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Environmental Information and Monitoring Programme (EIMP). Air Quality Monitoring Component

Mission 11 Report

Oddvar Røyset and Bjarne Sivertsen



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1 Introduction

The 11th mission to Egypt covered the period 21.2-4.3. 1999. The mission was undertaken by senior scientist Oddvar Røyset in cooperation with Bjarne Sivertsen.

Oddvar Røyset, chemical analysis expert, performed the work carried out in this mission. Of the work programme activities A - I, the following tasks were covered:

E. Training

Follow up the procedures implemented during the 10. Mission, and on the job training at CEHM, Cairo University, for personnel from CEHM and NIS

F. QA/QC

Update SOPs and develop new SOPs to be used in the EIMP Air Quality Manual

H. Reference laboratory

Make recommendations to the preparation of QA standards for SO_4 , NO_2 and lead to be used at CEHM

The work in this mission was mainly focused towards the follow up of the methods implemented during the 10. Mission. The work also included on the job training of the staff at the Centre for Environmental Hazards and Mitigation (CEHM) at the Cairo University and the Reflab. Water at Ain Shams University and NIS. The follow up work included training included sampling and chemical analysis methods for NO₂, SO₂, TSP, PM₁₀, passive sampling (NO₂, SO₂) as well as a method for collection of dustfall from the air. New training included implementation of a method for determination of lead in air, based on EPA-procedures, and on quality control and data storage procedures.

2 A. Institutional support

No activity during this mission.

3 B. Design of monitoring programme

No activity during this mission.

4 C. Procurement of equipment, hardware and software

No activity during this mission.

5 D. Data management

No activity during this mission.

6 E. Training

On the job training of the staff at Centre for Environmental Hazards Mitigation (CEHM) at the Cairo University, Giza and NIS. The training waas focused on procedures for data storage, data presentation, data evaluation and quality control for the determination of SO₂, NO₂, TSP/PM₁₀ and dustfall (using dust buckets).

The training included one person from the NIS.

The training programme had the activities listed below and was performed by Oddvar Røyset. The preliminary training program schedule is given in appendices.

6.1 22. 2. 1999 - EIMP office

Meeting with Ulla Lund.

- Status of new equipment ordered.
- Determination of lead in air. Procedures recommended by CAIP (Cairo Air Improvement project) were evaluated. It was decided to recommend the procedures from Environment Protection Agency (EPA;
 - 40CFR Ch I(7-1-96), Part 50, appendix G (digestion by nitric acid and determination by flame atomic absorption spectrometry)
 - Method 6010B (ICP-AES, inductively coupled plasma atomic emission spectromentry)
- Arrange meeting with Saad Hassan form Ain Shams Reflab water to discuss QA-QC procedures for SO₄, NO₂, lead.

6.2 23.2.99 - EIMP Office

Prepared procedures for data storage and lead in air.

Meeting with Anwar Ahmed regarding status for new equipment. The status for the new equipment is:

Equipment type		Status pr. 23.2.99
Autosampler for the Dionex DX 100 Ion Chromatograph (recommended the Gilson 222XL type or equivalents)	ca 75000	Under evaluation by dr. Ahmed Soliman/Anwar Ahmed to find a model with the correct specifications.
Water treatment system for production of pure water	ca 50000	In Cairo.
New microbalance for TSP with larger weighing chamber to fit for 10"x8" highvolum filters	ca 25000	It was decided to use a Sartorius balance in the store.
Laboratory shaking machine for the extraction of NO2 tubes	13000- 15000	Cairo airport 27.2.99.
Computer	7000	Received Nov. 1998.
Desiccator	1300	Cairo airport 27.2.99.
Filtration equipment for dustfall	3000	Cairo airport 27.2.99.
Volumetric flasks of 1000 ml, 10 units	1500	Cairo airport 27.2.99.

6.3 24.2. 99 - CEHM Cairo University

Discussed possible problems of the analysis procedures implemented in October/November 1998.

Lecture on procedures for data storage and security.

6.4 25.2.99 - EIMP office

Evaluation of data produced by CEHM..

Investigations of the system for VOC.

