

**STUDY VISIT FOR SOURCE EMISSION MEASUREMENTS
ON THE PROJECT “CAPACITY BUILDING FOR
EMISSION MEASUREMENTS IN INDIA”**

AT VTT, FINLAND

09th September 2013 To 13th September 2013



Submitted by:

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Table of Contents

| | |
|---|---------|
| 1. Introduction | Page 3 |
| 2. Schedule of the study visit in Finland | Page 5 |
| 3. Programmes at VTT | Page 6 |
| 4. Visit to Helsinki Energy | Page 10 |
| 5. Visit to EKOKEM | Page 11 |
| 6. Visit to VTT Lab | Page 12 |
| 7. Photographs | Page 15 |

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1. Introduction:

First I would like to acknowledge the Competent Authority, Centre Pollution Control Board for nominating me to the study visit for the project “Capacity Building for emission measurement in India” on “Source Emission” during 9th September to 13th September, 2013 and also Ms. Mita Sharma, Additional Director who had been helping us from the word go, in every aspects for the preparation of the tour.

This study tour consists of seminars and visits to laboratories of Emission control knowledge center, composting plant, Power plant and a Hazardous waste Incineration Unit. Fruitful interactions with the international technical experts in VTT were well received by the participants and proved to give an effective overview of different aspects of the Finnish initiatives.

We had an opportunity to meet and dine the Indian Ambassador of Finnish Government **Mr. Aladiayan Manickam** at the Indian Embassy. He along with his team explained about the functioning of a composting plant and operation of sewage treatment plant in Finland. He insisted us to initiate projects in India by involving private entrepreneurs to make wealth from waste and also to keep our environment clean.

Hospitality and Co-operation from the instructors and factories was excellent, which enabled us for the successful completion of the tour.

Totally 13 Participants were nominated from Central & State pollution control Boards/ Committees for this study visit.

VTT Technical Research Centre of Finland has started a project focusing on the development of emission measurement in India. Reliable measurement has a key role in identifying and reducing emissions.

During our stay at VTT, we understand the

- functions and activities performed by VTT

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- Environmental permitting and licensing procedures
- Finnish emission monitoring procedures- Legislation, standards and Quality Assurance.
- Hands on training for emission measurements and recent technologies available for emission measurements.

We visited to the following places:

- laboratories of Emission control knowledge center
- composting plant
- Power plant
- Hazardous waste Incineration Unit

The study tour was very worthwhile:

- We were able to see commitment to control source emissions by VTT.
- Actually experiencing the recent technologies available to measure and control emissions rather than reading case studies allows one to gain a better understanding.
- The chance to network with a group of people with a similar interest but from a range of backgrounds.

Hospitality and Co-operation from industries was excellent, which enabled us for the successful completion of the tour. The tour was worth while as it gave an opportunity to discuss various technologies associated with emission monitoring and it also initiated network with the instrument suppliers in Finland.

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09th September 2013 To 13th September 2013

2. Schedule of the study visit in Finland

The study visit week in Finland consisted of the following:

Monday, 9th September 2013

Presentation of participants and expectations for the Study Visit

Presentation of VTT and its activities/Technology

Visit to laboratories of Emission Control Knowledge centre, VTT

Finnish Ministry of the Environment – environmental permitting and licensing procedure

Visit to the composting plant of Ekolannoite

Tuesday, 10th September 2013

Finnish emission monitoring procedures

Visit to the Helsinki Energy, Hanasaari Power Plant

Wednesday, 11th September 2013:

Visit to the hazardous waste incineration unit, Ekokem

Thursday, 12th September 2013

Hands – on- training for emission measurements

Friday, 13th September 2013:

Technologies for emission measurements.

