**U.S ENVIRONMENTAL PROTECTION AGENCY**
**OFFICE OF AIR QUALITY PLANNING & STANDARDS**
**EMISSION STANDARDS DIVISION (MD-13)**
**RESEARCH TRIANGLE PARK, NC 27711**

# COVER SHEET

**DATE:** 5/13/97 (revised 5/20/97)

1997 AIR Biotreatment Meeting,
**June 3, 1997** (ONE DAY)
US EPA, RTP NC



| | |
|---|---|
| **FROM: Mohamed Serageldin** | **VOICE PHONE: 919-541-2379** |
| **OFFICE:** OAQPS (MD-13) | **FAX PHONE: 919-541-5689**<br><br>serageldin.mohamed@<br>epamail.epa.gov |



**MESSAGE:**

A copy of the notice and the registration form are available on the Internet under "News/Bulletin". The section "News/Bulletin" is on the OAQPS Technology Transfer Network (TTN):
**http://ttnwww.rtpnc.epa.gov/index.htm**
Select TTN 2000 Master and type any of the following key words: **"bioreactor" or "biofilter**."

Several **important changes** were made to the meeting notice. Also, a cost-spreadsheet using Lotus (WK4) is available in the same location as this document. The file is named "**mgcost.zip**" Refer to **Attachment 3** for important information: A statement regarding the composition of the aliphatic compounds was added. A draft Agenda is included (**Attachment 7**).

EPA ttn bbs : News/Bulletins, version **(May *20, 1997)***

**NOTICE OF MEETING**
JUNE 3, 1997 :

SUBJECT:

1997 AIR BIOTREATMENT MEETING--US EPA_ NC
a government/industry/academia partnership

PURPOSE OF THE MEETING:

Biodegradation is an important process for removal of relatively low concentrations in ppm (**mg/ $m^3$ at S.T.P**) of *regulated* organic materials such as volatile organic compound (VOC) materials and hazardous air pollutant (HAP) materials from industrial waste air. There are numerous ***bioreactor system*** designs today . All use microorganisms to metabolize the pollutants and thus help in their biodegradation. Some are of the fixed-bed type, where the total air stream is directed into the bed carrying the microorganisms. Other designs (systems) involve first concentrating the pollutants before they are biodegraded in a designated reactor.

Many factors are involved in the operation of a ***bioreactor system***, and operating data need to be developed to document the performance of such systems under various conditions. A lack of a uniform procedure for reporting biodegradation rate, cost information, and compliance related information also needs to be developed.

One purpose of this meeting is to provide the EPA and other interested parties with a better understanding of the state of the technology . The meeting should also help industry/university participants understand the type of information EPA needs to consider such a technology, as a control option, in future regulatory development activities.

Persons interested in participating should mail the attached Presentation Proposal form **(Attachment 1**) to the US Environmental Protection Agency (EPA) as soon as possible. EPA will post this notice and other related information , including a list of selected terms and definitions for adoption during the meeting , under this same section, "News/Bulletins". The section "News/Bulletins" is on the OAQPS Technology Transfer Network (TTN) which can be accessed via the Internet: "**http:// ttnwww.rtpnc.epa.gov/index.htm**." Select TTN 2000 Master and type any of the following key words: **bioreactor or** biofilter.

WORKSHOP AGENDA

The workshop is scheduled to start on **June 3**, 1997 at **9:30 a.m.** and is schedulrd to end at **4:30 p.m** . The meeting will feature presentations by industry and US EPA persons. It will provide

opportunity for interaction with EPA meeting participants.

REGISTRATION INFORMATION:

Preregistration by **May 3, 1997** is necessary to reserve a seat at the meeting. To attend the meeting, please send the attached registration form to EPA. *Short Abstracts (180 words) must be received by **April 30**, 1997.* Technical presenters will need to provide **Extended Abstracts by May 27, 1997**. These should be from 2-6 pages in length , *excluding tables, figures, and appendices*).

All abstracts should be in **copy- ready** and will be distributed in bound form at the meeting. Information that must be included in the Extended Abstract is provided in **Attachment 3**. A presenter may include other information.in addition to that indicated in Attachment 3.

