Training Programme on

Continuous Emission Monitoring System: From Understanding to Implementation

6 – 10 February, 2017

Background of the Programme

Centre for Science and Environment (CSE), New Delhi organized a one week training programme on **"Continuous Emission Monitoring System- From Understanding to Implementation"** from 6th to 10th February 2017 at its main office at 41, Tughlakabad Institutional Area, New Delhi. The training programme was organized under CSE's capacity building initiatives as per the tripartite agreement between CSE, Ministry of Environment, Forest and Climate Change (MoEF&CC) and Central Pollution Control Board (CPCB). The training programme was designed to develop the knowledge base and skills of regulators on following aspects of continuous emission monitoring system (CEMS):

- Basic understanding of "Real time monitoring/ or continuous emission monitoring system" and its importance.
- Status of CEMS implementation and challenges in implementation
- Technical knowledge and practical experience on suitable device selection, correct installation, operation & maintenance, data transmission, inspection and compliance check.
- Checklist preparation for inspection of CEMS installations and course correction for proper implementation.
- Field visits for hands on experience.

The training was attended by 31 participants from 14 stat pollution control boards (SPCBs). The participant group included environmental engineers, scientific officers, environment officers, lab heads and field officers. The training sessions involved lectures, group exercise, discussions and presentation and field visits to get hands on experience of CEMS. A diverse group of experts including experts from CSE, CEMS device manufacturers and service providers were involved as resource persons.

Summary of the training sessions

Day 1

The training programme was started with the introduction of regulator's training initiative and the objective of the training programme on CEMS. CSE presented the CEMS implementation status in India and highlighted the need of training. The findings of CSE's survey on CEMS implementation in India (carried in collaboration with Karnataka State Pollution Control Board (KSPCB) and Madhya Pradesh Pollution Control Board (MPPCB)) were shared with the participants to understand the implementation on ground. It was clarified that CSE's initiative for capacity building of regulators and industries on CEMS is a step to boost successful its implementation in India. The participant from Odisha State pollution Control Board (OSPCB) also shared the implementation initiatives taken by OSPCB in Odisha.

The technical sessions of the day one was dedicated for Particulate Matter (PM) CEMS. It included presentations and discussions followed by group exercise. During the presentations and discussion session, available technologies, location of installation, operation and maintenance, points to check for regulators etc. were discussed in detail. The key points of the technical sessions were following:

- **Suitable device selection**
  All the technologies available were explained in brief with their pros and cons. CSE shared some typical solutions for major sectors like cement, coal fired power plants, pulp and paper etc. All the measurement technologies are affected by various processes and gas conditions in the stack. Thus a discussion on suitability of PM CEMS in various conditions was also held.

- **Location of CEMS installation**
  Locations of CEMS installation have to be in reference to the position of sampling port and height of the stack. The following should be kept in mind:
  - The device installed in stack needs to follow 8D/2D formula or in rare case 2D and 1/2D formula and should be 500mm below the manual sampling port.
  - Only the process stacks or the stacks for which pollution norms are to be met should install CEMS.
  - The position of PM CEMS with respect to other monitors should also be taken care of. The plane and angle of installation should be such that there is no interference from other monitors or to the other monitors.

- **Calibration and importance of isokinetic sampling and dust factor**
  The lecture focused on isokinetic sampling as a must requirement for correct readings. The dust factor is obtained while calibrating a PM instrument. This factor should not be changed by the industry and if it is changed, then it should be notified to the regulators along with the reason of change. The lecture highlighted the importance of calibration and maintenance of CEMS device. It also shared the calibration requirements as per the CPCBs draft guidelines on CEMS.

- **Key points to note for regulators**
  During presentations, key points related to PM CEMS were shared to the regulators that they can notice during inspection of the plant. Knowing the fact that many of the CEMS installations are not perfect and need course correction, inspection checklist for regulators was very much needed and appreciated.

Lecture on PM CEMS

Group Exercise and Presentation

Based on the presentations and discussions, participants took part in group exercise and presentation session. The participants were divided into 5 groups. Each participant worked in the respective group and prepared answers for the given questionnaire on following points:

- PM CEMS technologies,
- Key factors to select suitable technology,
- Location of installation,
- Importance of dust factor and
- Key points to check during inspection.