Evaluations of procedures for lead in air.

6.5 28.2.99 - CEHM, Cairo University

Lecture on procedures for lead in air.

40CFR Ch I(7-1-96), Part 50, appendix G (digestion by nitric acid and determination by flame atomic absorption spectrometry).

Method 6010B (ICP-AES, inductively coupled plasma atomic emission spectrometry.

Discussion of quality control procedures.

6.6 29.2.99 - CEHM Cairo University

Discussions of quality of data produced by the laboratory from November 1998 to January 1999.

- Data for Alex for SO₂ is lower than expected. No obvious reason is found
- Some strange values for Alex in February 1999, high Cl-values (possible seaspray, or burning of Cl-containing plastic trash in the vicinity of the stations).

Method comparison between NILU and CEHM for the determination of NO_2 and SO_2 by passive samplers.

The passive samples for comparison were taken by 2 parallel colocated passive samplers at the Cairo, Abu Zabel station from 21.10.98 to 02.11.98. The following results were obtained for filters leached into 5 ml of solution. The agreement was satisfactory, as the deviations were within 25 %.

		NILU	CEHM	CEHM/NILU
NO ₂	µg NO ₂ /ml	1.13	0.93	0.82
SO ₂	µg SO ₂ -S/ml	1.2	1.49	1.24

Delivered updated Excel templates for the storage and graphical presentation of data for SO₂, NO₂, SO₂-passive, NO₂-passive, TSP/PM₁₀, lead, dustfall.

Further discussions about the Gilson autosampler. Discussions of need for possible new equipment.

6.7 3.3.99 - CEHM, Cairo University,

Lecture on quality control.

Discussions regarding quality of data for SO2 and NO2 in Cairo and Alexandria.

EIMP office

New equipment needs.

Updated EIMP Air quality manual with new procedures.

Prepared lecture on quality control procedures

Writing mission report

Investigation on VOC equipment.

7 F. QA/QC

7.1 SOPs

Follow up and training have been performed for the 8 methods where SOPs was developed, as listed below:

Action	Parameter	Procedure name
Follow up	SO ₂	Procedure for sampling and analysis of SO ₂ in air by use of a filterpack sampler
Follow up	NO ₂	Procedure for sampling and analysis of NO ₂ in air. Iodide absorption method
Follow up	Passive SO ₂ and NO ₂	Procedure for sampling and analysis of NO_2 and SO_2 in air by the use of passive samplers.
Follow up	TSP, PM ₁₀	Procedure for sampling and analysis of suspended particulates in air by the use of a highvolume sampler
Follow up	Dustfall	Procedure for sampling and analysis of dust fallout from the air
Updated	QA-QC	EIMP Air Quality QA-QC-procedures
New	Lead	Recommendation for EPA 40CFR50G, EPA 6010B
New	Data	Data storage

7.2 QA/QC samples and presentation

The level of quality control needed was discussed with Ulla Lund, and it was decided that three types of quality control samples was needed, one for $SO_4^{=}$, NO_2^{-} and lead. The two former is recommended to prepare locally by Reflab water, while for lead a commercial standard sample from Spex industries, USA, was recommended. For lead two additonal certified reference materials from NIST (Urban fly ash and Urban particulate matter) was recommended.

The CEHM -laboratory had access to a specially developed program for presentation of quality assurance data. The program is developed by VKI in Denmark and has the name Quality. Personnel from the laboratory have got training on the use of this program, but the program has yet not been implemented for routine use.

8 G. Monitoring

No activity during this mission.

9 H. Reference laboratory

Training of 1 person from the NIS was performed

10 I. Component Co-ordination

No activity during this mission.

