



Republic of Maldives

Ministry of Environment and Energy

**Provision of Water Supply Facilities in R.
Ungoofaaru and Sh. Milandhoo, Maldives**

Section 6-B

Specification For Reverse Osmosis Plant

Part 5 - Ha.Horafushi

May 2016

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6-B-1 Water Consumption Data:

Maximum product water requirement = 65 m³/day

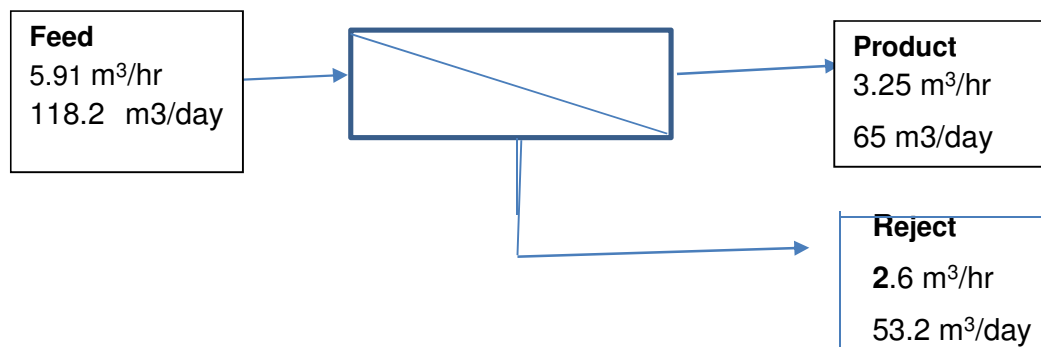
Operation = 24 hrs/day

6-B-2 Reverse Osmosis Plant Design Capacity:

Operating hours = 20 hrs/day

Operating maximum Product flow rate of the system = 3.25 m³/hr
= 65 m³/day

Recovery at RO System = 55% + 10% / - 5%



A treatment plant consisting Dual media filtration, Activated Carbon filtration, Anti scalant dosing, Micro filtration and RO membranes separation system and CIP system is proposed with necessary pumps and storage facilities.

The water feed design temperature is one of the most important parameters and membrane manufacturers give the membrane nominal production based on defined and fixed test conditions. The defined test temperature is 25 °C.

Reject

2.6 m³/hr

53.2 m³/day

Due to physical changes with temperature in some characteristics of the water, like viscosity, permeate flow or water production of a membrane could increase or decrease at a rate of 2.5% to 3% per degree of temperature, related to 25 °C (other parameters remaining constant, i.e. salinity, pressure, pH and recovery ratio). By the temperature to be adopted in this design, the production should be guaranteed. The design temperature considered for this RO plant shall be 30 °C.

6-B-3 Treatment Processes/ Equipment

6-B-3 -1 FILTER FEED PUMP:

A centrifugal feed pump having 5.91 m³/hr discharge capacity should be installed to pump the raw water through the pre-filtration units and deliver the feed flow to the RO unit.

Quantity : One No (Duty)

Type : Centrifugal end suction (either horizontal or vertical)

Bidder Has to Provide Following Data

Make :

Model :

Material of Construction :

Power :

Duty point :

Inlet/ outlet :

Raw water should be pumped to the RO pre-treatment system from the 20 m³ GRP storage tank supplied by the Bidder.

6-B-3-2 MEDIA FILTRATION SYSTEM:

This filter should work in automatic mode, manufactured in GRP/ FRP, designed and tested at 10 bar_g pressure. The main characteristics of the media filtration system should be as listed below:

No. of Filters : One (Duty)

Bidder has to Submit Following Data

Filter Diameter :

Filter Height

Make/ Model

Media : Graded sand

Material of Construction : GRP/ FRP

Operation : Automatic

Graded sand should be available locally and product certificate for particle size distribution and uniformity shall be furnished by the contractor.

6-B-3-3. ACTIVATED CARBON FILTRATION SYSTEM:

The water pumped through the media filter shall feed the activated carbon filter. This filter should work in automatic mode, manufactured in GRP/ FRP, designed and tested at 10 bar_g pressure.

The main characteristics of the activated carbon filtration system should be as listed below:

No. of Filters : One (Duty)

Bidder Has to Submit Following Data

Filter Diameter :

Filter Height

Make/ Model

:
:

Media : Granular Activated Carbon ASTM 12x30

Iodine number > 1,100

Material of Construction : GRP/ FRP

Operation : Automatic

Granular activated carbon should be available locally and manufacturer's product certificate

for particle size distribution, moisture, ash, pH, surface area and iodine adsorption number shall be furnished along with the bid.

6-B-3-4. CHEMICAL DOSING SYSTEM

The feed water must be chemically treated to avoid scaling on the surface of the membrane and to avoid oxidants attack over the membrane. The chemical pre-treatment will be composed of:

6-B-3-4.1. Antiscalant Dosing System

Quantity : One.