Group exercise and presentation

After discussion, each group presented their answers. The participants were actively involved and well appreciated the exercise.

Day 2

The second day of the programme was on Gaseous CEMS. It consisted of presentations followed by group exercise and group presentations. The lecture discussed various available technologies, location of installation, operation and maintenance, points to check for regulators etc. The following major points were discussed in the lecture:

- **Types of technologies and points to consider**
  The various types of technologies for measuring different gaseous pollutants were discussed in detail. The discussion highlighted the key points regulators should consider during inspection of these technologies.

- **Calibration and maintenance**
  The lecture explained various types of calibration and enlisted the key points regulators should notice with respect to calibration. The availability of calibration cylinders, their certificate of validation, last calibration date etc. were few points to be kept in mind.

- **Key points to note for regulators**
  During presentations, key points related to Gaseous CEMS were shared to the regulators that they can notice during inspection of the plant. Knowing the fact that many of the CEMS installations are not perfect and need course correction, inspection checklist for regulators was very much needed and appreciated.

Lecture on Gaseous CEMS

Group Exercise and Presentation

Based on the presentations and discussions, a group exercise session was conducted. The participants were divided into 5 groups. The exercise highlighted the following points:

- Parameters for online gaseous monitoring for major sectors (cement, iron and steel, fertilizers, power plants etc.),
- Technologies available to measure them,
- Key factors to select suitable device,
- Location of installation and
- Key points to check during inspection.

Each group, based on their learnings throughout the day, completed the exercise and presented. The participants found the training sessions and exercise quite informative and a good learning experience.

Group Exercise and presentation

The day ended with a brief presentation on best practices on CEMS. The presentation highlighted the importance of quality assurance of devices and experiences of Europe and USA which started CEMS decades ago. CSE organized a regulators training cum exposure visit on CEMS in Germany in September 2016. The learnings of the visit were also shared with the participants.

Day 3

The third day of the programme was scheduled for a site visit to Ramky's Waste to Energy plant known as Delhi MSW Solutions Ltd. in Bawana (Delhi). The site visit was intended to show the CEMS installation and its operation and maintenance. It converts the municipal waste collected from nearby areas to electricity. The plant segregates the biodegradable and non biodegradable waste by means of rotating screens of different sizes. The non biodegradable waste is burned in boilers and is used to produce electricity while the biodegradable waste is sold as a fertilizer. The participants were taken around the plant to understand the process.

Hands on experience at Ramky's Waste to Energy plant

The plant has installed PM CEMS and Gaseous CEMS for measuring SO_2, NOx, CO, CO_2, O_2 and HCl. The visit was organized with a purpose to give practical exposure to the participants on CEMS. Participants were divided into 5-6 groups and were taken to the stack to see the installation of CEMS. Later, each group was taken for hands on experience in calibration, zero and span check for PM and gaseous CEMS. The session was very informative and was well appreciated by the participants.

Day 4

The fourth day of the programme was dedicated for presentation and discussions on continuous effluent quality monitoring systems followed by the site visit. The participants were taken to Orient Syntex plant. It is a textile dyeing and spinning unit located in Bhiwadi, Rajasthan.

The day began with the presentation and discussion on effluent quality monitoring system. Resource persons shared and discussed on following key points related to continuous effluent quality monitoring systems:

- Parameters to monitor by various industries
- Various technology options, their functioning and suitability
- Operation and maintenance of devices
- Regulator's key points to note for proper implementation of continuous effluent quality monitors

Lecture on effluent quality monitoring system

Post discussion, participants were taken to see the plant operations and effluent quality monitoring installation. The plant converts manmade fibre to thread. The fibre is dyed using hot wet process in different colours and is further converted to thread. The waste water generated from process is treated in an effluent treatment plant (ETP). The treated effluent quality is monitored by continuous effluent quality monitoring system. The parameters being monitored were COD, BOD,

TSS and pH. The participants got opportunity to see and understand the installed monitors, their function and operation and maintenance. The plant was in the process of installing multi effect evaporator (MEE) to become a ZLD facility.


