

1. SCOPE OF SUPPLY

We offer to design, manufacture, supply for the BWRO Reverse Osmosis Demineralization Systems.

2. DESIGN BASIS

2.1. Raw water analysis. (No analysis report given by client. The following values are assumed values)

PARAMETER	UNIT	RAW WATER ANALYSIS	EXPECTED RO PRODUCT WATER ANALYSIS
Ph		7,0-7,5	
Conductivity	µs/cm	500 - 2000	
TDS	ppm	250 - 1000	
Turbidity	NTU	<1	
Total hardness	Fr	<25	
Calcium	Mg/l		
Magnesium	Mg/l		
Sodium	Mg/l		
Potassium	Mg/l		
Chloride	Mg/l		
Sulphate	Mg/l		
Nitrate	Mg/l		
Bicarbonate	Mg/l		
Iron	Mg/l	<0,03	
Manganese	Mg/l	<0,02	
Silica	Mg/l Si	<25	
TOC Total organic carbon	Mg/l O ₂	<1	
Boron	Mg/l	<0,1	

2.2. Reverse osmosis systems design criteria

Recovery	%50-60
Inlet water pressure	2-5 bar
Inlet water design temperature	25 °C
Inlet water pH range	2-11
Max. inlet water turbidity	1 NTU
Max. inlet water SDI (@15 °C)	3
Max. raw water TDS	<1.000 mg/l
Max. working pressure	300 PSI
Silica	<25 mg/l
Free chlorine and other oxidant materials	None
Max. allowable iron, manganese, aluminium concentration	<0,05 mg/l
Organic material concentration (TOC, BOD, COD)	None
Hydrocarbons, oil & grease	None
Hydrogen sulfide H ₂ S	None

3. PROCESS DEFINITION

Reverse Osmosis (RO) uses a specialized membrane material that is selective about what it allows to pass through, and what it prevents from passing. The RO membranes pass water very easily because water has a small molecular size, but membranes stop many other contaminants from passing through. Only water and small non-ionized (or non-charged) molecules are allowed to pass through. RO has become very popular for water purification applications due to its ability to remove both suspended and dissolved impurities without the need for regenerant chemicals.

Reverse Osmosis is a process that separates impurities from water by passing the water through a semipermeable membrane. The semipermeable membrane only allows very small atoms and groups of atoms such as water molecules, small organic molecules, and gases, to go through it. Hydrated ions, or ions that have been dissolved and are therefore surrounded by water molecules, cannot pass through the membrane.



4. WATER TREATMENT SYSTEM EQUIPMENT

4.1.-TRAILER TYPE BWRO SYSTEM-

4.1.1. ATLAS HYDRA AUTOMATIC BACKWASH SCREEN FILTER

-(TRAILER BWRO PLANT)

It will be used to remove any sediments that may be present in the raw water.

Brand	: Atlas / İtalya
Model	: Hydra
Nominal flow rate	: 6 m ³ /h
Body material	: Plexiglass
Filter material	: SS304 Stainless Steel
Filtration size	: 90 micron
Connections	: 1"
Backwash	: Automatic



4.1.2. MF-80/P13 AUTOMATIC MULTIMEDIA SAND FILTER

-(TRAILER BWRO PLANT)

Model	: MF 80/P13
Quantity	: 1 nos
Flowrate	: 1,08 m ³ /h (Vbed= 12,7 mt/h)
Backwash flowrate	: 2,57 m ³ /h
Piping	: 1"
Inlet / Outlet	: 1"
Working pressure	: 2 – 6 bar

Maximum inlet water temperature	: 45 C
Energy requirement	: 220 V-50 Hz
Filter tank material	: FRP composite
Filter tank dimensions	: Ø=350 mm, H=1350 mm (13" x 54")
Filter material quantity	: 55 kg Quartz Filter Sand 25 lt Anthracite
Valve system	: Runxin (Optional: Clack/USA)
Regeneration control	: Automatic timer control



4.1.3. CF-80/P13 AUTOMATIC ACTIVATED CARBON FILTER

- (TRAILER BWRO PLANT)

