PROCEEDINGS OF EPA'S OPTICAL REMOTE SENSING (ORS) WORKSHOP HELD ON JULY 29-31, 2002 AT RESEARCH TRIANGLE PARK, N.C.

PURPOSE AND OBJECTIVE:

For years the Emissions Measurement Center (EMC) within EPA's Office of Air Quality Planning and Standards has been the focal point for scientific development and regulatory acceptance of new methods to measure emissions of airborne contaminants. Until recently, this generally meant the measurement of smokestack emissions of criteria pollutants (e.g. sulfur and nitrogen oxides, carbon monoxide, and particulate material) which was accomplished either through manual monitoring methods or by Continuous Emission Monitoring Systems (CEMS). In the past few years, however, EPA has recognized a growing need to measure emissions of many different air toxics compounds from a wide spectrum of open sources which, heretofore, were not important in the national regulatory or enforcement processes. Recognizing major gaps in this field, the EMC has established a number of partnerships with the U.S. academic community, the Department of Defense, EPA's Office of Research and Development, and private sector instrument manufacturers to further our knowledge of optical remote sensing (ORS) of air emissions. In order to promote the regulatory acceptance of these new measurement capabilities by State and local pollution control agencies, EPA sponsored a workshop in July 2001 that brought together experts and regulators in this field. (The summary of this EPA workshop is available on the Agency's website: http://www.epa.gov/ttn/emc/).

The purpose of this workshop is to take the current, state-of-the-art ORS technologies that were developed for regulatory and other applications and to leverage these opportunities into (1) a variety of new applications for multi-media regulatory applications for compliance monitoring, and (2) potential applications to homeland security issues. A number of projects in this area have been funded, are well underway, and instruments are now being field demonstrated. These new measurement techniques are yielding exciting new insights into their potential use in our national homeland security program and will be presented in the technical session of this workshop. It is the intent of this workshop to bring together (1) national scientific experts in the ORS field, (2) public, private, and military organizations currently involved in regulatory programs for quantifying airborne emissions, and (3) national programs and budget managers involved with regulatory compliance programs or those involved with homeland security programs who may not be fully aware of the large potential for technology transfer in this field.

A number of research and field engineering projects, currently underway within EPA and DoD, were discussed at the workshop along with demonstrations of ORS equipment operating under actual field conditions. One important outcome of the workshop was an increased understanding by national governmental authorities on the potential application of these new technologies for monitoring (in real-time) the plumes of air contaminants and community risk exposures due to short-term events (e.g. spills or other disasters). Another important outcome was identification of new projects, which may need to be undertaken to further integrate ORS science with national air compliance or homeland security needs and objectives.

SUMMARY

The second Optical Remote Sensing (ORS) Workshop was successfully held on July 29-31, 2002 at the EPA campus at Research Triangle Park, N.C. A wide variety of attendees contributed to the many valuable discussions about new ORS technologies and their potential compliance applications in the national air regulatory programs. The workshop was co-sponsored by EPA's Emissions Measurement Center (EMC), Arcadis Inc., and Desert Research Institute (DRI) with Dr. Ram Hashmonay of Arcadis and Dr.Hampden Kuhns of DRI arranging and chairing both technical sessions. The Agency wishes to publicly acknowledge and thank these two individuals and their respective organizations: without their talents and dedicated efforts the workshop would not have achieved the success that it did. We also wish to thank Mr. Wade Peele of EMC for his administrative leadership and contributions in making the workshop successful.

The compilation of materials in these Proceedings was done informally and in an ad-hoc fashion—namely by collecting and putting together the abstracts and power point displays from the presenters, the summaries of the panels and small group discussions from the team leaders, and the final agenda and attendee lists from the workshop coordinators. Undoubtedly there are gaps and corrections still needed but time was short and resources low and the reader's patience is appreciated.

