MALE' DECLARATION ON CONTROL AND PREVENTION OF AIR POLLUTION AND ITS LIKELYTRANSBOUNDARY EFFECTS FOR SOUTH ASIA

QA / QC Programme for Dry Deposition

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Importance of QA/QC activities

- Considering the significance of possible future problems regarding acid deposition, it becomes increasingly important to obtain accurate and precise data on acid deposition.
- However, informed decisions cannot be made on the basis of unreliable data, and therefore certain levels of data quality should be assured.
- A monitoring system without adequate QA/QC runs the risk of not being able to control the quality of data, and not being able to assure accuracy and precision.
- QA/QC has thus become essential part of all measurement systems because it requires especially high international comparability of data.

Objectives of QA/QC program

- The objectives of this QA/QC program are to obtain reliable data which can be comparable with other networks by ensuring data accuracy, precision, representativeness and completeness in monitoring.

Coverage of QA/QC programs

- QA/QC programs should cover the whole process of monitoring activities, starting from sampling activities to the end, reporting.

- All the related organizations need to implement QA/QC activities.

Definition of QA/QC

- Quality control (QC): the routine use of procedures designed to achieve and maintain a specified level of quality for a measurement system
- Quality Assurance (QA): a set of coordinated actions such as plans, specifications, and policies used to assure that a measurement program can be quantifiable and produce data of known quality
- QA is quality control for QC.

Quality Assurance for AQM Networks

- Systems audits
  - Operating procedures
  - Calibration procedures
  - Maintenance procedures
- Performance audits
  - Flow rate checks
  - Reference standards for continuous monitors and met. equipment
  - "Blind" standards for off-site laboratories
- Data quality review
- Develop corrective action plans

Fundamental matters regarding the QA/QC programs

- Decision of national QA/QC programs
- Clear assignment of responsibility
- Preparation of standard operating procedures(SOPs)
- To make effort to meet the data quality objectives(DQOs)

Clear assignment of responsibility

- In the national center, a QA/QC national manager should be appointed.
- In the sampling and/or chemical analysis organizations, a supervisor and persons in charge should be appointed. Their names should be reported to the national center.

Preparation of Standard Operating Procedures (SOPs)

- SOPs are the step-by-step procedures used in all the processes of the monitoring system, i.e. in the field, laboratory, and data management areas.
- The sampling and chemical analysis organizations(laboratories) should respectively prepare SOPs for the monitoring activities.

SOPs (2)

- SOPs provide a method to ensure
- ✓ that all personnel perform the same procedure to avoid the variance of data quality between personnel in charge, and
- ✓ that they conduct their works with good understanding of QA/QC.
- SOPs should be sufficiently specific and easy to understand.

To make effort to meet the data quality objectives (DQOs)

- The data quality objective(DQO) values define the desired levels of accuracy,precision,completeness, detection limits and determination limits required by the program.

Required accuracy, precision

- Accuracy is evaluated by analytical values and certified values of RM. (±15%)
- Precision is evaluated by duplicate analysis of samples. (±15%)

Selection of sampling sites

- More than one site should be selected that is clearly defined as either urban, rural or remote.
- Regarding the deposition monitoring sites, at least one or more remote or rural site should be established in a country.

Site selection for rural and remote sites

- Selection of sampling sites is a critical factor in the wet deposition monitoring.
- Sampling sites should be located in areas suitable for the purpose.
- They should properly represent the area in question.

Criteria for Monitoring Sites

- Land use in the vicinity of the sites is likely to remain in almost the same condition for several decades.

- The precipitation samples should represent the area in question.

- Consideration of the topographic features and meteorological conditions should be taken into account.

Minimum Distance to Emission Sources

Regions within 50 km of large pollution sources should be excluded as remote sites.

Regions within 20 km of large pollution sources should be excluded as rural sites.

Regions within 500 m of main roads should be excluded as remote and rural sites.

Local criteria

- An open, flat, grassy area far enough from trees, hills and other obstructions. No objects should be within a few meters of the collector, and no object should shade the collector.
- The top of an obstruction as viewed from the collector should be less than 30 degrees above the horizon.
- Regions within 100 m of emission sources (waste disposal sites, incinerators, parking lots, open storage of agricultural products, domestic heating) should be excluded.

Site selection

- Intake points of automatic instruments should be 5 to 10 meters from the ground if no obstructions are located around the sites.
- They should be around 3 meters higher than the height of the buildings if buildings or other obstructions are located around the sites, or the intake points are on the buildings.

PARAMETERS REQUIRING CALIBRATION

- Temperature
- Pressure
- Mass
- Flow Rate
- Particle Size
- Volume

DEVICES/INSTRUMENTS REQUIRING CALIBRATION

- Balance
- HVS/RDS (Rotameter, Manometer)

CALIBRATION FREQUENCY

Depends on:

1. Type of instrument/Device
2. Factors affecting calibration
3. Accuracy requirements
4. Analyst Experience
5. Manufacturers recommendations
6. Costs

COMMON SOURCES OF ERRORS IN ANALYSIS

Types of Errors

- Systematic Error (Bias)
- Random Error (Precision)
- Blunders (Gross mistakes)

METHOD VALIDATION/STANDARDIZATION

- Process of demonstrating an analytical procedure for its acceptance for the intended use.
- Includes defining
- Detailed methodology
- Specificity and limitations
- Linearity
- Accuracy
- Precision
- Detection limit
- Measuring Range
- Ruggedness

ACCURACY

Difference between the measured value and true value.