Model	: CF 80/P13
Quantity	: 1 nos
Flowrate	: 1,08 m ³ /h (Vbed= 12,7 mt/h)
Backwash flowrate	: 2,57 m ³ /h
Piping	: 1"
Inlet / Outlet	: 1"
Working pressure	: 2 – 6 bar
Maximum inlet water temperature	: 45 C
Energy requirement	: 220 V-50 Hz
Filter tank material	: FRP composite
Filter tank dimensions	: Ø=350 mm, H=1350 mm (13" x 54")
Filter material quantity	: 15 kg Quartz Filter Sand 35 kg Activated Carbon-Coal based (Optional: Coconut Based Active Carbon)
Valve system	: Runxin (Optional: Clack/ USA)
Regeneration control	: Automatic timer control



4.1.4. ANTISCALANT DOSAGE PUMP - (TRAILER BWRO PLANT)

Brand	: SEKO
Model	: On/off
Quantity	: 1 nos.
Capacity	: 0,6 lt/h @ 7 bar
Chemical tank	: 100 Lt PE tank
Accessories	: 1 PE storage tank



4.1.5. R-403 REVERSE OSMOSIS SYSTEM

- (TRAILER BWRO PLANT)

Quantity	: 1 nos
Feed water flowrate	: 1,08 lt/hour
Capacity	: 650 lt/hour
Recovery	: %60



5 MICRON PRE-FILTRATION

Quantity	: 1 nos.
Cartridge type	: Polypropylene
Cartridge quantity	: 1 nos – 20"
Filtration range	: 5 micron
Housing material	: PVC

HIGH PRESSURE PUMP

Brand	: CNP or equivalent (Optional: LOWARA / GRUNDFOS)
Model	: Centrifugal pump
Quantity	: 1 nos.
Capacity	: 1,08 m ³ /h @11 bar
Pump material	: AISI304 stainless steel



MEMBRANE ELEMENTS

Brand / Model	: TECHFLOW {OPTIONAL : LG}
Quantity	: 3 nos. 4040 membrane element
Membrane type	: Thin Film composite
Configuration	: Spiral wound, fiberglass outer wrap
Maximum applied pressure	: 41 bar
Recommended Operating Temperature	: 2-45 C
Feedwater pH Range	: 2-11
Chlorine Tolerance	: <0,1 ppm
Minimum Brine Flow / Permeate Flow Ratio	: 5/1
Maximum SDI (15 minutes)	: 5.0
Maximum Turbidity	: 1 NTU



MEMBRANE PRESSURE VESSELS

Model	: 1x4040 elements/ea.
Quantity	: 3 nos
Material	: FRP
Design operating pressure	: 21 bar (300 PSI)
Maximum operating temp.	: 49 C



FLOW METER

Brand	: LZS (Optional: GF+)
Quantity	: 2 nos. (RO product line + RO reject line)



CONDUCTIVITY METER

Model	: Digital (Optional: GF+)
Quantity	: 1 nos. (RO product line)



PRESSURE SWITCH

Brand	: Lefoo (Optional: KELLER 4 – 20 mA)
Quantity	: 2 nos. (High pressure pump inlet + outlet)

LOW PRESSURE PIPING

Material : PVC

HIGH PRESSURE PIPING

Material : PVC {OPTIONAL : SS304 Stainless steel}

Valves

5 micron inlet	(1)
5 micron outlet	(1)
High pressure pump suction	(1)
High pressure pump outlet	(1)
Reject line	(1)
Reject flush line	(1)

CONTROL PANEL

Electronic card based control panel will be used to control working conditions of the reverse osmosis system. **(Optional: PLC based RO control panel)**

4.1.6. CHLORINE DOSAGE UNIT- (TRAILER BWRO PLANT)

Brand	: SEKO / Italy
Quantity	: 1 nos.
Capacity	: 0,6 lt/h @ 7 bar
Chemical tank	: 100 Lt PE tank
Accessories	: 1 PE storage tank



4.1.7. UV-505 DISINFECTION UNIT

-(TRAILER BWRO PLANT)

Model	: UVS-505 PRO
Max. Flowrate	: 5 m ³ /hour
Max. pressure	: 8 bar
Material	: AISI304 stainless steel
Dimensions	: 95 x 60 x 950 mm
UV lamp	: 1 nos.
Energy	: 220 V, 65 W
Piping	: 1"
Time of life of lamp	: 9000 hours



4.1.8. RM80/P13 REMINERALIZATION FILTER

-(TRAILER BWRO PLANT)

