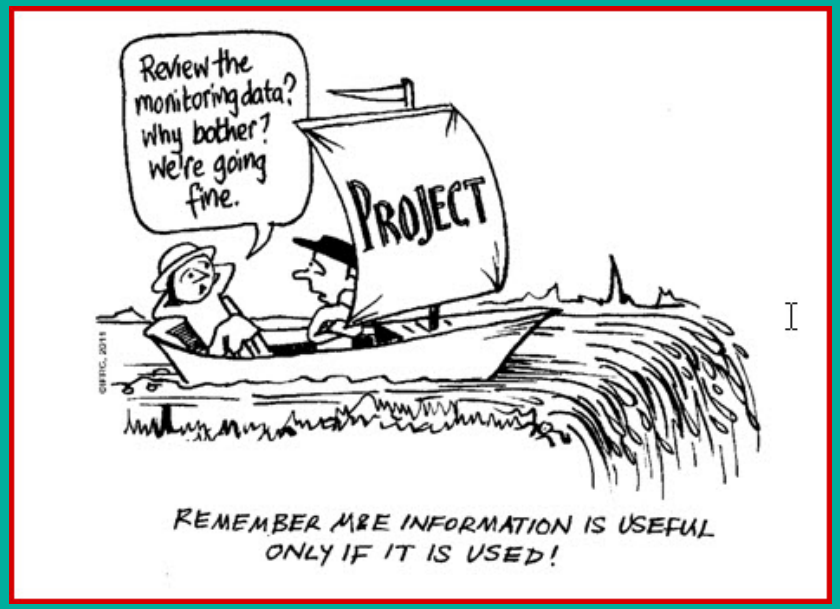
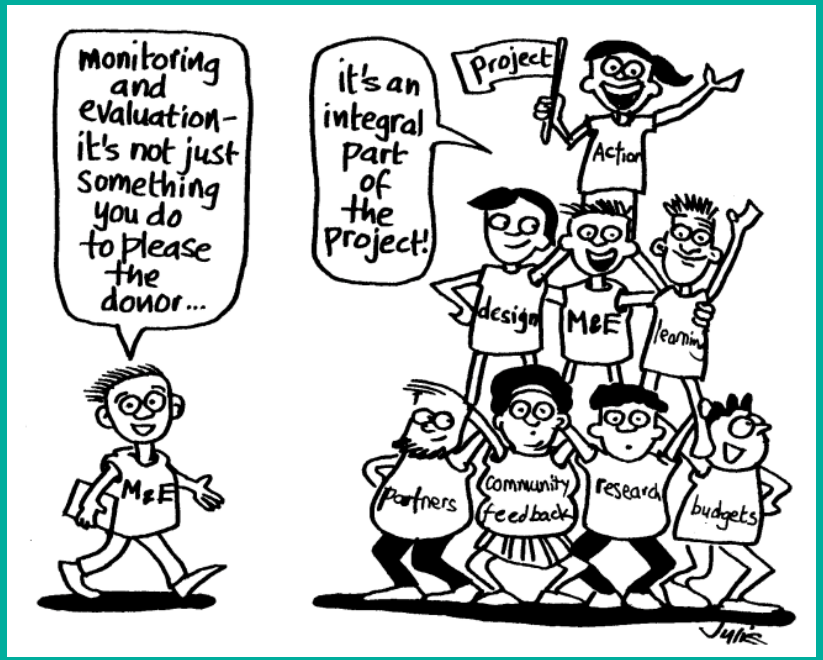
Monitoring and Evaluation for Project Implementation

Chirag Bhimani

“It is absolutely certain that we must act to protect nature much more efficiently than ever before. Tomorrow – when mankind will step forward to a totally uncertain future – will be too late.”

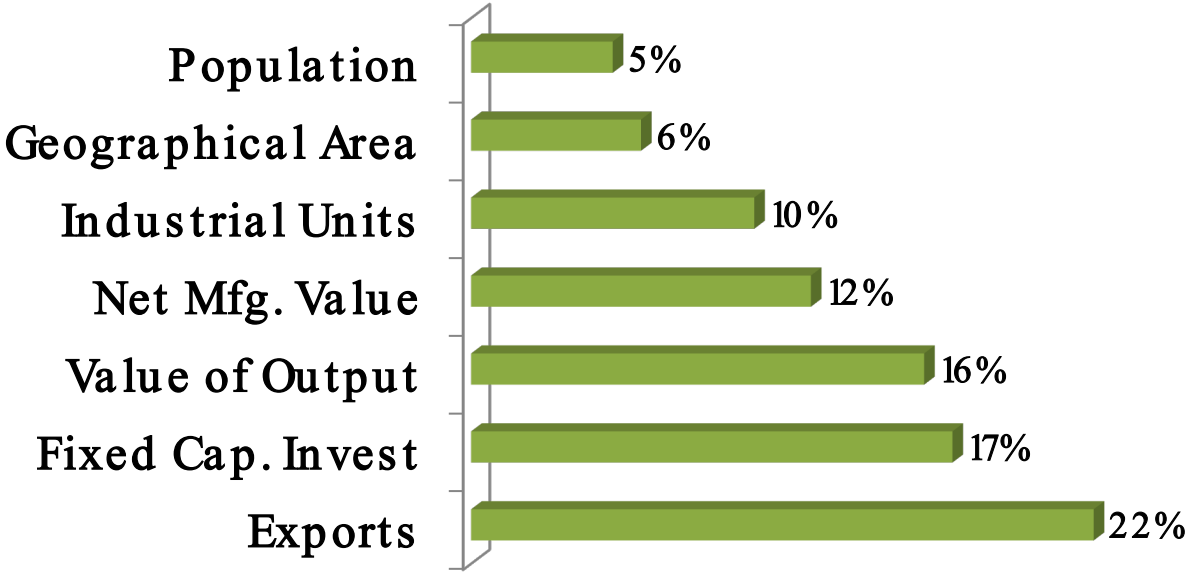

Review the monitoring data? Why bother? We're going fine.
PROJECT
REMEMBER M&E INFORMATION IS USEFUL ONLY IF IT IS USED!