Hands on experience at Orient Syntex

Day 5

Last day of the training programme was on CEMS data acquisition and handling system (DAHS) was held at CSE. The programme for the day consisted of presentation by expert followed by a group exercise. The expert presented and discussed on following key points:

- Various mode of data acquisition and handling system,
- Pros and cons of different modes of data handling
- Various real time experiences of data manipulations and reporting
- Various aspects of CEMS data analysis
- Key points for regulators for inspections of CEMS installations and data acquisition and handling system in industries.

Lecture on DAHS

Group Exercise and Presentation

Post presentation, a group exercise was conducted. The participants were divided into 5 groups and were given data sets for different scenarios and asked to identify the problems in them, if any. Each group presented their learning with enthusiasm. The participants were actively involved in the exercise and appreciated it.


Group exercise and presentation

Finally programme was wrapped-up with feedback collection and certificate distribution. Participants were very positive and appreciated CSE and resource persons for this capacity building initiative. They also requested CSE to organise more of such training programmes on CEMS in future.


Certificate distribution

List of participants and agenda are attached below as ANNEXURE.

ANNEXURE

List of attendees

S. No.	Organisation	Name	Designation
1	Andhra Pradesh SPCB	A Sri Samyuktha	JSO, Visakhapatnam
2	Andhra Pradesh SPCB	K Venkateswara Rao	AEE
3	Chattisgarh SPCB	Dinesh Kumar Patel	AE, Raipur
4	Chattisgarh SPCB	Vijay Singh Porte	AE, Korba
5	Delhi PCC	Dr. B. M. S. Reddy	SEE
6	Delhi PCC	Rajiv Sharma	EE
7	Gujarat PCB	Rajan B. Trivedi	EE, Ankleshwar
8	Gujarat PCB	Arun G. Patel	Dy. EE., Gandhinagar
9	Haryana SPCB	Smita Kanodia	AEE
10	Jammu & Kashmir SPCB	Anil Kumar Sharma	AEE
11	Jammu & Kashmir SPCB	Khurshid Ahmad Ganai	JEE
12	Karnataka SPCB	Rajshekhar Puranik	EO
13	Karnataka SPCB	Dr R. Lakshminarayana	Sr. EO
14	Karnataka SPCB	Shanmukhappa	RO
15	Kerala SPCB	Ramya G.	AEE
16	Kerala SPCB	Rema Devi S.	AEE
17	Madhya Pradesh SPCB	Dr. P. R. Deo	SSO
18	Madhya Pradesh SPCB	Dr. D. K. Wagela	Chief Chemist & Lab Head
19	Maharashtra SPCB	Satish Hanumant Padwal	Sub-RO, Taloja
20	Maharashtra SPCB	Ajit Vasant Rao Patil	Field Officer, Tarapur-I
21	Maharashtra SPCB	Rajendra Tippanna Jadhav	Field Officer, Kalyan
22	Odisha SPCB	Subhadarsini Das	DEE
23	Odisha SPCB	Debdutta Mohanty	AEE
24	Odisha SPCB	Biswakant Pradhan	AEE
25	Rajashthan SPCB	Ankur Pathak	Jr. EE
26	Rajasthan SPCB	Prasputita Nanda	JSO
27	Rajasthan SPCB	Dr. Vimal Poswal	JSO
28	Tamil Nadu SPCB	I. Abubakkar	AE
29	Tamil Nadu SPCB	Mohamed Musthafa U.	AE
30	West Bengal SPCB	Sudip Barua	EE
31	West Bengal SPCB	Nupur Sengupta	AEE

