


| | | | | |
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|  | Customer: | Customer reference | | Our reference |
| | Project: | Date | Issue 1 | Page 1 (19) |
| System MT-50T SRH rack mounted | Subject: Freshwater production | Enwa quotation number: | | |

Quotation


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Written by

| | | | |
|-------------------|------------------------|-------|------|
| Signature | Print name on Original | Title | Date |
| ENWA Approval | | | |
| Signature | Print name | Title | Date |
| Customer Approval | | | |
| Signature | Print name | Title | Date |
| Signature | Print name | Title | Date |

1. Intention and conditions
Intention

| | | | | |
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This quotation defines how ENWA will fulfil the customer's requirements of the equipment.

Conditions

Parameters missing in the requirement from the customer are on assignment by the customer set to average sea water freely chosen by ENWA.

Analysis- raw water before water treatment unit, table 1

| | |
|------------------|--------------|
| TDS | 35703,1ppm |
| Temp | 25°C |
| pH | 8,1 |
| SDI-index | <3 (15min) |
| Ca | 410 mg/l |
| Mg | 1310 mg/l |
| Na | 10968,5 mg/l |
| K | 390 mg/l |
| NH ₄ | 0,0 mg/l |
| Ba | 0,050 mg/l |
| Sr | 13,000 mg/l |
| CO ₃ | 16,3 mg/l |
| HCO ₃ | 152,0 mg/l |
| SO ₄ | 2740,0 mg/l |
| Cl | 19700,0 mg/l |
| F | 1.4 mg/l |
| NO ₃ | 0,0 mg/l |
| SiO ₂ | 0,0 mg/l |

Design parameters permeate/product, table 2

| | |
|-----------------------|-----------------------|
| Permeate flow, normal | 50m ³ /day |
| TDS | <500ppm |
| Temperature, normal | 25°C |

Design parameters permeate/product, table 3



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System
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RO program licensed to: Enwa
Calculation created by: *Olie
Project name: MT 50T SRH
HP Pump flow: 5,2 m3/hr
Permeate flow: 50,00 m3/d
Raw water flow: 125,0 m3/d
Feed pressure: 54,0 bar
Feedwater Temperature: 25,0 C(77F)
Permeate recovery: 40,0 %
Feed water pH: 8,1
Element age: 2,0 years
Chem dose, ppm (100%): 0,0 H2SO4
Flux decline % per year: 7,0
Salt passage increase, %/yr: 10,0
Average flux rate: 18,7 lm2hr
Feed type: Seawater - well

| Stage | Perm. Flow m3/hr | Flow/Vessel Feed m3/hr | Conc m3/hr | Flux lm2-hr | Beta | Conc.&Throt. Pressures bar | bar | Element Type | Elem. No. | Array |
|-------|------------------|------------------------|------------|-------------|------|----------------------------|-----|--------------|-----------|-------|
| 1-1 | 2,1 | 5,2 | 3,1 | 18,7 | 1,04 | 53,7 | 0,0 | SWC5 | 3 | 1x3 |

