Meeting Notes
Informal discussion of equipment needs and configuration for revisions to Method 202.

2:00 PM on Thursday January 18, 2007 at
Eastern Research Group's Laboratory Facility
601 Keystone Park Drive
Suite 700
Morrisville, NC 27560

Attachments

- **1 - Meeting Agenda**
- **2 - Attendee Sign-In List and Affiliation**
- **3 - Schematic of Dry Impinger Modification to Method 202**
- **4 - Photograph of Apparatus suggested by Jim Serne**

Welcome and Introduction of Attendees -ERG Conference Room

Dr. Ray Merrill (ERG) welcomed the stakeholders (see Attachment 2 for Attendee Sign-In List) and thanked them for their time and interest.

Ray Merrill reiterated the purpose of the meeting (see Attachment 1 for Agenda):

1) See sampling train and equipment used during replicate tests of modified Method 202;
2) Share observations about train equipment and operation; and
3) Describe issues/concerns regarding field ruggedness of equipment.

Ray Merrill stated that because this is an equipment-focused meeting, EPA and ERG will not address other issues related to stakeholder concerns. Concerns related to chemistry will be discussed at the February 9, 2007 meeting at EPA.

Ray Merrill introduced Mark Owens (ERG) and Randy Bower (ERG), who have been completing the laboratory experiments using the current equipment configuration (see Attachment 3 for Schematic of Modified Method 202 train). They provided a quick overview of their findings regarding the equipment.

Mark Owens noted that maintaining the temperature of the hot box at 320°F would be difficult in the field. Walt Smith (Walter Smith and Associates) added that maintaining 220±25°F for Method 5 particulate sampling in the field is difficult.

Ray Merrill stated that the condensible particulate portion of the train runs at ambient temperatures. He stated that the 320°F temperature for the probe and filterable particulate was established to reduce the reactions between sulfate and ammonia. Ron Myers, the EPA Work Assignment Manager, directed ERG to conduct the experiments a higher temperature than

filterable particulate trains to minimize drawing in SO_2 and the potential for chemical reactions that could lead to formation of condensible particulate matter.

Walt Smith noted that essentially, the modified method for condensible particulate starts at the exit of the heated filter.

The group moved to the lab, where everyone viewed and discussed the modified sampling train. In the lab, Mark Owens (ERG) described the sampling train and observations while it was operated. After observing the train and having a short discussion, the group returned to the conference room.

The group identified several items that would make the train difficult to operate in the field:

- Thermocouples - Accommodating seven thermocouples instead of five will be challenging in the field.
- Temperature - Maintaining the high front end train temperatures will be difficult in the field.
- Boxes - Accommodating two separate cooling boxes will be difficult in the field. One cooling box divided into two chambers would make the train more rugged.
- Condenser - The connection between the condenser and the hot box is too fragile.
- Other sampling trains operate with a cold filter between impingers in the cooling boxes and the stack sampling representatives thought the train could be operated with improvements to the cooling boxes.

Thermocouple Issues

Jim Serne (TRC Solutions) and others noted that the "umbilical" is too short and needs to accommodate more thermocouples. The standard setup is for five thermocouples and the data collection box contains space for five thermocouples; however, this train has seven thermocouples. ERG noted that some of the thermocouples in the laboratory train were in place as quality indicators and may not be necessary in field operation.

Temperature Issues

Randy Bower (ERG) stated that ERG's test runs were 1 hour. To maintain the temperature of the "bath" during the 1-hour runs, he would add small amounts ice to the ambient temperature bath two or three times to maintain the temperature of the cooling condenser below 30°C. He also noted that water condensed throughout the ambient impinger and filter portion of the train.

Mark Owens noted that operating the train at 320°F put a strain on the circuit breakers. Adding more demand to the train control box circuits would trip the breakers. If operators must heat the train to 320°F in cold weather, additional amperage may be required in the control circuits to maintain the higher temperature.

Mike Hartman (Air-Tech) described challenging field test temperatures in which he worked the day before. With ambient temperatures at 30-40°F, maintaining temperature was difficult.

Ray Merrill stated that the thermocouple on the back of the cold filter is a QC check to ensure that the temperature does not get too hot. Ray Merrill asked if the cold filter created a breakage issue, the group said it did not since other EPA trains had a similar requirement.

Ron Myers (EPA) stated that stack testers could run the condensible particulate portion of the train at lower than 30°C (85°F) as long as the temperature did not exceed 85°F. He pointed out the concern from a regulatory approach regarding temperature, i.e., a lower temperature will potentially trap more SO_2 if it is known to be in the stream.

