CEMS – Data Acquisition Systems

How Technology is solving challenges to bring a shift in Regulatory Practices

LogicLadder, Gurgaon
Energy & Environment Intelligence Company
Agenda

- CEMS – CPCB Initiative & Compliance Guidelines
- How technology paradigm has changed
- Security & Scalability
- CEMS Application Snapshots
- Challenges Ahead
CPCB Initiative for central monitoring

Data driven environment management

Section 5.2 Pg 18 CPCB Guidelines 07-11-2014
Central Platform At CPCB

• Acquire data from 22 categories of polluting industries, in a modular and analyzer agnostic way.

• Make data available to various stakeholders.

The Instrument supplier layer makes market open for any analyzer or software company to provide solution to the Industry /OEM without changes in existing analyzers.
The CPCB Guidelines for CEMS Data Acquisition

What's required?

Section 5.2 Pg 18 CPCB Guidelines 07-11-2014
Real time monitoring without any intermediary PC

Accurate timestamps

Two way communication (For on demand calibration & Diagnostics)

Data logging in case of communication failure

Multi tenancy and user access – SPCB, CPCB & Data Generator (Industry) ...
Auto report and auto mail generation

Change request and workflow management for managing analyzer downtime/maintenance and data change requests.

Real time video streaming for ZLD industries

Real time alert over email and SMS.
CEMS DATA ACQUISITION: How technology paradigm is changing?
INTERNET 1.0

Client Server - Request response

INTERNET 2.0

IoT - Persistent Connectivity with Push Messaging

HTTP

REST API

FTP

Big Data

MQTT

COAP

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How it Works?

Internet of things (IOT) or Machine to Machine (M2M) platform for remote monitoring, control & management of environment monitoring stations and analyzers over GPRS, satellite and broadband.
Data Acquisition Software Platform: What to look for?

- Should be highly available
- All layers of data transmission should be secure
- Intelligent alarm system
- Scalable
- Reliable
- User Access Control
- Audit logs
How secure and scalable is it?
BIG DATA
Store large amount of data

Share information with multiple stakeholders

OPEN PROTOCOLS
Support any device

MQTT MODBUS HTTP REST

SCALABLE & RELIABLE

M2M
Makes Communication Reliable

LOCAL LOGGING
Local Logging on Device to Safeguard against Network issues.

NTP
Makes time stamps accurate

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Audit Logs

Device to Server Secure Communication

Data Integrity and Validation Test

SECURITY & INTEGRITY

Data Signature

No fixed IP. Secure streaming.

Fraud Analytics

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CPCB Application
Snapshots
A sneak peek into the platform
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<th>Parameter</th>
<th>Value</th>
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COD Chart (30 Min. Avg.):
- Maintenance Phase
- Delayed
- Corrected
- Maintenance

BOD Chart (30 Min. Avg.):
- Maintenance Phase
- Delayed
- Corrected
- Maintenance

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Dashboard – Quick snapshot of Country Scenario
Map View – Easy Location of Industries
Hardware – All models supported

<table>
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Industry Dashboard – Single centre view of all parameters

ACC Limited Bargah (Industry Code: Not Available)
Cement

No. of exceedance (Past 24 hours): 0
Alerts Communicated (Past 24 hours): 0
Located in Ganga Basin?: No

Industry Representatives

No Representative for this Industry

Number of Stations (2)

Kiln (stack)

<table>
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<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Diagnostics</th>
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<th>Regulatory Limit Min</th>
<th>Regulatory Limit Max</th>
<th>Analyzer acceptance range Min</th>
<th>Analyzer acceptance range Max</th>
<th>No. Of Exceedance (24hrs)</th>
<th>Alarms Communicated (24hrs)</th>
<th>Device Info</th>
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Challenges Ahead
## Challenges

<table>
<thead>
<tr>
<th>Limitations in delivering 99.99% real-time uptime</th>
<th>99.99% SLA requires multiple actors to work perfectly – Analyzer, Network, Software. Is it possible?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependence on third parties</td>
<td>Communication of data depends on Internet (mobile &amp; broadband) which is owned by third parties. How do we ensure 99.9% SLA from them?</td>
</tr>
<tr>
<td>Gap between Reality and Expectations of Industry Uses, Regulators</td>
<td>100% data uptime, except for a downtime of some days allowed in a year for maintenance. Is this possible for the Industry to achieve?</td>
</tr>
</tbody>
</table>
## Challenges

<table>
<thead>
<tr>
<th>Incompatible CEMS analyzers</th>
<th>Not all CEMS hardware provides all the information that may be required by an online system</th>
</tr>
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<tbody>
<tr>
<td>CEMS communication interfaces</td>
<td>Not all analyzers have digital output, 4-20 mA /analog outputs do not provide diagnostic information</td>
</tr>
<tr>
<td>Tampering of Data</td>
<td>Tampering of data at Analyzer or instrumentation level is difficult to stop.</td>
</tr>
</tbody>
</table>
Conclusion – Way Ahead

➔ Use CEMS data for emission trading and other business benefits
➔ Integrate the CEMS/AQMS data in public domain for health advisory
➔ Use data to predict environment impact