- Measure of correctness of the method
- Measuring Techniques
  - Analysis of certified reference material (CRM)
  - Blank spike recovery
  - Matrix spike recovery
  - Comparison to accepted method

PRECISION

- Measures the degree of scatter in replicates i.e. repeatability.
- Changes as a function of analyte concentration
- Measured by replicating a specific measurement
- Measured in terms of standard deviation using at least four replicates.

SOURCES OF SYSTEMATIC ERRORS AND REMEDIAL MEASURES

• Biased calibration	• Check calibrations for all devices time to time
• Inaccurate Blank Correction	• Establish Proper
• Inaccurate Zero setting	• Check Zero Setting in the beginning and reconfirm at the end of measurement
• Purity of gases/chemicals	• Ensure Purity (through clarification or traceability)
• Generally Unknown	• Participate in Inter laboratory Exercises
• Interferences	• Compare with alternate methods to pinpoint interferences and take appropriate measures to eliminate interferences.
• Sample instability between sampling and analysis	• Sample preservation and analysis within Prescribed Holding Time

SOURCES OF RANDOM ERRORS

Random variables affect Precision such as:

- Sample valiability/Homogenity
- Instrument Fluctuations
- Operator skills

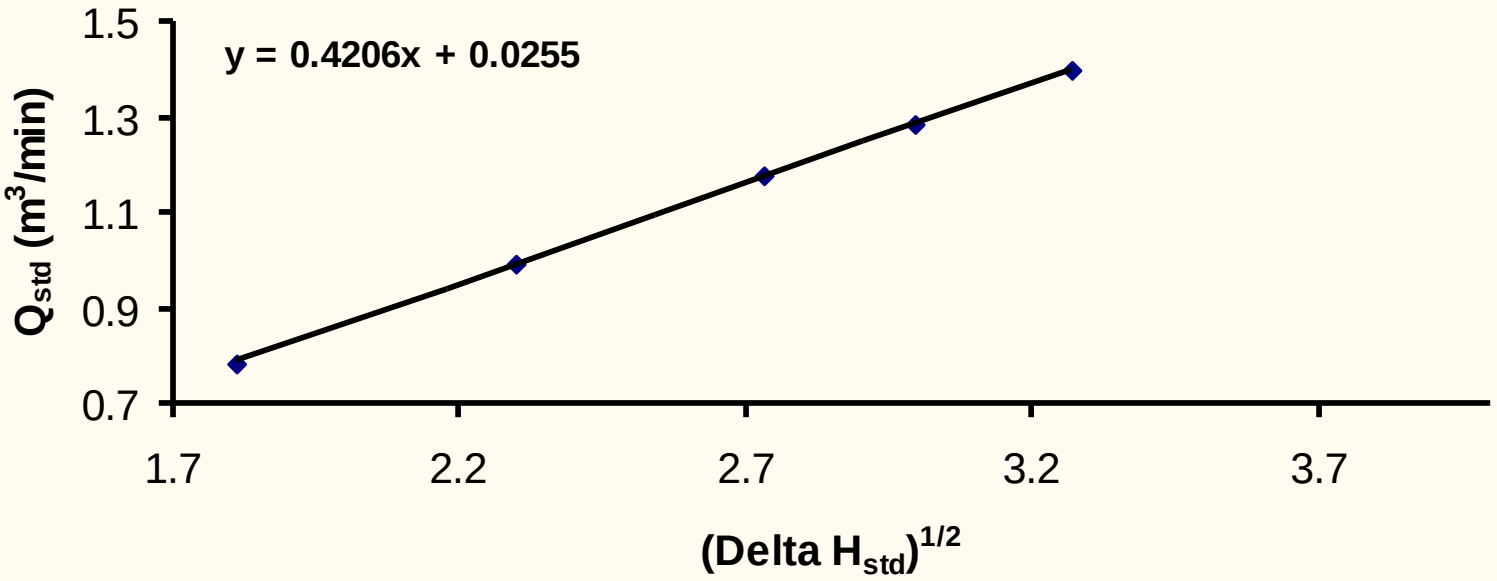
MINIMIZING RANDOM ERRORS

- Best method of improving precision is to make sure all technicians follow the well-defined and exactly the same procedure.
- Training, communication and SOP's are essential for obtaining reproducible results.
- Regularly monitor Quality Control Parameters through Control Charts etc.

BLUNDERS

- Calculation errors
- Improper sample labeling
- Data reporting errors (unit etc.)
- Sample mishandling
- Laboratory contamination
- Making changes in method without validation
- Improper calibration of Instruments.

Calibration Graph for Orifice Kit



Calibration Graph for HVS