TERMS OF REFERENCE FOR THE R&D PROJECT

1. Title : Study of Materials and Methods for Performance Testing of Displacement Type Chlorinators used for Disinfection of Drinking Water

2. BACKGROUND

Dosing machines called 'chlorinators' are used to carry out safe and accurate chlorine dosing for disinfection of drinking water. The safe dose of free residual chlorine approved worldwide for drinking water is 0.2-0.5 ppm at tail end of distribution supply i.e. at tap end where water is drawn out for drinking.

Chlorinators are of various types- vacuum feed type, gravity feed type, and displacement type chlorinator.

There is an Indian Standards, IS 10553 (Part 5) for Displacement type chlorinators, which are non-electrical and are intended to be used in high pressure schemes for safe, accurate and consistent chlorination of drinking water. These use bleaching powder[1] solution and are suitable for water treatment plants (capacity up to 1 MLD) and in rural water supplies. However, the standard does not provide any test methods for performance testing of the chlorinator.

In last few decades, newer raw materials for chlorinators are being used. The data regarding their safety and durability when these materials come in contact with chlorine is not available. Further, the test methods for evaluating performance of these chlorinators are not established. In this context, the study is needed which would also help to establish methods of performance testing of such chlorinators.

3. OBJECTIVE

Objective of the study is to:

a) Collect and analyse the data for safety of materials which comes in contact with the chlorine solution.
b) Develop test methods/protocols for performance testing of the chlorinators being used for drinking water applications.
c) Establish specific terms and definitions for various types of chlorinators to remove any confusion to their specific application.

4. SCOPE

4.1 Undertake thorough examination of the available literature on displacement type chlorinators, including but not restricted to the following and provide comparative analysis:

a) Existing Indian, National and International standards,
b) Research papers,
c) SOPs/instructions/guidelines issued by any Ministries/ regulatory bodies concerned,
d) Any studies conducted by other organizations, and
e) Any other sources.

[1] Variable mixture of calcium hydroxide, calcium chloride and calcium hypochlorite.

4.2 Collect data of import and export. Also collect the data for product quality and technical regulations/standards being followed for export/import. The guiding documents of countries having large manufacturing base to be included in literature study.

4.3 Conduct survey of the existing manufacturers to identify the manufacturing base and categorization of large, medium, small and micro units. The survey would also include information of the variety of products manufactured, if any and their technical specifications.

4.4 Prepare a sampling plan based on the literature review and survey.

4.5 Conduct visits to such facilities to identify manufacturing methods and materials being used which can be correlated with safety and performance of the chlorinators.

4.6 Hold group discussions and interviews to get feedback and collect first hand information on the challenges being faced during manufacturing.

4.7 The manufacturing process and materials will also help in identifying sustainable materials and methods. The materials which come in contact with treated water shall be of food grade quality.

4.8 Conduct survey of the waterworks treatment plants/units in the country to get an estimate of the user base and collection of information on indented and actual use at the field and feedback on performance of the product. Survey may be done through structured questionnaire or interviews to collect relevant information and get feedback.

4.9 Conduct survey of the existing labs in the country who are testing this product or are testing similar products. The survey shall provide information regarding the test infrastructure available in the country, the characteristics being tested, and the test methods being followed.

4.10 Visit to labs and collection of material testing data for safety and durability of materials.

4.11 Survey of test facilities available for performance tests and witnessing the test to establish recommended method of tests for performance of displacement type chlorinators.

4.12 Comparative analysis of the advantages and disadvantages of using different materials and different manufacturing technology.

4.13 Clearly define the scope of use of displacement type chlorinators based on the analysis of the data.

5. METHODOLOGY

5.1 Undertake thorough literature study in respect of areas mentioned in Scope and analyse it.

5.2 Conduct survey of manufacturing facilities, drinking water treatment facilities and laboratories available in India through circulation of structured questionnaires and get the feedback.

5.3 Prepare a first draft report based on the literature review and survey. Based on the survey, provide a sampling plan and the industry visits to be made at manufacturing facilities and

drinking water treatment facilities. Also include information of the test facilities available in India and details of those laboratories to be visited.

5.4 Conduct at least 3 visits to prominent manufacturing facilities to collect data for the following:

a) Raw materials used in manufacturing and how are they stored.
b) In house quality control requirements of raw materials.
c) Use of specific raw materials for specific applications.
d) Witness different manufacturing methodologies and in process checks that are being done and the methods used.
e) Safety measures that are already being followed during manufacturing.
f) Method of packaging, marking, labelling and storing the final product.
g) Sustainability efforts in place with respect to Reduce, Reuse and Recycle.

5.5 Organize group discussions in a structured format to get more information regarding the issues faced during manufacturing and during treatment operations.

5.6 Conduct at least 3 visits to labs for witnessing of the tests on materials and establishing test methods for performance testing of chlorinators. During the visit, data shall be collected for the following:

a) What materials are being tested at the facility, the test infrastructure required, and the methodology of tests being done.
b) Whether tests are being done for performance evaluation of chlorinators and what are the methods being followed.
c) Test infrastructure required for performance tests and the duration of testing.

5.7 Analyse the test data collected to give recommendations for the materials to be used and manufacturing practices to be followed and provide final analytical report.

NOTE: The proposer may forward the draft report to BIS without waiting for the test report in the case of a long duration test.

6. DELIVERABLES

a) Final Analytical report in soft and hard copy format, covering all aspects mentioned in scope.
b) Questionnaires, sampling plan, feedback received, reports of visits, tests, and group discussions to be appended with the final analytical report.
c) The analytical report shall also include data for wrong use indicating lack of awareness regarding the correct application of displacement type chlorinators.

7. TIMEFRAME

Time of completion shall be calculated from the date of award of project.

- First report having details of literature review and data from surveys – 1 Month
- Visit to labs for tests on materials – 1 Month
- Establishing methods of tests – 1 Month
- Final Report and suggestions – 1 Month

8. SUPPORT FROM BIS

- BIS will provide access to latest available editions of Indian standards and/ or international standards relevant to the project, on request.

9. NODAL PERSON

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