Thus was concluded the second of two EPA workshops on the subject of ORS and its potential application to national source monitoring and compliance assurance. There were three main outcomes of the Workshop:

1. The gathering of national experts, regulators, and military representatives provided a nationwide focus for addressing ORS topics of mutual interest and encouraged future research collaborations among the attendees.

2. Military needs in the field of emissions monitoring and compliance assurance discussed at the workshop resulted in EMC providing input to the Strategic Environmental Research and Development Program and the Environmental Security Technology Certification Program (SERDP/ESTCP) on their FY04 Statements of Need. EMC also

requested that SERDP/ESTCP co-sponsor future workshops, perhaps at EPA Regional Offices or State agencies to demonstrate new monitoring technologies and bring local military installations into discussions with local regulating agencies to discuss Title V permit problems, if any, and to review possible solutions. (***Note that this is unlikely to be funded anytime soon due to large recent reductions in the SERDP/ESTCP budgets for FY 03.)***

3. In a conference call following the workshop, four small task groups were formed to address the following:

A. Compile a case-study document of successful ORS applications that supported EPA/State/local regulatory monitoring requirements.

B. Develop a "how-to" guidance document for designing ORS monitoring networks.

C. Meet with State and local regulatory agencies to find champions for ORS applications and use this information to further promote the use of ORS by regulatory agencies nationwide.

D. Meet with Universities and other academic institutions to promote "Environmental Centers of Excellence" or "National Environmental Test Sites" that would be suitable for demonstrating the applicability of new monitoring technologies for compliance or trading purposes.

Please note that additional volunteer participants in these task-groups are welcomed.

At this point it is uncertain whether or not EMC will sponsor another workshop next year—it strongly depends on the demand for such a meeting and on the success of the above-mentioned task-group work.

John C. Bosch Jr.
Senior Engineer and Program Advisor
Emissions Measurement Center
U.S. Environmental Protection Agency
telephone: 919-541-5583
e-mail: bosch.john@epa.gov

AN ODE TO THE WORKSHOP

Our esteemed colleague, Dr. Don Stedman from the University of Denver, composed an ode to us all with this prose whilst whiling away the time at the Workshop. Thanks Don!

How Remote Can You Get?

Joe stood in for Patrick, pushing a multiple optical beam
And Tim is firm that tracer fluxes are better than they seem.

Harris is high on all hog-lagoons.
If something stinks nearby, then please-- do see him soon.

Harold sees H2S every day
but regulations get in his way.

Kagann claims he can see anything at all
as long as active infra-red is there, upon which he can call

Kestrel's Otten might see lots of stuff and such
if his palms are crossed with mega-bucks

Bisson needs millions for MEMS and say!
His gizmos might even work some day

Hans likes LORAX LIDAR and a million cars a day
To him is simply just childs play

Ram has oh-so-neat models and measures, you know
How many of his wheels can turn and work---in just one go?

Scott can measure it all—a Raman for every need
Sedlacek has bagged it—for him a particle-only feed
Stephen's new blimp is no joke–it really gets him into smoke

Miller's great HARLIE may never get to Mars
But it's *great* for dust from unpaved roads and cars

Thank you, John and Wade and all–what else can we say?

Thank you sponsors, DRI, Arcadis, and the EPA.

Don Stedman, July 2002

AGENDA AND ATTENDEE LIST
ABSTRACTS AND TECHNICAL PRESENTATIONS
PANELS AND SMALL GROUPS (My sincere apologies to those team leaders who gave me their writeups but which I misplaced and thus cannot include in these proceedings.)