Model	: Remineralization Filter RM-80/P13
Quantity	: 1 nos
Flowrate	: 1 m ³ /h (V _{BED} ~12 mt/h)
Piping	: 1"
Working pressure	: 2 – 6 bar
Maximum inlet water temperature	: 45 C
Energy requirement	: 220 V-50 Hz
Filter tank material	: FRP composite
Filter tank dimensions	: 13"x 54"
Filter material quantity	: 80 lt dolomite mineral
Valve system	: Manual control valve



4.1.9. TRAILER - (TRAILER BWRO PLANT)

- Trailers are in the dimension of 190 cm (Width) x 300 cm (Depth) X 200 cm (Height)
- Double axle with torsion brake system.
- The inner side walls will be insulated with 4 cm polystyrene material.
- Brake Coupling
- Safety Steel Wire
- Trailer front support Wheel
- 12V LED signaling system
- Galvanized full-size subframe
- Interior floor Marine type baseboard (18mm)
- Curved front panel
- Support feet at the front and rear corners.
- Front Box
- 7,5 kVA Diesel Generator
- Ceiling lighting in the interior
- Spare tire



*** Images are for illustrative purposes only.**

4.1.10. AIR CONDITIONING UNIT – SPLIT TYPE – (OPTIONAL)

Cooling capacity (BTU/h)	9.000
Nmbr. of indoor units	1
Heating type	Heat-Pump



4.2. -2 M3/H CONTAINERIZED BWRO REVERSE OSMOSIS SYSTEM-

4.2.1. ATLAS HYDRA AUTOMATIC BACKWASH SCREEN FILTER

It will be used to remove any sediments that may be present in the raw water.

Brand	: Atlas / İtalya
Model	: Hydra
Nominal flow rate	: 6 m³/h
Body material	: Plexiglass
Filter material	: 316 Stainless Steel
Filtration size	: 90 micron
Connections	: 1"
Backwash	: Automatic



4.2.2. MF-200/P18 AUTOMATIC MULTIMEDIA SAND FILTER

Model	: MF 200/P18
Quantity	: 1 nos
Flowrate	: 3,3 m ³ /h (Vbed ~ 20 mt/h)
Backwash flowrate	: 5,2 m ³ /h
Working pressure	: 2 – 6 bar
Maximum inlet water temperature	: 45 C
Energy requirement	: 220 V-50 Hz
Filter tank material	: FRP composite
Filter tank dimensions	: Ø=450 mm, H _{TOTAL} =1800 mm (18" x 65")
Filter material quantity	: 115 kg filter sand 75 lt anthracite
Valve system	: Runxin (Optional: Clack / USA)
Inlet outlet	: 1"
Regeneration control	: Automatic timer control



4.2.3. CF-200/P18 AUTOMATIC ACTIVATED CARBON FILTER

Model	: CF 200/P18
Quantity	: 1 nos
Flowrate	: 3,3 m ³ /h (Vbed ~ 20 mt/h)
Backwash flowrate	: 5,2 m ³ /h
Working pressure	: 2 – 6 bar

Maximum inlet water temperature	: 45 C
Energy requirement	: 220 V-50 Hz
Filter tank material	: FRP composite
Filter tank dimensions	: $\varnothing=450$ mm, $H_{TOTAL}=1800$ mm (18" x 65")
Filter material quantity	: 80 kg Activated Carbon (Optional: Coconut Based Active Carbon) 50 kg quartz
Valve system	: Runxin - Fobrite (Optional: Clack / USA)
Inlet outlet	: 1" 1/2
Regeneration control	: Automatic timer control

4.2.4. ANTISCALANT FEED SYSTEM

Brand	: SEKO
Quantity	: 1 nos.
Capacity	: 0,6 lt/h @ 7 bar
Chemical tank	: 100 Lt PE tank
Accessories	: 1 PE storage tank

4.2.5. R-4010 REVERSE OSMOSIS SYSTEM



Quantity	: 1 nos.
Inlet Flow	: 2,85 m3/hour
Product flow	: 2 m3/hour
Recovery	: %70
Ion rejection	: %96-99



5 MICRON FILTRATION

Quantity	: 1
Cartridge type	: Polypropylene
Cartridge length	: 20"
Piping	: 1"
Filtration range	: 5 micron
Housing material	: PVC



HIGH PRESSURE PUMP

Brand / model	: CNP or equivalent (Optional: Grundfos / Lowara)
Quantity	: 1 nos.
Capacity	: 3 m ³ /h @10 Bar
Pump material	: AISI 304 stainless steel
Motor	: 380V /50 Hz



