METALLURGICAL ENGINEERING DEPARTMENT

(MTD 14- FOUNDRY AND STEEL CASTING SECTIONAL COMMITTEE)

TERMS OF REFERENCE FOR THE R&D PROJECT

Title: Study of the requirements of Iron oxide powder for use in foundries

1. Background:

1.1 Iron oxide powder is manufactured by pulverizing Soft Hematite Ores (fully weathered) and is used as an additive for both core and moulding sand mixture to achieve high temperature plasticity, hot strength and anti-metal penetration characteristics. In core sand, addition of iron oxide prevents veining/high temperature cracking of cores.

1.2 In steel foundry, iron oxide is used both for core and moulding sand, but in iron foundry the use is restricted to core making only. Limited applications of iron oxide are also there in refractory wash to suppress nitrogen pin-holing defect.

1.3 There is an Indian standard IS 10091: 1981 "Iron oxide powder for use in foundries–Specification". This standard has been prepared on the basis of the use of iron oxide with a high percentage of iron. This standard specified the requirements of Iron oxide powder for use in foundries like colour, fineness, chemical composition and pH. In addition to the iron oxide with high percentage of iron, the iron oxide powder widely used nowadays in foundries contains lesser percentage of iron.

1.4 A need was thus felt to initiate a R&D project to study the properties and assess whether lower purity Iron oxide powder can be used in foundries. This is turn will help in revision of IS 10091: 1981.

This standard can be accessed from https://standardsbis.bsbedge.com/

2. Objective:

To collect relevant data and information from primary and secondary sources of requirements of lower purity iron oxide powder and verify the usage of the same in foundries.

3. Scope:

3.1 Study the available literature like national and international standard such as ASTM, JIS, EN, ISO etc available on the subject, research papers, any study conducted by other organisations, companies' brochure. Identify the foundries that are using lower purity iron oxide powder, their properties like colour, fineness, chemical composition and pH, specify the limit of the purity of the lower purity iron oxide used

3.2 Collect data of the manufacturing base of the product.

3.3 Visit the manufacturers of the product and get the information on the following:

3.3.1 Types of Raw material used

3.3.2 Varieties manufactured i.e. high purity iron oxide powder/ lower purity iron oxide powder.

3.3.3 Quality parameters (chemical and physical properties) of both varieties

3.3.4 Manufacturing process,

3.3.5 In process quality checks.

3.3.6 Test facilities and test methods used

3.3.7 Marking and labelling being done

3.3.8 Packaging requirement

3.3.9 Tests being undertaken -–colour, fineness, chemical composition, pH, any other and any other parameter from literature survey.

3.3.10 Testing facilities in the plant

3.3.11 Waste recycling

3.4 Identify and visit the laboratories.

3.5 Identify the foundries using lower purity iron oxide powder and verify the properties and assess whether the lower purity iron oxide powder can be used in foundry without any quality degradation of final product. Take feedback from the users of the difference in usage of high purity and lower purity iron powder. Take data of the quantity being used by them variety wise like high purity iron oxide powder/ lower purity iron oxide powder, specification used, check for the test certificates received by them and study the chemical and physical properties mentioned in the TC. Observe the main properties required by them for both variety of iron oxide powder (high purity/lower purity) like- colour, fineness, chemical composition and ph.

3.6 Identify the importers, exporters, traders of this product and seek data of any technical regulation for this product. Also seek data of the specification as per which the product is being imported /exported and the test certificates received.

3.7 Prepare a comprehensive project report incorporating the points mentioned above.

4. Methodology:

4.1 Study the literature and analyse the findings.

4.2 Visit the manufacturing unit and

a. observe the manufacturing process,
b. Examine in-process control measures
c. conduct focussed group discussion with quality personnel
d. collect the data as mentioned in the scope through a questionnaire.
e. draw samples of both the varieties and get it tested in In-house laboratory/ NABL accredited laboratory/ BIS recognised laboratories.

4.3 Visit laboratories and make report on

a. test equipment's required
b. test method used
c. testing charges
d. testing time required.
e. the test being undertaken on the sample drawn.

4.4 Visit the users of the product and collect the information as mentioned in the scope through a questionnaire. Prepare moulding sand and core sand using lower purity iron oxide powder and use this sand for preparation of moulds. Prepare a few castings using lower purity iron oxide powder and check the quality of the castings prepared. Also note any issues faced in manufacturing.

4.5 Visit the importer/exporters/traders and collect the information as mentioned in the scope through a questionnaire.

4.6 Analyse the data and test reports from diverse sources and include the same in the project report specifying the minimum purity of iron oxide, its properties viz. colour, fineness, chemical composition and pH, Quality of castings prepared and issues faced in manufacturing

5. Sampling plan:

5.1 One manufacturer each from large/medium and small/micro scale shall be visited

5.2 Two foundries each from large/medium and small/micro scale shall be visited.

5.3 Three samples for both varieties shall be tested for colour, fineness, chemical composition and pH and any other parameter from literature survey.

5.4 Samples may be drawn from manufacturer, user, trader or market.

5.5 Cast four castings using lower purity iron oxide powder in mould sand and core sand.

5.6 Two laboratories, preferably one in government sector and one in private sector shall be visited.

6.Deliverables:

6.1 Final project report, in hard copy format as well as in soft copy, covering all aspects mentioned in the scope.

6.2 Questionnaire, discussion, visit reports, test reports to be appended with the final project report.

7.Timeline:

The duration of the project is 3 months from the date of award of the project. The proposed indicative timeline stage-wise is given below:

Sr No	Stage	Time from date award project(cumulative)
1	Literature review and identification of manufacturing base, testing laboratories, user/user industry, and discussion with BIS for the finalization of sampling plan	1 month
2	Visit to manufacturers, testing laboratories, users and importers and exporters and data collection	2 month
3	Preparation and submission of first draft report to BIS	2.5 month
4	Submission of final project report	3 month

Note: The proposer may submit the draft report to BIS without waiting for test report from independent laboratories if the test is of long duration test.

8.Support BIS will Provide:

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

9. Relevant sectional committee and Nodal officer from BIS

Sectional committee:

- MTD 14-Foundry and Steel Castings Sectional Committee Sectional Committee

Nodal officer:

- Mr Kunal Kumar, Scientist D/ Joint Director – Member Secretary MTD 14,
- Email: mtd14@bis.gov.in