



**BHARAT HEAVY ELECTRICALS LIMITED
SOLAR BUSINESS DIVISION(SBD)**

**EOI Ref:
BHEL/SBD/SCR/EOI/TIO2**

BHEL SBD Herewith Publishes

Expression of Interest

(EOI)

and

**Invites Prospective vendors to partner with BHEL for TITANIUM DIOXIDE
(TiO₂) required in SCR (Selective Catalyst Reduction)**

Ref: BHEL/SBD/SCR/EOI/TIO2 Dated 05.09.2023

Due Date of Receiving duly filled EOI: 26.09.2023 14:00 Hrs

About BHEL

BHEL is India's largest engineering and manufacturing enterprise, operating in the energy, industry and infrastructure sector. Company was established in the year 1964 and since then it has been "Making in India" offering comprehensive products, systems, and services in various areas including power generation (thermal, hydro, gas, nuclear, and solar PV), transmission, transportation, defence, aerospace, oil and gas, and emerging sectors like battery energy storage systems and electric vehicle chargers. BHEL has been instrumental in developing the country's power generation capacity, contributing to core industrial and strategic sectors since the time of its humble beginning. The company's commitment toward its customer is evident through wide range of product portfolio, development and absorption of new technologies, consistent investment of more than 2.5% of its revenue on R&D and innovation, establishment of world-class manufacturing facilities and offering sustainable business solutions. Apart from serving customers, BHEL has been supporting communities through programs like skill development, promoting health, hygiene, education, cleanliness and environmental protection, thus contributing to the society as a whole.

Solar Business Division (SBD) of BHEL, situated in Bangalore, India has the state-of-the-art facility for manufacturing of SCR. SCR catalyst manufacturing facility at its SBD unit caters to NO_x abatement in thermal power stations. Recognising the long-term severe effects of NO_x and in consideration of the Ministry of Environment and Forest's notification.

Power Sector

BHEL is one of the few companies in the world having the capability to manufacture the equipment for entire range of power plants - thermal, gas, hydro and nuclear, with proven capabilities to execute large size projects. BHEL's offering include:

- Steam turbines, generators, boilers and matching auxiliaries for fossil-fuel applications up to 1000 MW unit size
- Emission control equipment including Flue Gas Desulphurisation systems for SO_x emission control, high efficiency Electrostatic Precipitators for particulate emission control, and Boiler modification and Selective Catalytic Reduction systems for NO_x emission control



- Gas turbines and generators up to 299 MW unit size
- Hydro turbines and generators up to 400 MW unit size
- 220/235/500/540/700 MW nuclear turbine generator sets
- Plant performance improvement through renovation, modernization, flexibilization, uprating, residual life assessment, health diagnostics and life extension of plants

Contribution to Environment

BHEL is contributing to a greener environment through development of environment friendly technologies and improvement in efficiency of equipment. Continuous improvement in power cycle efficiency and reduced emissions from coal-based power plants have been achieved over the time by evolution of technology from sub-critical to supercritical. Attributes of BHEL supplied power plant equipment such as lower auxiliary power consumption, higher plant efficiency, lower design heat rate and higher operating availability help in attaining lower life cycle cost. BHEL provides comprehensive solutions for reducing emissions through supply and commissioning of Flue-gas Desulphurization (FGD) systems, Selective Catalytic Reduction (SCR) systems, Solar Photovoltaic plants, Electrostatic Precipitators (ESP). BHEL has developed fully indigenous Pressurized Fluidized Bed Gasification (PFBG) technology for generating syngas from high ash Indian Coal. The syngas further acts as a feed for production of industrial chemicals. There is also conscious effort towards reduction of embodied carbon in products. Company has opted to replace polluting fuels with cleaner ones, e.g., gas is now used as a source of heat energy (instead of coal earlier) during production of products like ceralin, and has also converted furnaces to RLNG from LPG at its manufacturing plants.