Appendix A

People and colleagues

People and colleagues

The following persons participated in the training program

Name	Participation during 11. mission	Location
Dr. Ahmed Soliman Abd Ellah, laboratory manager	X	СЕНМ
Dr Amany Taher, ass. laboratory manager	Х	CEHM
Hany Nabil	Х	CEHM
Dr. Gehad Genidy	Х	CEHM
Mohammed Abd El Maugood		CEHM
Shireen Ali		CEHM
Kamla Moustafa	Х	CEHM
Moustafa Morad	Х	CEHM
Mona Moneer		Ain Shams University
Wagdi Mahmoud Khedr		Ain Shams University
Basma Salia	Х	NIS

In addition I also had the pleasure to meet

Dr. Tarek El Araby, manager of CEHM	CEHM
Dr. Hesham Mohamed El Araby, manager of information and data	CEHM
analysis laboratory	

The address for mailing is Dr. Ahmed Soliman Abd Ellah Department of chemistry Faculty of Science Cairo University Giza EGYPT Tel. 202 567 4843 job (202 518 7785 private) email : ahmedsoliman α frcu.eun.eg

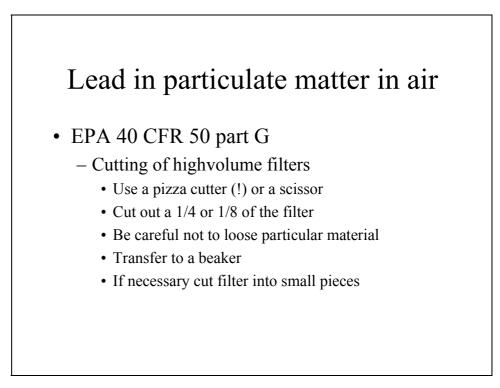
Appendix B

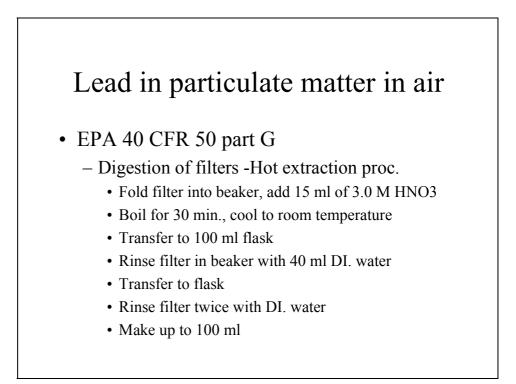
E. Training E1 Preliminary time schedule for training E2 Lectures given

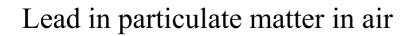
E1 Preliminary time schedule for training Oddvar Røyset, NILU, Norway, chemical analysis expert.

Sunday 21.2	Arrival in Cairo at about 17:50 with	
	Lufthansa	
Monday 22.2	Discussions at EIMP office	
11:30	Status on new equipment ordered.	Ulla
	QA/QC procedures of Ain Shams,	Ulla
	how to proceed	
	Procedure for lead in air - go through	Ulla
	EPA docs. and decide which	
	procedure to recommend	
14:00	• Air section meeting 14:00. Planning of	LM,BS,OR, MF,
	activities	JS
	 Setting up my PC in EIMP network. 	EIMP experts
Tuesday 23.2.	EIMP office.	
09:00	 Status new equipment 	Anwar
09:13:00	Further planning and preparation of	
14:00 - 16:00	procedures	
	• Visit at CEHM. Staff meeting at 14:00.	
	Making agreements with CEHM staff	
	regarding ORs program. NB. Need a	
	whiteboard and overhead	
Wednesday 24.2.	CEHM Cairo University	OR
10:00-15:00	Discuss with Ahmed Soliman and co-	Ahmed Soliman
	workers.	Armany Taher
	Status of procedures implemented in	CEHM
	Nov. 1998. Discuss possible problems	coworkers
	regarding the methods for	Ain Shams
	• SO ₂ - Problems with leakage of	MM,WMK NIS (Basma)
	filterholders for SO ₂ .	
	 NO₂, passive sampling, dustfall, 	
	TSP/PM ₁₀ .	
	Status of new equipment ordered	
	November.	
	• The new microbalance for TSP/PM ₁₀	
Thursday 25.2	Visit at CEHM. Further discussions.	OR
10:00-15:00	• Data storage and data presentations.	Ahmed Soliman
	• Excel reporting tools. It would be fine if	Armany Taher
	all analysis of	CEHM
	SO2/NO2/Dustfall/TSP/Passive	coworkers
	sampling were entered into Excel and	Ain Shams
	printed out.	MM,WMK
	• Evaluation of data, using data graphs	NIS (Basma)
	for evaluating quality of analysis.	
	• Data storage procedures (Archives for	
	site forms, worksheets, chromato-	
	grams, storage of data files from ion	
	chromatographs - file structure,	
	backup).	