STUDY VISIT FOR SOURCE EMISSION MEASUREMENTS ON THE PROJECT “CAPACITY BUILDING FOR EMISSION MEASUREMENTS IN INDIA” AT VTT, FINLAND

09th September 2013 To 13th September 2013

3. Details of Programmes at VTT

Day 1 : Monday, 9th September 2013

Venue: VTT center, Helsinki, Finland

Presentation: VTT and its activities/technology by Ms. Tuula Pellikka

The programme started with the formal introduction of all the participants followed by presentation of Ms. Tuula Pellikka on the activities of Technical Research Centre of Finland (VTT)

The team visited Laboratory VTT emission knowledge centre. In VTT- emission knowledge centre, the monitoring of Petrol/Diesel driven vehicle is being carried out at a temperature of -31 °C to bring out the emission during prevailing climatic condition. Visual inspection of the exhaust system and all emission control equipment fitted by the manufacturers also being checked here for its satisfactory condition and for leaks. After a reasonable period of time, engine conditioning (as per manufacturer's recommendations) and the carbon monoxide (CO), hydrocarbon(HC) and oxygen (O₂) content of the exhaust gases from the engine is measured in idling (no load). Exhaust gas opacity is being measured during free acceleration. To control the emission all exhaust gases were let out through a Stack provided with proper Air Pollution Control System. This visit includes heavy duty and light duty diesel vehicle workshop and laboratory of emission control where operation of instruments viz. FID, FTIR, GC, and Isokinetic sampling machines etc. were performed/ demonstrated.

Presentation: Finnish Ministry of the Environment: Me. Markku Hietamaki.

Mr. Markku Hietamaki, Finnish Ministry of the Environment (FME) presented overview of the functions of Ministry Of The Environment which are summarized below:

- Takes part into the preparation of EU environmental legislation for Finnish state
- Transpose the EU directives to nation legislation via acts or statues
- Strategic control of environmental permitting
- Strategic and operative control of compliance monitoring of environmental permit

STUDY VISIT FOR SOURCE EMISSION MEASUREMENTS ON THE PROJECT “CAPACITY BUILDING FOR EMISSION MEASUREMENTS IN INDIA” AT VTT, FINLAND

09th September 2013 To 13th September 2013

- Ministry can give guidance documents to state environmental authorities
- Ministry has no competence concerning “single cases” permitting or compliance monitoring
Ministry can try help if who’s who give permits or monitor the compliance of environmental permit

Environmental Protection Legislation in Finland; some of the most important legislative acts

- Environmental protection Act
- Waste Act
- Water Act
- Nature Conservation Act
- Act on Water Resources Management
- Act on Environmental Impact Assessment Procedure
- Land Use and Building Act
- The assessment of the implementation of the act is in progress
- Climate Act (preparation has just started)

EPA covers: Pulp and Paper, Iron and Steel, Mining, Peat Production, Animal shelters, Fish farming, Waste and waste water treatment etc.,

Salient features of the Environmental Protection legislations in Finland

The Traditions of the Law Drafting in the Ministry of the Environment are Openness, transparency in all activities and partnerships. It encourages others to express their views and makes even difficult decisions transparently and gives its reasons for them thus: Ad hoc committees and working groups are widely used when environmental law (acts or decrees) is prepared, all relevant interests groups are involved (e.g. NGOs, industry, authorities, research institutes) Hearings and public hearings (via internet) take place.

Environmental Permit Division Responsibilities

- determination of environmental permits and related notifications of experimental activities

STUDY VISIT FOR SOURCE EMISSION MEASUREMENTS ON THE PROJECT “CAPACITY BUILDING FOR EMISSION MEASUREMENTS IN INDIA” AT VTT, FINLAND

09th September 2013 To 13th September 2013

- determination of permits for water projects and associated administrative compulsion measures
- determination of compensation for losses due to water pollution
- support for municipal environmental protection authorities

General principles in permitting

- Integrated approach
- Polluter pays principle
- BAT/BEP
- Precautionary principle
- Prevention principle
- EIA-principle

Permit decisions

- Permit consideration is done case by case
- People concerned and interest groups involved have broad right to participate in the permitting process
- All kind of emissions to environment are covered by same permit
- These elements are commonly seen as a strength in the permitting process

Decision

- An environmental permit is granted for activities that:
- Meet the requirements of Environmental protection Act and the Waste Act and those of the decrees issued under them.
- Provisions lay down in and under the Nature Conservation Act must be observed when resolving a permit matter.