The above files are located at the following:

http://www.epa.gov/ttn/emc/emcopticalsensingworkshop.html

CONCLUSIONS AND FOLLOW-ON ACTIVITIES

The Conference Call

As a result of many discussions by workshop participants, we arranged a conference call so that interested individuals could discuss certain ORS topics of interest and volunteer for specific workgroups on these subjects of interest. This call was held on August 27, 2002 with invitations sent to all workshop attendees. Discussed on the call were the following topics distilled from thoughts and discussions at the workshop

1. COMPILATION OF SUCCESSFUL CASE STUDIES USING ORS

Bob Spellicy moderated the largest "small group" discussion that dealt with "How to get the word out?" regarding successful uses and applications of optical remote sensing devices. From the attendees, it seems that at least 30 successful regulatory applications are readily available for compilation. Apparently, many examples exist but are not available as a national document for other State/local agencies to refer to. The attendees felt very strongly that there would be huge benefits if EPA were to communicate these successful examples (possibly arranged by source category) to States, local agencies, industries, and other regulated entities. Note: See his small group summary write-up for more details.

Need volunteers and a team leader from workshop attendees to lay

out the goals & objectives, formats, collect case studies, arrange into standard formats, edit, etc. From conversations heard at the workshop, materials seem to be available and merely put into a standard format, edited, and compiled. (Specific, identified example case studies that resulted in accepted compliance agreements or permits would seem to be the most valuable: any large obstacles in this?)

2. ORS NETWORK DESIGN PROCEDURES (ORS FOR DUMMIES)

The "Case-Study Compendium" in Nr 1 above could also be accompanied by a "how-to" document on designing an ORS network for compliance or permitting purposes. This was said to be a definite high-priority need by NC and other State representatives responsible for newly-formed emergency response teams. Robin Segall of the EMC is working on a SERDP project with Joe Wander's USAF group and Ram Hashmonay of ARCADIS that will produce ORS network design protocols for a number of sources such as lagoons and landfills. So we have a start.

2. 3-D PICTORIAL REPRESENTATIONS OF ORS

A quick way is needed to give a manager or layman a visual way to simplify his/her understanding ot the usefulness of ORS technologies. This chart is envisioned as a kind of multicolor wall-poster that would visually show different ORS technologies and their applications and relative costs in relation to those axes. One axis would be spatial (distance), perhaps from 0.1 meter (i.e. pump leaks) to 100 meters (i.e. pig farms and landfills) to 5000 meters (urban/ regional areas). Another would be time, perhaps from 0.1 seconds (i.e. real time plume characterizations) to 1 year averages (i.e. ambient trends). The third axis might be either annualized costs or a "pollutant aggregation" index which might range from very large categories of chemical compounds all the way to multiple detections of specific molecules or any number of specific applicabilities (i.e. pulp mills, combustions, fugitives). Individual types of instruments (i.e. DOAS, FTIR, lidar) would be represented by "clouds" within the chart matrix.

3. WORKING WITH STAPPA/ALAPCO AND OTHERS

Identify State/local officials who might be especially interested in promoting ORS for compliance and defense purposes. Enthusiastic support

and interest from existing multi-state organizations such as WESTAR, NESCAUM, and MIRAMA is probably essential and any influence with members of these groups would greatly help. The idea would be to set up a work group and invite the multistate organizations to join and actively participate and collectively explore ways for ORS to better meet the State/local regulatory, permitting, and defense needs. They, themselves, might be motivated to form an official internal work group to work on workshops or published protocols.

4. HELP FROM SERDP AND ESTCP

Meet with SERDP/ESTCP and private industrial groups to explore the possibility of their providing logistical support (and co-sponsorship with EPA) for follow-on ORS workshops, equipment demos, and training sessions to promote commercial acceptance and viability and regulatory use of ORS research products.

5. HOMELAND DEFENSE DETECTION NETWORKS

Meet with other interested parties to explore the feasibility of piggy-backing an early-alarm warning system for homeland security purposes onto the existing national networks for ambient and compliance air monitoring. The intent would be to promote the concept of "duality" discussed at the workshop which was that any defense detection network for unlikely occurences would best be connected to one that keeps working all the time for unrelated reasons. Study areas would be:

- New Technology: Add-ons (sensors, software, indicators) to existing continuous ambient air and source emission monitors for doing the HD monitoring.

- Voluntary State pilot programs to explore various alternative configurations

- Funding partnerships with Federal and S/L agencies to provide these emergency response capabilities.