r		1
Sunday 28.2	Visit at CEHM. Procedure for determi-	OR, Ahmed
10:00-15:00	nations of lead (Pb). Go through	Soliman
	• EPA 40CFR-50 Part G (digestion and	Armany Taher,
	flame AAS-analysis)	CEHM
	EPA 6010B (ICP-AES-analysis)	coworkers,
		Ain Shams
		MM,WMK
		NIS (Basma)
Monday 1. 3	EIMP office.	
10:00 -11:00	Meeting with Saad Hassan from Ain	Ulla, Saad
	Shams Reflab Water QA-QC procedures	Hassan
	for SO ₄ , NO ₂ , lead (NIST 1648b).	
	Writing mission report.	
Tuesday 2.3	Visit at CEHM	OR, Ahmed
10:00 - 14:00	QA-QC Procedures for SO4, NO2,	Soliman
	lead.	Armany Taher,
	The use of the Quality data program	CEHM
	from VKI (Denmark).	coworkers, Ain
	Questions about GC method of VOC	Shams
	(canisters, injection)	MM,WMKNIS
		(Basma)
Tuesday 2. 3	EIMP office. Writing mission report.	
Wednesday 3. 3	Visit CEHM. Closure of visit and summing	
10:00 - 12:00	up. Future work.	
Thursday 4.3	Departure Cairo (03:35) to Oslo by	
	Lufhansa	





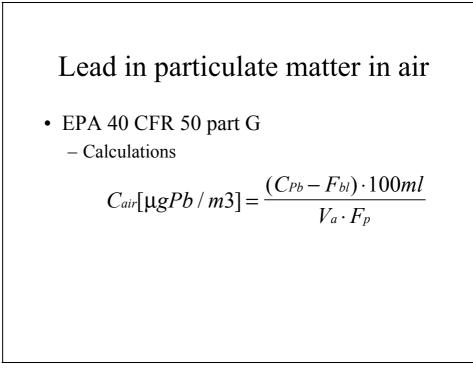


• EPA 40 CFR 50 part G

- Analysis by ICP-AES or FAAS
 - Standards 0.1 10 µg Pb/ml
 - Prepare from $Pb(NO_3)_2$ salt to 1000 µg Pb/ml stocks
 - Or commercial available standards 1000 μg Pb/ml
 - Matched with the same HNO3-conc as samples
 - Wavelength ICP-AES 220.353 nm
 - Wavelength FAAS 283.3 or 217.0 nm

Lead in particulate matter in air

- EPA 40 CFR 50 part G
 - Quality control
 - Standards from Spex Industries, USA
 - 1000 μg Pb/ml in 1 % HNO3
 - Reference materials from NIST
 - NIST 1633a Coal fly ash

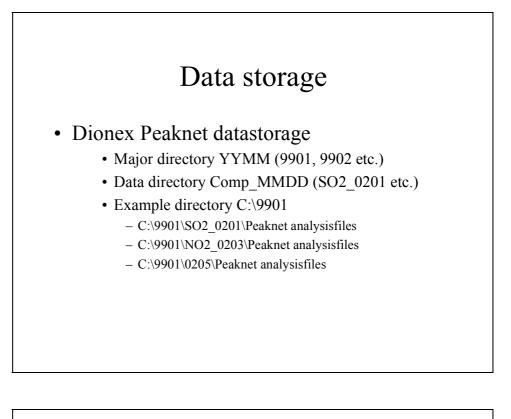


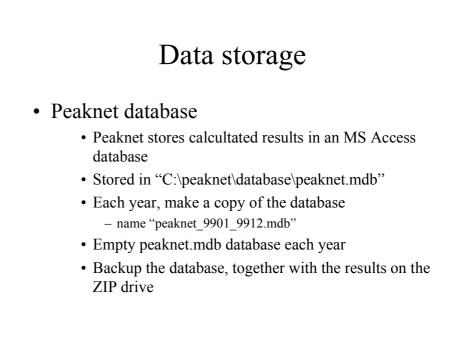
Data Storage

- Storage time 5 years
- Data must be available for inspection and easy acces
- Stable storage media
 - Tape
 - CD-ROM
 - ZIP-drive diskettes
 - Mirror harddisk (extra harddisk in PC)

