



**NOTICE INVITING TENDER FOR PRE TREATMENT SKID AS PER
SPECIFICATION NP/CM/02**

18-2-2009

BHEL/EPD is desirous of procuring one number of "PRE TREATMENT SKID" of 30 cubic meters per hour capacity using Ceramic membranes for pre treatment of agricultural run off water.

Sealed bids are invited under two part bid system from the interested suppliers with sound technical and financial capabilities fulfilling the requirements stated in the bid document.

Interested and eligible suppliers may study the tender document carefully and offer their bids in the form of Part A i.e. Techno commercial bid and Part B i.e. Price bid. Please note that no contra conditions in the price bid are admissible. Interested bidders have to clearly indicate their rates in the price bid for

a) supply portion, b) supervision of installation and c) commissioning at site of BHEL i.e. Bellary TPS.

The salient features of tender documents are as follows

- | | |
|--|---------------|
| 1) Format for techno commercial bid ----- | Page 2 |
| 2) Scope of supply and technical requirement---- | Page 3 to 4 |
| 3) General terms and conditions of the tender----- | Page 5 to 9 |
| 4) Specification NP/CM/02for pre treatment skid | Page 10 to 26 |

Pre qualification technical bid will be opened on 05-3-2009 at 2.30 PM in the presence of tenderers who represent at the time of opening

Sr DGM/MM



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TENDER REFERENCE: MM/Pre filtration skid/09-10

DATE OF ISSUE: 18-2-2009

LAST DATE FOR RECEIPT OF TENDER: 05-3-2009

DATE & TIME OF TENDER OPENING (Techno commercial bid): 05-3-2009

DETAILS OF THE VENDOR:

NAME AND ADDRESS OF THE TENDERING FIRM

PART A. PRE QUALIFICATION BID

a) Technical

PRE QUALIFICATION TECHNO COMMERCIAL BID SHOULD COVER ALL TECHNICAL QUALIFICATION DETAILS, EXPERIENCE DETAILS, AND CONTRACTUAL TERMS EXCLUDING PRICE.

b) Commercial

SL NO	DESCRIPTION	BHEL REQUIREMENT	VENDORS' OFFER
1. Terms of quote			
	1 A	Ex Works/FOR Bellary TPS	
	1 B. Applicable for Imports	FOR Foreign port/CIF Port of Clearance/FOR Bellary TPS.	
Taxes and duties			
2	EXCISE DUTY/SERVICE TAX	%	
3	E. CESS	%	
4	CST/VAT	%	
5	CUSTOM DUTY	%	
6	CVD	%	
7	E. CESS	%	
8	SAD	%	
OTHER CHARGES			
9	PACKING CHARGES	TO MENTION	
10	FORWARDING CHARGES	TO MENTION	
11	FREIGHT	TO MENTION	
12	INSURANCE	TO MENTION	
13	PAYMENT TERMS : IMPORTS	A) 70 % OF SUPPLY PRICE WITHIN 60 DAYS OF DESPATCH THROUGH LC B) 20 % OF SUPPLY PRICE AND 90 % OF COMMISSIONING CHARGES ON SUCCESSFUL COMPLETION OF TRIAL RUN AFTER COMMISSIONING C) BALANCE 10% OF SUPPLY AND COMMISSIONING CHARGES AFTER WARRANTY PERIOD OR ON SUBMISSION OF PBG AFTER TRIAL RUN.	
14	PAYMENT TERMS INDIGENOUS	A) 70 % OF SUPPLY PRICE WITHIN 60 DAYS OF DESPATCH THROUGH NEFT B) 20% OF SUPPLY PRICE AND 90% OF COMMISSIONING CHARGES ON SUCCESSFUL COMPLETION OF TRIAL RUN AFTER COMMISSIONING C) BALANCE 10% OF SUPPLY AND COMMISSIONING CHARGES AFTER WARRANTY PERIOD OR ON SUBMISSION OF PBG AFTER TRIAL RUN.	
15	DELIVERY TERMS	F.O.R BHEL-BELLARY TPS	
16	LEAD TIME	MINIMUM LEAD TIME TO BE MENTIONED	
17	LD CLAUSE	0.5% per week up to a maximum of 5% OF THE TOTAL VALUE FOR DELAYED DELIVERY	
18	RISK PURCHASE CLAUSE	AS PER BHEL NORMS	
19	ANY OTHER CLAUSE		



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Scope of supply (Indicative)