LOCATION: US Environmental Protection Agency,
Environmental Research Center (ERC) Auditorium
Research Triangle Park, North Carolina, USA

DIRECTIONS: From **Raleigh/Durham Airport** take **I-40** West (to Durham)
Take exit **279 A** (Route 147, Freeway South to Alexander Drive)
At "T" intersection turn right on Alexander Drive, cross NC 54 at light.
* ERC Building is first drive on left. ERC *Receptionist* (919)541-2350

CONTACT PERSON: Dr. Mohamed Serageldin
Ph: (919) 541-2379; Fax: (919) 541-5689
*Mailing Address*
Regular Mail: US EPA, OAQPS (MD-13), RTP NC 27711
E-Mail: serageldin.mohamed@epamail.epa.gov

LODGING INFORMATION :

A list of hotels and their phone numbers is included for your convenience (**Attachment 6**). The nearest airport to the hotels and to the meeting location in Research Triangle Park is the **Raleigh-Durham International Airport** (RDU).

# List of Attachments

**-- Attachment 1: Registration & Presentation Notice**

**-- Attachment 2: Guidance for Extended Abstract**

**-- Attachment 3: Instructions for Determining the Cost of a Bioreactor System "***revised***"**

**-- Attachment 4: OAQPS Capital Cost Determination Method**

**-- Attachment 5: OAQPS Annual Cost Determination Method**

**-- Attachment 6: List of RTP Area Hotels**

**-- Attachment 7: A draft Agenda and Title of the Presentations *"New"***

*end of list of attachments*

**ATTACHMENT 1.**

1997 AIR BIOTREATMENT MEETING--US EPA_ NC

a government/industry/academia parternship

# REGISTRATION FORM & PRESENTATION NOTICE

## June 3, 1997 (ONE DAY MEETING)

Name ( Mr., Ms., Dr.): _____

_____

Title: _____ Co./Organization _____

Address: _____

_____

_____

Phone : ( _____)_____ Fax : (_____)_____ _____

E-Mail Address: _____

PRESENTATION TITLE (IF APPLICABLE): ***see Attachment 2 for guidance***

_____

_____

Fax or mail this form to M. A. Serageldin, US EPA, OAQPS (MD-13), RTP, NC 2711, USA
Abstracts of Presentation should be mailed copy-ready or E-mailed.[1]

[1]. File c:\....\registra.att, Revised 4/97

**ATTACHMENT 2**

## GUIDANCE FOR EXTENDED ABSTRACTS

The abstracts should be prepared in accordance with the following guidelines and should include a cost section prepared according to the instructions provided in this notice :

1. The abstract should be from two to six pages in length, excluding figures and tables.

2. Use high contrast paper if possible.

3. The paper size should measure **21.6 cm** (81/2 inch ) x **28 cm** (11 inch) .

4. Type on one page only and use single space.

5. Leave 2.5 cm (1 inch) from top and bottom of a page and 2.5 cm (1 inch) for left and right margins.

6. Photographs must be in black-and white for copying.

7. Pages should not be numbered unless non- photocopiable markers are used.

8. The heading of the manuscript should include the title of meeting , the meeting location, and meeting date . It should also include the title of the presentation in capital letters, the name of the author (s) and the organization's name and address. The name of the presenters (s) should be underlined. For example:

PREPRINTED EXTENDED ABSTRACTS <<<<position left margin
Presented at the 1997 Air Biotreatment Meeting--US EPA_NC
a government/industry/academia partnership: Research Triangle Park, NC 27711

TITLE (of presentation in capital letters) <<<<position center of page
Author (s)
Affiliation

9. Do not use business letter head.

10. Print manuscript using a high quality printer-- laser quality.

11. Extended aAbstracts will be published as received.

*end of attachment 2*

**ATTACHMENT 3**

The size and cost of a bioreactor system should be determined by utilizing a mixture of two aliphatic in *equal proportions* ( **isobutyl acetate and methyl ethyl ketone**) and one aromatic (**m-xylene)** compound. The split should be 80% aliphatic to 20% aromatic by mass. These two groups of compounds are prevalent in wood furniture emissions and emissions from aerospace finishing.

**Calculate the cost for the following air flows and concentrations.**

-***Condition No***. 1:
8,450 m3/min (300,000 CFM) with a total VOC concentration of 330 mg/m3 at 25 C and 101.3 kPa.