Monitoring and evaluation - it's not just something you do to please the donor...
M&E
it's an integral part of the project!
Project
Action
design
M&E
learning
partners
community feedback
research
budgets

About Gujarat

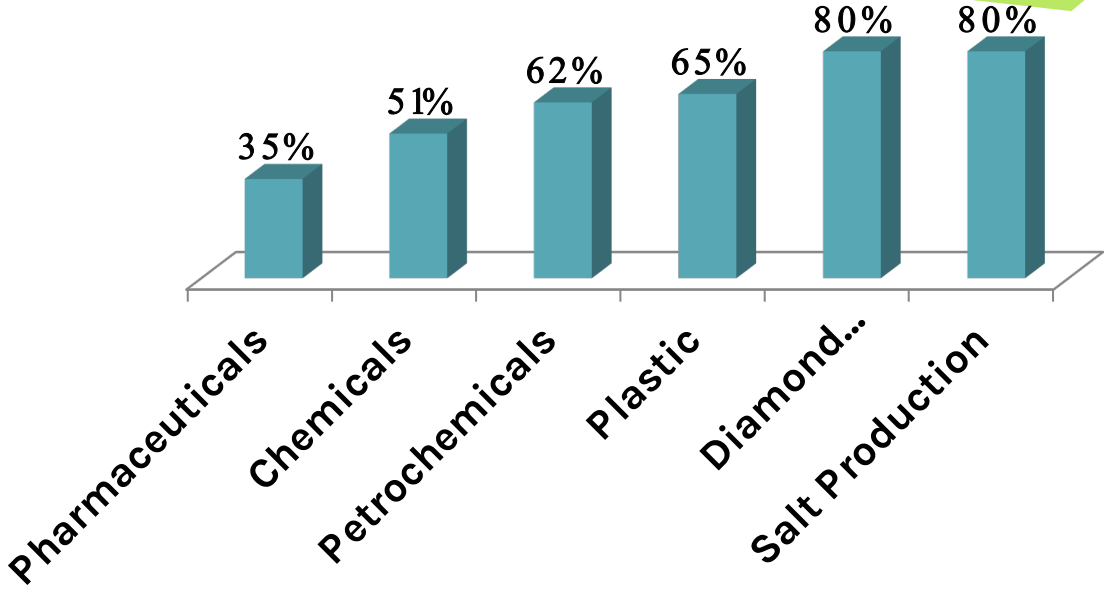
- Gujarat is a state in Western India
- Capital city - Gandhinagar
- Largest city - Ahmedabad
- Encompasses some sites of the ancient Indus Valley Civilization, such as Lothal and Dholavira
- The only home of Asiatic lions
- Mahatma Gandhi and Sardar Patel are Gujaratis

About Gujarat



Gujarat's Share in India

About Gujarat



Gujarat's Contribution to India

About Gujarat

- Third largest denim producer in the world
- World's largest ship breaking yard - Alang
- World's largest grass roots refinery - Reliance Petroleum, Jamnagar
- Achieved the distinction of being one of the most industrially developed states

About Gujarat Pollution Control Board

- Gujarat Pollution Control Board - constituted on 15th October, 1974 as per the Water Act, 1974
- GPCB - continued its efforts towards environment by better pollution control & improved management
- Several critical issues in the field of environment are being tackled by the Board through its Head Office and 27 Regional Offices

About Gujarat Pollution Control Board

Mission Statement

Gujarat Pollution Control Board (GPCB) aims at developing all round capabilities to protect the environment by preventing and controlling pollution by effective law enforcement and by adopting best environmental management practices to keep the State on course of sustainable development

About Gujarat Pollution Control Board

- Over the years the Board's mandate has grown several folds, necessitating ever increasing demand for skill to handle complex laws & to cope with the challenging tasks of stringent standards of performance expected of it
- Aims at being not only a regulator but a facilitator for developments with paradigm changes of a long-term nature through Environment Clinic and Help Desk

Genesis of An Innovative Tool

Due to the landmark judgment of Hon'ble High Court of Gujarat in SCA 770/95

- Need was felt for strengthening of the environmental monitoring and environmental infrastructure
- Difficulties in regular monitoring of thousands of industries scattered over the entire state due to shortage of man-power and infrastructure

Environment Audit Scheme

Environment Audit Scheme - modification of Rule 14 of the Environment (Protection) Rules 1986

Introduction to Audit Scheme

Two schemes operational in Gujarat :

- Environment Audit Scheme :

  An outcome of the judgment of Hon. High Court of Gujarat

- Third Party Monitoring Scheme in identified industrial clusters:

  An instrument used by the GPCB & Government of Gujarat to identify the defaulting industries and broader issues of the identified clusters – for better regulation and management

