



TENDER SPECIFICATION FOR
UF-RO System for waste water treatment for process reuse

BROAD FEATURES

- a. A UF- RO system for integration to existing Ceramic membrane filtration system at EPD and waste water recycling for process reuse and ensuring a TDS of less than 50 ppm and nil turbidity and an RO output of 3 Cu.M/hr
- b. Complete set up consisting of following :
 - a) UF module with pumps, valves, tanks, pre filters ,dosing ,back flushing facilities, with atleast 5 CuM/hr for feeding into RO loop
 - b) RO module : with high pressure pumps, tanks, valves, back flushing and dosing facilities with an out put of 3 CuM/hr
 - c) PLC based automated process operationDesigned for suitably integrating to the existing Ceramic membrane based pre- filtration system at EPD

QUALIFICATION CRITERION

1. The bidders for the equipment shall be on turnkey basis i.e., the bidders shall design, manufacture, supply, erection & commissioning at site, integrate with existing ceramic membrane system and demonstrate successfully the quality of water as per TDS and turbidity requirements and provide spares and service backup.
2. The bidders shall be original equipment manufacturer only.
3. The bidders shall have a proven performance for the turnkey project execution for the similar projects and shall have executed a minimum of 3 such installations in an industrial scale and in a similar or bigger ratings for similar usage in the last 2 years
4. Note :
 - a. *The qualification criterion as above is not exclusive of each other and successful bidders shall fulfil the entire criterion.*
 - b. *Bidders to provide documentary evidence for the qualification criterion set in along with the technical bids. BHEL at its discretion may verify the credentials provided for fulfilling the qualification criterion set.*



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Reference Technical details

The UF- RO system should consist of

Pre treatment system for RO

Ultra filtration system consisting of : Chemical dosing systems are to be included for the adjustment of pH and one for chlorine dosing , dechlorination, and for antiscalant. Activated carbon filtering system should be suitably incorporated. High capacity five (5) micron prefilters are to be provided to remove particulate matter which could damage the high pressure pump and/or foul the reverse osmosis membranes. The system should have suitably designed raw water pump, tanks ,back wash arrangement and pump. The raw water circuit after suitable conditioning should be provided with arrangement for diverting to either UF module or BHEL's Ceramic membrane based filtration system. . The Ceramic membrane system is of BHEL and the out put of UF both will go to permeate tank for feeding to RO system.

U F SYSTEM

Net Filtrate : ~ 5 cum/hr

SCOPE OF SUPPLY

Raw Water Pump Horizontal Centrifugal mono bloc

Dual Media Filter

Bag filte rating 50 Micron

U ltra filtration

Type of membrane : Hollow fiber, polysulphone

Make : X Flow / Hydranatics

Feed flow : 5 m3/hr

U F Back wash Pump

Acid/ Caustic dosing System

Disinfection dosing System

Volume of Tank : 100 litres

dosing pump : 1 no

REVERSE OSMOSIS SYSTEM

propose a reverse osmosis system capable of providing 3000 litres/hour of water with a total dissolved solids of less than 50 ppm . The system should operate atleast at a 60% recovery rate, thereby maintaining pump efficiency and reducing operating costs.

1. REVERSE OSMOSIS MEMBRANES. spiral wound membranes shall be used.
2. MEMBRANE PRESSURE VESSELS. The membranes are housed in filament wound, pressure vessels.
3. REVERSE OSMOSIS HIGH PRESSURE PUMP. A centrifugal pump with a body of 316 SS should be used. All internally wetted parts are 316 SS to eliminate corrosion problems. The pump is to be powered by a HP Totally Enclosed Fan Cooled (TEFC) motor.



