do pressure drop, efficiency weight gain and loaded dust composition change throughout filter lifetime?”

**Conference Paper 6:** Monday 8:00-9:30, Sutton North – “IAQ: Impact of Variables”

**Seattle**

**Track 1** Indoor Environment - Health Comfort and Productivity (Tom Kuehn), **Track 2** Research Summit (Conference Papers) – David Claridge, **Track 3** Ground Source Heat Pumps, **Track 4** HVAC&R Systems & Equipment, **Track 5** HVAC&R Fundamentals and Applications (Jenifer Leach), **Track 6** Standards, Guidelines and Codes, **Track 7** Refrigeration, **Track 8** Installation, Commissioning, Operation, Maintenance, of Existing Buildings, **Track 9** Professional Skills

**Chicago**

**Track 1** Systems and Equipment, **Track 2** Fundamentals and Applications **Track 3** Industrial Facilities, **Track 4** Large Buildings: Mission Critical Facilities and Applications, **Track 5** Energy Efficiency, **Track 6** Life Safety, **Track 7** Design of Energy and Water Efficient Systems, **Track 8** Hospital Design and Codes.

**Dates:**

**Seattle Meeting** – Seminar and forum by February 13, 2014

**Chicago Meeting** – Conference Paper Abstracts due March 24, 2014, Technical Papers due for Review – April 14, 2014

Tec Pap: 44/60, Conf: 93/163, Seminar **62**/141, Forum: **1**/14 for Workshops: **9**

Speakers rating below 3.5 will receive letters indicating that if they receive two additional low rating they will be required to provide proof that they have received speaker training before they will be permitted to speak again.

Type	Title	CoSponsor	Chair	When	Due Date
Conference Paper	UVPCO (Hugo Destail..., LBL) – Ashish will ask him 1457 Report (Ramses, U of W)				
Seminar	IAQ-Procedure in General Terms (62.1 is lead)	62.1, TRG4- IAQP, 2.4, 2.3	Chris Muller	Seattle	
Workshop	In the Year 2025 will filtration be alive (Indoor Environment Track)	2.4	Brian Krafthefer	Seattle	<b>2/13/14</b>
Conference Paper	Testing and Evaluation of Ozone Filters for Improving IAQ.		Jensen Zhang	Seattle	
Seminar	Residential IAQ		Stephanie Mason	Chicago	
Seminar	SVOCs		KJ Choi	Chicago	
	Chemical Media Consumption Expectations			Atlanta	
Workshop	What TC2.3 Can Do For You? (Charlene will do 2.3 overview: 15 minutes. 145 1 & 2: Kathleen. Gas phase filter rating systems – Ashish ) (Fundamentals Track)		Charlene Bayer	Seattle	<b>2/13/14</b>
Technical Paper	Case Studies of 145.2		Brian Krafthefer	Atlanta	
Conference Paper	Interpreting 145.2 Results: Which Filter is Best		Brad Stanley	Chicago	<b>3/24/14 (abstracts)</b>

**MEETING MINUTES**  
**TC 2.3 - Gaseous Contaminants/Removal Equipment**  
**Research Subcommittee Meeting**  
**Silver, Tower Bldg, Mezzanine Level**  
**Denver, CO Sunday 5:00-7:00 pm**

1. Meeting was called to order at 5:10 by Kathleen Owen.
2. Introductions and Sign-In were completed – attendees listed below
3. Review of Minutes from Dallas
  - A. Original minutes were correct, sent out in February. File sent on June 18 was incorrect.
4. RAC Report (Liaison TC 2.3 – David John)
  - A. David John not present
  - B. Kathleen informed committee that a new liaison has been assigned. She will meet him at the research breakfast on Monday AM. See notes below.
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”
    - I. Summary meeting was held with PMS about 2 weeks ago. A draft final report, received on June 20<sup>th</sup>, is being reviewed by the PMS.
    - II. All 4 gases have been tested on all 6 sorbents.
    - III. Initially looks as though performance at high concentration simulates what happens at low.
    - IV. Final report is due on August 31<sup>st</sup>.
      1. Should come with electronic data (.xls) spreadsheet
      2. Should come with recommendations about the 145.1 test method
      3. Action Item: After Final Report is issued, Brad Stanley will send out a letter ballot for approval so that we do not have to wait all the way until next meeting.
  - B. 1457-RP “By-product Production from Photocatalytic Oxidation Associated with Indoor Air cleaning Devices”
    - I. Ramsey was not present.
    - II. Dean Tompkins presented a summary of work that Ramsey has completed since last time.
      1. Overview of Apparatus and Equipment
      2. Operating Procedure Summarized
      3. Plot of concentration decay and some generation over time by different compound mass was displayed. Challenge gases were:

