

TERMS OF REFERENCE FOR RESEARCH PROJECT

(Industrial Gases Sectional Committee - CHD 6 under Chemical Department, BIS))

Title : Study of properties/specifications and the test methods for Refrigerant Gases

1. Background:

"The standard IS 5610 outlines the specifications for Chloro-Fluoro hydrocarbons belonging to the methane and ethane series. In accordance with the Montreal Protocol, developing nations committed to initiating a decrease in the consumption and production of HCFCs by 2015, aiming for a complete 100% reduction by 2030. Achieving a full HCFC reduction requires the adoption of alternative refrigerant gases with minimal global warming effects.

In light of this, the committee has chosen to amend the standard to align with best International Practices, encompassing various refrigerants in a unified standard.

2. Objective:

To collect the relevant data and information from both primary and secondary sources in regard to requirements of the refrigerant gases and its test method.

3. Scope:

- 3.1 Undertake a comparative study of existing literature which includes international standards, research papers, any SoPs/ guidance/ instructions issued by the Ministries/ regulators concerned and any other study.
- 3.2 Collect data on manufacturing base through government sources (website, reports) or industry associations.
- 3.3 Compile data on the requirements of all kind of refrigerant gases (Single Component Hydrocarbon Refrigerants, Single-Component Fluorocarbon Refrigerants, Zeotropic Blend Refrigerants, Zeotropic Hydrocarbon Blend Refrigerants, Azeotropic Blend Refrigerants) and associated test methods.
- 3.4 Provide the Gas Chromatography-Mass Spectrometry (GC-MS) test method for refrigerant gases.
- 3.5 Undertake a comprehensive study on availability of test facilities in the country.
- 3.6 Gather the import and export data for all type refrigerant gases. Collate and study the information pertaining to standards/technical regulations applied in major countries.
- 3.7 Visits to two industries Preferably one large and one MSME and 2 testing labs [preferably 1 govt and 1 private lab (NABL accredited or BIS recognized lab)] to collect data on the following:
 - i. Type of raw materials
 - ii. Varieties manufactured
 - iii. Manufacturing processes
 - iv. In process quality controls
 - v. Manufacturing facilities
 - vi. Safety and quality parameters

- vii. In-house test facilities
- viii. Parameters tested
- ix. Marking and labelling
- x. Packaging
- xi. Sustainability practices [energy consumption, renewable energy sources, sustainable practices, 3Rs (Reuse, Reduce and Recycle), waste management and disposal mechanisms, carbon footprints]
- xii. Collection of samples and generation of test data for important requirements of the material for the characteristics and against the parameters being reported.

3.8 Prepare a detailed analytical report that encompasses all research findings, specifications, recommendations, and guidelines as mentioned in the Scope.

4. Research Methodology:

The project will involve the following research methodologies:

- 4.1** Extensive review of the literature in respect to the scope
- 4.2** Contacting the relevant manufacturers, laboratories and R&D bodies of the product in the country for collecting information in respect of the scope
- 4.3** Collection of feedback through questionnaire
- 4.4** Observation of facilities and processes
- 4.5** Discussion with stakeholders - focused group discussion through a structured format
- 4.6** Collection of the sample during the industry visit and testing of samples
- 4.7** Analysis of the findings

5. Deliverables:

- 5.1** Analytical report of the study as per the entire scope of the Project.
- 5.2** All details of surveys, questionnaires, manufacturing database collected, lab reports, information gathered out of discussions during factory and lab visits should be appended to the report (in digital and hard copy form).

6. Delivery Milestones and Review Process

- 6.1** The project will have a timeframe of three Months since awarding the project
- 6.2** Interim Report covering the review of the literatures and desktop research – 15 days from awarding the project
- 6.3** Progress reporting on the visits to the industry and proposal on sampling plan– 45 days from awarding the project
- 6.4** Interim report submission – three months from awarding the project. This may not wait for receipt of final test reports of samples (Samples shall be tested in BIS recognized laboratories/ laboratories of national repute)

7. Support from BIS:

7.1 BIS will provide access to latest available editions of Indian standards and/ or international standards

7.2 BIS labs resources

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.

8. Nodal Point

Ms. Bunty Mudi, Scientist B & Member Secretary, CHD 06 may be contacted for more clarification on the R&D project (chd6@bis.org.in)