Data storage

- Storage of forms and printouts
- Use binders
 - Site forms
 - Worksheets for instruments
 - Cromatogram printouts





Data storage

• Backup system

- Mirror harddisk
 - Extra harddisk in PC (drive E)
 - Used for copy of drive C
- ZIP drive diskettes
 - Connected to serial port (or installed in PC)
 - Capacity of about 100 MB
 - Copy for backup storage

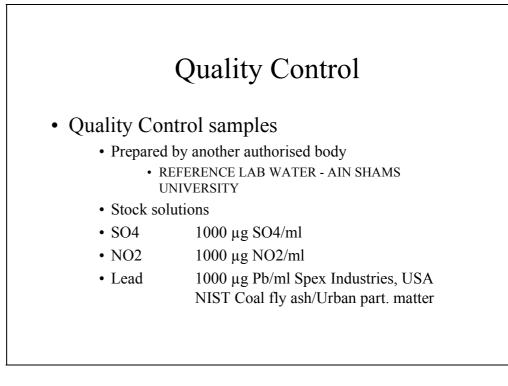
Data storage

- Backup procedure
 - Each day
 - Copy new datadirectoory to mirror harddisk
 - Each week
 - ZIP drive copy of YYMM directory of mirror harddisk
 - Each month
 - ZIP drive copy of YYMM directory. Label disk YYMM
 - Each year
 - Store 12 ZIP drives in safe place
 - Empty mirror harddisk and start over for new year



• Field blanks

- One filter is sent to the station but not exposed
- One field blank per station per week
- Mark with a RED LABEL so not mixed
- Analyse the field blank as a sample
- Log of field blanks in a Excel workbook and a binder
- Make action if field blanks increase
- Use field blanks for estimation of the detection limit. DL=3*standard dev. of field blanks

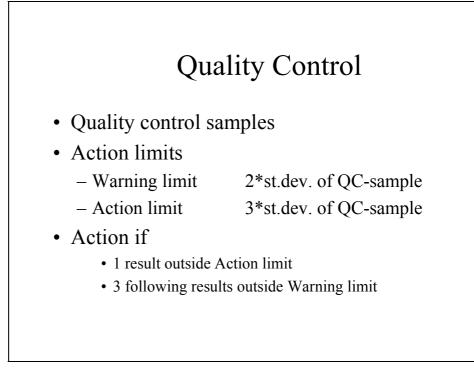


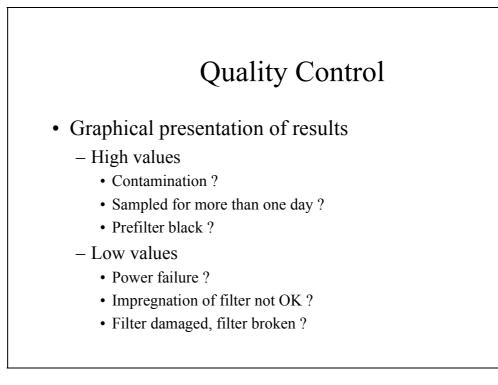
Quality Control

- Quality control samples
 - Daily working QC-samples
 - + SO4 $\,1.00$ and 10.0 μg SO4/ml
 - + NO2 1.00 and 10.0 $\mu g \; NO2/ml$
 - Lead 1.00 and 10.0 $\mu g \ Pb/ml$
 - Lead digests from NIST reference materials
 - Analyse at least TWICE each day where analysis are performed

Quality Control

- Quality control samples
- Presentation
 - X-Charts Plot of accuracy
 - Plot of results for QC-samples versus time
 - R-Charts Plot of precision
 - Plots of results of difference between parallel 1 and parallel 2 of each QC sample versus time
- Presentation by "Quality program" developed by VKI, Denmark