Agenda

Centre for Science and Environment

Regulators Training on

Continuous Emission Monitoring System: From Understanding To Implementation

6th - 10th February, 2017

Day 1: 6 February, 2017			
09:30 - 10:00 am	**Registration**		Kanika Bahel, Research Associate, CSE
10:00 - 10:30 am	**Welcome & Introduction**	• About CSE • About Regulator Training Programme	Nivit Kumar Yadav, Sr. Programme Manager, CSE
10:30 - 11:00 am Tea			
11:00 - 11:30 am	**Status of CEMS implementation and relevance of training**	• CEMS implementation status in India • Relevance of training programme • Programme agenda	Sanjeev K. Kanchan, Programme Manager, CSE
11:30 - 12:30 am	**Particulate matter CEMS**	**Technology selection** • Technology options and installation • Points to check for regulators • Discussion	Sanjeev K. Kanchan, Programme Manager, CSE
12:30 - 01:30 pm		**Operation and maintenance** • Calibration • Zero and span check	
01:30 - 02:30 pm Lunch			
02:30 - 03:30 pm	**Group exercise**	**Inspection checklist preparation for PM CEMS installation** • Technology options • Installation-location and position • Calibration and maintenance	Kanika Bahel, Research Associate, CSE
03:30 - 04:00 pm Tea			
04:00 - 05:00 pm	**Group presentation**	PM CEMS-inspection checklist preparation	Sanjeev K. Kanchan, Programme Manager, CSE
Day 2: 7 February, 2017			
09:30 - 10:30 am	**Gaseous CEMS**	**Technology selection** • Technology options and installation • Points to check for regulators • Discussion	Angshuman Paul, Director, Adage Automation
10:30 - 11:00 am Tea			
11:00 - 12:00 am		**Operation and maintenance** • Calibration • Zero and span check	Angshuman Paul, Director, Adage Automation
12:00 - 01:30 pm	**Group exercise**	**Inspection checklist preparation for Gaseous CEMS installation** • Technology options • Installation- location and position • Calibration and maintenance	Kanika Bahel, Research Associate, CSE
01:30 - 02:30 pm Lunch			

02:30 - 04:00 pm	**Group presentation**	Gaseous CEMS-inpection checklist preparation	Sanjeev K. Kanchan, Programme Manager, CSE
04:00 - 04:30 am Tea			
04:30 - 05:00 pm	**Quality assurance and best practices**	• Certification and performance assurance • Best practices in CEMS	Sanjeev K. Kanchan, Programme Manager, CSE
Day 3: 8 February, 2017			
09:00 am onwards	**Site visit**	• PM CEMS installations and operation & maintenance • Gaseous CEMS installation and operation & maintenance	Angshuman Paul, Director, Adage Automation Sanjeev K. Kanchan, CSE Programme Manager, CSE
Day 4: 9 February, 2017			
09:30 - 10:30 am	**Effluent quality monitoring systems**	**Technology selection** • Technology options and installation • Points to check for regulators • Discussion	Amol Malode, Product Manager, Forbes Marshall Ajit Joshi, Divisional Manager, Forbes Marshall
10:30 - 11:00 am		**Operation & maintenance** • Calibration • Zero and span check	Amol Malode, Product Manager, Forbes Marshall
11:00 - 11:30 am Tea			
11:30 am onwards	**Site visit**	• Effluent continuos monitoring system installation and operation & maintenance	Amol Malode, Product Manager, Forbes Marshall Ajit Joshi, Divisional Manager, Forbes Marshall Sanjeev K. Kanchan, Programme Manager, CSE
Day 5: 10 February, 2017			
09:00 - 10:00 pm	**Data acquisition & handling system**	• Understanding data acquisition and handling system • Existing scenario & challenges • Tampering issues- field experience • Points to check	Sudheesh Narayanan, CEO, Glens
10:00 - 10:30 am Tea			
10:30 - 12:00 am	**Group exercise**	• Checklist preparation • Data analysis	Kanika Bahel, Research Associate, CSE
12:00 - 01:00 pm	**Group presentation**	• Checklist preparation • Data analysis	Sanjeev K. Kanchan, Programme Manager, CSE
01:00 -01:30 pm	**Certification distribution and feedback session**		
Lunch			

Venue

Centre for Science and Environment
41, Tughlakabad Institutional Area, New Delhi-110062
Phone: 011-29956110, 29955124-25
Fax: 011-29955879

Contact

Kanika Bahel, Research Associate
Mobile: 09654368026 / Email: kanika.bahel@cseindia.org

Rahul Kumar Singh, Research Associate
Mobile: 09650737735 / Email: s_rahul@cseindia.org