Sl. No.	Item Description	Qty.
1	Filtration system modules housing 5 / 3 nos membrane holding housings in each with piping	02 sets
2	Pre filtration system with 2 micron cartridge housing with cartridge filter (2 module)	04 Nos.
3	Raw water feed pump – 60to70 M3/hr, 7Kg/cm2, Vertical Type	02 Nos
4	Acid/Alkali cleaning – 30 M3/hr, 7 kg/cm2, Vertical Type	01 Nos
5	Electrically actuated valves– MOC:SS316 (Valve Type: Ball or Butterfly-need based)	46 nos
6	Manually actuated valves– MOC:SS316 (Valve Type: Ball or Butterfly-need based)	26 nos.
7	Non-return valves – MOC:SS316	18 nos
8	Water strainer (Y type) with bypass arrangement	02 nos
9	Acid/Alkali dosing pump, Make: Grundfos/Milton Roy	02 nos
10	Rubber Bush for ceramic candle	** nos
11	Locking Plates for rubber bushes	** nos
12	Inter connecting pipes & fittings	1 lot



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Instruments

Sl. No.	Item Description	Qty.
13	Metallic body magnetic flow meters (permeate line)	03 Nos
14	Pressure Guage 0-10 kg/cm2, (as indicated in PID drawing)	10 Nos
15	Temperature Gauge 0-100 Deg.C,	04 Nos
16	ROTAMETER / BYE-PASS ROTAMETER	02 Nos
17	<u>SOLENOID VALVES</u>	11 Nos
18	Online Turbidity meter (Make - Hach make)	02 Nos.
19	Online SDI meter (Make - RODI system only)	02 Nos
20	Online pH meter, Range 0-14pH,	1 No.
21	PLC Starter Panel & Accessories	1 Set
22	VFD System for Motors Make: ABB / Danfoss / Delta	1 Set
23	DP Guage	10 Nos.
24	DP Switches	10 Nos.
25	Miscellaneous items like expn. Bellows, SS 316 fasteners etc	1 set
26	Power, Control & Instrumentation Cables	1 set
27	Power, Control & Instrument Cables shall be routed thro' Plica make Flexible conduits	1 Set

PID drawing is separately available in page 25-26 for reference. However the final configuration is to be given by vendor based on their design.

General technical requirement:

Ceramic tubes will be provided by BHEL. Corresponding seals, housings, modules, necessary pipings, valves, instruments, pumps, flow meters and gauges, PLC control panels, prefiltration system, acid/alkaline cleaning systems, back wash system, tanks etc are to be supplied by the bidders. Supervision of installation and commissioning of the system is in supplier's scope.



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GENERAL TERMS AND CONDITIONS OF THE TENDER

The offer should be submitted in two parts in separate sealed covers superscribing " Part A- Techno commercial" and " Part B- Price bid" and tender number "MM/Pre filtration skid/09-10 due on 05-3-2009" addressed to

Sr DGM/MM

Bharat Heavy Electricals Ltd
Electro Porcelains Division
PB No: 1245, Science Institute Post
Bangalore – 560 012

So as to reach here within 2 P.M. on the due date and the tenders will be opened at 2-30 P.M. on the same date in the presence of those vendors or their authorised representatives who wish to be present.

1. YOUR OFFER SHALL BE VALID FOR ATLEAST 120 DAYS FROM DATE OF OPENING OF TECHNO-COMMERCIAL BID, EXTENDABLE TO A MUTUALLY AGREED PERIOD. FOR IMPORT, THE CURRENCY SHALL BE USD / EURO. FOR PRICE COMPARISON, CLOSING EXCHANGE RATE ON THE DAY OF PRICE BID OPENING WILL BE CONSIDERED.

2. **TECHNO-COMMERCIAL CONDITIONS SHALL INTERALIA CONTAIN THE FOLLOWING:-**

A COMPLETE TECHNICAL OFFER INCLUDING DETAILED SPECIFICATIONS, DRAWINGS, CATALOGUES AND TEST REPORTS ETC., AS REQUIRED TOGETHER WITH EXPERIENCE LIST TO BE FURNISHED. IN ADDITION TO THIS THE SUPPLIER SHOULD ALSO COMPLETE TECHNICAL REQUIREMENT MENTIONED IN THE ATTACHED TABLE FOR EVALUATION, IF PROVIDED. .

B LIST OF MANDATORY SPARES & OPTIONAL ACCESSORIES TO BE PROVIDED SEPARATELY. ANNUL MAINTENANCE CONTRACT, IF ANY, TO BE QUOTED SEPARATELY.

