

**3 ALTERNATIVE PROPOSALS  
 FOR SEA WATER DESALINATION PLANTS**

**1.. DESIGN CRITERIA:**

**CHEMICAL VALUES OF RAW INPUT WATER**

Table.1 Chemical analysis values of raw water

Parameters	Unit	Raw Water Values
pH	-	7,2
Turbidity	NTU	< 5
TSS	ppm	< 5
TDS	ppm	< 48000
Oil & Grease	ppm	0

**CHEMICAL VALUES OF TREATED WATER**

According to above feed water parameters, Purified water shall meet the below parameters :

Table.2 Chemical analysis values of treated water.

Parameters	Unit	Permeate Water Values
pH	-	6,5 – 7,5
TDS	ppm	< 500

\* RO : Reverse Osmosis Unit is designed according to the above parameters. Permeate quantity and quality may vary according to the real situation.

## REVERSE OSMOSIS DESIGN LIMITATIONS

Description	Value
Inlet Pressure	4 bar
Max Iron, Manganese, Aluminium	< 0,02
Bacteriological Growth	None
Organic Matter	None
Hydrocarbons, Oil or Grease	None
Hydrogen Sulphite	None
Ba, Sr, F	< 3
Max Feed Water SDI	< 1
Max Feed Water NTU	< 5

## 2.. PROCESS DESCRIPTION:

### Chlorine Dosing Unit

Automatic chlorine dosing is carried out inside the raw water tank; this is necessary especially for oxidising organic matters (ammonia and nitrite), ions like iron and manganese and for microbiological disinfection of well waters.

### Sand Filters

Sand filters are used for removal of particles bigger than 20 microns. Sand filters also protect other treatment units from destructive particles. Filter back-wash is performed on timer control and removed particles are discharged by draining.

### Reverse Osmosis System

#### Antiscalant Dosing Unit

At the influx side of reverse osmosis units, antiscalant is dosed to prevent cloggings caused by settling of ions inside raw water.

#### Automatic SMBS Dosing Unit

If the residual chlorine in raw water reacts with the membranes, the hydrolysis of the membranes happens and damages the membranes irreversibly. Sodium-metha-bisulphite (SMBS) is dosed to protect membranes from chlorine. SMBS dosage is performed automatically. Adequate dosage is done by measuring the chlorine level in water.

#### Reverse Osmosis System

Pre-treated water becomes ready to drink or use at processes by desalination with a ratio of 98 – 99 % with reverse osmosis unit. At the inlet of the system water passes from 5 micron sized cartridge filters for protecting membranes. After cartridge filter, water is pumped to membranes by a high pressure pump. With high pressure pump, the reverse of natural osmosis takes place and water desalinates by taking ions. By flushing unit on reverse osmosis unit, ions settled on membrane surface can be cleaned.

### **Membrane Flushing and Chemical Cleaning Unit**

When the system stops automatically or manually, cleaning with water must be done for flushing the surface for preventing the clogging due to settling of ions inside the water in membrane housings. Depending on the raw water quality, when the membrane performance and output water quality begin to decrease, chemical cleaning must be done. Membrane cleaning procedure is carried out to prevent membrane clogging and to prolong the membrane life.

### **Manual Dolomite Filter**

For using reverse osmosis effluent as drinking water, some minerals must be added to the water. Dolomite filters are used for this purpose. These filters work manually without backwash process.

### **Ultraviolet System**

Ultraviolet unit is used for killing the viruses, bacteria and microorganisms which may exist in output water. Disinfection occurs with ultraviolet lights and kills all microorganisms.

## **3.. RESPONSIBILITIES OF THE MANUFACTURER & CONTRACTOR :**

- Process design and detailed engineering of the Desalination Plant
- Supplying all units and mechanical and electrical equipment of the system exworks Istanbul
- Providing operation manuals for start-up, operation, and repair & maintenance
- Start-up service if requested
- Training and seminars

## **4.. RESPONSIBILITIES OF THE USER / CLIENT :**

- Electrical power supply to the main control board
- Supply of input (raw) water
- Installing the drainage piping
- Supply of all water storage tanks
- Transportation of the Desalination Plant Equipment from Istanbul to the construction site
- Providing lifting and handling machines such as crane and forklift
- Local unskilled labour for installation and commissioning work
- For our start-up and installation supervisors, traveling-visa, accommodation and food expenses
- For training course, travel, accommodation and food expenses
- Other necessary administrative, official and technical support and assistance necessary to start-up the Plant Equipment

## 5.. PRICES & COMMERCIAL CONDITIONS

	CAPACITY	QTY	PRICE USD	DELIVERY PERIOD	DELIVERY TERMS
1	250 m <sup>3</sup> /day (250.000 lt) Sea Water Reverse Osmosis System For a Town of 5000 people	1 set	237.900	16 – 18 Weeks*	Ex works istanbul
2	500 m <sup>3</sup> /day (500.000 lt) Sea Water Reverse Osmosis System For a Town of 10.000 people	1 set	475.800	16 – 18 Weeks*	Ex works istanbul
3	1000 m <sup>3</sup> /day (1.000.000 lt) Sea Water Reverse Osmosis System For a Town of 20.000 people	1 set	888.600	16 – 18 Weeks*	Ex works istanbul

\*\* This period begins after approval of our detailed engineering documentations by the Client and may change depending on the pump delivery times.

### TERMS OF PAYMENT

50 % cash transfer upon proforma invoice, 45 % cash before shipment. 5 % cash after start-up within 3 weeks. Or 100 % Letter of Credit, irrevocable and sight LC.

### INSTALLATION & START-UP CONDITIONS

We will charge for 4 technicians/engineers for installation and start-up operations of the Desalination Plant on site. We plan total installation time as 7-10 days (excluding flight days). This period may vary according to the site conditions.

Client is to pay for traveling-visa and flight tickets, accommodation and food expenses for our technical personnel during site works. Start-up fee is 300 USD/day per person. This amount will be invoiced to our clients before the site visit.

### GENERAL STATEMENTS

We may change the design and specs (quantity, size, capacity, dimensions etc) according to our own know-how and past experience without any advance notice to our clients.

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