| Ion | Raw water | | Feed water | | Permeate | | Concentrate | |
|------|-----------|-------|------------|-------|----------|-------|-------------|-------|
| | mg/l | meq/l | mg/l | meq/l | mg/l | meq/l | mg/l | meq/l |
| Ca | 410,0 | 20,4 | 410,0 | 20,4 | 0,491 | 0,0 | 683,0 | 34,1 |
| Mg | 1310,0 | 107,8 | 1310,0 | 107,8 | 1,568 | 0,1 | 2182,3 | 179,6 |
| Na | 10968,5 | 476,9 | 10968,5 | 476,9 | 62,911 | 2,7 | 18238,9 | 793,0 |
| K | 390,0 | 10,0 | 390,0 | 10,0 | 2,795 | 0,1 | 648,1 | 16,6 |
| NH4 | 0,0 | 0,0 | 0,0 | 0,0 | 0,000 | 0,0 | 0,0 | 0,0 |
| Ba | 0,050 | 0,0 | 0,050 | 0,0 | 0,000 | 0,0 | 0,083 | 0,0 |
| Sr | 13,000 | 0,3 | 13,000 | 0,3 | 0,016 | 0,0 | 21,656 | 0,5 |
| CO3 | 16,3 | 27,2 | 16,3 | 0,5 | 0,008 | 0,0 | 27,2 | 0,9 |
| HCO3 | 152,0 | 2,5 | 152,0 | 2,5 | 1,408 | 0,0 | 252,4 | 4,1 |
| SO4 | 2740,0 | 57,1 | 2740,0 | 57,1 | 3,533 | 0,1 | 4564,3 | 95,1 |
| Cl | 19700,0 | 555,7 | 19700,0 | 555,7 | 101,495 | 2,9 | 32765,7 | 924,3 |
| F | 1,4 | 0,1 | 1,4 | 0,1 | 0,014 | 0,0 | 2,3 | 0,1 |
| NO3 | 0,0 | 0,0 | 0,0 | 0,0 | 0,000 | 0,0 | 0,0 | 0,0 |
| B | 4,50 | | 4,50 | | 0,742 | | 7,01 | |
| SiO2 | 0,0 | | 0,0 | | 0,00 | | 0,0 | |
| CO2 | 0,77 | | 0,77 | | 0,77 | | 0,77 | |
| TDS | 35703,1 | | 35705,8 | | 175,0 | | 59393,0 | |
| pH | 8,1 | | 8,1 | | 6,5 | | 8,5 | |

RO program licensed to: Enwa
Calculation created by: *Olie
Project name: MT 50T SRH
HP Pump flow: 5,2 m3/hr
Permeate flow: 50,00 m3/d
Raw water flow: 125,0 m3/d
Feed pressure: 54,0 bar
Feedwater Temperature: 25,0 C(77F)
Permeate recovery: 40,0 %
Feed water pH: 8,1
Element age: 2,0 years
Chem dose, ppm (100%): 0,0 H2SO4
Flux decline % per year: 7,0
Salt passage increase, %/yr: 10,0
Average flux rate: 18,7 lm2hr
Feed type: Seawater - well

| Stage | Perm. Flow m3/hr | Flow/Vessel Feed m3/hr | Conc m3/hr | Flux lm2-hr | Beta | Conc.&Throt. Pressures bar | bar | Element Type | Elem. No. | Array |
|-------|------------------|------------------------|------------|-------------|------|----------------------------|-----|--------------|-----------|-------|
| 1-1 | 2,1 | 5,2 | 3,1 | 18,7 | 1,04 | 53,7 | 0,0 | SWC5 | 3 | 1x3 |

| Stg | Elem no. | Feed pres bar | Pres drop bar | Perm flow m3/hr | Perm Flux lm2hr | Beta | Perm sal TDS | Conc osm pres | CaSO4 | Concentrate saturation levels | | | Lang. |
|-----|----------|---------------|---------------|-----------------|-----------------|------|--------------|---------------|-------|-------------------------------|-------|------|-------|
| | | | | | | | | | | SrSO4 | BaSO4 | SiO2 | |
| 1-1 | 1 | 54,0 | 0,1 | 1,0 | 26,9 | 1,08 | 102,0 | 32,2 | 27 | 54 | 254 | 0 | 1,9 |
| 1-1 | 2 | 53,9 | 0,1 | 0,7 | 17,9 | 1,06 | 134,8 | 38,3 | 34 | 67 | 312 | 0 | 2,0 |
| 1-1 | 3 | 53,8 | 0,1 | 0,4 | 11,5 | 1,03 | 173,0 | 43,5 | 40 | 79 | 365 | 0 | 2,1 |