- How to "share" the same instrumentation and infrastructure (i.e. interrupting the routine jobs when a specific signal comes in).

Anyone have ideas or suggestions on this topic?

6. NASA/ HAMPTON UNIVERSITY PARTNERSHIP

EMC to meet with NASA (at Langley, Va) and Hampton University to learn about the joint academic "center of excellence" between Hampton and NASA. The idea would be to explore expanding EPA's support in helping interested academic institutions develop similar models in the ORS/environmental field.

Results of the Conference Call

Thanks to all of you for your participation on our conference call on August 27, 2002 and for volunteering to be on one or more of the work groups. The purpose of the call was to define objectives, identify volunteers, and begin work on follow-on projects and deliverables identified at our workshop held last month.

I am compiling the minutes of our conference call fully aware that they may be incomplete or even incorrect. The main thing is that we now have a nucleus of volunteers to work on five separate work groups–we look to these groups to fine-tune their objectives, deliverables, and schedules and to add to their memberships as they see fit.

THE WORK GROUPS (initial members—more can be added)

I. CASE STUDIES: ORS APPLICATIONS and LESSONS LEARNED

Kaye Whitfield
Ray Merrill
Bob Kricks
Bob Spellicy (nominated in abstentia)
Van Schieves
Cary Secrest (nominated in abstentia)
Ram Hashmonay
Chris Keiser (USARMY/AEC)
Joe Lapka (or Dan Powell as suggested by Joe L.)

II. DESIGN PROCEDURES

Tim Minnich
Kaye Whitfield

Pat Sullivan
Joe Lapka (or Dan Powell as suggested by Joe L.))

III. WALL CHART SHOWING ORS RANGES

(Note: This group probably depends on outputs and information from Groups I and II—and probably should work as part of those groups.)

Ram Hashmonay
Bob Kagann (nominated in abstentia)
Bill Vaughn
Harold Schiff

IV. PROMOTE INVOLVEMENT AND PARTICIPATION OF STATE/LOCAL AGENCIES

Deborah Howard
Ram Hashmonay
Bill Vaughn
Herb Dempsey
Van Shrieves

V. JOINT EPA/ACADEMIA COLLABORATION CENTERS ON ORS

Kaye Whitfield (to meet with Hampton University and NASA on their experiences)

The first step is for each team to set up communications via the addresses identified in this e-mail. Telephone numbers for most persons are included in the list of attendees given out at the workshop.

SOME THOUGHTS AND GENERAL RULES:

1. If any deliverables or work products are intended to eventually be “endorsed” or approved or officially recommended by the Agency’s Emissions Measurement Center (EMC), then each work group should define precisely what they want to do and involve EMC beforehand to clarify exactly what EMC must have in order to make this happen.

2. Kaye Whitfield will be the primary EMC advisory contact for these work groups

and will involve other EMC technical experts if the need arises. She and I will also plan to set up another conference call for us in three months or so to discuss our goals, progress, schedules, and any unresolved problems.

3. As suggested by some, a central, standing committee may be needed in the future but, for now, we will let the individual groups work independently and coordinate with the others as they feel desirable.

4. Kaye and I are willing to explore the possibility of EPA administrative or logistical support for the work groups but there is no guarantee that any can be found. Don't hesitate to ask us, however, if a such a lack affects progress.

5. The names on the work groups below are a start only. Others are welcome to join and contribute at any time.

6. Dan Powell and his colleague, Joe Lapka, represent the Technology Innovation Office within EPA's Office of Solid Waste and Emergency Response have expressed their strong interest in the work being undertaken. Their names are included on the teams as advisors but might also become active participants and be able to provide help via their websites and/or current contractors.

7. Deborah Howard of the Defense Ammunition Center mentioned that there may be a "workplace" software resource available to the teams to provide a centralized e-location for document compilation and revision—she offered to investigate this and advise us accordingly.