Terms of the Permit

- should be based on BAT

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09th September 2013 To 13th September 2013

- should be clear and monitorable
- should take account of the needs of compliance monitoring
- considerate case by case
- approval of installation's own monitoring plan

Day 2 : Tuesday, 10th September 2013

Venue: VTT centre, Helsinki, Finland

Presentation: VTT and its activities/technology by Ms. Tuula Pellikka

Ms. Tuula Pellikka, VTT outlined various Finnish Emission Monitoring Procedures and briefed Legislation related to emission measurement, Quality assurance of emission measurements and Safety issues during field measurement campaigns.

Source of Emissions are mainly carried out in Pulp mills, Power plants, Emissions from small-scale combustion (saunas), Traffic, Ship emissions and transboundary pollution etc.

Continuous Emission Measurement is conducted for the following parameters:

- NO_x
- CO
- total dust
- TOC (total organic carbon)
- HCl
- HF
- SO₂

And also oxygen, pressure, Temperature water vapor content, at least two measurements per year of heavy metals and dioxins and furans

VTT's focusing areas: Bio-Economy, Research efficient industries, Clean Technologies, Digital World, Low Carbon Energy, Promoting alternative fuels/Renewable energy.

STUDY VISIT FOR SOURCE EMISSION MEASUREMENTS ON THE PROJECT “CAPACITY BUILDING FOR EMISSION MEASUREMENTS IN INDIA” AT VTT, FINLAND

09th September 2013 To 13th September 2013

Quality Assurance in Emission Measurements in Finland:

- Accreditation according to EN-ISO 17025 is a requirement for emission measurements!
- All instruments must be calibrated on a regular basis. Note!
- Calibration for gaseous analysers must be performed at the site, before and after the measurements
- Competence of the personnel must be proofed
- Measurement methods => typically European EN- standards

Emission measurement laboratories must take part regularly on comparison measurements

4. Visit to Helsinki Energy

Visited Helsinki Energy, Hanasaari Power Plant, Ms. Anna Hayrinen was coordinated the visit.

- Helsinki Energy (UISO 14001 certified plant) generates most of the electricity and heat used in Helsinki.
- Power plants in Helsinki utilize the combined cycle technology, in which the energy generating gas turbine and steam turbine process have been combined. Wherein the energy is generated at a very high efficiency. 90% of the fuel efficiency is achieved by utilizing CHP. Less than 10% of the energy generated by means of the fuel is lost mainly due to heat losses via flue gases and cooling water as well as internal heat losses.
- Environmental Impacts: To minimise the environmental risks caused by the power plants, it takes regular monitoring measures.
- Nitric oxide content of the flue gases are monitored by means of continuous analysers.
- Other parameters monitored regularly are: Impurities in waste water, temperature of cooling water, heat transferred to the sea with the cooling water
- Leaks and emission exceeding standards are reported to the environmental authorities without delay.

STUDY VISIT FOR SOURCE EMISSION MEASUREMENTS ON THE PROJECT “CAPACITY BUILDING FOR EMISSION MEASUREMENTS IN INDIA”

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09th September 2013 To 13th September 2013

- 80% of sulphur di oxide contained in the flue gases of the power plant removes by desulphurization plant.
 - Powdered coal burners reduce the emission of nitric oxide.
 - Energy generation in Helsinki is ensured by the utilization of Coal
- During the visit, no flies, dust and fugitive emission found inside the campus.

Day 3 : Wednesday, 11th September 2013

5. Visit to EKOKEM

- Visited Hazardous Waste Incineration Unit at Ekokem, Presentation given by Ms. Minna Kaila
- **Ekokem** is the largest operator in the waste based energy business in Finland. It provide recycling, recovery and final disposal solutions, as well as soil remediation, construction and demolition services , waste to energy plants and incineration facility. The firm treated 250,000 tonnes of waste, generating 450 GWh of district heat and 59 GWh of electricity. The corresponding district heat production would consume 50 million Nm³ of natural gas
- During the year, they recycled ash over 5 000 tonnes from iron, aluminium, copper and steel.
- Installed CONTINUOUS EMISSION MONITORING SYSTEM and the following parameters are being measured :SO₂, NO₂, CO₂, TOC, , CO, Particulate, HCl, heavy metal, Dioxin and furan, PCB and heavy metal viz., Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel, Vanadium, Mercury, Cadmium and Titanium.
- Land fill: Dust from flue gas, Cleaning system of incineration plant, Precipitate from chemical plant are sent to secured land fill . Seepage water transferred to Chemical Treatment Plant.