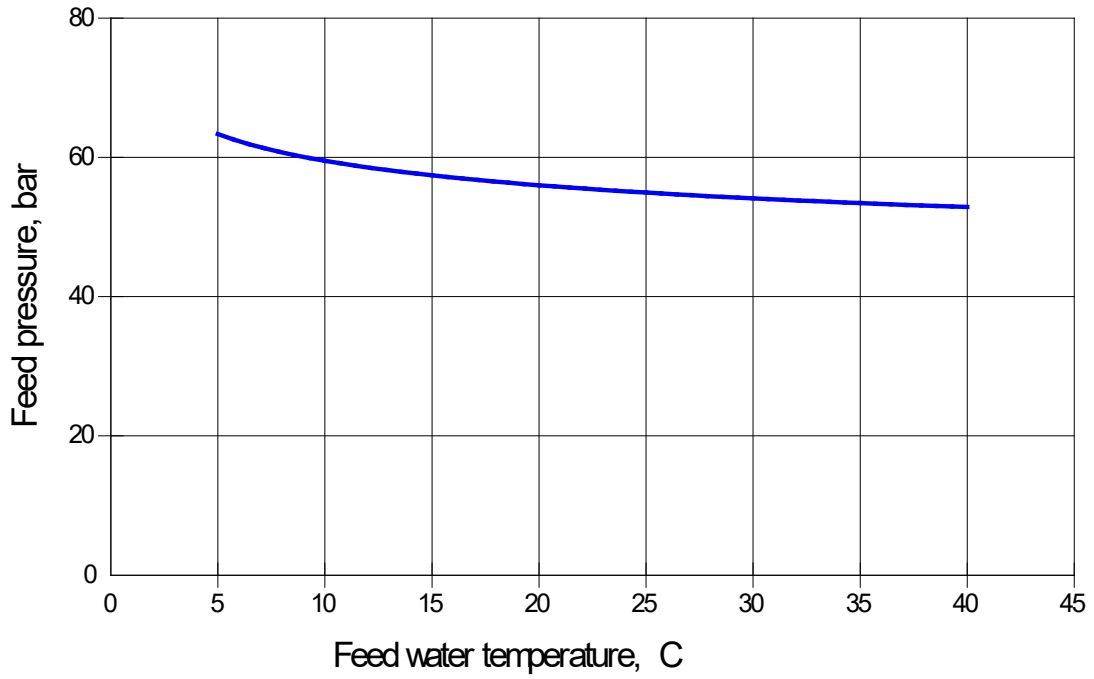
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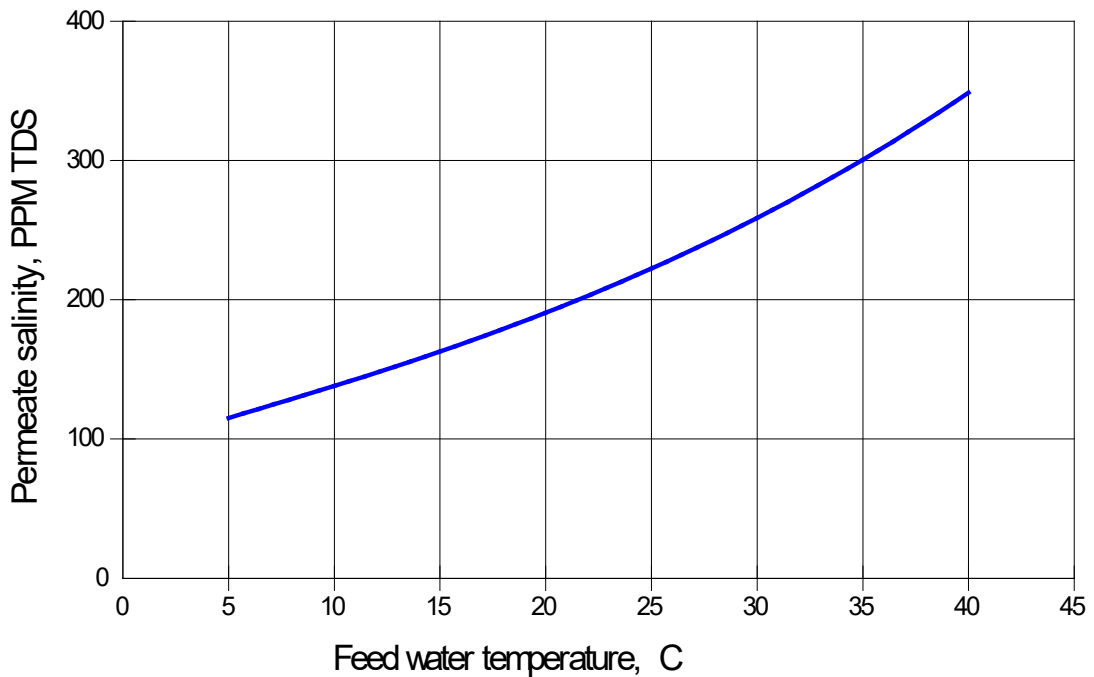
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MT 50T SRH Pressure vs temperature 2009-12-14