Principles of Audit Scheme

- ✓ Principle of "Polluter Pays" incorporated
- ✓ Scheme is based on the principle of "Continual Improvement"
- ✓ It is an extension of Environmental Statement Submission under Rule 14 of Environment (Protection) Rules – Environment Statement

Environment Audit Scheme

Introduced in December 1996 with a view to :

- enforcing discipline amongst industries;
- arming GPCB as well as the associations of industries with required data; &
- doing regular monitoring of various industries from different angle

Qualified technical professionals would become a link between the individual industries on one hand and GPCB as well as associations of industries on the other hand with vital element of accountability

Salient Features of Audit Scheme

- ✓ Classifies industries into Schedule I & II according to their pollution potential - Industries with more pollution potential classified in schedule I
- ✓ Industries audited by auditors recognized by Board as per the qualifications and experience prescribed

Salient Features of Audit Scheme

- ✓ Scheme applies to all industries manufacturing and/or processing any one or more of the products mentioned in the Schedule- I or Schedule-II
- ✓ Schedule-I industry shall carry out EA through Schedule-I Auditors and Schedule-II industry shall carry out EA through Schedule-II Auditors recognized by the GPCB

Salient Features of Audit Scheme

- ✓ Schedule-I auditors are credible institutes with high technical capabilities like Academic & R&D Institutes
- ✓ Schedule-II auditors are agencies / consultants having technical capabilities
- ✓ Both Schedule-I and Schedule-II auditors are recognized – constituted a committee – officers from Board, Government and experts / professionals
- ✓ Reporting formats are standardized & defined - uniformity

Salient Features of Audit Scheme

- ✓ In addition to adequate laboratory facilities, the Auditors must have atleast 4 technical team members
- ✓ Each team of auditors shall comprise of :
  - a person having a degree in Environmental Engg. or a degree in Civil Engg. with specialization in Environment
  - a person having a degree in Chemical Engg./ Technology
  - a person having a degree in Chemistry or Environmental Science
  - a person having a degree in Micro Biology/ Bio-Chemistry
- ✓ Provisions of levy of scrutiny fee

Audit Scheme - Advantages

- Increased monitoring - complimentary to existing regulatory mechanism
- Overall assessment of environmental performance by an industry
- Better compliance - adequacy of the EMS ascertained
- Element of voluntary compliance - encourages industry to think beyond the compliance

Audit Scheme - Advantages

- Recommendations given by the Auditors lead to Good / Green practices
- EA Reports provide important technical inputs to Board
- Environment Auditors are held responsible for the false / misleading reporting – blacklisting

Audit Scheme - Limitations and Challenges

- Repetitive in nature - stereo type reporting in a long run
- Auditors are appointed by industries
- Competition amongst the auditors results into reduced auditing fees – poor quality
- Auditors monitor the industries for grab samples

Audit Scheme - Limitations and Challenges

- Auditors rely upon the data supplied by the industries
- Does not apply uniformly in entire country – most of the industries feel that its burden
- Need for further strengthening and R&D to make it more effective

Randomised Control Trials (RCT)

Due to the experiences and limitations of the scheme, GPCB sought out researchers to help reform the Audit Scheme in 2009

The goal of reform was to improve the accuracy of audit reports and, ultimately, compliance with environmental regulation

Randomised Control Trials (RCT)

GPCB & Researchers jointly designed & evaluated a reform in which :

- Auditors were randomly assigned to industrial plants
- Paid from a common pool
- Monitored for accuracy
- Given incentive for accurate reports

Randomised Control Trials (RCT)

	Comparison Group: Status Quo Audit System	Treatment Group: New Audit System
Auditor Selection	Plants selected and paid their own auditors	Auditors were randomly assigned to the plants that they would monitor
Auditor Fees	Plants paid auditors directly and negotiated the price of the audit	Auditors were paid a fixed fee per audit from a common pool
Monitoring	Auditors' reports were not verified for accuracy	Twenty percent of audit reports were randomly "backchecked"
Accuracy Incentives	None	Auditors were also given incentive for accurate reports

RCT - Findings

- ✓ When auditors were hired and paid by the firms they were auditing, as in the status quo audit system, false reporting and pollution were high
- ✓ The new audit system led auditors to report pollution more truthfully and substantially lowered the number of plants that were falsely reported as compliant with pollution standards
- ✓ Industrial plants reduced pollution in response to more accurate audits

Converting Research into Policy

Policy Recommendations :

1. Randomly assign auditors to the firms, instead of letting firms choose their auditor
2. No negotiation between auditors and firms on their fees
   - Pay auditors from central pool, or
   - Have fixed fees based on the work needed & software decides payment
3. Introduce random backchecks to auditing system

