

## REPORT ON

### ***2<sup>nd</sup> STUDY VISIT TO FINLAND FOR OFFICIALS OF THE CPCB AND SPCBs AS PART OF INDIA-FINLAND BILATERAL PROGRAMME ON "CAPACITY BUILDING FOR EMISSION MEASUREMENT IN INDIA"***



***Study Period*** : ***April 15-19, 2013***

***Country Visited*** : ***Finland***



**CENTRAL POLLUTION CONTROL BOARD (CPCB),  
(Ministry of Environment & Forests),  
Delhi - 110 032**

**VTT TECHNICAL RESEARCH CENTRE OF  
FINLAND**

**APRIL 2013**

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## ***Report on***

# **2<sup>nd</sup> STUDY VISIT ( FUGITIVE EMISSION MONITORING) TO FINLAND FOR OFFICIALS OF THE CPCB AND SPCBs AS PART OF INDIA-FINLAND BILATERAL PROGRAMME ON “CAPACITY BUILDING FOR EMISSION MEASUREMENT IN INDIA”**

## **1.0 Background**

VTT Technical Research Centre of Finland and Central Pollution Control Board (CPCB), India signed MOU for Project on “Capacity building for emission Measurement in India”. This project is funded by Finnish Ministry of Foreign Affairs.

Overall objective of this project is to improve the level of emission monitoring in India. Project purpose is to improve the competences of emission measurements at CPCB and SPCB towards international level by taking into account the knowhow at the moment in India.

CPCB has a central role in the dissemination of information to State Pollution Control Board’s (SPCB) in India and therefore, the project is effective in dissemination of analytical skills in emission measurements. It is anticipated that with the help of this capacity building project, the access to emission measurements in India in various chemical industry sectors and the power sector will improve.

## **2.0 Objective of study visit to Finland**

The objective of the study visit is to share the experience of VTT Technical Research Centre of Finland about fugitive emission monitoring & techniques and to visit different chemical industries which are having monitoring facilities, control techniques and abatements to control fugitive emissions (VOC). The study visit also included the discussion on draft Standard Operating Procedure (SOP) of VOC emission monitoring.

## **3.0 Participation**

The entire study visit is funded by VTT Finland. With the concurrence and approval of Ministry of Environment and Forests (MoEF), nominations from CPCB, Zonal office and identified State Pollution Control Boards are invited. The list of nominations from various SPCBs and CPCB is given below:

S. No.	Name of Official	Designation	SPCBs/CPCB
1.	Nayak Jayaprakash Subrao	Senior Scientific officer	Karnataka State Pollution Control Board
2.	Buddhi Prakash Pareek	Senior Scientific officer	Rajsthan State Pollution Control Board
3.	Thankappan Thammanath Azhaky	Environmental Engineer	Kerala State Pollution Control Board CPCB
4.	Alok Saxena	Senior Scientific Officer	Madhyapradesh Pollution Control Board
5.	Charanjit Singh	Scientist "C"	Punjab Pollution Control Board
6.	Hadibandhu Panigrahy	Scientist "C"	Odisha Pollution Control Board
7.	Puthur Perumal Gounder Chandrasekaran	Scientist "C"	Tamilnadu Pollution Control Board
8.	Harish Chander Sharma	Scientist "C"	Himachal Pollution Control Board
9.	H D Varalakshmi (lady member)	EE/ Sc. "C"	CPCB, SZO, Bangalore
10.	V K Sachan (Team Co-ordinator)	Scientist "C"	CPCB, NZO, Lucknow
11.	Dr. Zawlthanglien Changsan	Scientist "D"	CPCB, NEZO, Shilong

*All eleven officials participated in the said programme. Mr. Antti Wemberg, Senior Research Scientist, VTT Finland, received the team at Helsinki Airport and accompanied & guided the team during the entire study period. He arranged technical discussion and logistic to visit 2 paint industries, 1 petrochemical industry and officials with Helsinki Regional Environmental Service Authority(HSY). The details of the programme are enclosed as **Annexure 1**.*