-***Condition No***. 2:
5,700 m3/min (200,000 CFM) with a total VOC concentration of 420 mg/m3 at 25º C and 101.3 kPa.

**For size and cost calculations, the pollutants should be in the proportions indicated above**.

NOTE: Aliphatics generally present in wood furniture and aircraft emissions include, isobutyl acetate; alcohol ( methanol, ethanol, isopropanol, butanol); ketones (methyl isobutyl ketone, methyl n-butyl ketone, methyl ethyl ketone, methyl isoamyl ketone); **2-butoxyethanol**.

The OAQPS Method for calculating equipment cost and annual cost is outlined in *Attachments4 and 5*. Additional information may be found in the OAQPS Control Cost Manual, Fourth Edition EPA 450/3-90-006; US EPA, OAQPS, RTP, NC 27711. January 1990. Contact person Bill Vatavuk (919) 541-5309.

**Cost Index**
The CE index for December 1996, 382.3, should be used to determine the purchased equipment cost.

**Labor Cost**: Use $23.1/hr.

**Bioreactor Lotus Cost Spreadsheet**
For your convenience, a spreadsheet for performing the cost- calculations is included. The spreadsheet was prepared by Mr. Robert Shepherd of North Carolina State University. The file name is **mgcost.zip**. The appropriate values should be entered in the boxed area of the spreadsheet.

**Cost Effectiveness Values**
Provide in a **table** the VOC and HAP cost- effectiveness values and the purchased equipment

cost determined for the above conditions of control efficiency, flow rate, and mass concentration of pollutant.

**Units**

The Metric units are the *primary* units for the purpose of this meeting. A presenter may include English units in the tables or in the written text s follows: 10 cm (4 inches).

*end of attachment 3*

**ATTACHMENT 4**

**OAQPS Capital Cost Determination Method**

Cp = equipment cost

| Item | Cost |
|---|---|
| **Direct Costs** | |
| **Purchased equipment costs**: | |
| Equipment (EC) + auxiliary equipment | Cp |
| Instrumentation | 0.1 x Cp |
| Sales taxes | 0.03 x Cp |
| Freight | 0.05 x Cp |
| **Purchased equipment cost, PEC** | **PEC= 1.18 x Cp** |
| **Direct installation costs**: | |
| Foundations and supports | 0.08 x PEC |
| Handling and erection | 0.14 x PEC |
| Electrical | 0.04 x PEC |
| Piping | 0.02 x PEC |
| Insulation for piping and duct work | 0.01 x PEC |
| Painting | 0.01 x PEC |
| **Direct installation cost** | **0.3 x PEC** |
| Total Direct Cost, TDC | 1.3 x PEC |
| **Indirect Costs (installation)** | |
| Engineering | 0.1 x PEC |
| Construction and field expenses | 0.05 x PEC |
| Contractor fees | 0.1 x PEC |
| Start-up | 0.02 x PEC |
| Performance test | 0.01 x PEC |
| Contingencies | 0.03 x PEC |
| **Total Indirect Cost, TIC** | **0.31 x PEC** |
| **Total Capital Investment, TCI = TDC + TIC** | **1.61 x PEC** |

*end of attachment 4*

**ATTACHMENT 5:**

OAQPS Annual Cost Determination Method

| Item | Cost Factor | Cost($/hr) | Total |
|---|---|---|---|
| Plant Operation: | | | |
| Equipment Lifetime: | 10 | | |
| Interest Rate: | 7 | | |
| Capital Recovery Factor: (based on assumed 10 yr life) | ? | | |
| Replacement Parts: | 10%/yr | | |
| Utility Requirements: | | | |
| Natural Gas (m3/yr): | ? | | |
| Electricity (KW-Hr): | ? | | |
| Steam (kg/yr): | ? | | |
| Cooling Water (L/yr): | 0 | | |

| **Item** | **Cost Factor** | **Cost/Yr** |
|---|---|---|
| Direct Costs | | |
| Operating labor | | |
| Operator | 0.5 hr/shift x labor-$ x shift/yr | |
| Supervisor | 15% of Operator | |
| Maintenance | | |
| Labor | 0.5 hr/shift x labor x shift/yr | |
| Supervisor | 15% of labor | |
| Materials | 100% of labor | |
| Replacement Parts (% system replaced/yr) | 10 | |
| Utilities | | |
| Natural Gas ($/1000 m3 | 99.6 | |
| Electricity ($/KW-Hr) | 0.041 | |
| Steam ($/1000 kg) | 9.24 | |
| Cooling Water ($/1000 | 0.092 | |