Future Implementation of Audit Scheme

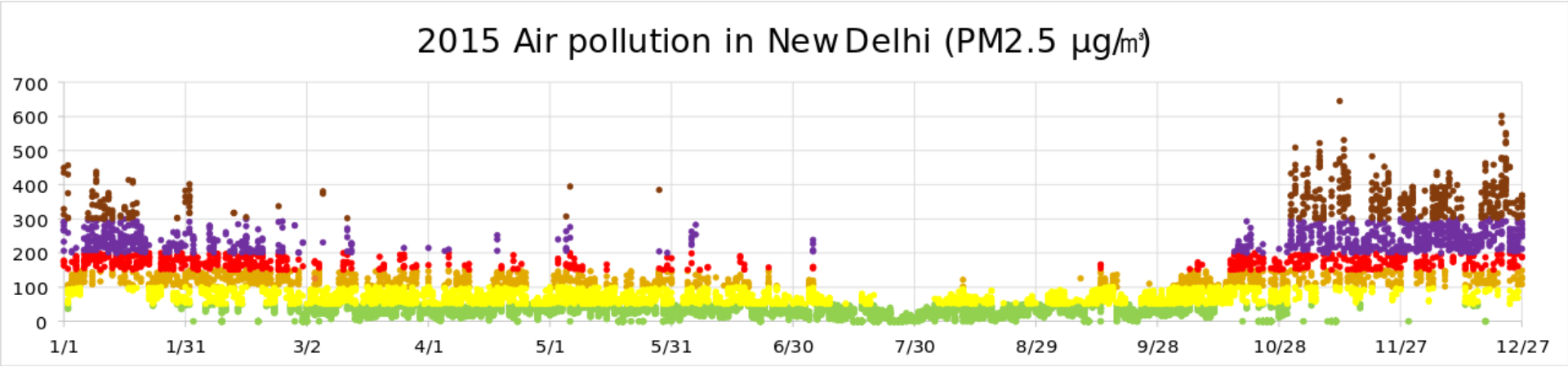
- ✓ **Auditors Certificate valid for exemption from routine visits for Orange Category Industries (EODB)**
- ✓ Auditors can be extended arms of GPCB for compliance monitoring
- ✓ Audit Reports can supplement in decision making process for consents
- ✓ Audit Reports can be used for backchecks


AP

Pollution – Particulate Matter (PM) Problem in India

- Air pollution in India is quite a serious issue
- Major sources - fuel wood and biomass burning, fuel adulteration, vehicle emission and traffic congestion
- Respirable particulate matter pollution - a key challenge for India
- Indian cities exceed acceptable levels of Suspended Particulate Matter (PM)

Pollution – Particulate Matter (PM) Problem in India



Mitigating Air Pollution

Tools / Ways for Mitigating Air Pollution

- Controlling the source of pollution - reduce, eliminate, or prevent pollution at its source
  - Change in Fuel, Process, Control Equipment
- Measurement of Air Pollution essential to know the effectiveness of control strategies adopted
  - Source Monitoring, Ambient Monitoring

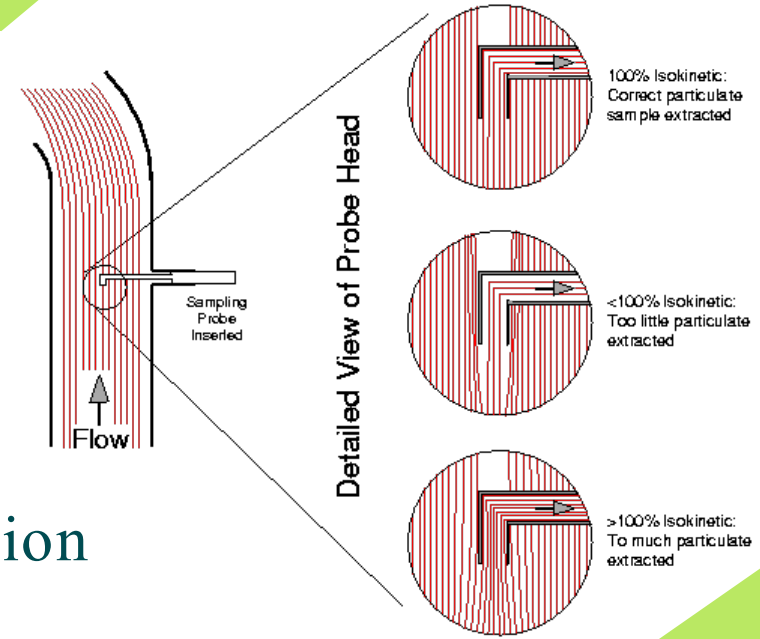
PM - Manual Sampling and Data Collection

- PM a key pollutant due to use of solid fuel
- Measurement of PM significant for quantification
- Existing method – manual air sampling
- Manual sampling is Isokinetic Sampling i.e. Undisturbed Flow.
- Purpose to capture particles that pass through a defined area for a defined time without disturbing their paths.

