AAETI
Anil Agarwal Environment Training Institute

CEMS & CEQMS
A good ENVIRONMENTAL GOVERNANCE regime paves the path for sustainable growth of a nation. Assures quality environment, equitable growth, health and safety for people while promoting growth.

All that it needs:

✓ Suitable pollution norms
✓ Standardised pollution monitoring practices
✓ Credible Reporting (disclosure)
✓ Transparency
✓ Strong regulatory framework
✓ Self regulation- market oriented pollution control

Emerging economies have incessant problem of: Weak pollution norms and regulatory system, poor monitoring practices, Non-transparency, lack of self regulatory of market based pollution control or monitoring mechanism (like emission trading).
What real time monitoring brings?

- Credible pollution monitoring - less manual intervention
- Transparency
- Better regulatory hand - continuous vigil
- Immediate corrective measures
- Process optimization
- Basic framework for market based pollution control
- Paves path for Self- monitoring regime

Helps in better compliance enforcement. Real time monitoring can be instrumental in bringing new era of environmental regulation.

US, Europe etc. have well established CEMS framework. Between 2005 and 2015, US has achieved huge emission reduction from power plants- NO\textsubscript{x} emissions declined by 62% (from 3.4 to 1.3 MnMT), SO\textsubscript{2} emissions declined by 78% (from 9.3 to 2.0 MnMT)
What is Continuous monitoring?

Two types of continuous or real time monitoring systems

- For air pollution: Continuous emission monitoring system (CEMS), Continuous Ambient Air Quality Monitoring System (CAAQMS)
- For water pollution: Continuous effluent quality monitoring system (CEQMS)

It comprises components for sampling, conditioning, and analysis. Hardwares and softwares are integrated to collect data, interpret into digital and readable format and transfer to server installed at regulators.
Device selection

Installation and calibration

Real-time pollution monitoring

Data acquisition system or Data logger

Secured Data Transfer

Data acquisition & handling at CPCB

Data acquisition & handling at SPCBs/PCCs

Display at Web-portals

- Suitable CEMS, CEQMS selection by industry
- Vendor selection

- Installation- device, software and hardware
- Data transfer system
- Equipment calibration, certification

- Emission, effluent quality monitoring
- Data collection through compatible software
- Periodical calibration, zero and span drift test
- Regular maintenance

- Secure data collection and transfer to servers installed at regulators
- Data of stack emission, effluent monitoring and ambient air quality monitoring can be handled and transferred together
- Industry, vendors can access the data.

- Data from industry is stored at servers/ internet storage facility at state and central regulators bodies
- Industry receives relevant auto response/instruction from servers
Conceptual view of online monitoring

Emissions/ Effluent

Analyzer

Analogue (4-20mA)

(Broadband/LAN/GPRS/Wifi)

Digital
(RS232/RS485
TCP/Modbus)

PC or Data Logger

REST based Open API Communication with Encrypted Data over HTTP

Central Server Software

Central Server

High Speed Internet
With Static IP

Browser based Access

Industry Representative

District Engineer
How CEMS started?

1. CPCB direction issued in Feb 2014
   http://cpcb.nic.in/upload/Latest/Latest_89_Direction_05022014.pdf

2. Pilot scale Particulate matter (PM) Emission Trading Scheme (ETS) in 2011 in Gujarat, Maharashtra and Tamil Nadu
   Guidelines in Nov, 2013,
   http://cpcb.nic.in/upload/NewItems/NewItem_202_CEMS_Specs_v21-11-13v_cpcb.pdf

3. CPCB direction under National Ganga River Basin Authority Mission (NGRBA), March 2014 for installation of CEQMS
   http://cpcb.nic.in/Direc18(1)(b)_27032015.pdf
   Guidelines issued in Nov, 2014
   http://mpcb.gov.in/images/FinalGuidelinse.pdf

4. Draft notification by MoEF&CC on CEMS- April, 2015
   http://www.ercmp.nic.in/adminfiles/RTM/Draft_Notification.pdf

5. Guidelines for CEMS- August 2017
   http://cpcb.nic.in/Guidelines_on_CEMS_02.08.2017.pdf
### Parameters to be monitored using CEMS