MT 50T SRH Salinity vs temperature 2009-12-14



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File Analysis RO Design UF Treatment Calculation Graphs Help

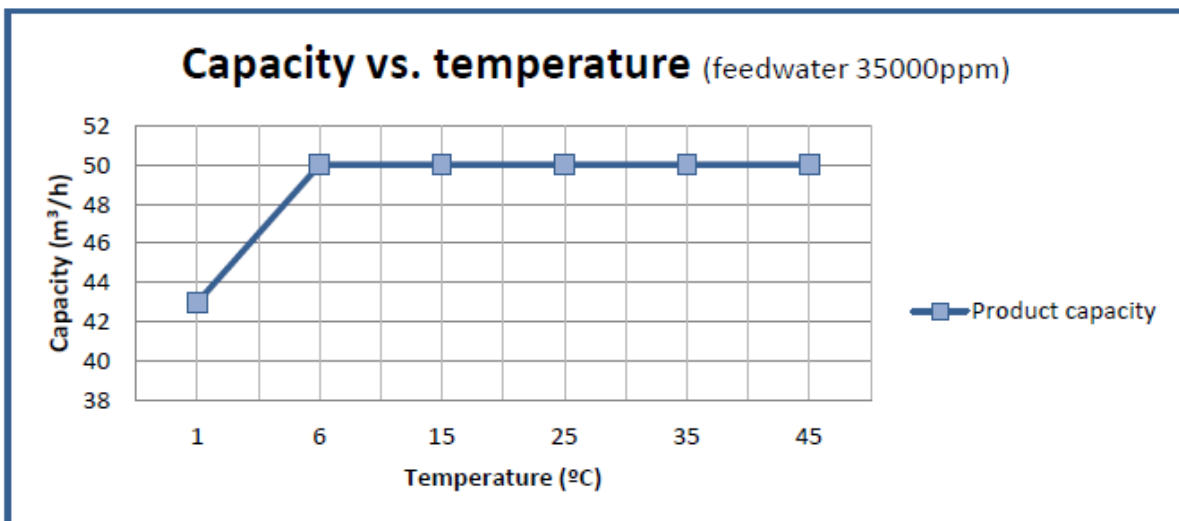
| Main | |
|----------------------|--------------|
| Feed pressure | bar 55,0 |
| Concentrate pressure | bar 54,7 |
| Permeate flow | m3/d 50,0 |
| Pump Feed Flow | 125,0 |
| Recovery ratio, % | 40,0 |
| Pump efficiency, % | 83,0 |
| Motor efficiency, % | 93,0 |
| ERT efficiency, % | 0,0 |
| ERT backpressure | bar 0,0 |
| Power/Stage/Pass | 10,1 |
| Pumping energy | kwhr/m3 5,06 |
| Pumping power | kw 10,5 |
| Recovered power | kw 0,0 |
| Power requirement | kw 10,5 |

Default values


Print Clear

Feedwater temperature

The product capacity is depending on the feed water temperature according to graph 1.



graph 1. Capacity vs. temperature

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2. Prices

We are pleased to offer you the following water treatment equipment.

This quotation includes:


| Quantity | Item description | Price each EURO | Price Total EURO |
|----------------------------------|---|-----------------|------------------|
| 1 | Water treatment unit complete assembly on a Skid, MT-50T SRH 440V/60Hz, 3-phase | | |
| 1 | Feed Pump BNM 32/160BE 440V/60Hz, 3-phase | | |
| 1 | Pre-sand filter, SA 800 TM with completely automatic backwashing. | | |
| 1 | Post mineral filter, N-80 RO | | |
| 1 | 320l cleaning tank including connections, heater and hand stirrer 440V/60Hz, 3-phase | | |
| Total price, VAT excluded | | | |

Other electrical voltages are available.

3. Options

3.1 Final adjustments at site

Personnel from supplier can make the final adjustments at site as a preparation before the run up. The condition is that the client does all necessary piping and electrical work in advance. Please ask for quotation.