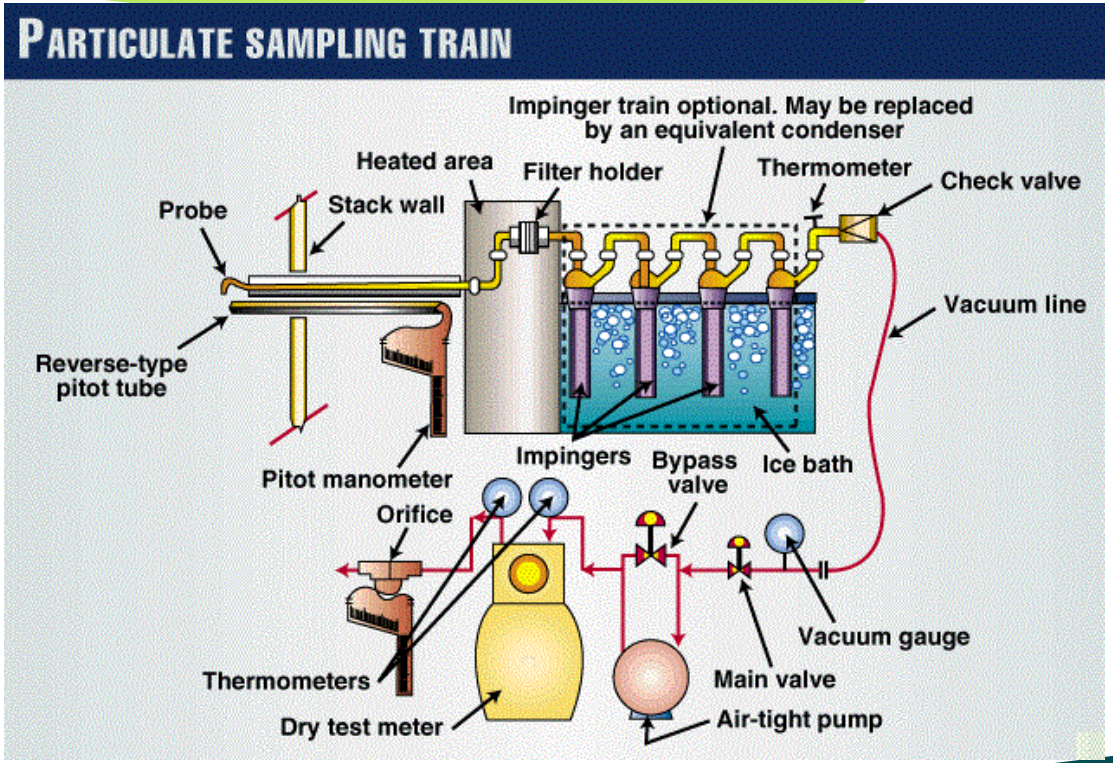
PM - Manual Sampling and Data Collection

Isokinetic Sampling

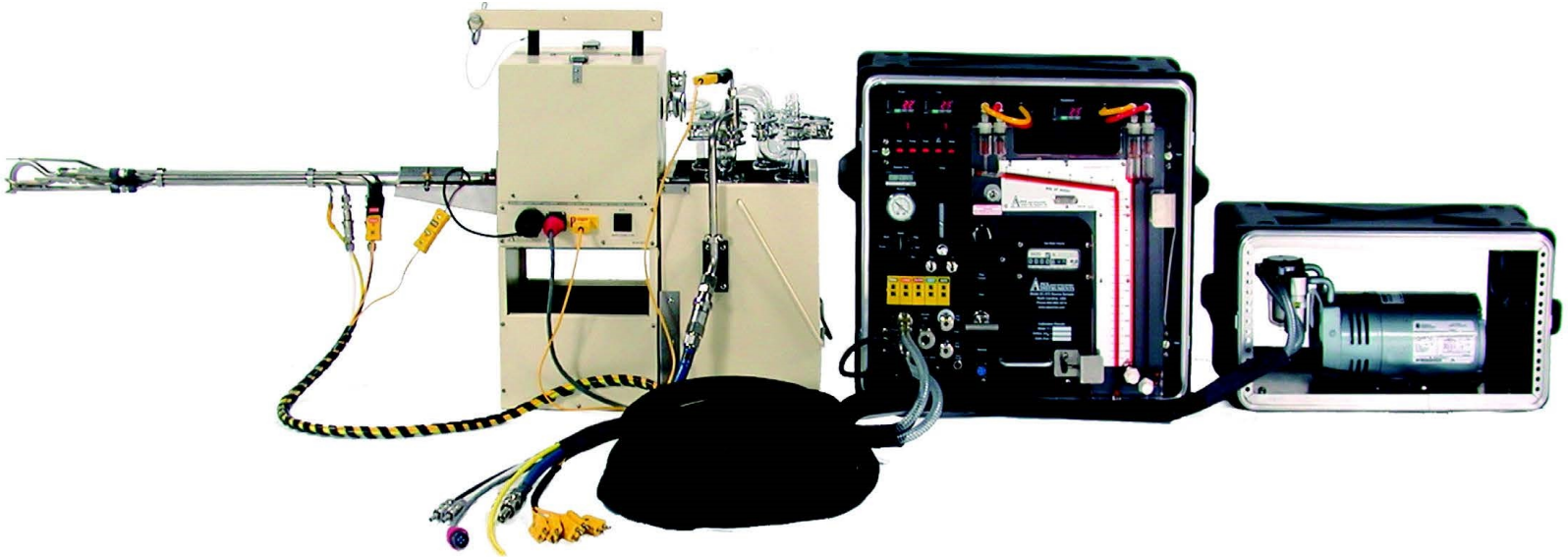
- ✓ Particulate emissions from source are sampled isokinetically using a recognised international standard
- ✓ The collected sample is analysed to determine the pollutant concentration



PM - Manual Sampling and Data Collection



PM - Manual Sampling and Data Collection



PM - Manual Sampling and Data Collection

Errors that could influence accuracy

- Moisture
- Gas Composition
- Nozzle, Probe direction
- Leakages in the equipment
- Test equipment calibration
- Unstable Process Conditions

PM - Manual Sampling and Data Collection

Manual sampling

- Gives instantaneous pollutant concentration
- Not useful for computing total pollutant released
- Due to human intervention chances of error
- Lengthy and cumbersome procedure