- c. DCD
      - d. Acetaldehyde
      - e. Ethanol – aldehyde intermediate shown
      - f. Acetone – intermediate looks to be acetaldehyde and others
    - 4. Action Item:  $C/C_0$  plots for byproducts were not shown in 2D plots, but are needed.
    - 5. Action Item: Is chlorine dioxide a byproduct for DCB and Limonene?
    - 6. 2D Only Plots for challenges of :
      - c. D-Limonene
  - III. How long will calibration curves take with standard gases that are coming for Ramsey? Tanks to run calibration curves are due in the end of July. Dean estimated 1 week time would be required to complete calibration.
    - 1. Estimate this will be complete or along the way in August.
  - IV. Action Item: acetaldehyde needs to be run a few more times to get data that appears correct, if the data presented is all of the data available.
6. Work statements & RTARs: status updates
- A. 1579-WS Testing and Evaluation of Ozone Filters for Improving IAQ. On Hold
    - I. Waiting on 1491 results. ASHRAE has approved allowing 1579 to be on hold until 1491 is completed. This is a 2 year project, still a couple years out before a final report will be issued. Bill Lull states that Michael Vaughn stated the project should be completed by February 28, 2014.
  - B. 1625-RTAR Application of Indoor Air Quality Procedure:
    - I. Delete this RTAR, no action.
7. Proposed RTARS: status updates
- A. Round Robin Testing of ASHRAE 145.2.
    - I. Chris Campion has left ASHRAE and was leading this project.
    - II. Gemma will take the RTAR and try work through it. Gemma hopes to submit by the next deadline.
  - B. Field performance of typical gas-phase air cleaning technologies over service life.
    - I. Spreadsheet was put up and described with ~ 10 rows of data and explained
    - II. Action Item: Brad will Distribute to Manufacturers to fill in ~20 -50 rows before the next meeting.
  - C. Cost of Ownership – ventilation vs IAQ.
    - I. No action has been taken, table.
  - D. Evaluating air cleaner technologies/devices for treating formaldehyde
    - I. No action has been taken, table.
  - E. Kitchen Hood – went through out of 5.10.
    - I. Only here for awareness.

- II. Brian Krafthefer is a representative in this group.

## F. Residential IAQ?

- I. Residential IAQ – Progress Report
    - 1. Wenhao Chen wrote up a draft document which summarized the issues and possible relation to TC 2.3 issues. (attached)
    - 2. Wenhao is seeking volunteers to work on these topics. Wenhao can contact Stephanie Mason (from 62.2).
    - 3. Co-sponsorship
  - II. Unvented Combustion Products – Residential
    - 1. Ina Parker expressed an interest in working on residential IAQ projects.
  - III. Please contact Wenhao at ----- if you'd like to help write or brainstorm.
8. New Ideas for RTARs
- A. Jensen mentioned the EHC research list: sVOCs (lighter ones may be similar to VOCs),
    - I. Action Item: Charlene to contact Ann Marie Summer to work with Jenson Zhang on this.
  - B. Remaining Life Analysis Test Method for Gas-Phase Medias
    - I. Ashish Mathur mentioned this.
    - II. Brainstorming will happen with Matt Middlebrooks & Paula Levasseur and Ashish Mathur.
9. New Business
- A. None
10. Break into Working Groups, if there is time
- A. None
11. Updates from Research Subcommittee Chairs Breakfast – (breakfast occurs after the research meeting, so these notes were added afterward)
- A. Our new liaison after this meeting will be Harvey Sachs -----
  - B. There is a new RTAR form. It's a pdf file that you can type into. Its best feature is that it limits the number of words that we can use and that RAC can expect. We need to be concise and focused. Please make citations to literature in the Background section and include the reference in the Reference sections. This form should be available soon. Any RTARs that are currently in the works may use the old form (but KO thinks it would be a good idea to switch).
  - C. Only 5 RTARs were submitted for consideration this time: 2 conditionally accepted, 2 returned, 1 rejected
  - D. 7 TRPs may be ready for bid in the fall, none currently ready. ASHRAE needs more RTAR & WS.