C COMMERCIAL ASPECTS COVERING :

- SCOPE OF SUPPLY :
- SCOPE OF WORK : supervision and commissioning at Bellary TPS
- STATUTORY LEVIES :
- TERMS OF PAYMENT :
- MODE OF PAYMENT :
- DELIVERY TERMS :
- GUARANTEE / WARRANTY OF THE EQUIPMENT INCLUDING BOUGHT OUT ITEMS



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- TERMS FOR ERECTION & COMMISSIONING, SUPERVISION, IF ANY :
- AFTER SALES SERVICE :
- PACKING & FORWARDING :
- TRANSIT INSURANCE
- APPROX SIZE OF THE PACKED MATERIALS AND VOLUME
- LIST OF ALL BOUGHT ITEMS AND MAKES
- VALIDITY OF THE BID

D COMPANY PROFILE:

PARTIES SHOULD BE REGISTERED WITH THE CONCERNED EXCISE & SALES TAX AUTHORITIES AND SHOULD QUOTE RELEVANT REGISTRATION NO. IN THE OFFER. RELEVANT REGISTRATION CERTIFICATE COPIES MUST BE ENCLOSED. AUDITED FINANCIAL RESULTS OF PREVIOUS 2 FINANCIAL YEARS SHOULD BE FURNISHED.

E DELIVERY:

EARLIEST POSSIBLE DELIVERY TO BE CLEARLY SPECIFIED IN THE OFFER. THE VENDOR MAY ALSO QUOTE THE EARLIEST DELIVERY PERIOD FOR MATERIAL DELIVERY AND COMMISSIONING PERIOD.

F PRICE IMPACT:

IN CASE, OUT COME OF TECHNO-COMMERCIAL DISCUSSION HAS ANY PRICE IMPLICATION, ONLY CORRESPONDING **PRICE IMPACT** IS TO BE SUBMITTED BY THE VENDOR IN A SEALED COVER WITHIN THE SPECIFIED DATE, **REVISED OFFER IS NOT ACCEPTABLE. THE PRICE IMPACT ALONG WITH THE ORIGINAL PRICE BID WILL BE OPENED ON A SPECIFIED DATE.**

10. PRICES SHALL BE CONSIDERED ON LANDED COST BASIS (COST TO BHEL). LANDED COST SHALL BE WORKED OUT ON PRICE QUOTED INCLUDING FREIGHT, EXCISE DUTY, AND SALES TAX AFTER CONSIDERING CENVAT AND VAT BENEFIT, AS APPLICABLE. THE COMPARATIVE STATEMENT SHALL BE WORKED OUT ON OVERALL LANDED COST BASIS FOR THE WHOLE PACKAGE AND IS SUBJECT TO FOLLOWING.

i) The comparative statement of the prices prepared on the reference date shall remain firm throughout the execution period. Any change in duty & tax structure during execution of the contract will not be considered for re-ranking of vendors.

ii) The lowest price received against BHEL tender need not be commercially lowest price (L1) and BHEL reserves the right to NEGOTIATE the same



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iii) BHEL reserves the right/option to REFLOAT the tender if L1 price is not the lowest acceptable price to BHEL.

- FOR IMPORTS PRICE COMPARISON, EXCHANGE RATE PREVAILING ON THE DAY OF OPENING PRICE BID WILL BE CONSIDERED
- **11. PAYMENT TERMS:**

PAYMENT TERMS : IMPORTS	A) 70 % OF SUPPLY PRICE WITHIN 60 DAYS OF DESPATCH THROUGH LC B) 20 % OF SUPPLY PRICE AND 90 % OF COMMISSIONING CHARGES ON SUCCESSFUL COMPLETION OF TRIAL RUN AFTER COMMISSIONING C) BALANCE 10% OF SUPPLY AND COMMISSIONING CHARGES AFTER WARRANTY PERIOD OR ON SUBMISSION OF PBG AFTER TRIAL RUN.
PAYMENT TERMS INDIGENOUS	A) 70 % OF SUPPLY PRICE WITHIN 60 DAYS OF DESPATCH THROUGH NEFT B) 20% OF SUPPLY PRICE AND 90% OF COMMISSIONING CHARGES ON SUCCESSFUL COMPLETION OF TRIAL RUN AFTER COMMISSIONING C) BALANCE 10% OF SUPPLY AND COMMISSIONING CHARGES AFTER WARRANTY PERIOD OR ON SUBMISSION OF PBG AFTER TRIAL RUN.

- THE INDIGENOUS VENDOR SHOULD FURNISH NECESSARY MANDATE FOR PAYMENT THROUGH NEFT. STAND BY L/C IS NOT PERMITTED.

3. QUALIFYING CRITERIA: Vendor should have designed, developed and supplied at least one module of ceramic membrane based pre-filtration system by themselves or their principals in last 3 years. Reference in this regards shall be provided with contact details.

4. LOADING FACTOR:

IF THE OFFER IS NOT INLINE WITH THE TERMS AND CONDITIONS SPECIFIED BY BHEL, THE FOLLOWING LOADING CRITERIA WILL BE ADOPTED FOR EVALUATION.

A. PAYMENT TERMS:

INTEREST @ 14% P.A. SHALL BE COMPUTED FOR THE DIFFERENTIAL PERIOD BETWEEN BHEL TERMS OF PAYMENT AND THAT OFFERED.