CEMS

Continuous Emissions Monitoring System

Introduction to CEMS

- To overcome limitations of Manual Sampling, Continuous Emissions Monitoring System (CEMS) developed.
- Sampling principles are similar to manual sampling as well as different depending on pollutant

Introduction to CEMS

Manual Stack Sampling

- Based on direct gravimetric method
- Infrequent intervals: no information on particulate emissions in the intervals between monitoring
- Regulation possible on concentration standards only

CEMS

- Based on indirect method
- Continuously obtained data in real time.
- Enables the use of load standards as the basis for regulating stationary source emissions.
- Manual stack monitoring still required for calibration and certification

Introduction to CEMS

Technologies used in CEMS for PM

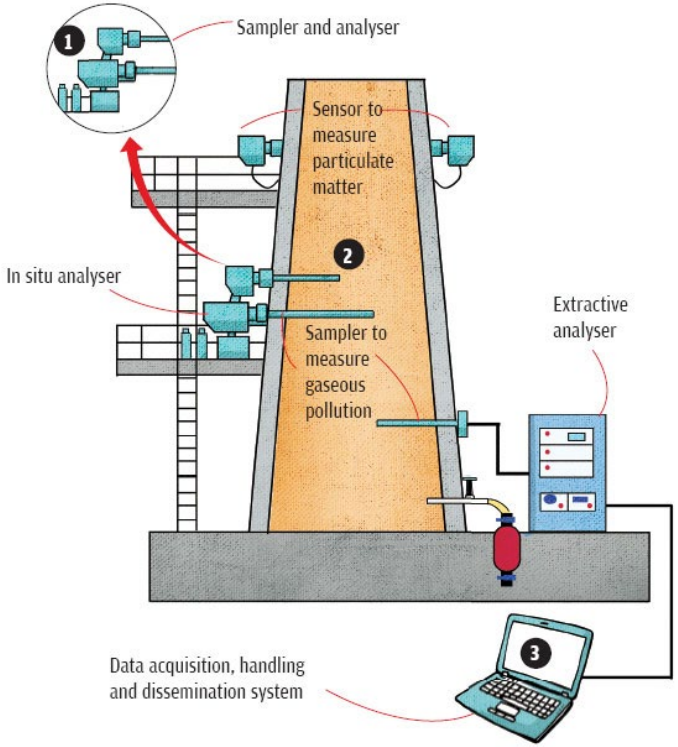
- Tribo Monitoring Probes (DC / AC)
- Electrodynamic Method
- Light Scattering (Forward / Backward)
- Opacity Monitor
- Extractive Technology

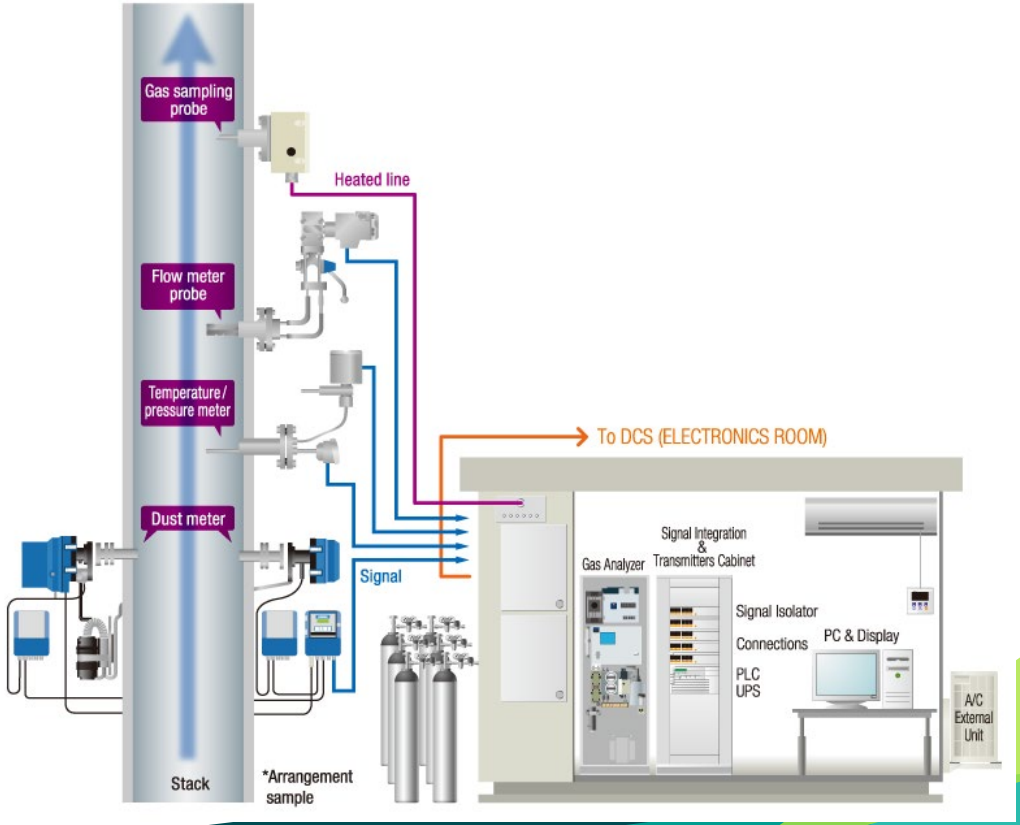
Introduction to CEMS

Advantages of CEMS over Manual Sampling

- Real Time Information
- Remote Accessibility to Operator / Regulator
- Reduction in long term regulatory cost
- Transparency and Openness
- Load Standards Implementation
- Applicability of Market Based Mechanisms
- Better compliance through self regulation
- Continuous efficiency check of EMS