SCR (Selective Catalyst Reduction) Systems

Fossil fuels have been main source for energy in terms of combustion, where chemical energy in fuels is converted into thermal and mechanical energies. In this process emissions are by products. Emission of oxides of nitrogen from combustion and high temperature industrial processes continue to be a major environmental concern. Nitrogen oxides, collectively termed as NO_x, are formed either from fixation of N₂ in the combustion air at high temperatures or from oxidation of nitrogen chemically bound in the fuel. Largely all combustion processes lead to formation of NO_x, emitted mostly as nitric oxide (NO) with smaller amounts of nitrogen dioxide (NO₂).

Government of India revised the environmental norms on 7th December 2015 for various pollutants from thermal power plants. As per the revised environmental norms, power plants installed after 2016 will be required to limit NO_x emission below 100 mg/Nm³. Presently, Selective Catalytic Reduction (SCR) is the preferred technology for controlling NO_x emissions from coal-fired power plants, particularly when high levels of reduction (i.e. 80 – 90%) are required. In order to comply with the new environmental norms, SCR system is required to be installed in all thermal power plants which will go into operation from 2017.

Ministry of Environment and Forest (MoEF), Govt through a gazette notification dt. Dec. 8, 2015 specified the permissible limits of NO_x emission for thermal power plants.

The notification specifies different permissible levels depending upon date of commissioning of thermal power plants and the limits are as below:



Thermal Power Plant Installation Period	NOx Emission Levels as per MoEF Norms
Installed by 31.12.2003	600 mg/Nm ³
Installed from 01.01.2004 to 31.12.2016	300mg/Nm ³
Installed from 01.01.2017	100mg/Nm ³

To keep the NO_x level below 100mg/Nm³, Selective Catalytic Reduction (SCR) is technically suitable and widely accepted technology.

Catalyst is an integral part of SCR system and plays a vital role in reducing the NO_x contents.

In an SCR system, vaporized ammonia (NH₃) is injected into the flue-gas stream at about 300 - 400°C, which is then passed over a catalyst. The catalyst promotes reactions between NO_x and NH₃ and reduces the NO_x formed during combustion into molecular nitrogen and water vapour. Since this temperature is normally the flue gas temperature at the outlet of the economizer, the SCR system is typically installed after the boiler second pass and before the air preheater. Two predominant styles of catalyst are used in SCRs - honeycomb and plate type. The reactions are as follows:

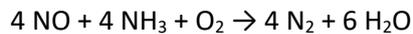


Plate type technology utilizes catalyst plates manufactured with active catalyst ingredients on a titanium dioxide matrix supported on a stainless-steel mesh substrate. Multiple catalyst plate elements are then assembled in a steel box and these catalyst units are then assembled into a welded steel frame (cage) to form a catalyst module.

The purpose of publishing this EOI is to provide opportunities to probable vendors who can partner with BHEL for supply of various materials required for SCR systems.

Note: BHEL reserves its right to independently verify the documents submitted and visit the vendor works for assessment. Necessary arrangements shall be made by the prospective vendors



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Material against which EOI is sought is as below:

SI No	ITEM DESCRIPTION	DRAWING/TECHNICAL SPEC.	ANNUAL REQ. (APPROX)	UNIT
1	TITANIUM DIOXIDE (TIO2)	SCR-D-RM-002 REV 02	700	MT

The vendors meeting the Pre-Qualification Requirement as per BHEL shall submit the necessary documents for fulfilling the criteria. BHEL reserves the right to independently verify these claims and visit the Bidder's. The bidder may visit BHEL and acquire full knowledge & information about conditions prevailing at plant and in & around the plant premises together with all the statutory, obligatory, mandatory requirements of various authorities before submission of the offer.