**B. TRANSPORTATION CHARGE:
FOR INDIGENOUS SUPPLIERS:**

- IN CASE, DELIVERY TERM IS OTHER THAN FOR BHEL STORES, BANGALORE THE INLAND FREIGHT RATE WITH BHEL'S APPROVED TRANSPORTER'S PREVAILING ON THE DAY OF TENDER OPENING / OCEAN FREIGHT WILL BE LOADED.



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- **FOR FOREIGN VENDORS:**
- **IN CASE, DELIVERY TERM IS FOB-MAJOR PORT, MARINE FREIGHT IS AS PER THE AGREEMENT BETWEEN BHEL-TRANSCHART-SCI AND INLAND FREIGHT. PREVAILLING RATE OF CUSTOMS DUTY AND MARINE INSURANCE WILL ALSO BE LOADED AS ON DATE OF PRICE BID OPENING.**

5. PORT OF DISCHARGE: CHENNAI PORT (INDIA)

6. PURCHASE INCIDENTALS:

- **LC: LETTER OF CREDIT OPENING CHARGES @ 0.25% AND QUARTERLY CHARGES OF 0.15% ON PRORATE BASIS.**
- **ALL BANK CHARGES OUTSIDE INDIA WILL BE TO BENEFICIARY'S ACCOUNT. HOWEVER, THE ACTUAL RATES PREVAILING ON DATE OF PRICE BID OPENING WILL BE CONSIDERED FOR BID EVALUATION.**
- **C.TRANSIT INSURANCE:**
- **AS PER BHEL RATE PREVAILING ON THE DATE OF OPENING OF TENDER**
- **D. OTHERS:**
- **ANY OTHER COST COMPONENT WHICH THE VENDOR HAS NOT QUOTED. EITHER A SEALED QUOTE FROM THE VENDOR WILL BE OBTAINED OR THE HIGHEST OFFER FOR THAT COMPONENT WILL BE LOADED**
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- 7. BHEL will have the option to defer the supplies of any purchase order with a notice period of 20 calendar days.**
- **F. In case of unsatisfactory performance of quality / delivery BHEL will have right to discontinue the contract in part or full.**

8. DEVIATIONS:

- **A SEPARATE SHEET INDICATING DEVIATIONS IN TECHNICAL SPECIFICATION, COMMERCIAL TERMS AND CONDITIONS TO BE ENCLOSED IN PART A OF THE OFFER.**

9. Lead time: Offer shall indicate minimum and maximum lead-time required to execute the orders for the capacity indicated. Quantities can be supplied progressively and for such supplies, minimum time required to start supplies and maximum time required to complete the order may be indicated.

10. The order will be placed depending on overall position of the vendor in comparative statement.



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11. BHEL reserves the right/option to REFLOAT the tender if the lower price is not acceptable to BHEL.

12. Risk Purchase Clause: BHEL at its option will be entitled to terminate the contract and purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the seller fails to deliver within the stipulated time. The seller shall be liable for any loss, which BHEL may sustain by such risk purchases. The loss may be recovered from the vendor's outstanding bills with the concerned unit or any sister unit.

13. The vendors will have to follow all the legal and statutory requirements and BHEL norms. BHEL will not be responsible in any way if the vendor is fined or penalized due to non-fulfillment of these requirements by any government agency like Sales Tax, Excise etc

14. Arbitration: Settlement of dispute, if any arises, at anytime between the BHEL and the vendors upon or in relation to or in connection with the vendor, the same shall be referred to the sole arbitration of the Head of BHEL unit or to person appointed by him. The award of the arbitrator shall be final and binding on both BHEL and the vendor

15. LD Clause: In case of delayed delivery, LD @ 0.5% per week up to a maximum of 5% will be levied on the defaulting quantity for the delayed period as per the corresponding PO.

16. Legal Jurisdiction: In case of any legal proceedings, area of jurisdiction will be Bangalore in case of EPD.

The tender not meeting the above conditions may not be entertained.



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*BHARAT HEAVY ELECTRICALS LIMITED,
ELECTROPORCELAINS DIVISION- 560012.*

TECHNICAL SPECIFICATION

For

PRE-TREATMENT SKID

[Design, manufacture, assembly, supply, supervision of erection & commissioning]



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01. ITEM : Design, manufacture, assembly, supply, supervision of erection & commission of 30 M³/hr flow capacity skid mounted ceramic membrane cross flow filtration system, complete with 10 nos horizontally mounted membrane housings module with necessary piping, valves, instruments, pumps & PLC control panel etc.. All the wetted parts of fluid flow are to be made of SS 316; skid is to be fabricated from structural steel with epoxy coating.

02. APPLICATION : Operation of system for pre-treatment of agricultural run-off water.

03. OPERATING MODE : Operation and control in automatic mode with PLC control, and manual override for maintenance and system operation.