#### **4.0 Details of study visit to Finland**

##### **4.1 April 15, 2013 : Visit to VTT Technical Research Centre Finland**

Ms Tuula Pallika warmly welcomed the team at VTT Technical Research Centre Finland and gave brief introduction about VTT groups in the world and activities/ fields of expertisation which includes the VTTs Strategic Research Portfolio, Research Results, Research & Development, Energy and Pulp & Paper, Emission control. She gave detailed presentation about Emission control viz characterisation of emissions, R&D measurement technique, emission abatement , emission research, capacity building and

technological consultation, Bio -CO<sub>2</sub> Monitoring, continuous Mercury monitoring, Vehicle emissions and energy efficiency research, Low Duty (LD) vehicles- test cell profile, High Duty (HD) vehicle- test cell profile etc., And also briefed about course content of study visit



Mr. Antti Wemberg took the team to HD & LD vehicles testing laboratory to introduce the facilities exist to test efficiency of fuel and emissions of different vehicles. It is informed that they check the emissions parameters viz NO<sub>2</sub>, Hydrocarbon, Particulate matter, CO and CO<sub>2</sub>. And also team visited the work place VOC emission monitoring facilities in VTT. They demonstrated the FID analyser ( Single component analyser) calibration methods, gas used for calibration and gas used for burning. During demonstration ignition was not working, so they shown the HC emission measurement in work place by inserting probe into vent of the circular duct carrying work place emissions. And also shown the Fourier Transform Infrared Spectroscopy (FTIR) analyser, it is informed that by this analyser parameters viz water vapour, CO, CO<sub>2</sub>, NO NO<sub>2</sub>, SO<sub>2</sub> and SO<sub>3</sub> can be measured.

## 4.2 April 16, 2013 : Visit to two paint industries in Helsinki

### 4.2.1 M/s Tikkorila Vantaa Site

M/s Tikkorila Vantaa Site is located 15 km to north of Helsinki in the city of Vantaa. This unit was established in 1862 and manufacturing paints. The unit has 3 plants (1) Monicolor Plant (1975), this plant is fully automated production and producing base paints for decorative paints and wood stains with production capacity of the plant is 30 million litres/year. (2) Finnersin Plant (1981), this plant is highly automated production and producing polyester and alkyed binders with production capacity of 15 million litres/year. (3) Temcolor plant (1983) and Novacolor plant (1988), these plants are semi automated production and producing paints and coatings for metal and wood industry, decorative paints, fillers, putties, thinners with production capacity of 30 million litres/year. The unit representative informed that they producing Eco- green labelled products and producing 50 % of water bound and 50 % of solvent based paints.



### 4.2.2. M/s Vantaca Ltd.,

This unit is manufacturing solvent based paints of 7 million litre/ year. The unit has two types of vent , one is process vent and another for general working place vent. The emissions are collected through suction pump and carries through closed conduits and discharged through elevated stack. No treatment abatement is provided, the unit representative informed that since the unit comes under small scale the incinerator is not economically viable and industry follows proactive type of measures. The unit informed that VOC emission monitoring is carried out through recognised consultant. The total VOC limit given by the authority is 43 tonns/ year. The unit informed that they are meeting with the limits.



The unit representatives taken the team to their plant and shown the arrangements made for collecting VOC emissions from process and general working place and circulating system to reduce the concentration of VOC before discharging through stack.

### 4.3 April 17, 2013 : Visit to Petrochemical industry

#### 4.3.1 M/s Borealis Group Ltd., Polymer Factory.

M/s Borealis Porvoo is located old city Porvoo. This unit was established in 1971 and engaged in manufacturing of plastic raw materials such as olefins, phenol, polyethylene, polypropylene, Borstar polyethylene and compounds.

The unit representative gave presentation about VOC measurement and management which includes maximum VOC discharge mass per year, Obligation of keeping VOC emission as low as possible, Obligation of conducting technical studies of further reducing VOC emissions, Measurements of VOC emission amounts by tracer gas measurements (SF<sub>6</sub>), Calculation of VOC emission amounts by appropriate calculation technique by using Average Emission factor method by the Environmental Protection Agency (EPA) and VOC mitigation by Leak Detection & Repair. And also gave brief presentation about Sulphur hexa flourine gas tracing technique to measure VOC emissions.



#### 4.4 April 18, 2013 : Visit to VTT and Helsinki Regional Environmental Service Authority(HSY)

##### 4.4.1 Discussion of the content of SOP, Best Practices and objectives at VTT

Mr. Antti Wemberg presented the structure of the Standard Operating Procedure (SOP) document for VOC Monitoring. Had discussion with VTT officer on best practices exist in Finland. Our team members provided suggestions to include in the SOP.