MATERIAL CODE: ER5421800016



PURCHASE SPECIFICATION FOR TITANIUM DI OXIDE (TiO₂)

ISSUE NO : 06

DOC.NO: SCR-D-RM-002

REV: 02

OCT' 2022

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1.0 GENERAL

This specification governs the requirements of Titanium Dioxide (TiO₂) Powder for application in manufacturing catalyst for selective catalytic reduction of NO_x (Oxides of Nitrogen)

2.0 Appearance

White to Cream / Off white in color and powder/granular in form.

3.0 Fineness

100% should pass through 30 Mesh

4.0 Chemical Properties

Shall confirm to the following.

Constituents/Components	Acceptable Limit
Crystallinity	Anatase
Particle Size(D ₅₀)	~ 2.5 μm
BET Surface area	80 ~ 100 m ² /g
Pore Volume	0.34±0.04 cm ³ /g
Pore Diameter	14±2 nm
Fe	<100 ppm
K	<100 ppm
Na	<100 ppm
P ₂ O ₅	<0.2 wt.%
SO ₃	1.5 ~ 2.5 wt.%
TiO ₂	>95 wt. %

All other remaining elemental composition should not be more than 0.001%

5.0 CONDITION OF DELIVERY

Powder shall be supplied in moisture proof packed condition as per Purchase order. Generally, package size will be 500 kg per pack unless otherwise specified.

Sample: Vendor needs to supply sample (Min 100 gms. with sample identification) along with the techno-commercial offer for approval by BHEL. The vendor shall ensure bulk supply as per the final sample approval.

6.0 Test Samples

Test samples will be drawn as per ASTM E300 or as per QAP provided by BHEL.

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The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in anyway detrimental to the interest of the company.

Issued By

SCR LAB

Prepared By

Priya Rani
Engineer

Checked By

Antara Baral
Manager

Approved By

Ajay Kumar Sharma-
AGM

Date

27-10-2022

MATERIAL CODE: ER5421800016



**PURCHASE SPECIFICATION
FOR
TITANIUM DI OXIDE (TiO₂)**

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7.0 TEST CERTIFICATE

Copies of test certificates shall be supplied along with each consignment, giving the following information:

- Purchase Order no.
- Purchase specification no.
- Suppliers reference and name
- Batch no. with traceability
- Consignment identification
- Results of various tests as called for in this specification
- Details of packing and the standards being followed

In addition, the supplier shall ensure to enclose one copy of the test certificates along with the dispatch documents to facilitate quick clearance of the material.

8.0 PACKING & MARKING

Manufacturer can follow any national or international standard to ensure moisture proof packing. Each pack shall be legibly identified with the following information.

- Supplier's/Manufacturer's Name and Trade mark, if any
- BHEL Purchase Order no.
- Quantity in the package
- Consignment identification
- Lot (or batch) identification
- Packing date

9.0 ENVIRONMENTAL REQUIREMENT

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc., as applicable.

10.0 INSPECTION AT VENDOR'S PREMISES

Internal Test Report /TC shall be forwarded to BHEL-SBD before offering the items for inspection. BHEL's representative shall have free access to the Vendors' premises at all times when work on the contract is being executed. The vendor shall offer BHEL's representative all reasonable facilities to convince the latter that the material is being manufactured in accordance with this specification. BHEL reserves the right to waive off the inspection, if they feel so, based on the requirement.

11.0 REJECTION

Material not conforming to the above stipulations shall be rejected. Also, in the event of proven defective in the course of any further processing the same shall be rejected notwithstanding any previous certification of satisfactory testing and/or inspection.