04. DESIGN CONCEPT / CONSIDERATION:

Item : Skid mounted ceramic Membrane filter unit
No. of modules : 2 nos (A and B)
No. of housing per module : 5 nos (Indicative)

Alternative configuration to have 96 Tubes per vessel in 3 housings may be suggested.

Part “A” technical offer shall Clearly specify the option considered.

Ceramic membrane – size : A) OD-27mm, Length – 1020mm.
B) OD – 32 mm, Length – 1200 mm

Permeate Flow rate : A) 50 Ltrs/hr/membrane tube
(Module A)

Considered : B) 240 Ltrs/hr per membrane tube
(Module B)

No. of cartridges per housing : 60 nos (Indicative)

Alternative configuration to have 96 Tubes per vessel in 3 housings may be Suggested.



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Part “A” technical offer shall
clearly specify the option
considered.

The suggested PID Drawing is available in page 25 and 26

Main Feed pump : Two independent feed pumps for each of the module shall be provided for operating each module independently and simultaneously.

Pre filtration system : 2 Micron cartridge type pre filtration system shall be provided and installed between the main filtration module and feed pump outlet. Pre-filtration system shall have provision for replacing cartridge of different rating if required.

Acid/Alkali cleaning : Acid/Alkali cleaning shall be provided with separate pump with suitable flow capacity. This pump shall be used for cleaning of modules with acid and alkali water. Specification of acid and alkali to be used is given below:

Alkali: NaOH, Cocentration – 15-20 m/Liter

Acid: A) Nitric acid, 58% concn. 5 ml/Liter or

B) Phosphoric acid, 75% Concn. 1ml/Liter

Backwash system : Back flushing of membrane with compressed air; necessary piping, solenoid valves and controls shall be provided and operated by PLC.

(Necessary Vent and Sampling point shall be provided at suitable location to take samples. All the drains shall be connected to a final single drain.)



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Flow meter	: Metallic body variable area magnetic flow meter with digital output and remote output facility shall be installed on permeate line.
VFD	: Variable frequency drive shall be provided of appropriate design to control the main feed pump and cleaning pump.
PLC	: Programmable PLC system shall be provided in control panel to automate operation of the filtration system. PLC should be provided with suitable number of input and outputs for automatic operation of the system. The sequence of Operation for filtration and cleaning is enclosed (Annexure-II).

06. TECHNICAL SPECIFICATIONS

Item Name	: Skid mounted ceramic membrane filtration System
Fluid to be handled	: Agricultural run-off water
Permeate flow rate	: 30 m³/hr
Working pressure	: 5 kg/cm² max

I. Main Pump

Type of pump	: Vertical multi stage SS 316 Monoblock pump With motor & VFD
Flow capacity	: 60-70 m³/hr
Working pressure	: 7 kg/cm² min.
Make	: Grundfoss / Wilo / KSB



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II. PRE FILTER ASSEMBLY

Material of construction	: SS – 316
Filter type	: micron cartridge filter Suitable for agricultural run-off water
No. of filter vessels	: 04 nos
Flow capacity per vessel	: Each vessel should be installed with 2 micron filter and should be able to allow water Flow rate of 30 Cu.M/Hr
System should have interchangeability of cartridge of different rating.	

III. MEMBRANE HOLDING VESSELS

- 1) No. of membrane holding vessels : 05 no.
- 2) Ceramic candle length (Module A) : Dia. 27 mm,
Length 1020mm
Ceramic candle length (Module B) : Dia. 32 mm,
Length 1200mm
- 3) No. of ceramic candles per vessel : 60 nos (Indicative)
- 4) Total no. of ceramic candles required : 300 nos
- 5) Material of construction : SS 316
- 6) 'O' ring : Silicon
- 7) Fasteners : SS 316
- 8) Rubber bush for ceramic candle : Silicone - Qty. as per no.
of membrane. Adequate no. of spare bushes shall be provided for
installation And periodic maintenance. Assembly with compression
adhesion
- 9) Locking plate for rubber bush : SS316 (Qty. as per
requirement)
Flanges and locking plates shall have interchangeability between
different housings.

IV. PIPING DETAILS

Inlet & outlet manifold,	
Piping & pipe fittings	: SS 316L schedule 40 – ERW
Flanges	: ANSI 16.5B #150 RF.



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V. VALVES

Butterfly valves	:	EPDM Lined CI body With SS 316 disc
Ball valves	:	SS 304 with Teflon seals
Make	:	Audco slimline /BDK/Inter valve

VI. FLOW METERS

Permeate flow meter :	Digital variable flow meter capacity 40 m3/hr
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Make : ABB, Rosemount, KROHNE

Output signal : 4-20mA DC

<u>Pressure Guage 0-10 kg/cm2</u>	: Direct reading, aluminium casing with Four (4) inch dial, SS 316L Bourdon tube, Accuracy $\pm 1\%$ of FSR, snubbers for pump discharge applications and chemical diaphragm for corrosive services. 2 Valve manifold are to be provided. IP65 or equivalent degree of protection for enclosure. Over range protection shall be 25% above maximum pressure with dampening liquid filled.
Make	: AN Instruments, H.Guru, General Instruments, Waaree Instruments, Manometer(I) P.Ltd.