Jim Serne noted that the modifications to M202 are designed around sulfates artifacts, which are not an issue when testing manufacturing plants.

Walt Smith explained techniques used in the field to maintain the target temperatures. On cold days, a "bird bath" heater could be used to prevent going below the bath temperature. On hot days, covering the whole train with a towel helps keep the train cool.

Jim Serne noted that if a heater were used to maintain the temperature, then the train would need a temperature control. Jim Serne noted that the back filter is required to be maintained at 85°F or less. He questioned whether there should be a minimum value, as well as maximum value.

Walt Smith recommended running the train at 68°F (20°C), which is typical of other sampling trains. He suggested running laboratory tests with one train at 85°F and another at 68°F. If there's no difference, then choose the lower temperature. He stated that 85°F is hard to maintain under any conditions.

Roger Shigehara (Emissions Monitoring) suggested that there would be no difference between 85°F and 68°F, unless the system is stressed.

Ron Myers stated that EPA is not wedded to 85°F. He expressed that he wants to satisfy the stakeholders. If the train can be operated at 68°F and can meet the objectives and stakeholders' needs, then that is acceptable.

Condenser Issues

Jim Serne and others noted that the condenser of EPA's modified method is long.

Regarding the condenser, Walt Smith suggested using a downward coil "pancake" condenser instead. The long stem on the first impinger should be 1/4 inch from the bottom of the impinger.

Roger Shigehara emphasized that the coil provide the necessary cooling capacity. In the modified method, the only moisture is condensed water.

Bill Howe (Apex Instruments) mentioned a stem-in-a-sleeve impinger apparatus to cool the gas.

Mike Hartman explained that stack testers have used a cyclonic separator that could be used in this train to remove condensed water from the cooled stack gas. The cyclone approach may be better at separating the water from the gas stream.

Ray Merrill explained that if there were too much water trapped in the impingers, then the stack gas would be forced to bubble through the water, defeating the purpose of the dry impinger approach to minimize SO_2 artifacts.

Ray Merrill noted that the proposed condenser on the modified M202 is common to EPA Method 23 and is inclined. Walt Smith stated that a vertical orientation makes sense to address the SO_2 issue.

Walt Smith suggested using a "Duncan" apparatus, which would not change the way the box looks, but would improve the condenser. The advantage of the Duncan is that it is more compact and does not have the same height as EPA's modified M202 condenser. It is oriented vertically and uses a hose jacket to cool the gas. It also has a larger collection bulb below. However, none of the attendees had an easy solution for purging the Duncan impinger. Mike Hartman noted that you would need several of the Duncan condensers with a high moisture stack.

Bill Howe (Apex Instruments) stated that if EPA solved the collection and artifact problems, his company could build the sample train so suit. A single box with a divider would be easy to build.

Catches and Purging Issues

Mark Owens and Randy Bower described how they purged the train: Before purging, they weighed the impinger catch, replaced the short stem impinger insert with a modified Greenburg-Smith insert in the first impinger (stem long enough so that the purge forced bubbles through the liquid). Approximately 50 ml of degassed deionized (DI) water was added, followed by purging the train with UHP nitrogen. The liquid is recovered, trains are rinsed, and the total liquid is measured.

ERG used ball joints to glass tube conversions to connect the nitrogen purge. Only the condensible particulate portion of the train was purged. The knockout (first) impinger contained most of the water at the end of the run. The gel impinger had the next highest amount of water.

Ray Merrill stated that the literature shows organic material is retained through the drying step in the method for compounds that have higher boiling points (lower vapor pressure) than n-hexadecane (normal C16 hydrocarbon). Higher vapor pressure compounds will be lost during analysis, so there is no need to completely capture them during sampling.

Walt Smith noted that in the "asphalt method," if the collection temperature goes from 80 to 85 to 90°F, then the sample does not all evaporate. His concern is that if methylene chloride were used as a rinse, then it would not recover the organics that are on the walls of the sampling train or the impingers. Walt Smith noted that you could put oil or asphalt roofing tar in the train and clean it up several ways to determine what works best.

Mike Hartman suggested using acetone as a rinse. He explained the cleanup for a source with no moisture and questioned why the train would need to be rinsed with water.

Ray Merrill explained that water and organics follow the surface of the condenser and that acetone is completely immiscible in water. However, acetone is more reactive than methylene chloride and may cause artifacts.

Walt Smith questioned/explained that volatile and semivolatile metal compounds may pass through the heated filter and be captured as condensible particulate matter. Elements and compounds of boron, selenium, silica, etc. may act this way. At an aluminum or phosphate plant, the filter catches silica tetrachloride as condensible particulate matter. The filter may catch many different metals.