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Issued By	Prepared By	Checked By	Approved By	Date
SCR LAB	 Priya Rani Engineer	 Antara Baral Manager	 Ajay Kumar Sharma AGM	27-10-2022



**BHARAT HEAVY ELECTRICALS LIMITED
SOLAR BUSINESS DIVISION(SBD)**

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**TECHNICAL PRE-QUALIFICATION REQUIREMENT (TECHNICAL PQR)
EXPRESSION OF INTEREST
MATERIAL DESCRIPTION: TITANIUM DIOXIDE (TIO2)**

Sl. No.	Description	Bidder's Confirmation (Yes / No)	Supporting documents
1	Vendor should be a manufacturer of TITANIUM DIOXIDE (Anatase) or manufacturer's authorized agency	Manufacturing Plant location: (Name of original manufacturer, complete address & contact details). Vendor to provide the Business License/Udhya certificate	Supporting documents (Attached / Not-attached) <input type="checkbox"/> / <input type="checkbox"/> (please tick at appropriate place)
2	Vendor must have supplied at least 700 MT of TITANIUM DIOXIDE (Anatase) in India or abroad.	Vendor should share proof of supplies as supporting document along with offer and share PO copies of the supplies made to other customers cumulating to not less than 700 MT for the past five years.	Supporting documents (Attached / Not-attached) <input type="checkbox"/> / <input type="checkbox"/> (please tick at appropriate place)
3	Vendor should supply 250 gm. of sample along with the offer.	Not Dispatched / Dispatched (Sample dispatch docket no.)	Supporting documents (Attached / Not-attached) <input type="checkbox"/> / <input type="checkbox"/> (please tick at appropriate place)

BHEL WILL VERIFY THE CLAIMS MADE FOR CONFORMANCE TO THE PRE-QUALIFICATION CRITERION. BIDDERS TO ENSURE PROVIDING AUTHENTIC CERTIFICATES / DOCUMENTATION AND CREDENTIALS IN ORDER TO QUALIFY FOR BHEL TENDER PROCESS.

Seal and signature of the Bidder



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FINANCIAL PRE-QUALIFICATION REQUIREMENTS (PQR) against Expression of Interest (EOI) to Invites Prospective vendors to partner with BHEL for TITANIUM DIOXIDE (TIO2)			
Sl. No.	PRE-QUALIFICATION REQUIREMENTS	Bidders claim in respect of fulfilling the PQR Criteria	
		Name and Description of qualifying requirements	Supporting document
A	Financial Criteria		
A1	Turnover: Bidders must have achieved an average annual financial turnover (Audited) of 555 Lakhs or more over last three completed Financial Years (FY).	<u>T/O value:</u> FY 2020-21: Rs. _____ Lakhs FY 2021-22: Rs. _____ Lakhs FY 2022-23*: Rs. _____ Lakhs (* - in case audited Balance Sheet is not available, duly certified details from Chartered Accountant may be submitted on their letter head of CA)	Supporting document (Attached / Not-attached) <input type="checkbox"/> / <input type="checkbox"/> (please tick at appropriate place)
A2	Net worth of the Bidder based on the latest Audited Accounts as furnished for 'A1' above should be positive. Net worth = Paid up share capital* + Reserves. (*Share Capital OR Partnership Capital OR Proprietor Capital as the case may be)	To be confirmed by bidder with supporting documents <input type="checkbox"/> - POSITIVE <input type="checkbox"/> - NEGATIVE (please tick at appropriate place)	Supporting document (Attached / Not-attached) <input type="checkbox"/> / <input type="checkbox"/> (please tick at appropriate place)

NOTE: Supporting documents for qualification against PQR needs to be enclosed.

Seal and signature of the Bidder



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Queries:

Bidders to note that any queries related with EOI are to be submitted online only at Email ID provided in Table A with CC to **k.manoj@bhel.in**. Queries/clarifications received in any other form are liable to be unanswered. A reply from the concerned will be given on the same Email ID.