##### 4.4.2 Visit to Helsinki Region Environmental Service Authority (HSY):

Ms Anu Kousa (PhD, Air Quality Expert ) briefed about principal duties of HSY which includes Waste management, water management and Regional & Environmental information. The regional & Environmental information division main function is monitoring of Air quality, informing the public on air quality, air quality research & planning and Air quality communication and education. The Helsinki regional authority has continuous air quality monitoring station at 9 places and mobile monitoring facilities at 4 places. In all station it is monitoring 13 parameters viz. particle number concentration, particle number size distribution and meteorological parameters such as wind speed, direction relative humidity, pressure, temperature, Precipitation and radiation. And also gave brief presentation about contribution of PM emission sources in Helsinki, prevention measures taken to reduce the PM emission from different sources.



Air quality (value)	CO	NO <sub>2</sub>	SO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	TRS
Good (<5)	<4	<40	<20	>80	<20	<10	<5
Satisfactory (50-75)	5	70	50	100	50	25	10
Fair (75-100)	20	150	250	140	100	50	20
Poor (100-150)	50	200	350	180	200	75	50
Very poor (>150)	>10	>250	>350	>180	>200	>75	>50

Unit per hour: micrograms per cubic meter (µg/m<sup>3</sup>), carbon monoxide CO (mg/m<sup>3</sup>)  
For an example: when the number of air quality index rises above 51, the air quality turns from good to satisfactory.

Mr. Ammassuo, HSY officer gave presentation about leak detection of methane gas from old land fill site and air quality monitoring at waste management site which includes the collection & transportation of wastes from house hold and public facilities, segregation of wastes at source, management of bio waste, recyclable waste and land fill waste, land fill site exist in the region, After care of the closed land fill, biogas collection and utilisation, waste advisory services and passing regional waste regulations.



#### **4.4.3 Visit to The Indian Embassy, Kulosaarentie, Helsinki:**

VTT officials Mr. Antti Wemberg and Mrs. Tuula Pellikka took our team to the Indian embassy to meet Mr. A. Manickam, Ambassador of India. The Ambassador organised the presentation on Biolan Environmental products such as compact compost kit for handling house hold garbage, waste generated from hotel, marriage hall, market places etc., modified composting process for biodegradable wastes generated from the cities. And also gave presentation on innovative solution for sewage sludge treatment to reduce the problems of disposal of sewage sludge generated from STP's.

#### **4.5 April 19, 2013 : Mission summary, Discussions and comments**

Mr. Antti Wemberg presented the structure of the Standard Operating Procedure (SOP) document for VOC Monitoring and asked to provide suggestions to include in the SOP. Mrs Tuula Pellikka asked individual team member to share their experience about study visit and distributed the certificate and soft copy of the study materials. The study visit was ended with vote of thanks by Mr. V.K. Sachan, Sc. C on behalf of CPCB & SPCBs.

#### **5.0 Observations :**

As per the programme organised by the VTT Technical Research Institute the study visit to Finland comprises the following;

- Principles on VOC monitoring techniques (EN 13526 Determination of the mass concentration of total gaseous organic carbon in flue gas from solvent using process, continuous flame ionisation detector method).
- Introduction to European VOC solvents emission legislation (1999/13/EC) and Finnish environmental permits
- Introduction to process control innovations to reduce VOC emission in Finnish chemical industry
- Introduction to industrial fugitive emission monitoring with tracer gas method
- Introduction to fugitive monitoring in Helsinki city area by Helsinki region Environmental Service Authority
- Site visits to M/s Tikkurila Ltd., paint factory, M/s Vantaco Ltd., paint factory and M/s Borealis Group Ltd., polymer factory.