Quality Control

- Graphical presentation of results
 - Compare NO_2 and at the same station
 - Compare with neighbouring stations where available
 - Compare with monitor results, daily averages
 - Compare with other environmental parameters
 - Traffic
 - Wind speed and wind direction

Quality Control

- If problems occur
- Make notes
 - in the site forms, which are archived
 - in the Excel analysis workbook
- Make action as soon as possible
- Contact Site responsible person
- Contact laboratory manager
- Fix problems gather experience on how to avoid problems in the future



- Audit trail logs
 - Archives must be kept in good order
 - All electronic data must be stored in a safe way
- Data availability for at least 5 years for all data of relevance for the quality of the results delivered

Quality Control

- Air Quality Manual
 - Available to users !
 - Always updated with correct version of procedures!
 - Issue no.
 - Revision date
 - Printed date
 - Outdated procedures must be removed from the laboratory and the Air Quality Manual!

Appendix C

F QA/QC EIMP Air Quality Manual. Standard Operational Procedures for Wet Chemistry analysis methods. New methods implemented during the 11. Mission.

Standard Operational Procedures for Wet Chemistry analysis methods

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particulate matter collected from ambient air		
	Date:	01.03.99
Printed date: 99.03.08	Issue no	o: 001

Determination of lead in suspended particulate matter collected from ambient air

Oddvar Røyset Norwegian Institute for Air Research, NILU, Norway.

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particulate matter collected from ambient air		
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Printed date: 99.03.08 Issue no: 001		: 001

1. Introduction

The determination of lead in suspended particulate matter in ambient and urban air is performed according to procedures developed by the U.S Environmental Protection Agency -EPA.

The preparation of filters, digestion of filters, are carried out according to the procedure:

40 CFR, Part 50, Appendix G (40CFRCh.I(7-1-96 Edition)). Reference method for the determination of lead in suspended particulate matter collected from ambient air.

The determination of lead in the solution achieved from the digestion, may be achieved in two ways.

Determination by flame AAS according to the method above (40CFRCh.I(7-1-96 Edition)). Alternatively the determination may be performed with inductively coupled plasma atomic emission spectrometry (ICP-AES) according to the method:

Method 6010B Inductively coupled plasma atomic emission spectrometry. Revision 2, December 1996. US EPA.

The latter method is recommended since CEHM have a modern ICP-AES instrument.

2. Quality control

The digestion of particulate matter should be checked by a certified reference material. This material should be digested according to the procedure in (40CFRCh.I(7-1-96 Edition)). Digest 100 mg of the material with 15 ml of the 3 M HNO3 solution used for the digestion of the filters., and dilute to 100 ml. Determine the amount of lead and check against the certified values. The following reference materials from US National Institute for Standards and Technology (NIST) are recommended:

NIST Coal fly ash NIST Urban particulate matter.

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Printed date: 99.03.08	Issue no:	001

Procedure for storage of data from chemical analysis in the EIMP project

Oddvar Røyset Norwegian Institute for Air Research, NILU, Norway.

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1. Introduction

This procedure describes recommendation for the storage of various data for chemical monitoring systems used within the EIMP project.

1.1 Storage time for archives

It is generally recommended in quality systems that all data should be archived and be available for inspection for at least -5- years. Exceptions for this rule may be where electronic media stores the same data in a safe way.

2. Archives of forms

2.1 Site forms

The site forms shall be stored in binders. It is recommended to save the forms for each site in separate binders. In each binder it is advisable to separate the site forms for different sampling systems.

2.2 Chromatograms

The daily printouts of chromatograms from the ion chromatographs should be stored in binders. If these data are also stored electronically (on tapes or CDs) these paper printouts may not be stored for more than one year.

2.3 Worksheet for chemical analysis

It is recommended to gather the results for the daily analysis on worksheets ("Laboratory worksheet Ion Chromatography") before they are entered into Excel or laboratory database (LIMS) systems. The Laboratory worksheets should be filled in during the quality assurance control of the chromatograms from the ion chromatographs (or printout from other types of instrumentation).