MEMBRANE ELEMENTS

Brand / Model	: TECFLOW (Optional: LG)
Quantity	: 10 nos.
Membrane type	: 4040 membranes
Configuration	: Spiral wound, fiberglass outer wrap
Recommended applied pressure	: 3-21 bar
Maximum applied pressure	: 41 bar
Recommended Operating Temperature	: 2-45 C
Feedwater pH Range	: 2-11
Chlorine Tolerance	: <0,1 ppm
Maximum SDI (15 minutes)	: 5.0
Maximum Turbidity	: 1 NTU



MEMBRANE PRESSURE VESSELS

Quantity	: 5 nos.
Model	: 2 elements /vessel
Material	: FRP
Design operating pressure	: 21 bar (300 PSI)
Maximum operating temperature	: 49 C



FLOW METER

Brand	: LZS (Optional: GF+ Signet)
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Quantity : 2 nos. (RO product line + RO reject line)

CONDUCTIVITY METER

Model : Digital (Optional: GF+ Signet)

Quantity : 1 monitor and 1 sensor (RO product line)



PRESSURE GAUGES

Type : Liquid filled

Quantity : 3 (RO pump inlet + RO membranes feed + RO reject line)

PRESSURE SWITCH

Brand : Danfoss/Denmark (Optional: KELLER 4 – 20 mA)

Quantity : 2 nos. (High pressure pump inlet + outlet)



Chassis

Material : Epoxy coated ST-37 Carbon Steel (Optional: SS304 Stainless Steel)

PIPING & VALVES

Low pressure piping

Material : PVC/PP

High pressure piping

Material : PVC/PP{OPTIONAL : SS304 Stainless steel}

Valves

5 micron inlet	(1)
5 micron outlet	(1)
High pressure pump suction	(1)
High pressure pump outlet	(1)
Reject line	(1)
Reject flush line	(1)

CONTROL PANEL

Electronic card based control panel will be used to control working conditions of the reverse osmosis system. **(Optional: PLC based RO control panel)**

4.2.6. AUTOMATIC FLUSH AND CIP CLEANING UNIT **(OPTIONAL)**

Model	: CIP-KT-4/3
Flowrate	: 6 m ³ /h
Membrane diameter	: 4"
Design pressure	: 3,0 bar
Tank material	: PE Polyethylene
Pump	: GRUNDFOS / EBARA / LOWARA
Pump material	: AISI 316 stainless steel



4.2.7. CHLORINE DOSAGE UNIT

Brand	: SEKO / Italy
Quantity	: 1 nos.
Capacity	: 0,6 lt/h @ 7 bar
Chemical tank	: 100 Lt PE tank
Accessories	: 1 PE storage tank



4.2.8. UV-505 DISINFECTION UNIT

Model	: UV-505 PRO
Max. Flowrate	: 5 m ³ /hour
Max. pressure	: 8 bar
Material	: AISI304 stainless steel
Dimensions	: 95 x 60 x 941 mm
UV lamp	: 1 nos.
Energy	: 220 V, 65 W
Piping	: 1"
Time of life of lamp	: 9000 hours



4.2.9. RM 100/P14 REMINERALIZATION FILTER

Model	: Remineralization Filter RM-100/P14
Quantity	: 1 nos
Flowrate	: 2 m ³ /h (V _{BED} ~20 mt/h)
Piping	: 1"
Working pressure	: 2 – 6 bar

Maximum inlet water temperature	: 45 C
Energy requirement	: 220 V-50 Hz
Filter tank material	: FRP composite
Filter tank dimensions	: 14"x 65"
Filter material quantity	: 100 lt dolomite mineral
Valve system	: Manual control valve



4.2.10. 20 FEET ISO CONTAINER

- (CONTAINERIZED BWRO PLANT)

- 20 Ft New container.
- Dimensions: Containers are in the dimension of 2.40 x 6.00 X 2.6.



4.2.11. SANDWICH PANEL HEAT INSULATION

The inner side walls will be insulated with 4 cm polystyrene material.

4.2.12. AIR CONDITIONING UNIT – SPLIT TYPE (OPTIONAL)

Cooling capacity (BTU/h)	12.000
Nmbr. of indoor units	1
Heating type	Heat-Pump