**ATTACHMENT 6 (CONT.)**

**Indirect Costs**

| | |
|---|---|
| Overhead | 60% of labor and material |
| Administrative | 2% of TCI |
| Property taxes | 1% of TCI |
| Insurance | 1% of TCI |
| Capital recovery | Capital recovery factor x TCI |

**Total Annual Cost**

Uncontrolled VOC emission rate (MG/yr)
VOC controlled (MG/yr)
Controlled emission rate (MG/yr)

**VOC Cost Effectiveness ($/MG**

Uncontrolled HAP emission rate (MG/yr)
HAP controlled (MG/yr)
Controlled HAP emission rate (MG/yr)

**HAP Cost Effectiveness ($/MG)**

*end of attachment 5*

**Attachment 6**

RTP Area Hotels

The following is a list of hotels in close proximity to EPA's Research Triangle Park facilities and Raleigh-Durham International Airport. This service is provided to EPA-RTP personnel so that they may give hotel information to out-of-town business visitors.

1. Best Western Hotel Crown Park
   4627 S. Miami Blvd., RTP
   (800) 528-1234 or (919) 941-6066

2. Budgetel Inn
   1001 Aerial Center Parkway, Morrisville
   (800) 428-3438 or (919) 481-3600

3. Courtyard by Marriott
   2001 Hospitality Court, Durham
   (800) 321-2211 or (919) 467-9444

4. Doubletree Guest Suites
   2515 Meridian Parkway, Durham
   (800) 222-8733 or (919) 361-4660

5. Fairfield Inn by Marriott
   4507 N.C. Highway 55, Durham
   (800) 228-2800 or (919) 361-2656

6. Holiday Inn Raleigh-Durham Airport
   4810 New Page Road, RTP
   (800) 465-4329 or (919) 941-6000

7. Innkeeper of Durham/RTP
   4433 N.C. Highway 55, Durham
   (919) 544-4579

8. Marriott at RTP
   4700 Guardian Drive, RTP
   (800) 228-9290 or (919) 941-6200

9. Meredith Suites at the Park
   1900 Meredith Drive, Durham
   (919) 361-1234

10. Omni Durham (Downtown, near Mutual Building)
    201 Foster Street, Durham
    (919) 683-6664

11. Radisson Governors Inn
    Highway 54, RTP
    (800) 333-3333 or (919) 549-8631

12. Red Roof Inn
    Interstate 40 and N.C. Highway 55, Durham
    (919) 361-1950

13. Sheraton Imperial Hotel and Convention Center
    Imperial Center, RTP
    (800) 325-3535 or (919) 941-5050

NOTE: Please email any recommendations for modification of the Area Hotel list to the RTP Wide Web's listings of commercial services to RTPWW-GROUP or rtpww@epamail.epa.gov.

***end of attachment 6***

**Attachment 7:**

**DRAFT AGENDA**

1997 AIR BIOTREATMENT MEETING--US EPA_ NC

a government/industry/academia parternship

June 3, 1997 (9:30 a.m.) -- ERC Auditorium **( RTP)**

0**9:30** a.m. Introductory Remarks (EPA)

0**9:45** a.m. General Presentations by Industry

**11:00** a.m Technical Presentations

**12:00** p.m. Lunch

0**1:00** p.m. Technical Presentations (cont.)

0**2:30** p.m. Panel Discussion

0**4: 25** p.m. Summary

0**4:30** p.m. Adjourn

**Titles of Technical Presentations**

**-- A Membrane Biotreatment System**

**-- Bioscrubber Technology for the Control of VOC and/or Ammonia Laden Process Streams**

**-- BIOVOC SCRUBBER: Application and Performance**

**-- Self Cleaning Granular Activated Carbon: HAPs/VOCs Reduction Filter with Continuous Bioregeneration.**

**-- Biofiltration Pilot Study on Mixing Room Exhaust, Oregon Facility**