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RO System	Permeate flow rate	:	3.0 cum/hr
R O SYSTEM Feed pump			
Type	:		Horizontal, Centrifugal, Monoblock
Service Flow	:		5 m3/hr
Make	:		Sharp or eqt
Motor	:		1 hp
Acid Dosing System			
No of Tank	:		1 no
Material of Tank	:		HDPE
Volume of Tank	:		100 litres
No of dosing pump	:		1 no
Anti oxidant dosing system			
No of Tank	:		1 no
Material of Tank	:		HDPE
Volume of Tank	:		100 litres
No of dosing pump	:		1 no
Anti Scalent dosing system			
No of Tank	:		1 no
Material of Tank	:		HDPE
Volume of Tank	:		100 litres
No of dosing pump	:		1 no
Dosing rate	:		0-6 lph
Micron Filter			
CAPACITY	:		5 m3/hr
Micron Size	:		5 MICRON
Cartridge type	:		P P
MOC housing	:		SS 304
Operating pressure	:		3 kg/cm2
High pressure pump			
Quantity offered	:		1 no
Service Flow	:		5 m3/hr
Make	:		Grundfos
Motor	:		5 hp
RO Block			
Quantity offered	:		1 no
Feed rate	:		5 cum/hr
No of membrane	:		3 nos-8'dia x 40 long
Type of membrane	:		Composite polyamide
Make	:		Hydranatics
No of pressure tubes	:		1
Foundation for equipment	:		as per requirement
D. PIPING			

All piping should be Schedule 80 PVC on low pressure side, 316 stainless steel on high pressure side or spiral reinforced transparent PVC hose or specially qualified thermoplastic tubing of food grade. The arrangement of piping and valves should be for ease of service and operation. Cleaning connections are to be provided for flushing. Valves are to be provided for cleaning operations.



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E. MEMBRANE CLEANING SYSTEM

One tank to be provided to facilitate flushing, cleaning and preservation of membranes. The system to be fitted with selector valves, flowmeter and control panel.

F. VALVES

All valves are to be PVC or bronze Ball, Ballcheck, Swingcheck or diaphragm valves. The high pressure regulating valves are 316 SS Needle/Regulating Valves. All PVC valves are to be true-union, except where open-ended, which are single-union. An automatic solenoid diverter valve is to be provided on the product to storage/waste line, to ensure that only the highest quality water is routed to the vessel's storage tanks.







G. PRESSURE

1. Pressure gauges are to be provided on the water supply line, in order to monitor unit operations. These gauges are 316 SS (tube and socket) and glycerine filled. The booster pump supply pressure and R/O feed gauges are to be panel mounted.
2. Pressure gauges are to be panel mounted and indicate the pressure at the outlet of the pressure pump.

H. FLOW INDICATORS

Flow meters to be provided the flow of the reject brine and product in order to monitor unit operations. These are to be panel-mounted.

Instruments

-  transmitter to measure and control the flow of product & reject
-  Pressure gauges of SS 316 (Glycerin filled)
-  Panel mounted conductivity meter
-  Pressure switches to control pressure given high / low pressure trip..
-  ORP with dump valve
-  PLC :Siemens/Allen-Bradley make

I. STRUCTURAL FABRICATION

The Reverse Osmosis unit including the controls, pump and motor drive assembly, control center and membrane pressure vessels are to be skid mounted on steel frames which are coated with a corrosion resistant paint.

J. CONTROL CENTER

A centralized control console to be provided be provided which will control operation of:

- Reverse Osmosis system and controls, etc.
- Ancillary components
- PLC Operation



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The controls are housed in a NEMA 4 enclosure. Local controls and conduit are to be rated NEMA 4. This means that all electrical controls are to be moisture isolated for a high level of safety.

The details of PLC ,The PI schematics should be submitted (the ref schematics is provided Annexure I)

K. MOTORS

All motors are to be Epoxy Coated and TEFC and energy efficient.

L. SAFETY DEVICES

Process monitoring devices are to be provided to prevent damage of components due to process upsets.

1. The pressure pump is to be protected from low suction conditions by a vacuum switch on the suction side of the pump.
2. The pressure pump is to be protected from high discharge pressure by a stainless steel pressure switch on the pressure side of the pump.
3. The system is to be protected from overpressure by 316SS relief valves at the outlet of the pressure pump.
4. The product salinity content is to be monitored by a conductivity controller which indicates product quality. Upon deviation from the pre-set (high conductivity) point, any high salinity product water is automatically diverted to waste, via a 3-way activated valve, and red warning light illuminated which continues to operate until the product water returns to adequate quality. The set point on the controller is adjustable.
5. All electrics are NEMA 4 or better - splash resistant.

The Ceramic membrane filtration system has an out put SDI less than 4 and will be sent to Permeate tank

M. AUTOMATION

The following automatic features are provided with this system:

1. All system sensors and shut-down relays previously described are operational in the automatic mode.
2. All ancillary process related equipment shall be automatically switched "on" with plant start up.