Jim Serne noted that the train can be purged with nitrogen in the field. Ray Merrill described how iron oxide from the nitrogen cylinder can contaminate the train during purging, therefore, the nitrogen purge gas should be filtered.

Ron Myers noted that the purge must be done as soon as possible after the sampling run.

Walt Smith questioned what happens when the SO_2 concentration is increased in stack gas. Does the artifact increase proportionately? Ray Merrill stated that a laboratory study during FY2005 by Battelle (EPA Contract No. 68-D-02-061, Work Assignment 3-14) contains information on the rate of reaction and affect of SO_2 concentration. Battelle showed the impinger solutions reach a stead state. Environment Canada and ERG both noted that the rate limiting step in the conversion of SO_2 to SO_4 seemed to be the formation of acid in solution and that the lower the pH, the slower the reaction.

Roger Shigehara questioned why EPA chooses not to just measure SO_2 and SO_3. You would need two trains, or get organics and subtract the sulfuric acid.

Sample Volume Issues

Walt Smith suggested that EPA "stress" the high end. Instead of operating the train at ½ cubic feet per minute (cfm), run it at closer to 1 cfm. Jim Serne noted that Pennsylvania requires 50 feet per hour flow rate.

Jim Serne stated that considering the challenges, EPA might need two methods: one for organic and one for inorganic condensible particulate matter.

Equipment Issues

Jim Serne stated that as a stack tester, he does not want to buy all new equipment to run the method. He prefers that EPA use as much existing glassware and equipment as possible. Ron Myers stated that he likes the idea of using existing glassware.

Regarding glassware, Mike Hartman noted that a glass blower can make any modification you need to standard impingers. The price of a modification may be equivalent to the cost of a new impinger.

Jim Serne shared photographs of an equipment configuration that he assembled on the meeting day using existing glassware and equipment at his company (see Attachment 4 for Photographs of configurations suggested by Jim Serne). However, he conceded that you would have to buy a single cold box with a divider to accommodate the new configuration. The suggested knock out impinger is wider in diameter, shorter, and has a long side arm. The group largely approved of Jim Serne's modification, but questioned how it could be purged.

Attachment 1 - Meeting Agenda

Informal discussion of equipment needs and configuration for revisions to Method 202.
2:00 PM on Thursday January 18, 2007 at
Eastern Research Group's Laboratory Facility
601 Keystone Park Drive
Suite 700
Morrisville, NC 27560

Agenda

Welcome and Introduction of Attendees -ERG Conference Room

ERG is hosting an afternoon gathering at our facility in Morrisville, NC to show how we've assembled a train in the laboratory to meet EPA and Stakeholder recommendations**.** This is an equipment-focused meeting and we will not address other issues related to stakeholder concerns–other issues will be discussed at the February 9, 2007 meeting at EPA.

Review Purpose of the Gathering -ERG Conference Room

See equipment used during replicate modified Method 202 tests
Share observations about train operation
Describe issues/concerns regarding field ruggedness of equipment

View Equipment - ERG laboratory

Discuss Ideas/Solutions on Field Application of Equipment- ERG Conference Room

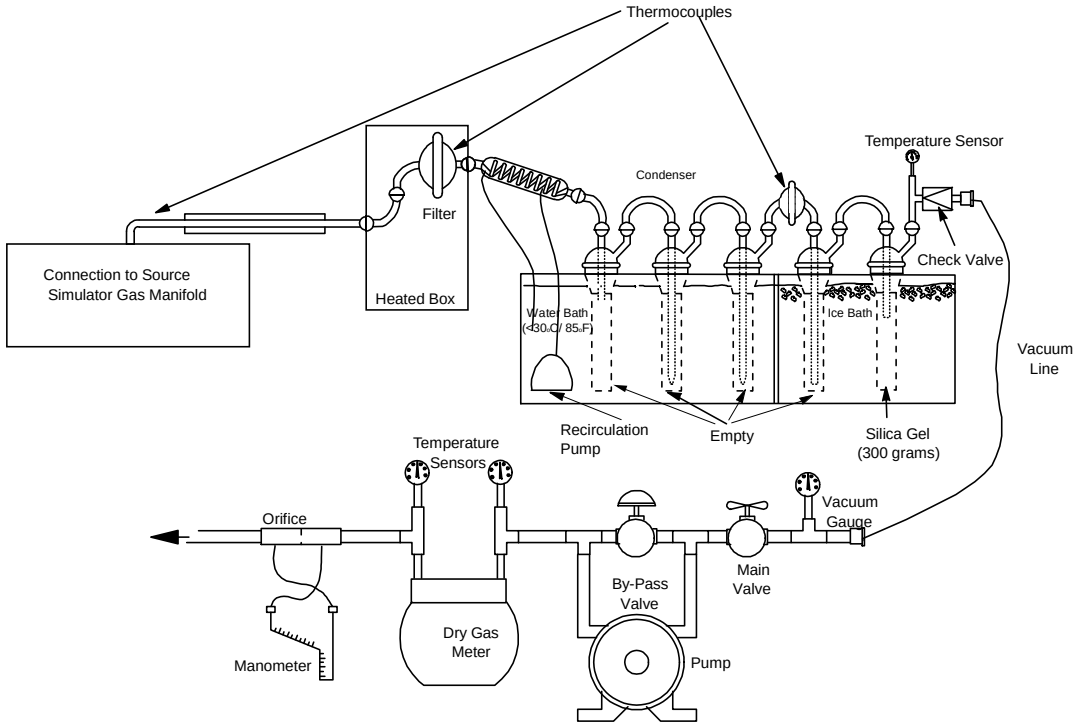
Discuss / Share Observations
Identify equipment available from Vendors to make system easier to use in the field.