2.4 Excel data storage and reporting forms

When all data have been properly quality controlled they are entered into the Excel data storage and reporting forms. It is recommended to store the Excel worksheet with data for each year a separate directories on the computer, i.e. "Data1998" etc. The following Excel workbooks are recommended:

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Table 1

Recommended workbooks for storage of data

Report type	Excel file name	Comments
Report SO ₂	SO2_template.xls	The Report SO ₂ is a Excel workbook
		with one sheet for data and one for graphical presentation for each site.
Report NO ₂	NO2_template.xls	As above
Report Passive NO ₂	NO2_passive_template.xls	As above
Report Passive SO ₂	SO2_passive_template.xls	As above
Report Dustfall	Dustfall_template.xls	As above
Report PM ₁₀	PM10_template.xls	As above
Report Lead	Lead_template.xls	As above
Field blanks	Fieldblank_template.xls	Prepare one sheet for each component in one Excel workbook

2.5 Field blanks

It is recommended to make a separate log of the results for the field blanks, using a separate binder named "Field blanks". The data should also be stored in an Excel Workbook with graphical presentation (see Table 1). It is of high importance to have a good documentation of these to get a quick overview of the blank values of the sampling and analysis systems.

3. Electronic storage of data

3.1 Electronic storage of data from the Dionex Peaknet chomatography system

It is recommended to prepare a directory structure which facilitates easy access to the rawdata (data for each sample) files from the Dionex Peaknet chromatography system. A directory structure which is efficient is to make one catalogue (directory) for each month containing the year and month, (i.e. YYMM, 9901, 9902, 9903 etc.). Under each of these monthly catalogues a daily catalogue is made where the results for the single day is stored. For convenience these catalogues may be named MMDD plus additional information of choice. The directory structure for February 1999 may thus look like:

Table 2: Example of directory structure		
YYMM-catalogue	MMDD-catalogues	Alternative names
9902		
	0201	SO2_0201
	0203	NO2_0203
	0228	

Table 2. Exa	ample of dire	ectory structure
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analysis in the EIMP project		
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The analysis results for each sample is in Peaknet stored in an Microsoft Access database under the directory Peaknet/database with the name Peaknet.mdb. During analysis this database aggregates data and may eventually become rather. It is recommended to store this database under a separate name which is used for archiving old data. Depending on the production of data, this may be done on monthly, quarterly or yearly basis. For the EIMP program it is probably sufficient to do the archiving of this database on a yearly basis.The Peaknet.mdb file is thus copied to another name, such as Peaknet_9801_9806.mdb (to take care of data from January to June 1998), or Peaknet_9901_9912.mdb (for the whole year). The original Peaknet database is now emptied for data and new data may now be stored there.

3.2 Permanent electronic storage of data

All data of relevance which are captured non PCs must be stored on permanent storage media. Such media may be an extra harddisk, a tape, a CD or a high capacity floppydisk (a ZIP drive). For convenience we recommend a system consisting of an extra harddisk and a ZIP drive, which facilitates an appropriate data safety with a low cost of work.

3.2.1 Extra Harddisk on Peaknet PC

The production of data from the Peaknet system is rather large. About 100 MB per month is needed, so that a harddisk of 1500-2000 MB is necessary to cover one year. It is recommended to install an extra harddisk on thePeaknet PC (named for example E)

3.2.2 ZIP drive

A ZIP drive is a high capacity floppydisk with a capacity of at least 100 MB per disk. The ZIPdrive may be connected to a serial port on the PC or directly inside the PC, and named drive F. It may be advisable to connect it onto the serial port so that the ZIP drive may be moved between different PCs.

3.3 Procedure for electronic storage

The following procedure should facilitate a good data safety:

Make the same data directories for Peaknet data on the backup harddisk of the PC, i.e. 9901/SO2_0201, 9901/SO2_0202 etc.

For good data safety it is important to copy the Peaknet data directory on the C harddisk to the same directory on the backup harddisk (E) each day.