Introduction to CEMS





Introduction to CEMS

Introduction to CEMS

Introduction to CEMS

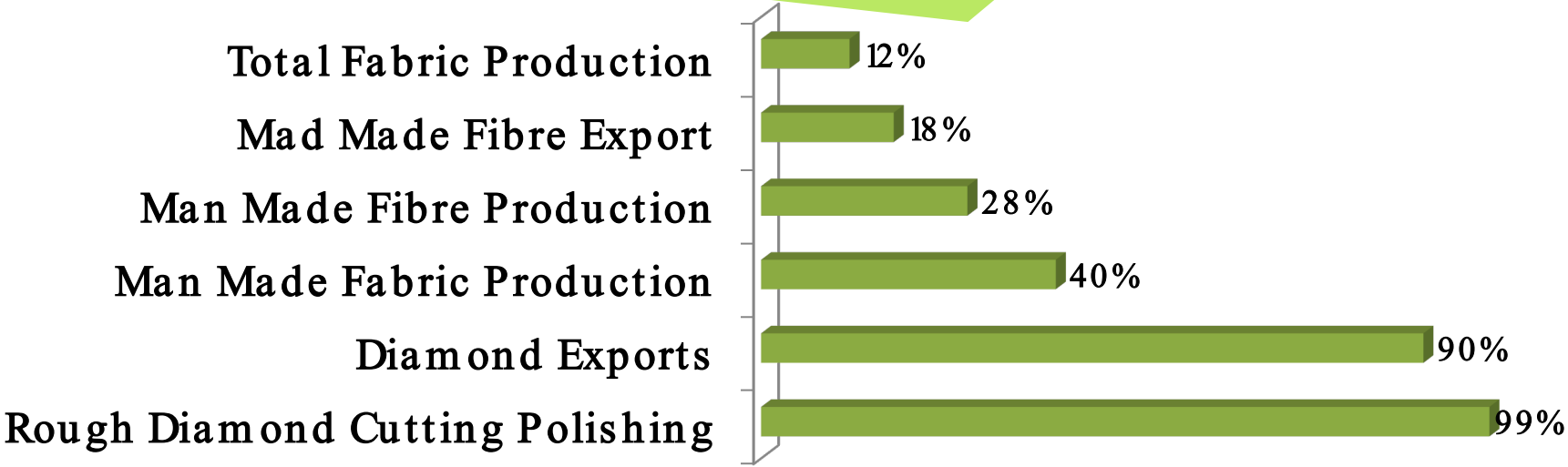
Importance of Calibration

- ✓ All of technologies (except extractive method) are based on indirect measurement principles
- ✓ All require calibration to smoke stack conditions before use
- ✓ Calibration of CEMS - a central part of all performance specifications
- ✓ Calibration involves a comparison of the CEMS to standard gravimetric sampling techniques

Introduction to Surat

- Surat - port city on the banks of the Tapi River
- Second largest city in Gujarat after Ahmedabad