<table>
<thead>
<tr>
<th>Category</th>
<th>Effluent Parameters</th>
<th>Emission Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium</td>
<td>pH, BOD, COD, TSS, Flow</td>
<td>PM, Fluoride</td>
</tr>
<tr>
<td>Cement</td>
<td>-</td>
<td>PM, NOx, SO₂</td>
</tr>
<tr>
<td>Distillery</td>
<td>pH, BOD, COD, TSS, Flow</td>
<td>PM</td>
</tr>
<tr>
<td>Dye and dye</td>
<td>pH, BOD, COD, TSS, Cr, Flow</td>
<td>-</td>
</tr>
<tr>
<td>Chlor Alkali</td>
<td>pH, TSS, Flow</td>
<td>Cl₂, HCl</td>
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<tr>
<td>Fertilizers</td>
<td>pH, flow, Ammonical Nitrogen, F</td>
<td>PM, Fluoride, NH₃</td>
</tr>
<tr>
<td>Iron &amp; steel</td>
<td>pH, Phenol, cyanide, flow</td>
<td>PM, SO₂</td>
</tr>
<tr>
<td>Oil refinery</td>
<td>pH, BOD, COD, TSS, flow</td>
<td>PM, CO, NOx, SO₂</td>
</tr>
<tr>
<td>Petrochemical</td>
<td>pH, BOD, COD, TSS, flow</td>
<td>PM, CO, NOx, SO₂,</td>
</tr>
<tr>
<td>Pesticides</td>
<td>pH, BOD, COD, TSS, Cr, As, flow</td>
<td>-</td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>pH, BOD, COD, TSS, Cr, As, flow</td>
<td>-</td>
</tr>
<tr>
<td>Power Plants</td>
<td>pH, TSS, Temperature</td>
<td>PM, NOx, SO₂</td>
</tr>
<tr>
<td>Pulp &amp; paper</td>
<td>pH, BOD, COD, TSS, AOX, flow</td>
<td>-</td>
</tr>
<tr>
<td>Sugar</td>
<td>pH, BOD, COD, TSS, flow</td>
<td>-</td>
</tr>
<tr>
<td>Tannery</td>
<td>pH, BOD, COD, TSS, Cr, flow</td>
<td>-</td>
</tr>
<tr>
<td>Zinc</td>
<td>pH, TSS, flow</td>
<td>PM SO₂</td>
</tr>
<tr>
<td>Copper</td>
<td>pH, TSS, flow</td>
<td>PM SO₂</td>
</tr>
</tbody>
</table>
Equipments & Installation
Gaseous CEMS
Success demands?

Roadmap
Strategy
Time-bound action plan
Quality assured - Certified/Performance checked

Certified/Performance checked

Correct installation
Right location/position/platform

Self-regulation regime

Compliance check system

Tamperproof data transfer system

Right equipment selection

Regular operation & maintenance

Capacity building
Best Practices

CSE’s training cum exposure visit to Germany for regulators to understand the best practices and framework for CEMS.
Key Learnings from Germany

• No generalized approach for technology selection. It is based on the type of industry, process and flue gas characterization.

• The data acquisition and handling software is provided with the device as a package.

• Sector-specific directives and clear standards/ regulations is a necessity.

• Roles and responsibilities are clearly defined.
  ✓ Quality of the product and certification - Manufacturer
  ✓ Installation, O&M - Supplier and Industry
  ✓ Compliance - industry
  ✓ Compliance check - Regional environmental agency.
Certification, Quality assurance, Quality control of a CEMS device by a competent agency is mandatory.
Industries install CEMS devices before and after pollution control equipments. Installing before treatment checks for any malfunction and level of treatment required.
Environment, health and safety are prime concerns for German industries.
Environment, health and safety are prime concerns for German industries.
CEMS data is seen in conjunction with plant’s key operational data. German industries consider CEMS data complementary to a plant’s operational data as it helps in optimization of the process.
Thank you

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