- E. Someone from the PES or related may attend RAC meeting (can be by phone) when they are considering our WS. Not clear as to whether we can do so for RTAR. But our liaison should be prepped to be our spokesman before the RAC meeting.
- F. Next deadline for RTARs appears to be August 15.
- G. Presentation on responsibilities of PES in evaluating proposals. There will be revisions made to the ASHRAE Research Manual to make it clearer including:
  - I. Section 6.2 should say that the Research liaison will be present during the PES eval meetings to assist with evaluation of proposals.
  - II. Each PES member must individually review and score each proposal before the group meeting. When the group meets, the proposals should be discussed. Individuals may reveal their scores. After discussion, each member should reconsider their scores. Then the group does the proposal evaluation form & Summary Sheet (in the Research Manual).

## 12. Dinner plans

- A. Mentioned

## 13. Meeting adjourned

Attendees - present	Affiliation	Attendees - present	Affiliation
Kathleen Owen – Chair	RTI	Marilyn Listvan	Listvan & Assoc.
Dean Tompkins	Consultant	Philip C. Farese	Advantix Systems
Paula Levasseur - Sec	Cameron Great Lakes	Steve Zitin	Bioclimatic Air Systems
Brad Stanley	AAF	R. Vijayakumar	AERFIL
Ina Parker	Ahlstrom Filtration	Kyung-Ju Choi	Univ of Louisville
Gemma Kerr		Ashish Mathur	UVDI
Stephany Mason	Eurofins Air Toxics	Rahul Bharadwaj	AAF
Peter Freeman	Jacobi Carbons	William Lull	Garrison/Lull
Henry Greist	Lennox	Charles Seyffer	Camfil
Zuraimi Sultan	NRC Canada	Charlene Bayer	Georgia Tech & Hygiene Sciences
Thad Ptak	Columbus	Matt Middlebrooks	Filtration Group
Sanjeev Hingorami	Lennox	Keith Chesson	Clarcor
Brian Hafendorfer	Trane	Jan Fretthold	Air Tech Intl.
Dave Schaaf	MWV	John Simenson	Johns Manville
Peter Hoekstra	IBR	Grace Byfield	RTI
Chris Muller	Purafil	Dan Haas	Clarcor

### Wenhao Chen's Residential IAQ – Progress Report

#### **Background:**

People, especially infants and the elderly, spend a majority of their time in homes.<sup>1</sup> The importance of the residential environment to cumulative air pollutant exposures has been demonstrated in prior research.<sup>2</sup> Recent LBNL studies identified nine pollutants as priority

hazards in residences, including PM<sub>2.5</sub>, formaldehyde, acetaldehyde, acrolein, benzene, 1,3-butadiene, 1,4-dichlorobenzene, naphthalene, and nitrogen dioxide. These studies also identified three contaminants which may cause site-specific health problems in homes, including second hand smoke, ozone, and radon.<sup>3,4</sup>

Besides source control and ventilation, air cleaning devices have generally been recognized as a good supplemental approach for reducing contaminant concentrations indoors. However, the question of whether and how to best apply air cleaning/filtration for home exposure reduction remain unclear, especially for the gas-phase. The goal here is to develop RTAR(s) that can help to answer (or partially answer) the above question.

### **Progress up-to-date:**

A brainstorming call was conducted on April 23. Participants include Frank Hammes, Kathleen Owen, Jeffrey Roseberry, Zuraimi Sultan, Richard Hecker and Wenhao Chen.

Preliminary potential RTAR ideas generated from this call include (in random order):

- General
  - ✓ Literature review and health benefit analysis of reducing indoor concentrations of gaseous pollutants in homes.
  - ✓ Evaluating the performance of off-the-shelf air cleaning devices/filters for VOCs and ozone removal for residential applications via controlled field experiments.
  - ✓ Modeling the effect of housing characteristics and pollutant source characteristics on the effectiveness of air cleaning devices in residential applications.
- For Specific Gaseous Pollutant
  - ✓ Evaluating Performance and Role of Formaldehyde Removal Filters in Reducing Home Exposures.
  - ✓ Evaluating Performance and Role of Ozone Removal Filters in Reducing Home Exposures.
- For In-room Air Cleaners
  - ✓ Developing standard test method that incorporates the measurement of removal effectiveness as well as potential byproduct generation.

No further action has been taken due to the lack of response from the group on how to prioritize (or synchronize) these ideas to generate a specific RTAR.

### **Plan for Next Step:**

Invite inputs from TC2.3 meeting at Denver. Establish WG to develop a RTAR before 2014 winter meeting based on one (or more) selected ideas.

