Term of Reference (ToRs) for Research Project
Water Quality Sectional Committee, CHD 36 under Chemical Department of BIS

1 Title: Study the assessment and usage of polyelectrolyte in water and wastewater.

2 Background:

2.1 Improvement in the quality of potable water supply is a thrust area of all municipal and public health engineering department water supply systems. As part of this quest to improve the quality of water supplied, there is a need for a cost effective and efficient water treatment chemical. Polyelectrolytes have become increasingly popular in water treatment due to their effectiveness in various processes like coagulation and flocculation.

2.2 However, the lack of adequate data on testing methods for residual monomers is impeding their full utilization. These residual monomers, if not properly tested, could potentially harm water quality and human health. Considering the usage and providing a confidence to users BIS has identified the subject for formulating the Indian Standard.

3 Objective:

Extensive analysis, collection of information, and validation of existing methods of test for determination of polyelectrolyte in water and wastewater.

4 Scope:

4.1 Literature Review
Conduct a comprehensive study and comparative analysis on the following data:

4.1.1 Data on Polyelectrolyte
4.1.1.1 Compilation of data on different types of polyelectrolytes manufactured and used in India by municipal corporation and PHEDs for treating the water and wastewater. Additionally, prepare a comprehensive list having details of manufacturers of these polyelectrolyte along with the details of user industries/organizations.
4.1.1.2 Undertake a comprehensive study and analysis of existing literature which includes available standards, technical regulations, research papers, any SoPs/guidelines/ instructions issued by the Ministries/ regulators concerned and any other relevant study. Identify studies that discuss methods of testing for polyelectrolytes in water and wastewater, and gather data on the specific techniques and procedures used in these tests.
4.1.1.3 Gather information on the potential hazards associated with the use of polyelectrolytes for water treatment by public health engineering departments (PHEDs) and municipal corporations and all the industries and STPs using this product for treatment from manufacturers and suppliers.

4.1.2 Database for laboratory which possess the testing facilities:

4.1.2.1 Comprehensive data on NABL accredited laboratories or BIS recognized laboratories which possess the testing infrastructure for determination of polyelectrolyte in water and wastewater after treatment.

4.1.2.2 Detailed data on different methods of test for determination of polyelectrolyte along with the measurable range, Limit of Detection (LoD), principle, reagents required, equipment required, procedure, calculation methodologies for all the methods of test.

4.1.2.3 Evaluate the strengths and limitations of different testing techniques to develop a comprehensive understanding of the limit of detection (LoD) and measurable range of different method of tests for determination of polyelectrolytes in water treatment.

4.2 Collection of data on scale wise manufacturing and user base, suppliers and vendors involved through government sources (website, reports, survey, etc.) and/or industry associations.

4.3 Gather the import and export data for different types of polyelectrolyte used. Collate and study the information pertaining to technical regulation/ standard regulation applied in major countries concerned with respect to polyelectrolyte for water treatment.

4.4 Share the comparative assessment of methodologies adopted to collect the data as specified in scope

4.5 Collection of data on the following through visits to two industries each of larger, medium, small and micro scales and one each of government and NABL accredited private testing facility, in case the manufacturing and testing facilities data advises otherwise:

a) Types of raw materials
b) Varieties of the product
c) Manufacturing processes
d) In process quality control checks
e) Safety and quality parameters
f) In-house test facilities
g) Performance and safety parameters
h) Packaging, Marketing and labelling
i) Post quality checks parameters
j) Types of Sustainability practices being used such as energy consumption, renewable energy sources, sustainable practices, 3Rs (Reuse, Reduce and Recycle), waste management and disposal mechanisms, carbon footprints.
k) To undertake user feedback (criteria)

5 Research Methodology:

The project will involve the following research methodologies:

5.1 Literature Review:

5.1.1 Conduct an extensive literature review with respect to areas covered in scope.

5.1.2 Additionally, contact and collect data on the different types of polyelectrolyte used for water treatment from industry association, regulatory bodies, various export and import regulating agencies in India.

5.2 Visit to manufacturing units and laboratories to witness and observe the manufacturing process, testing facilities have first-hand information on method of test opted for determination of polyelectrolyte in water and wastewater in additional to properties/requirements for polyelectrolytes.

5.3 Data Collection:

- ❖ Conduct Surveys or interviews with industry professionals to gather insights on industry specific remedial strategy covering points specified in scope.
- ❖ Review Tender agreements related to procurement of polyelectrolyte for water treatment floated by consumer industries, PHED, Jal Boards with view point gather insights of testing methodologies opted by them for determination of residual polyelectrolyte in water and wastewater.
- ❖ Structured Questionnaire for collection of feedback from manufacturers, user organization (PHEDs, Jal Boards), importers/exporters, user interaction as per the points specified in scope. This can be done at initial stage.
- ❖ Conduct focused group discussion in a structured format with Quality Personnel, workers, and managers in the visits to be carried out in manufacturing units and testing laboratories.

5.4 Analyse the findings collected as specified in scope.

6 Sampling Plan:

6.1 Visit to four manufacturing units (preferably 2 large and 2 MSMEs unless the manufacturing database indicates otherwise) visit to four consumer industries/organization (preferably 2 PHED and 2 Jal Board unless the consumer organization database indicates otherwise) and 4 laboratories (2 private and 2 government unless the laboratories database indicates otherwise). Collect data on points specified in scope. However the final sampling plan will be finalized on the basis data collected by the proposer.

7 Deliverables:

Considering the scope, the research shall be taken up by the proposer and final report shall be prepared incorporating the following information:

7.1 Submit comprehensive analytical report documenting the research findings/ data collected as given in scope (**4**).

7.2 Along with the final analytical report, append the survey formats and responses, structured questionnaire, feedback forms collected after focussed interaction with managers and quality personnel's.

7.3 Report on comparative analysis of methodologies used.

8. Delivery Milestones and Review Process

Project Timeline- 3 months from the date of issue of sanction letter by BIS.

8.1 Review of the literatures, manufacturing and user industries, transporter database, collated feedback forms through surveys, structured questionnaire responses and existing stipulations, thereof – within 1 month from the date of issue of sanction letter by BIS.

8.2 Report of site visits and specific requirement as mentioned in scope and methodologies etc. – By end of 1 months from the date of issue of sanction letter by BIS.

8.3 Draft report covering all the aspects of the Scopes By end of 2.5 months from the date of issue of sanction letter by BIS.

8.4 Final report covering all the aspects of the Scope – By end of 3 months from the date of issue of sanction letter by BIS.

9 Support by BIS:

9.1 BIS standards are freely available in public domain.

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

9.3 Ms. Shubhanjali Umrao, Scientist B & Member Secretary, CHD 36 may be contacted for more clarification on the R&D project (chd36@bis.org.in)

NOTE: *The proposer should collect and rely on the primary data to the extent possible and may also use peer reviewed publication data to support the finding, wherever necessary.*