Electrical work

The following are the list of electrical works that will be carried out by the supplier.
Control and wet panel, Control cables,Cable trays & accessories, Earthing.

To be provided:

- a. Overall dimension of the equipment.
- b. Working space, space for maintenance and upkeep and machine margin space required.
- c. Total connected load to the equipment in kW.
- d. Environmental conditions for safe operation.



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- e. Set of minimum spares required and to be maintained in our inventory.
 - f. Tools & tackles to be provided by BHEL for Erection & Commissioning and for routine operation.
 - g. Safety features incorporated.
 - h. Any other requirement
- Any other equipments / accessories for integration to BHEL ceramic membrane based filtration system

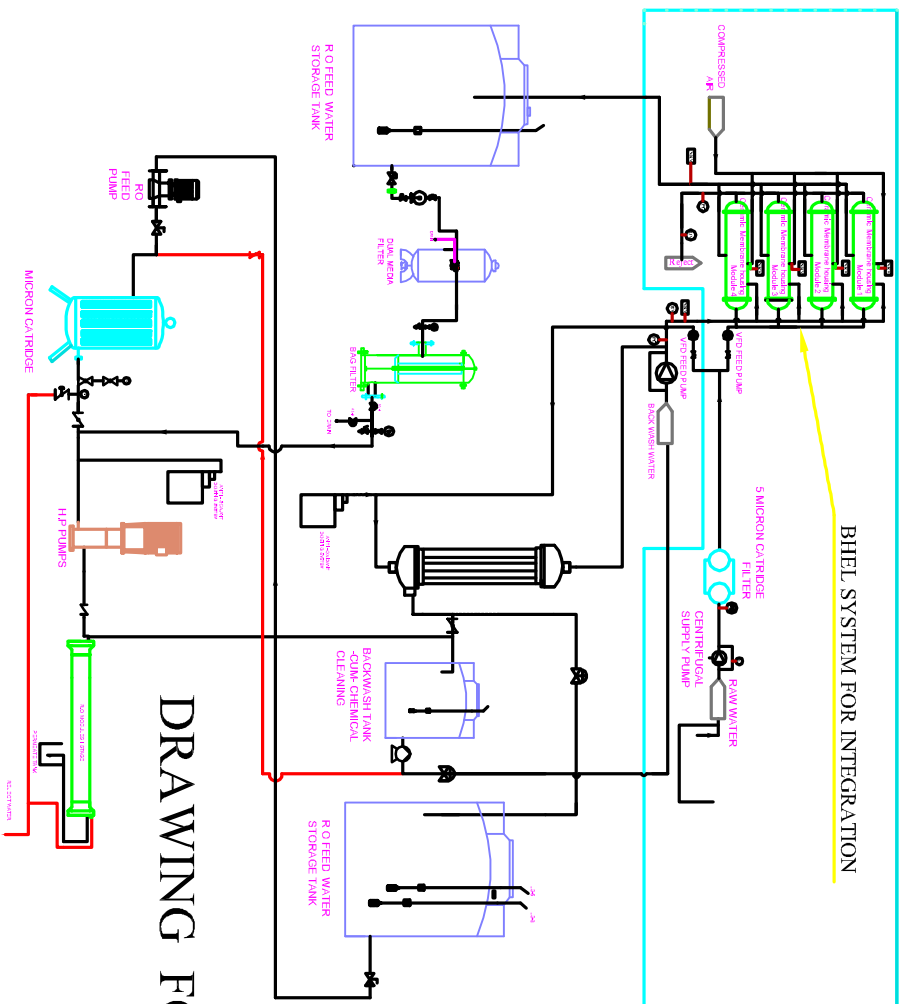
For any technical clarification the following personals may be contacted

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DRAWING FOR REFERENCE ONLY

REV	DATE	ALTERED	REV	DATE	ALTERED
		CHECKED			CHECKED

		BHARAT HEAVY ELECTRICALS LTD., ELECTRO-POWER PLAINS DIVISION BANGALORE - 560 012		NAME		SIGN		DATE	
DRN		S R C							
GAD		G S							
APPRO		G S							
REF TO ASST.DRNG									
DEPT		GRADE		WGT		QTY		ITEM	
TOL. DIM				N T S		SCALE		NO. OF	
								ITEMS	