1. Klepeis NE, Tsang AM, and Behar JV. Analysis of the National Human Activity Pattern Survey (NHAPS) Respondents from a Standpoint of Exposure Assessment. 1996. Final Report, EPA/600/R-96-074. U.S. Environmental Protection Agency.
2. Weisel CP, Zhang J, Turpin BJ, Morandi M, Colome S, Stock T, and Spektor DM. Relationships of Indoor, Outdoor, and Personal Air (RIOPA), Part I. Collection Methods and Descriptive Analysis. Research Report 130 Pt 1. Health Effects Institute.
3. Logue, J.M., T.E. McKone, M.H. Sherman, and B.C. Singer. 2010. "Hazard Assessment of Chemical Air Contaminants Measured in Residences." *Indoor Air* 21:92-109.
4. Logue, J.M., P.N. Price, M.H. Sherman, and B.C. Singer. 2011. A Method to Estimate the Chronic Health Impact of Air Pollutants in U.S. Residences. *Environmental Health Perspectives*. LBNL-5267E.

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

Monday, January 20<sup>th</sup> 2014, 6:00-8:00 p.m.

Hilton Concourse B, Hilton Concourse Level, NY Hilton, New York, NY, USA

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

<u>Name</u>	<u>Email</u>
1) Paolo Tronville (Chair)	
2) Keith Chesson	
3) Kyung-Ju Choi	
4) Dan Haas	
5) Volker Haendler	
6) Gemma Kerr	
7) Sanjeev Khingorani	
8) Paula Levasseur	
9) Peter McKinney	
10) Matt Middlebrooks	
11) Kathleen Owen	
12) Kartik Potukuchi	

**1) Update on standards within scope of ASHRAE TC 2.3**

- a) GPC 27P “Measurement procedures for gaseous contaminants in commercial buildings” - *Bill Lull*
  - Progress is being made faster now that the committee is arranging teleconferences between meetings. Completion of the first draft is expected in 2015.
- b) ASHRAE Std. 145.1-2008 “Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Loose Granular Media” – *Kathleen Owen*
  - This document has revisions (mainly test methods improvement) almost completed and will go out for public review before the Seattle meeting.
- c) ASHRAE Std. 145.2-2011 “Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Air Cleaning Devices” - *Kathleen Owen*
  - This Standard was published in 2011. The SSPC 145 committee is co-sponsoring a research project with TC 2.3 and SSPC 62.1 to validate the method. One small addendum going out for public review.

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

- a) GPC35P “Method for Determining the Energy Consumption Caused by Air-Cleaning and Filtration Devices – *Brad Stanley*
  - First meeting is tomorrow. Discussion will include new loading dust for particulate filters. Brad Stanley is a voting member. Kathleen Owen and Matt Middebrooks are non-voting members so that there is reasonable gas phase representation.
- b) TC 2.4 “Particulate Air Contaminants and Particulate Contaminant Removal Equipment” – *Gemma Kerr*
  - i) SSPC 52.2 “General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size”

- The standard is undergoing revision to improve the method precision. A proposal to change the test RH has passed public review; ones to restrict the measuring equipment to optical particle counters and to tweak the definitions of some of the MERV categories are in public review; and one related to particle shedding is on its way to public review. The SSPC is also initiating a research project to check the effects of these changes.
- 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”
    - This document is ready to go out for final public review. The committee is writing an RTAR for a research project to collect data using the test method..
  - ii) SPC 185.2 “Method of Testing Ultraviolet Lamps for Use in HVAC&R Units or Air Ducts on Irradiated Surfaces”
    - This document is ready to go out for public review. The committee is also interested in PCO and stand-alone germicidal units for hospitals
- d) TC 9.11 “Clean Spaces” – *Matt Middlebrooks*
  - There is little talk about filters in this committee, Matt is not going to continue following them. There is a clean room design guide in the works which he has reviewed.
- e) SSPC 62.1 “Ventilation and IAQ High Rise Buildings” – *Chris Muller*
  - No report
- f) SSPC 62.2 “Ventilation and IAQ Low Rise Buildings” – *Barney Burroughs*
  - No report