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09th September 2013 To 13th September 2013

Day 4 : Thursday, 12th September 2013

6. Venue: VTT Lab

Hands on training for emission measurements/Mr. Harri Puustinen, Mr. Harri Mustikkamaki

Mr. Harri Puustinen, and Mr. Harri Mustikkamaki, Scientist of VTT Lab gave Hands on training for emission measurements followed by visit to VTT Lab. They described various instruments used for emission monitoring and methodology being adopted. They further explained about Particulate measurement principle of the method, isokinetic sampling, measurement place and location of sampling points.

- Source emission measurement for Batch Process and Continuous Process.
- The Calculation of the Stack Gas Flow Rate Based on the Finnish Standard.
- Demo was conducted by inserting the sampling probe at stack provided to let out the exhaust of the diesel and petrol driven vehicle. The team visited Odour testing lab and learnt methodology adopted by them. M/s. Tuula Pellikka taught about Measurement Uncertainty for Gaseous components.

Day 5: Thursday, 13th September 2013

Venue: VTT Lab

The leading manufacturers of Continuous Emission Measurement technology in Finland presented on their products, which is summarized as below:

Gasmet

- FTIR Gas Analyser for Continuous Emission Monitoring
- Stack Testing
- Process Monitoring
- Quality Control
- Engine Exhaust Gas Monitoring
- Work Place Air Quality Monitoring

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- Combustion Research
- Emergency Rescue services
- The FTIR technology used in every Gaset analyzer has its origins in the fundamental research work performed in Finnish Universities

Dekati

- Instrumentation for fine particle sampling and dilution for demanding measurements
- Accurate Instrumentation for high-end particle measurements
- Real-time instruments
- Dekati[®] Impactors
- To measure PM10 and PM2.5

Kontram

- Emissions analyzers
- Process gas analyzers
- Combustion analyzers
- Ambient analyzers
- Gas calibrators
- Gas and flame detectors
- pH, conductivity and dissolved oxygen measurements
- Water analyzers in power plants
- Waste water and other liquid analyzers
- Ambient and emissions particulate monitors
- Ambient air PM analyzers
- Source analyzers
- Continuous sampling of Dioxins and Furans

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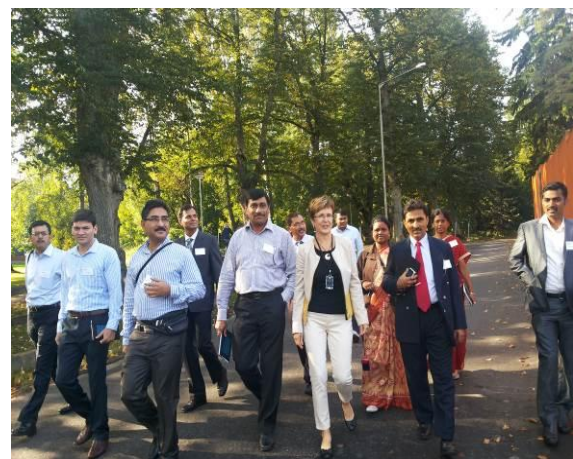
Sick

- Sensor solution for cement industries
- Sidor gas analyser
- Mobile measurement system for gravimetric dust concentration measurement
- Total Hydrocarbon Analyzer for continuous hydro carbon measurements
- Laser Gas Analyzer
- Measurement of gaseous components

The session was followed by a concluding discussion, where we exchanged our knowledge of the entire tour with the host. At the end all participants were awarded with a certificate of attendance by the organiser

The exposure and knowledge I gained in Finland will be immensely useful in implementing several improvements.

8. Photographs:



Visit to VTT lab

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EMISSION MEASUREMENTS IN INDIA”
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At sludge composting plant along with Ambassador



At VTT Lecturer Hall



At EKOKEM