Very first day VTT officers took the team to VTT and presented about capacity building project and the objectives for study visit. And took to show facilities exist to monitor emissions. Similarly visit to industry also started with

presentation about their plant, Environmental management, environmental regulation, control abatement and monitoring and reporting techniques etc. After the presentation, technical discussion followed with plant visit. During visit, following observations were made;

### 5.1 Visit to VTT Emission Control Laboratory

- Visited the Heavy duty vehicle and Low duty vehicle emission testing laboratory and shown the facilities available to verify the efficiency of fuel and emissions emitted. It is informed that they check the emissions parameters viz NO<sub>2</sub>, Hydrocarbon, Particulate matter, CO and CO<sub>2</sub>. And also team visited the work place VOC emission monitoring facilities in VTT. They demonstrated the FID analyser (Single component analyser) calibration methods, gas used for calibration and gas used for burning. During demonstration ignition was not working, so they shown the HC emission measurement in work place by inserting probe into vent of the circular duct carrying work place emissions. And also shown the Fourier Transform Infrared Spectroscopy (FTIR) analyser, it is informed that by this analyser parameters viz water vapour, CO, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub> and SO<sub>3</sub> can be measured. **But no practical demos were illustrated.**

### 5.2 Visit to Ms/ Tikkurila Ltd., Paint Factory

- It was observed that the unit is engaged in manufacturing solvent based and water bound paints. The unit representative gave presentation about Environmental management, control abatement, VOC monitoring and Environmental permission etc.,

#### *Measures taken for Environmental Protection :*

- **Air quality Protection :** The unit claims that the entire process is carried out under closed system. The dust separators are provided to prevent pigment dust from spreading. It is also informed that the VOC emissions from dissolving tank, finishing tank and dispensing tank is collected through hood and duct system from all plants and incinerated in catalytic incinerator to reduce the VOC emission to environment. Platinum/palladium is being used as catalysts in incinerator. The treated air quantity is around 30000 -35000 m<sup>3</sup>/h during work shift. The reported electricity consumption is 1431 MWh/year and reported cleaning rate is 91-96 %.

- **Waste water Management** : The waste water generated from the different process reactors washing and washed solvents are collected separately and treated separately by recovering solvents and reusing in the process. Other wash water is collected and given pre-treatment then send to municipal purification plant .
- **Waste Disposal** : Washing solvents are distilled and reused in the process hazardous wastes sent to waste treatment plant for destruction and recyclable waste is being reused.
- **Structural Measures and preventive actions related to accident situations:** The plant ground paved, rain water drainage system equipped with oil separators and alarms, tank farms equipped with secondary containment, The unit has own fire brigade to respond to fire out breaks.
- **Environmental Permission** : The authority granting the permission for operation for 5 years,
  - Permitted total VOC emission (organic carbon) is 70 tonnes /year
  - Emissions from the incinerator
    - maximum of 100 mg/m<sup>3</sup> (organic carbon)
    - Average value for one measuring period - max 100 mg/m<sup>3</sup>
    - Average value for one hour period - max 1.5 x 100 mg/m<sup>3</sup>
    - Monitoring of incinerator - 4 times /year, each monitoring duration is 24hrs monitoring for 5 days
    - Fugitive emissions - measurement once in year at 12 points in the site.
    - Exhaust ventilation duct monitoring - at 6 points in the site where emission is evaluated for a period of 24 hrs.
- The unit allowed the team to visit incinerator only, to asses the efficiency of incinerator the unit has arrangement to monitor VOC connotation at inlet and out let of incinerator by using FIT analyser.
- The team couldn't get opportunity to visualise the arrangements made to collect fugitive emissions from different sources because the unit was not allowed the team to visit the process area.

### 5.3 Visit to Ms/ Vantaco Ltd., Paint Factory

- It was observed that the unit is engaged in manufacturing only solvent based paints. The unit representative gave presentation about Environmental management, control abatement, VOC monitoring and Environmental permission etc.,

- The team was allowed to visit the process area as well as general working place. The unit has two types of vent , one is process vent and another for general working place vent.
- The fugitive emissions generated during loading of raw material into reactors were collected through suction pump and carried out through circular conduit and discharged through elevated stack.
- Similarly the fugitive emission from work place is collected through hood and suction pump and carried out through circular conduit and discharged through elevated stack.
- No treatment abatement is provided, the unit representative informed that since the unit comes under small scale the incinerator is not economically viable and industry follows proactive type of measures.
- The unit informed that VOC emission monitoring is carried out through recognised consultant. The total VOC limit given by the authority is 43 tonns/ year. The unit informed that they are meeting with the limits.