### 3) Information Exchange

- a) AFS – *KJ Choi*
  - The Annual Conference will take place March 25-26, 2014 in the Marriott Westchase in Houston, TX. The topic is “Oil and Gas and Chemical Processing Filtration and Separations Conference”.
- b) ASTM D22.05 “Air Quality” SC “Indoor Air” – *Brad Stanley*
  - No report
- c) ASTM D28.04 “Activated carbon” SC “Gas Phase Evaluation Tests” – *Paula Levasseur*
  - i) D6646 - 03(2008) “Standard Test Method for Determination of the Accelerated Hydrogen Sulfide Breakthrough Capacity of Granular and Pelletized Activated Carbon”
    - There is nothing new since the change from carbon tetrachloride to butane as a challenge gas. This is used as a test for raw media in place of Standard 145.1 because it is easier. It also gives different information on the media.
- d) CEN/TC 195 “Air filters for general air cleaning” WG 5 “Gas phase filters” – *Paolo Tronville*
  - i) EN ISO 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)”
    - This is being voted in parallel with the ISO Standard with same title (see below).
  - 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 was voted in parallel with the ISO Standard last year and is now a European standard.
- e) CEN/TC 346 “Conservation of cultural property” WG 4 “Environment” – *Chris Muller*
  - Several years ago this committee worked on gaseous contaminants. Chris is not here to update.
- f) CEN/TC 386 “Photocatalysis” – WG2 “Air Purification” – *Paolo Tronville*
  - They are working in parallel with ISO TC 206 (see below).
- g) ISO/TC 22/SC7/WG3 “Air and oil filters” – *Paolo Tronville*
  - i) ISO/TS 11155-2: 2009 “Road vehicles - Air filters for passenger compartments - Part 2: Test for gaseous filtration”
    - This test uses toluene, butane and sulfur dioxide as challenge gases. Car manufacturers in Europe are required to use this test.

- h) ISO/TC 142 “Cleaning Equipment for Air and Other Gases” /WG8 “Gas-phase air cleaning devices” – *Matt Middlebrooks*
  - i) ISO 10121-2:2013 “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 was published last year.
  - ii) 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)” (FDIS vote ends February 5<sup>th</sup> 2014) - This is being voted on, comments have been received but nothing controversial. It should be accepted.
  - iii) US Technical Advisory Group (TAG) to ISO/TC 142 - No update
- i) ISO/TC146 “Air quality” /SC6 “Indoor air” – *TBD* - It is possible that this document has something useful for GPC 27. They publish methods for measuring gaseous contaminants in indoor air.
- j) 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” - The secretariat is ASHRAE. BACNET is included. The standard has been reconfirmed without change but is not widely used.
- k) 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 – under revision) - No details on revision are available at present.
    - (2) Part 2: Removal of acetaldehyde (2011)
    - (3) Part 3: Removal of toluene (2011)
    - (4) Part 4: Removal of formaldehyde (2013)
    - (5) Part 5: Removal of methyl mercaptan (2013)
  - ii) ISO/DIS 18560-1 “Fine ceramics (advanced ceramics, advanced technical ceramics) - Test method for air-purification performance of semiconducting photocatalytic materials by test chamber method under indoor lighting environment - Part 1: Removal of formaldehyde” - This is a different series of methods with tests conducted in a chamber.
- l) ISO/TC209 “Cleanrooms and associated controlled environments” – *Chris Muller*
  - i) ISO 14644-8:2013 “Classification of airborne molecular contamination” - This was published last year. It is about classifying clean rooms according to what level of contamination is present in the air.
  - ii) ISO 14644-10:2013 “Cleanrooms and associated controlled environments : Classification of surface chemical cleanliness” - Same as above, but classification of surfaces according to contamination present.
- m) ITRI (Taiwan) – *Chris Muller* - No update. Their information has been useful in the past.
- n) USGBC – *Charlene Bayer* - There is a pilot credit in use now that gives points for using ASHRAE’s IAQ Procedure.

#### 4) Old Business

- a) Life Cycle Cost Calculation Guideline/Standard - GPC 35 may have problems covering both gas and particle filters. To be effective, have to separate the effects of the two, i.e. assume no particle loading of gas phase filters and vice versa.

#### 5) New Business

- a) 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”
      - There is an ISO survey trying to gather information on needs, potential users and limitations to justify continuing with this preliminary work item. This document is intended to provide help to engineers specifying air cleaners. Paula reported that she had participated in a conference call on this topic (related to Standard 145) and that Ashish will report at the TC meeting.
    - 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”
      - There is an ISO survey trying to gather information on this topic to justify continuing with this preliminary work item. There is no clock running on PWIs.
- 6) The meeting was adjourned at 7:15 pm.