<u>DP Guage</u>	: Direct reading type, bellows or diaphragm operated, aluminium casing (epoxy coated) with Four (4) inch dial, SS 316L pressure element with 3 Valve manifold, Accuracy $\pm 1\%$ of FSR, Material of accessories shall be SS. IP 65 or equivalent degree of protection. Over range protection shall be 50% above maximum pressure. DP Gauge should be interfaced with PLC panel. In case of membrane tube breakage/choking in a pressure vessel, DP gauge should provide signals to PLC, making alarm and the
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pressure vessel should get isolated through PLC logic operation.

Make : AN Instruments, H.Guru,
General Instruments, Waaree
Instruments, Manometer(I) P.Ltd,
Pyro Electric Instruments

DP Switch : 220 V NO/NC contacts with SS bellows.
Make : Indfoss/Switzer

Temperature Gauge 0-100 °C : Indicating type, Four (4) inch
dial housed in aluminium casing
(epoxy coated) and SS 316L
thermowell. Material of
accessories shall be SS. IP 65 or
24equivalent degree of protection
for enclosure.

Make : AN Instruments, H.Guru,
General Instruments, Waaree
Instruments, Pyro Electric

Instruments

**ROTAMETER /
BYE-PASS ROTAMETER**

: Variable Area type Flow meters
(Rotameters or Bye-Pass
Rotameters) shall be provided
wherever required. Material of
Tube shall be Borosilicate glass.
Wetted parts materials shall be
SS316L. Packing material to be
Teflon. Over range protection to
be provided.

Make : Eureka, IEPL, Placka, Trac, GIC.

SOLENOID VALVES

: Direct operated solenoid valves with
shut off class (leakage) IV, body material
of brass, plunger material of 316 SS rated
for continuous duty. IP 65 or equivalent
protection class for enclosure. Insulation
class of 'F' for the solenoid. The operating
voltage shall be suitable for 24VDC,
220VDC or 110VAC.



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Make	: ASCO / Parker/HERION / Jefferson.
Online Turbidity meter	: Microprocessor Based, Range 0.001 to 100NTU, Operating Temp 0-50Deg.C, Sensor with Controller, Power Supply 100-230V, IP66, Analog Output Signal 4-20mA DC. Suitable provision for isolating the turbidity meter during acid/alkali cleaning should be made.
Make	: HACH make only.
Online SDI meter	: Microprocessor Based Controller, 120-240VAC, Operating Temp. 50 Deg.C, IP66, with accessories, Output Signal 4-20mA DC. Suitable provision for isolating the turbidity meter during acid/alkali cleaning should be made.
Make	: RODI System
Online pH meter	: Range 0-14pH, Automatic Temperature Compensation, Solid state / micro processor based system with system accuracy of 0.02 pH, auto temperature compensation, auto zero check, manual zero and span calibration, integral indicator, Housing for electrode and analyser shall be IP65. Output shall be isolated 4-20 mA DC linear signal. Accessories shall include preamplifier, screened junction box for electrode. Isolation provision shall be provided.
Make	: Honeywell, ABB, Yokogawa, Emerson Process, Endress + Hauser

VII. PLC STARTER PANEL

PLC shall be provided with latest version of LAP TOP and provision shall be made to transfer Data from PLC PANEL TO LAP TOP. Provision for alarm and fault display on faulty operation, or choking of any of the membrane vessel to be made.



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Panel enclosure	: Fabricated from GI / CRCA Sheet Metal with Epoxy powder coat finish.
Starter components make	: Siemens/ L&T / Telemecanique/ ABB/ Control Switchgear /
PLC Make	: Rockwell Automation (ABIL), Seimens, GE Fanuc, ABB, Honeywell/Messung
Laptop Make	: Wipro/HP/Dell/Lenovo
Power & Control Cables	:Power (Aluminum Conductor) & Control (Copper Conductor) cables will be 1100V grade, multicore, stranded copper conductor having 7 strands, PVC insulated, inner PVC sheathed outer sheath made of PVC compound as per IS 1554
Instrumentation Cables	: Instrumentation cables will be with stranded high conductivity annealed, tinned copper, twisted pair extruded PVC insulated with overall and / or individual screening, extruded PVC inner sheathed, extruded outer sheathed with PVC compound. The conductor size will be minimum 0.5 sq.mm as per IS 1554.