#### **5.4 Visit to Ms/ Borealis Group Ltd., Polymer Factory.**

- The team was not allowed to visit the industry, the unit representative taken the team to lecture hall and given presentation about their production and measures taken for Environmental protection.
- The unit representative informed that they are calculating VOC emissions annually by using Average Emission factor method by the Environmental Protection Agency (EPA) and submitting to authority.
- The unit also doing regular Leak detection and Repair, in case of any leaks found , the VOC emission is being quantified for the period till rectification and same is reported to authority.
- Borealis Ltd use Trace Gas Method by VOC measurements which is based on NILU -method. This technique comes from Norway and it has been used in Borealis for the past 15 years.
- It is informed that VOC measurement by Trace Gas method is not possible throughout the year because it requires meteorological conditions such as Wind is above the emission targets (process, rail tankers, trucks etc.),Construction of the measuring wall should be below the wind. Wind speed should be stable (4 - 8 m/s) and no rain or fog.
- The unit has shown the equipments required for collecting samples to estimate the concentration of VOC in ambient.

- The unit informed that the VOC emissions from the process area being collected and treated through Thermal oxidizers/flare to burn VOC streams
- No practical Demo is given and not allowed to visit the unit to visualise the abatement taken to control VOC emissions as per regulation of Environmental Regulatory Authority.

## 5.5 Visit to Helsinki Region Environmental Service Authority (HSY):

- It is informed that the Helsinki regional authority has continuous air quality monitoring station at 9 places and mobile monitoring facilities at 4 places. In all station it is monitoring 13 parameters, particle number concentration, particle number size distribution and meteorological parameters viz wind speed, direction relative humidity, pressure, temperature, Precipitation and radiation.
- As per their information the major PM emission sources are vehicular(45%) and power plant (27%) and local wood burning (18%).
- The HSY is strictly imposing the measures to control PM emissions during construction, digging, repairing of under ground sanitary works etc.,
- The HSY also disseminating air quality data to publics through radio, and displaying quality index at public places and also advising the public to use mass transportation in case of exceeding the air quality index.
- It is also informed about the waste management by HSY. The solid waste generated from the house hold and public facilities being segregated into biodegradable, recyclable, hazardous and land fillable at the source itself.
- Biodegradable wastes being composted and used as manure, the recyclable waste being sent for reuse/recycle in appropriate way. The hazardous wastes are collected periodically and sent to hazardous waste treatment site. The land fillable waste being taken their land fill site and disposed scientifically. The land fill height is maintained up to 40 m. After attaining of the designed capacity of the land fill site, it is covered with LDPE and soil. To avoid soil erosion during rainy period grass and other small plantation is being done.
- The HSY is monitoring the leak detection regularly in closed land fill and collecting methane gas from these closed land fill and generating power through gas power engines. It is informed that the methane gas from land fill is replacing significant fossil fuel in the districts t heat forum.

- The leachate generated from the land fill site being used partially for maintain the required moisture in land fill and remaining being sent to for treatment.
- The HSY also doing regular air quality monitoring around the land fill site, surface water monitoring ground water monitoring, odour monitoring, noise monitoring and bird counting in the surrounding of the land fill site.

## 6.0 Conclusions

- The facilities available at VTT to measure emissions from Low duty and High duty vehicles and workplace are excellent but no practical demo was given by VTT staff.
- The VTT staff organised very nice trip to 3 industries, the presentation given by the three industries were excellent. One industry allowed the team to visit their incinerator and other unit allowed to visit their process area to show the arrangements made for collection fugitive emission's from process as well as work place. And third unit restricted the visit to lecture hall.
- The team gained more on theoretical knowledge about different monitoring techniques of VOC, quantification of VOC by using emission factors, environmental measures taken by the industries, industries proactive attitude towards environment protection and control abatements.
- The VOC emission limits given by the Authority is vary from industry to industry ( For one industry VOC emission limit is 70 tonns/year and other unit is 43 tons/year) , during visit to industry the same was asked to industry representative as well as VTT staff but they were unable clarify the same.
- Helsinki Region Environmental Service Authority shared their experience about air quality monitoring, solid waste management, methane gas collection and its utilisation in power generation and dissemination of information to publics. It is learnt that the quantity of methane gas generated from the land fill site is huge, if it is captured properly, it can replace fossil fuel as well as reduce the greenhouse gas in atmosphere.

