

Terms of Reference for Research Project

(for Air Quality Sectional Committee CHD 35 under Chemical Department of BIS)

1 Title:

Study on the various testing methods used for determination of the concentration of suspended particulate matter in air.

2 Background:

Serious damage may be caused by polluting substances discharged into the atmosphere from various sources. Such emissions can adversely affect agricultural land and crops, can soil clothing and building, can corrode metal installations and can have a harmful effect on the health of the community.

Suspended particulate matter (SPM) in air generally is considered to be all airborne solid and low vapour pressure liquid particles, involving a complex, multi-phase system consisting of a spectrum of aerodynamic particle sizes ranging from below 0.01 μm to 100 μm and larger. Historically, particulate matter (PM) measurement has concentrated on total suspended particulates (TSP), with no preference to size selection.

BIS has published IS 5182 (Part 4), Methods for measurement of air pollution Part 4 Suspended Particulate matter, which prescribes a method for the determination of concentration of suspended particulate matter in air. The method does not cover particle counting or sizing.

The instruments most commonly used to measure particulate matter do so either by measuring PM concentration or particle size distribution. Gravimetric analysis of PM collected via filtration is the most widely used technique for determining ambient concentrations of PM as well as the amount of PM in emissions.

There are several methods such as Beta Attenuation Method, Scanning Mobility Particle Sizer, Light Scattering Instruments which are used for the measurement of suspended particulate matter (PM) in the air. The choice of method depends on factors such as the size range of particles to be measured, the required sensitivity, and the specific objectives of the measurement. Additionally, regulatory agencies may specify certain methods for compliance monitoring. With an increasing focus on human health as well as environmental concerns, a need was felt to commission a research project for undertaking an in-depth and incisive study to determine the suitability and effectiveness of various testing methods used for determination of the concentration of suspended particulate matter in air.

3 Objective:

To collect relevant data and information from both primary and secondary sources regarding the suitability and effectiveness of various testing methods used for determination of the concentration of suspended particulate matter in air, which will address the limitations of the current standard.

4 Scope:

4.1 Undertake comprehensive study and comparative analysis of the available literature on the various testing methods used for determination of the concentration of suspended particulate matter in air, which will inter alia include any international standards, research papers published, study conducted by any industry or any other organization on the subject.

4.2 Collection of data regarding the testing facilities and various methods of test available in the country for determination of the concentration of suspended particulate matter in air.

4.3 Identification of the methods specified for compliance monitoring by the regulatory agencies in various major countries, and studying the technical regulations/standards which are applicable in these countries.

4.4 Collection of data regarding manufacturers of the testing equipment which are used in the various testing methods used for determination of the concentration of suspended particulate matter in air.

4.5 Visit to six laboratories (preferably four government and two in private sector) to study the various testing methods used for determination of the concentration of suspended particulate matter in air, unless the testing laboratories data collected indicates otherwise.

4.6 During literature survey and visits to testing laboratories, information on the following parameters shall be collected:

- (i) Method(s) of testing used
- (ii) Procedure used for selection of the testing Method(s) used
- (iii) Validation/verification of the testing method used, if carried out
- (iv) Details of the participation of the laboratories in Inter-laboratory comparison(ILC) and/or Proficiency testing (PT)
- (v) Level of automation in the testing methods
- (vi) Details regarding the make and manufacturers of the testing equipments used
- (vii) effectiveness of various testing methods followed
- (viii) Sustainability practices followed, if any [energy consumption, renewable energy sources, sustainable practices, 3Rs (Reuse, Reduce and Recycle), waste management and disposal mechanisms, steps taken to reduce carbon footprints], future plans.

4.7 Preparation and submission of report on the all the parameters covered in the scope.

5. Research Methodology:

The following research methodologies shall be followed:

5.1 Study the literature in respect to the Scope and analyze it.

- 5.2 Collection of information through structured questionnaire and contacting the relevant testing laboratories in respect to the scope
- 5.3 Collection of data regarding the testing infrastructure available in the country for various testing methods used for determination of the concentration of suspended particulate matter in air
- 5.4 Visits to laboratories for observing testing methods used and the testing facilities available.
- 5.5 Focussed discussion with the Quality Control team through a structured questionnaire/ format.
- 5.6 Comprehensive and concise reporting

6. Sampling Plan

- 6.1 Preferably six laboratories (preferably four government and two in private sector) to study the various testing methods used for determination of the concentration of suspended particulate matter in air, unless the testing laboratories data collected indicates otherwise.

7. Deliverables:

- 7.1 Study report consisting of outcomes of the study covering all the aspects of the scope shall be submitted in both digital and paper form.
- 7.2 Along with the final report, the survey formats and responses, questionnaires, results of testing, report of visits, other relevant documents/ information shall be appended.

8. Delivery Milestones and Review Process

- 8.1 The duration of the project shall be four months.
- 8.2 An interim report indicating the review of the literature, desktop research and sampling plan shall be submitted in 30 days from award of the project.
- 8.3 Draft report shall be submitted by the end of three months from award of the project.
- 8.4 Final report shall be submitted within 4 months from the date of award of project.

9. Support from BIS:

BIS will provide access to available international standards required for the project as per the requirement identified by the proposer and on request.

10. Nodal Point

Ms. Preeti Prabha, Scientist C & Member Secretary, CHD 35 may be contacted for more clarification on the R&D project (chd35@bis.org.in)