For Sl. No. IV, V & VI, design to consider providing bypass
Arrangements/isolation by way of valves/ cocks shall be provided.

VIII. MAIN SKID

Main skid	: Fabricated from MS structural steel And coated with Epoxy / polyurethane paint.
IX. <u>Acid/Alkali Cleaning Pump</u>	
Type of pump	: Vertical multi stage SS 316 monoblock Pump With motor & VFD
Flow capacity	: 30 m ³ /hr



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**Working pressure : 7 kg/cm² min.
Make : Grundfoss / Wilo / Kirloskar / equivalent.**

X. Acid / Alkali Dosing Pumps with tanks

Flow capacity: Suitable for filling and decanting acid/alkali tanks

Make : Grundfos / Milton Roy.

Pipe connection : During acid/alkali cleaning provision shall be made such that the permeate goes back to acid/alkali tank. Suitable heating arrangement of acid, alkali and backwash water flow upto 85 deg. C shall be provided.

XI. Tanks

Tanks to be placed on platform at least 1 meter above ground.

Acid Tank : 5000 Liters

MOC : MS with FRP lined and insulated

Heating arrangement : Provision for heating upto 50°C shall be made.

Alkali Tank – FRP : 5000 Liters

MOC : MS with FRP lined and insulated

Heating arrangement : Provision for heating upto 85°C shall be made.

Water tank : 5000 Liters – FRP (with frame work)

Permeate tank : 10000 Liters – FRP (with frame work)

All tanks shall be offered optional in price quote.



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7. SCOPE OF SUPPLY (Indicative):

Sl. No.	Item Description	Qty.
1	Filtration system modules housing 5 / 3 nos membrane holding housings in each with piping	02 sets
2	Pre filtration system with 2 micron cartridge housing with cartridge filter (2 module)	04 Nos.
3	Raw water feed pump – 60to70 M3/hr, 7Kg/cm2, Vertical Type	02 Nos
4	Acid/Alkali cleaning – 30 M3/hr, 7 kg/cm2, Vertical Type	01 Nos
5	Electrically actuated valves– MOC:SS316 (Valve Type: Ball or Butterfly-need based)	46 nos
6	Manually actuated valves– MOC:SS316 (Valve Type: Ball or Butterfly-need based)	26 nos.
7	Non-return valves – MOC:SS316	18 nos
8	Water strainer (Y type) with bypass arrangement	02 nos
9	Acid/Alkali dosing pump, Make: Grundfos/Milton Roy	02 nos
10	Rubber Bush for ceramic candle	** nos
11	Locking Plates for rubber bushes	** nos
12	Inter connecting pipes & fittings	1 lot



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Instruments:

<i>Sl. No.</i>	<i>Item Description</i>	<i>Qty.</i>
13	<i>Metallic body magnetic flow meters (permeate line)</i>	<i>03 Nos</i>
14	<i>Pressure Guage 0-10 kg/cm2, (as indicated in PID drawing)</i>	<i>10 Nos</i>
15	<i>Temperature Gauge 0-100 Deg.C,</i>	<i>04 Nos</i>
16	<i>ROTAMETER / BYE-PASS ROTAMETER</i>	<i>02 Nos</i>
17	<u>SOLENOID VALVES</u>	<i>11 Nos</i>
18	<i>Online Turbidity meter (Make - Hach make)</i>	<i>02 Nos.</i>
19	<i>Online SDI meter (Make - RODI system only)</i>	<i>02 Nos</i>
20	<i>Online pH meter, Range 0-14pH,</i>	<i>1 No.</i>
21	<i>PLC Starter Panel & Accessories</i>	<i>1 Set</i>
22	<i>VFD System for Motors Make: ABB / Danfoss / Delta</i>	<i>1 Set</i>
23	<i>DP Guage</i>	<i>10 Nos.</i>
24	<i>DP Switches</i>	<i>10 Nos.</i>
25	<i>Miscellaneous items like expn. Bellows, SS 316 fasteners etc</i>	<i>1 set</i>
26	<i>Power, Control & Instrumentation Cables</i>	<i>1 set</i>
27	<i>Power, Control & Instrument Cables shall be routed thro' Plica make Flexible conduits</i>	<i>1 Set</i>

PID drawing is available in page 25 and 26 for reference. However the final configuration is to be given by vendor based on the design.

8. Quality Plan

Quality assurance plan is to be submitted by the successful bidder incorporating incoming materials, process and testing procedures and protocols confirming to various standards/requirements of components



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used, indicating checkpoint/hold points. QP shall be approved by BHEL before manufacturing.

9. Training

Training for operation of equipment and maintenance should be provided at BHEL-EPD to at two persons nominated by BHEL-EPD.

10. Qualifying criteria:

Vendor or should have designed, developed and supplied at least one module of ceramic membrane based pre-filtration system by themselves or their principals in last 3 years. Reference in this regards shall be provided with contact details.