Introduction to Surat



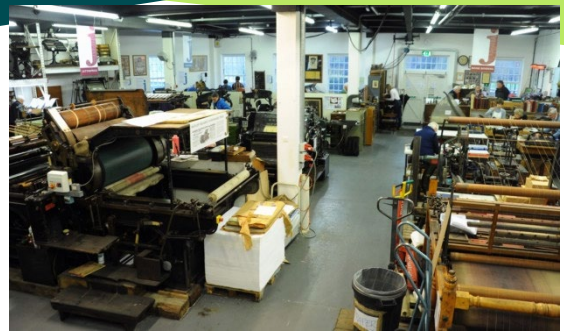
Surat's contribution towards the Nation

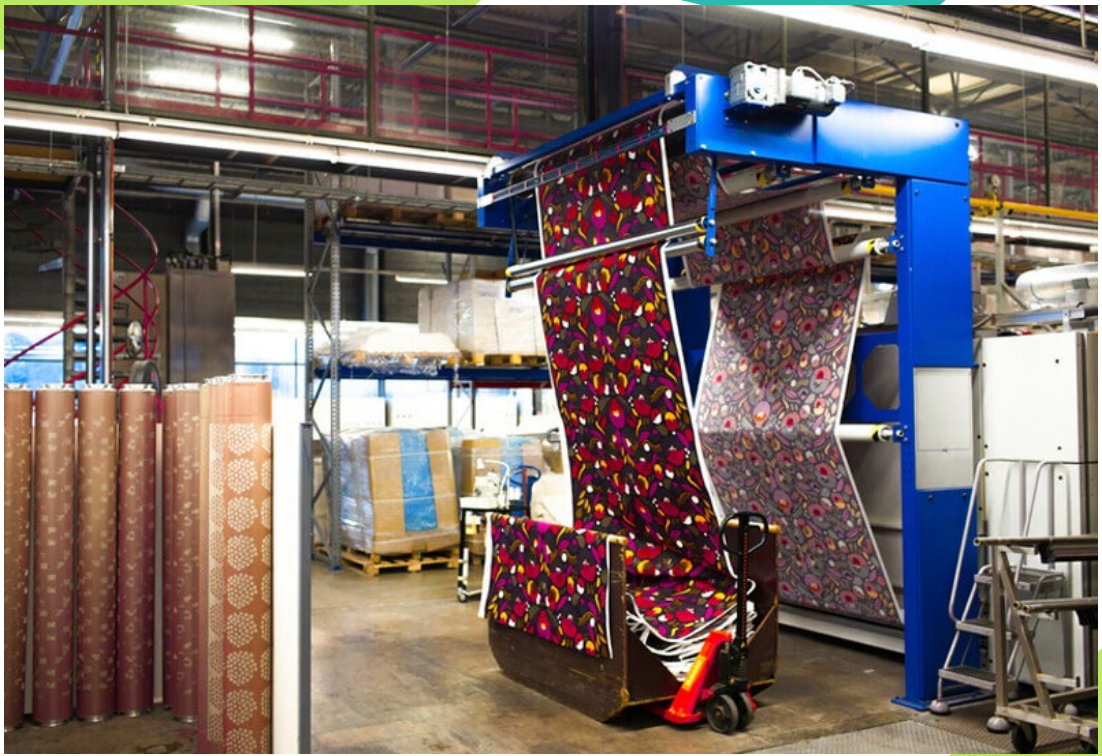
Introduction to Surat

Overview of the Surat textile industry

- Main activities - yarn production, weaving, processing as well as embroidery
- Nearly 30 million metres of raw fabric & 25 million metres of processed fabric are produced per day
- Clusters like Katar Gam, Magdalla, Sachin, Palsana, Udhana etc. Where manufacturing units are mainly concentrated

Introduction to Surat





Introduction to Surat

Overview of the Surat textile industry

- All textile manufacturing units have boilers for steam used in manufacturing process
- These boilers mainly use solid fuel - coal and lignite as fuel in this boilers
- While few use natural gas as fuel
- This contributes towards the air pollution in the city

Selection of Surat for CEMS implementation

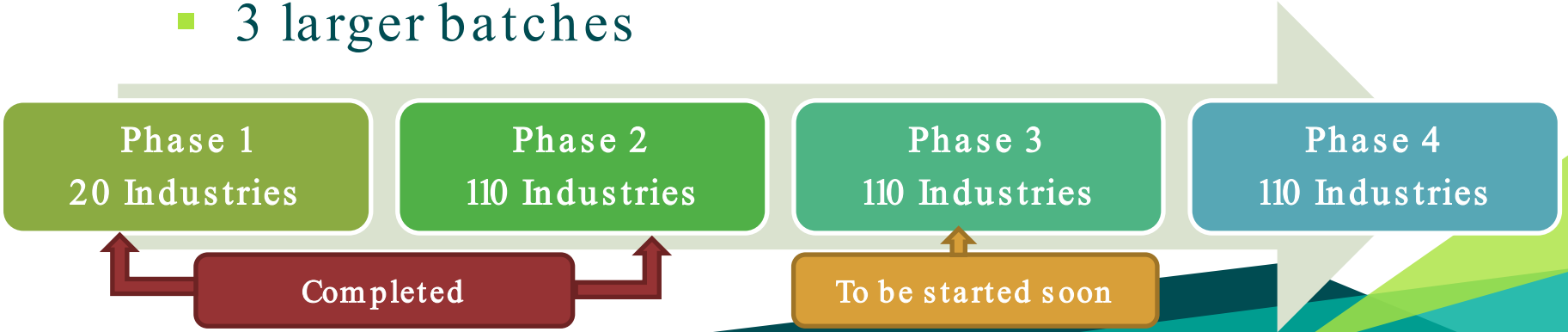
- ✓ More than 450 industries in the area
- ✓ All industries almost similar i.e. Textile processing
- ✓ Have boilers using solid fuel
- ✓ Industrial units showed readiness
- ✓ Most units in small and medium scale so success could be replicated at other locations

CEMS implementation in Gujarat

- ✓ CEMS implementation done as a part of Emissions Trading Scheme for PM - Pilot Project
- ✓ CEMS roll out done in phase wise manner
- ✓ Selection of industrial units done in a way to have gradual transition

CEMS implementation in Gujarat

- ✓ 350 Industries selected for participation in ETS
- ✓ The sample batch of 350 industries split into "batches"
  - 1 pilot batch
  - 3 larger batches



CEMS implementation in Gujarat

Key Steps for Roll Out in every phase

1 Batch Division	• Industries divided into Batches • Final List with Industry Names and ID
2 Communication	• Each Industry informed to install CEMS • Guidelines issued concurrently
3 Workshops	• Workshop to explain CEMS installation and operation
4 Installation	• Installation of CEMS by industries through vendors • Forms submitted to GPCB for registration
5 Sampling and Certification	• Lab carries out Isokinetic Sampling • GPCB does performance test to certify CEMS device

CEMS implementation in Gujarat

CEMS Implementation : The Big Picture

- CEMS rollout not only limited to installation of CEMS device
  - Also includes many institutional arrangements and roles of several stakeholders (vendors, labs, industry association etc.)
- Several activities must be completed before physical installation begins
  - Set foundation for successful physical rollout

CEMS - Challenges

Issues of CEMS Implementation

- Technology selection
- Certification
- Installation
- Calibration
- Data Acquisition and Handling System
- Data Validation

“Earth provides enough to satisfy every man's needs, but not every man's greed.”

— Mahatma Gandhi

Thanks!

Any questions?

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