We'd like feedback on what equipment is available from vendors who supply Method 5 type equipment and we'd like to hear feedback from the stack sampling community about improvements to the configuration of the train to make it more rugged for use in the field.

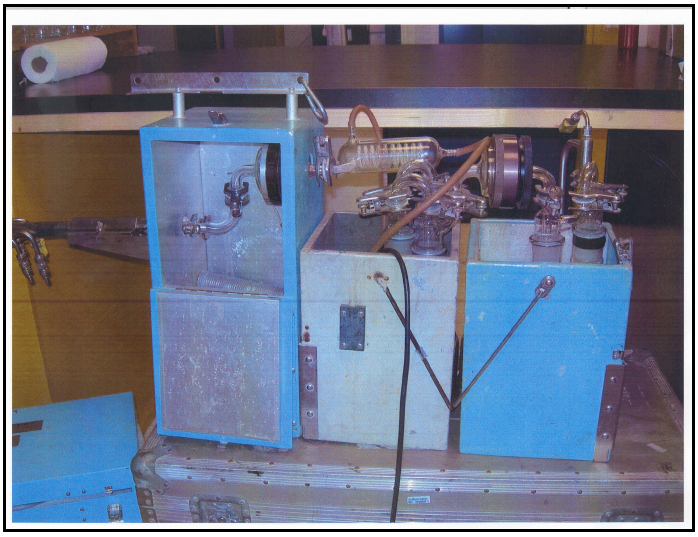
Attachment 2 - Attendee Sign-In List and Affiliation

Name	Company	Expertise	Contact Info
Ron Myers	U.S. EPA	Regulations	myers.ron@epa.gov
Tom Logan	U.S. EPA	Source Sampling	logan.thomas@epa.gov
Ray Merrill	Eastern Research Group	Method Development	ray.merrill@erg.com
Randy Bower	Eastern Research Group	Method Development	randy.bower@erg.com
Mark Owens	Eastern Research Group	Stack Sampling	mark.owens@erg.com
Joe Fanjoy	Eastern Research Group	Technical Writing, Regulations	joe.fanjoy@erg.com
Mike Hartman	Air Tech Environmental LLC	Stack Sampling	answers@ipass.com
Jim Serne	TRC Solutions	Stack Sampling	jserne@trcsolutions.com
Bill Howe	Apex Instruments	Equipment Vendor	whowe@apexinst.com
Cody Cress	Apex Instruments	Equipment Vendor	
David Hendricks	Environmental Supply	Equipment Vendor	davidh@environsupply.com
Lew Ballard	Environmental Supply	Equipment Vendor	lewb@environsupply.com
Roger Shigehara	Emissions Monitoring	Consultant	rshigehara@emissionsmonitoringing.com
Walter Smith	Walter Smith and Associates	Consultant	walt@waltsmith.com
Art Werner	MACTEC, Inc.	Stack Sampling	aswerner@mactec.com
Mike Maret	MACTEC, Inc.	Stack Sampling	mdmaret@mactec.com
Ralph Roberson	RMB Consulting	Stack Sampling	roberson@rmb-consulting.com

Attachment 3 - Schematic of Dry Impinger Modification to Method 202



Attachment 4 - Photographs of Configurations Suggested by Jim Serne



Serne configuration of modified Method 202 sampling train using existing glassware.

Serne configuration of modified Method 202 knockout impinger using existing glassware.