- While discussion on content of SOP, team given some feedback to include in SOP. The third chapter of SOP i.e “Procedure matrix for fugitive emission control” is a good concept. If VTT provides SOP with respect to this matrix , i.e. each type of combination ( e.g Need is cause of damage or obligation, Source is industry or traffic, Pollutant is VOC or small particles, method is measurement or emission factors) it may give more clarity to follow SOP.
- In the absence of practical demo the study visit is partially full fill the objective of the study tour programme. If study tour includes following programmes, it will be very use full to officers for better understanding;
  - ✓ The time given for theoretical class may reduce, practical demos may be included for measurement of emissions.
  - ✓ Extending opportunity to visualise the Environmental measures/ abatement taken by the industries to reduce the emissions. Visit to industry also visualise the good practices exist to reduce the pollution.
  - ✓ Organising at least one practical monitoring of emissions at industry premises which provides practical experience.
  - ✓ Interaction and sharing of experience with concerned Environmental Authority.

**2<sup>nd</sup> STUDY VISIT ( FUGITIVE EMISSION MONITORING) TO FINLAND FOR  
OFFICIALS OF THE CPCB AND SPCBs AS PART OF INDIA-FINLAND BILATERAL  
PROGRAMME ON “CAPACITY BUILDING FOR EMISSION MEASUREMENT IN  
INDIA”**

**PROGRAMME SCHEDULE**

- 14/04/2013 Travel From Delhi to Helsinki (Finland)
- 15/04/2013 Introduction about capacity building project and objectives for study tour and Visit to VTT emission control Laboratory
- 16/04/2013 Visit to M/s M/s Ttikkurila Ltd., paint factory and M/s Vantaco Ltd., paint factory
- 17/04/2013 Visit to M/s Borealis Group Ltd., Polymer Factory and site visit to Poorvoo old city
- 18/04/2013 Discussion of the content of the SOPs at VTT, visit to Helsinki Region Environmental Service Authority (HSY) and visit Indian embassy at Helsinki
- 19/04/2013 Mission summary , Discussion and comments about study visit, Certificate distribution and Vote of thanks.
- 19/04/2013 Evening Started from Helsinki to Delhi
- 20/04/2013 Travel back to Delhi/ Bangalore



**Tech-61/Training/Finland/ZOB/2013-14/**

**May 02, 2013**

To

**The Member Secretary**  
Central Pollution Control Board  
Parivesh Bhawan,  
East Arjun Nagar,  
**Delhi-110 032**

**Kind Attention : Mrs. Mita Sharma, Additional Director, Incharge Coordinate Cell**

**Sub: Report on study visit to Finland under Bilateral Programme on “Capacity Building For Emission Measurement in India” - regarding.**

**Ref:** H.O officer order No. CPCB/CC/20-Finland/2012-2013/13319 dated March 06, 2013

Sir,

As per H.O. office order dated March 06, 2013, Mrs H.D. Varalaxmi, Scientist ‘C ‘ performed the study visit to Finland during April 14-19 , 2013 under Bilateral Programme on “Capacity Building For Emission Measurement in India”. The report on study visit is enclosed for kind perusal please.

Yours faithfully,

**Encl :** As above

**(A. Manoharan)**  
I./c Zonal Office

No. Trg./IV-16/ZOB/2012-13/1235-1236

May 06, 2013

To

**Mrs. Mita Sharma**  
Additional Director & I/c Coordination Cell  
Central Pollution Control Board  
Parivesh Bhawan,  
East Arjun Nagar,  
**Delhi-110 032**

Sub: Nomination for Hand –on- Training for Odour and Fugitive emission measurement under Bilateral Project between CPC – VTT Finland - regarding.

**Ref:** H.O officer order No. CPCB/CC/20-FIN//2013-2014/89 dated April 10, 2013

Madam,

This has reference to above mentioned subject, Mrs. H.D. Varalaxmi, Sc. C is nominated to attend Hand –on- Training for Odour and Fugitive emission measurement under Bilateral Project between CPC – VTT Finland at Delhi during May 13-17, 2013..

Yours faithfully,

**(A. Manoharan)**  
I./c Zonal Office

Copy to:

Mrs. H.D. Varalaxmi, Sc. C : to attend 5 days Hand on training  
CPCB, SZO, Bangalore programme at H.O., Delhi

**(A. Manoharan)**  
I./c Zonal Office