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	Date:	23.02.99
Printed date: 99.03.08	Issue no: 001	

At the end of the month the whole directory for that month (i.e. 9901 etc.) is copied to the ZIP drive. Make sure that all the subdirectories is copied to the ZIP drive. The ZIP drive is labeled with month and year and stored in a safe place.

At the end of the year the data are thus stored on 12 separate ZIP drives. The backup harddisk of the PC (E) contains also the 12 monthly catalogues. Check that the monthly ZIP drives contains all the data on the backup harddisk and store the ZIP drives in a safe place.

The data on the backup harddisk may now be deleted, and the backup harddisk is now free to be used for the data created in the future year.

Appendix D

Equipment needs at CEHM



Environmental Information and Monitoring Programme EEAA - Danida - COWI 30 Misr-Helwan Str. Maadi, Cairo, Egypt Tel: 202 525 6442, Fax: 202 526 6447

Memo

To:	Bjarne Sivertsen
Copy to:	Mohammed Fathy, Ahmed El Seoud,
	Joergen Simonsen, Ulla Lund, Anwar
	Ahmed
From	Oddvar Røyset
Subject	Equipment needs at CEHM
Date:	03.03.1999

Equipment needs at CEHM of Cairo University

During my second visit at the CEHM at Cairo University I noticed some shortages of equipment. The equipment listed below, is strongly recommended for the measurements of SO2, NO2, TSP, PM10 and dustfall measurements for the EIMP project.

Equipment type	Priority	Approximate price DKK
Vacuum pump for VOC canisters	1	max 40000
Injection device for Gas Chromatograph for VOC collected in canisters	1	not available by 03.03.99
Printer	1	ca 5 000
New PC for Ion chromatographs with mirror harddisk, ZIPdrive for backup, ethernetcard, CD write and read, Windows95/98	1	ca 15 000
Vacuum pump for filtration device for dustfall measurements	1	not available by 03.03.99
Upgrade of Peaknet software from 4.0 to version 5.1.	1	not available by 03.03.99

Comments

Vacuum pump for VOC canisters

A vacuum pump is needed for the evacuation of VOC canisters. The pump must be of a special quality - oil free pump (to avoid hydrocarbon contamination of canisters by oil from the pump).

A suitable pump is the type

Vacuubrand MD 4 Vario Vacuubrand MD 4C Vario

Injection device for Gas Chromatograph for VOC collected in canisters

The Gas Chromatograph used for VOC analysis of VOC canister samples must have an injection device appropriate for injection of gas samples. The detailed specifications of this is not clear at 03.03.99.

Printer

There is a strong need for a printer which should be attached to Ahmed Solimans PC, or the PC where the data for the analysis are stored in the excel worksheet laboratory database. For quality control the graphs for the data achieved for the different stations should be plotted on a weekly basis in order to quickly sort out possible problems.

A laserprinter or equivalent is recommended.

PC for ion chromatographs

The PC on the ion chromatograph is old and do not have facilities for proper data security routines. I recommend strongly to get a new PC for this purpose. The new PC for Ion chromatographs should contain: 17" monitor CD-drive with read and write Harddisk of at least 2 GB Extra harddisk of at least 2 GB (mirror harddisk) ZIPdrive for backup Ethernetcard for communication with ion chromatographs Windows95/98

With the use of a mirror harddisk and a ZIP drive it is possible to develop good routines for data storage and security.

Vacuum pump for filtration device for dustfall measurements

The laboratory wishes to get a small lowcost vacuumpump for the filtration device used for dustfall samples.

Upgrade of Peaknet software

The current version of the Peaknet chromatography software used at the CEHM laboratory is v.4.0. It is recommended to upgrade to the latest version, v. 5.1., as this version have many new useful features.

Appendix E

VOC method

Instrumentation at CEHM

HP 6890 Series Gaschromatograph.

HP Purge and trap Concentrator for VOCs in water samples.

N2 generator for generating GC carrier gas. Thermo Environmental Instruments mod 640 VOC steel canister sampler.

Air Quality Monitoring Programme



Norwegian Institute for Air Research (NILU) P.O. Box 100, N-2027 Kjeller – Norway

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