Table A

Description	Email Id
For Technical Queries	chetanbhawsar@bhel.in
For General & Commercial Queries	rahul.k@bhel.in
For submission of offers against EOI	technicalbid-epd@bhel.in

Submission of EOI

Offers against EOI to be submitted on Email address to **technicalbid-epd@bhel.in** with subject as Ref: **BHEL/SBD/SCR/EOI/TIO2 Dated 05.09.2023 "Item description against which EOI is submitted"**

Following documents to be attached while submitting EOI:

1. Annexure I (Duly filled, signed, stamped on official letterhead)
2. Annexure II- Non-Disclosure Agreement (Duly filled, signed, stamped on official letterhead)
3. Documents in support of Pre-Qualification Requirements- Technical & Financial
4. Technical offer, comprising of technical specification/Product Catalogues/Datasheets/Drawings/ QAP/ Test report etc
5. Documentary evidences for Manufacturing capabilities
6. Any other documents

Note: No physical offers for EOI will be accepted.

Plant Location details:

**BHARAT HEAVY ELECTRICALS LTD
SOLAR BUSINESS DIVISION
Prof. CNR Rao Circle,
Opp. Indian Institute of Science,
Malleswaram Bangalore – 560012 India**



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ANNEXURE – I

FORMAT FOR SUBMISSION OF EOI

(to be printed on the official letterhead of the APPLICANT)

To,

Mr.A K Nived Kumar
AGM-Materials Management
BHEL SBD Bengaluru-560012

Dear Sir,

Subject: Submission of Expression of Interest Ref: BHEL/SBD/SCR/EOI/TIO2 Dated 05.09.2023 "Item description against which EOI is submitted"

With reference to your EOI inviting notice Ref: BHEL/SBD/SCR/EOI/TIO2 Dated 05.09.2023 and after examining the detailed documents and other details mentioned in the EOI document, I/We hereby offer to submit my /our Expression of Interest.

1. All the annexures and documents necessary in this connection are enclosed hereto. All the documents/ photocopies of the documents have been self-attested by me/us and BHEL is free to reject our offer if any of the documents/photocopies of the documents is/are found to be false or forged.
2. I/we, hereby also declare(s) that I/we have read all terms and conditions in the EOI and all terms and conditions mentioned in the EOI are acceptable. I herewith submit duly signed and accepted Non Disclosure Agreement as per Annexure II.
3. I/we, hereby also declare(s) that my/our organisation/firm is not debarred/ blacklisted by any Central/State Govt. department, agency, PSUs/ Institution/ Agencies/ Autonomous organization.
4. The information sought from me as per the EOI notice is enclosed to this letter.

Yours Faithfully,

(Signature & Stamp of Authorised Signatory)

Name

Designation:

Date:

Place:



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ANNEXURE II

NON-DISCLOSURE AGREEMENT

I, _____, on behalf of the _____ (Name of Company),

acknowledge that the information received or generated, directly or indirectly, while working with BHEL on contract is confidential and that the nature of the business of the BHEL is such that the following conditions are reasonable, and therefore:

I warrant and agree as follows:

I, or any other personnel employed or engaged by our company, agree not to disclose, directly or indirectly, any information related to the BHEL Without restricting the generality of the foregoing, it is agreed that we will not disclose such information consisting but not necessarily limited to:

- Technical information: Methods, drawings, processes, formulae, compositions, systems, techniques, inventions, computer programs/data/configuration and research projects.
- Business information: Customer lists, project schedules, pricing data, estimates, financial or marketing data,

On conclusion of contract, I, or any other personnel employed or engaged by our company shall return to BHEL all documents and property of BHEL including: drawings, blueprints, reports, manuals, computer programs/data/configuration, and all other materials and all copies thereof relating in any way to BHEL, EPD's business, or in any way obtained by me during the course of contract. I further agree that I, or any others employed or engaged by our company shall not retain copies, notes or abstracts of the foregoing.

This obligation of confidence shall continue after the conclusion of the contract also.

I acknowledge that the aforesaid restrictions are necessary and fundamental to the business of the BHEL and are reasonable given the nature of the business carried on by the BHEL. I agree that this agreement shall be governed by and construed in accordance with the laws of country.

I enter into this agreement totally voluntarily, with full knowledge of its meaning, and without duress.

Place:-_____ Date:-_____

Name

Company

Signature