11. Safety:

Equipment to be provided with suitable Safety and overload switches to protect the equipment.

12. Equipment Layout Plan

Information on the requirements for proper layout plan for erection and installation of equipments with set of dimensions to be furnished along with the offer in order to enable BHEL to check suitability in the identified location. Technical bid to accompany a detailed schematic diagram , PID diagram and layout plan.

13. Guarantee

Guarantee for 1 year from the date of commissioning, for trouble free operation of the equipment should be provided. In case of any problem during 1 year period, the desired spares or material replacement should be provided at the site.

14. Acceptance criteria

- 1) System and sub elements excluding ceramic membrane to operate at its rated/desired parameters.
- 2) Continuous satisfactory operation of 100 hrs without manual intervention.



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15. Documents required

- a) Catalogues of the offered instruments with detailed specification.
- b) Vendor to indicate clearly the scope of supply in the offer
- c) PID
- d) Layout Drawing
- e) Electrical load list with power consumption details

16. Documents for supply

- a) O & M manual for the system in hardcopy as well as in pen drive along with BHEL approved drawing etc.
- b) PID drawing for the system with design calculation details etc. of the vessels with PCD etc. to be submitted for BHEL approval.
- c) Quality Plan for BHEL approval
- d) Guarantee Certificate.
- e) Electrical connection drawings to be furnished.

17. INSPECTION:

- a) By BHEL before dispatch.
- b) After inspection, if any suitable modification if required to be done.

18. PACKING:

The skid, SS vessels, motor, pump etc should be packed suitably to avoid any damage in transit. Instruments and other delicate items should be separately packed with bubble plastic or any other packing material to avoid any damage during transit.

19. TERMINAL POINT & EXCLUSION

- i) BHEL will provide 415 V, 3 phase, 50 Hz AC supply in the PLC starter panel and further distribution shall be in vendor's scope.
- ii) BHEL will provide ONE inlet water connection from the existing process water line. Further connection to the skid assembly shall be in vendor's scope.



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Annexure – II Sequence of PLC operation:

- 1) The buffer tank in PID drawing will store agricultural run-off water. The main feed pumps as indicated in PID drawing shall draw water from this tank through water strainer. The feed water shall be pumped through 2 micron pre-filtration system into the membrane housings.
- 2) The feed water should be pumped into the respective distribution headers of modules, using two separate pipe lines. The housing shall draw feed water from these headers and deliver permeate water and brine water as indicated into the PID drawing. Each permeate line should have DP gauge and switches, and should be connected to PLC. The DP switch pressure limits to be optimized and set during trial run of Pre-treatment skid.












This arrangement shall be made such that during operation if any tube breakage/choking happen inside the housing, then it should get isolated and normal operation to continue with remaining housings. During such an event provision for an alarm and fault displays shall be provided.

- 3) Suitable provisions for introducing compressed air into the housing should be made as indicated in PID drawing. The compressed air line should have solenoid valves to allow compressed air into the housing at regular intervals of time, controlled by 24 hr timers.

During compressed air cleaning, the VFD for the feed pumps should operate at lower speed to deliver optimum feed water into the housings. After compressed air cleaning normal operation should be resorted.

- 4) For cleaning of the modules with acid/alkali water, a suitable pump should be provided. This pump shall draw alkali/acid water from respective tanks and pump to one of the modules. The permeate and brine coming out from the housings during this period should go to respective alkali/acid tank. During this cleaning operation the second module operation can be temporarily stopped. This cycle should be alternatively carried out to clean both the modules. Periodicity of acid/alkali cleaning to be optimized based on trial run.
- 5) The waste water tank indicated in the PID should be filled with permeate water using acid/alkali dosing pump. After cleaning of modules with acid/alkali water, cleaning of modules with permeate water should be carried as described in step 4. The sequence of cleaning for step 4 and 5 shall be
 - a. Acid cleaning
 - b. Alkali cleaning
 - c. Water cleaning
 - d. Rinse with permeate water
- 6) Indications on above by way of indicating lamps/mimics on control panel shall be provided.

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B		DP GAUGE AND SWITCH(10 NOS.)
		VALVE(MAN. ACT.) 26 NOS.
		VALVE(ELEC. ACT.) 46 NOS.
		SOLN. VALVE (11 NOS.)
		PRESSURE DIAL GAUGE 0-10 BAR,10 NOS.
		MAIN FEED PUMP, 120 CU.M/HR,6 BAR
		NON RETURN VALVE,18 NOS.
		2 MIC. PREFILTER
		WATER STRAINER,5 MIC.
		MAGNETIC WATERFLOW METER,3 NOS.
		ROTAMETER,2 NOS.
	B ——— BHEL SCOPE S ——— SUPPLIER SCOPE	