Accessories. : Injection valve, Foot valve, Tubing

Dosing Tank : One No, HDPE/GRP

Capacity : 500 l

Dosing pump : One No, Data

Bidder has to submit following

Make/ Model :

Antiscalant proposed :

Dosage : mg/l

Antiscalant quantity : kg/year

Price of antiscalant : Rs/kg

6-B-3-5 . MICRO FILTRATION

The water, chemically conditioned, feeds to the micro (safety) filtration. This filtration retains the particles which could leak through the filters or which are introduced with the chemical product, protecting the high pressure pumps and the membranes. This micro filtration is composed of one primary cartridge system.

6-B-3-5-1 Primary Safety Filtration

Quantity : One.

Bidder has Submit following Data

Number of cartridges :

Length of cartridge :

Type of cartridge :

Make/ Model :

6-B-3-6 . HIGH PRESSURE PUMPING

The conditioned and filtered water comes to the HP pumping system, which pumps it to the RO membranes.

Bidder has to submit following Data

High pressure pump : One No

Make :

Model :

Material of construction : All wetted parts SUS304

Power :

Duty point :

Inlet/ Outlet :

6-B-3-7. RO MODULE:

The single pass RO should produce 65 m³/day of permeate working 20 hours per day. These membranes should have a high chemical resistance in pH range from 2 to 12 which allows easy clearing and recovery because a wide variety of chemical products can be used. These membranes should be mounted into pressure vessels.

The permeate water from each pressure vessel should be collected where water flow and quality are controlled. A valve for permeate sampling will be installed at the outlet of each vessel.

Rotameters shall be provided for permeate and reject streams. Low pressure switch to be provided on the suction side of the high pressure pump. The system should be protected against dry run. Inlet solenoid valve/ flush solenoid valve and pressure regulator shall be provided and Pressure gauges are necessary to identify all differential pressures across the treatment plant. Treated water on-line electrical conductivity (or TDS) meter shall be installed. Preference will be given for original membrane manufacturers submitting RO plant simulation with feed data, water balance, array data and chemical dosing data for the proposed design.

The original membrane manufacturer should be also available for fully fledged technical services during the bid negotiation, project implementation and also providing after sales services for this project.

RO original membrane manufacturers letter of authorization for the bid requirement should be submitted along with the bid.

Number of membranes :

Bidder Has to Submit Following Data

Make : Hydranautics/ Filmtec/ GE

Type :

Model :

Material of construction :

Number of pressure tubes :

Make :

Material of construction :

This process should possess a salt rejection rate of 96% – 99%. This system shall consist of MSEP/ SUS304 pe-fabricated skid for mounting of high-pressure tubes [pressure vessels] assembled with RO membrane elements. Basic desalination of

feed takes place in RO skid. A PLC based control system shall be proposed for the total treatment system.

6-B-3-8. CIP SYSTEM:

The cleaning system consists of a tank to prepare the cleaning solution and a multistage stainless steel centrifugal pump with necessary instrumentation and controls.

Number of tanks : 1

Volume : 6000 litres

Number of pumps : 1

Bidder Has to Submit Following Data

Make :

Material of construction : All wetted parts SUS304

Power :

Duty point :

Inlet/ Outlet :

A suitable micron filter, rotameter, pressure gauge, flexible connections, pre-wired and plumbed skid mounted CIP system shall be proposed.

6-B-3-9. UV PURIFIER:

Bidder has to Submit Following Data

Number of lamps :

Make :

Type :

Model :

Material of construction :

6-B-3-10. EQUIPMENT INSTRUMENTATION AND CONTROL

All instruments required to monitoring the below listed parameters should be installed and connected to the control system.

- 9.1. Rotameters:
- 9.2. Conductivity meter:
- 9.3 Flow switches:
- 9.4 Pressure regulator:
- 9.5 Solenoid valves:
- 9.6. Level switch/ controllers:
- 9.7. Flow control Valves:
- 9.8 Sampling valves:
- 9.9. Pressure gauges:
- 9.10. PROGRAMMABLE CONTROLLER (PLC)
- 9.11. RO Controller MIMIC panel

6-B-3-11. POWER SUPPLY:

230 VAC, 50 Hz, 1 ph
Control Panel : IP 55, MSPC

6-B-3-12. PLUMBING:

HP - uPVC PN16
LP - uPVC PN6

6-B-3-13. REJECT WATER DISCHARGE/ DISPOSAL:

The method of disposal of reject water shall be elaborated with attached drawings.

6-B-3-14. High Lift Distribution Pumps

A centrifugal pump having 3.76 KW capacity should be installed at pump house to supply water to distribution lines.

Quantity : Two No (One Duty, One Stand by)

Type : Centrifugal end suction (vertical)

Bidder Has to Provide Following Data

Make :

Model :

Material of Construction :

Power :

Duty point :

Inlet/ outlet :

6-B-3-15. Post Chlorination Dosing Pumps

A centrifugal pump having capacity to pump Chlorine to 500 m3 Capacity retention time) Clear Water Tank.

Quantity : One No (Duty)

Type : Centrifugal end suction (vertical)

Bidder Has to Provide Following Data

Make :

Model :

Material of Construction :

Power :

Duty point :

Inlet/ outlet :