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3.2 Recommended consumables for approximately one (1) year each RO unit.

| Pcs | Parts | Art. No | Price each | Price Total |
|-----|--|---------|------------|-------------|
| 48 | pre-filters 20" 5 microns | 10256 | | |
| 1 | Active Carbon Cartridge 10" 5 microns | 10305 | | |
| 1 | MT 5-300 preservation chemicals | 17426 | | |
| 2 | MT 11-300 cleaning chemicals, alkaline | 17427 | | |
| 2 | MT 20-300 cleaning chemicals, acid | 17428 | | |
| | | | | |

Note 1 number of pre-filters 20" 5 micron that is consumed is depending on the quality of the raw water.

3.3 Recommended spare parts for approximately one (1) year each RO unit.


| Pcs | Parts | Art. No | Price each | Price Total |
|-----|--|---------|------------|-------------|
| 2 | O-rings for BB 20" pre filter | 12907 | | |
| 1 | O-ring for 10" carbon cartridge filter | 12906 | | |
| 1 | Permeate port with O-ring | 17080 | | |
| 1 | Pressure switch 0,35-2bar | 13562 | | |
| 1 | Conductivity cell | 13560 | | |
| 1 | Seal kit CAT 3531 | 17437 | | |
| 2 | Valve kit (3 pcs) note 6 pcs per pump | 17438 | | |
| 1 | Seal kit for feed pump BNN 25 & 32/160BE | 16807 | | |
| 3 | V-Belts, XPA 1600 for 50Hz | 17381 | | |
| | or XPA 1582 for 60Hz | 17347 | | |
| | | | | |

4. Commercial conditions

Validity

The quotation is valid for three (3) months from today's date.

Guarantees and responsibilities

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Mechanical guarantee: 18 months for material and workmanship from delivery date or 12 months from date of commissioning whichever comes first. Consumable parts are not included.

The storage time for the RO-unit is maximum 12 Months from the FAT date due to the conservation of the membranes.

The guarantees and responsibilities are based on the analysis and conditions attached in this quotation. The vendor cannot be held responsible for any kind of incidents caused by other conditions than the one stated in this quotation.

The validity of the guarantee implies on operation/maintenance/installation and general care of the equipment in accordance with instructions stated and forwarded in the operation manual by ENWA.

Payment conditions

To be discussed

Terms of delivery

Sweden, according to Incoterms 2010

Delivery time conditions


Eight (8) to ten (10) working weeks.

5. Technical specification

5.1 General Description ENWA RO unit MT-50T SRH

MT-50T SRH is a single pass RO unit where dissolved solid continuous separate from the raw water. MT 50T SRH single pass type of unit produces permeate water from raw water without chemicals involved. The units produce 50m³ with a TDS of 35703,1 of permeate water per day (24h). Pre-treatment, reverse osmosis components, cleaning equipment, post treatment and control system are mounted on steel skid or integrated feet.

The control system measures the quality of the produced water continuously and will dump to waste if quality is poor. The unit has automatic freshwater flush to prevent biological growth. The design is optimized to meet the demands of efficient service and maintenance.

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5.2 Capacity, consumption and utility data

The capacity is calculated for desalination of 50m³ of fresh water per day (24h) with an average TDS according to table 1.

| Connection | Type | Size | Pressure | Consumption | Note |
|----------------------------|-------------------------|---------------------|-----------|---|------|
| 1. Feed water pump in | DIN flange | DN50 | | | |
| 2. Feed water pump out | DIN flange | DN32 | | | |
| 3. Feed water media filter | DIN flange | DN40 | 1.5-4 bar | 5,2 m ³ /h* | A, |
| 4. Back flush water | BSP 2" male | | | | |
| 5. Inlet RO | DIN flange | DN40 | | | |
| 6. Permeate | BSP 1" female | | 2,5 bar | 2.08 m ³ /h | B, |
| 7. Brine flow | DIN flange | DN32 | | 3.12 m ³ /h 5.33 m ³ /h** | |
| 8. Flush water | BSP 1/2" female | | 2-4 bar | 1 m ³ /h | |
| 9. Post filter | BSP 1" female | | | | |
| 10. Power Supply RO-unit | 3ph | 440V +5/- 10 % 60Hz | | Approx. 10,5 kW | C, |
| 11. Power Supply feed pump | 3ph | 440V +5/- 10 % 60Hz | | Approx. 4 kW | |
| 12. Remote Supervision | Potential free contacts | | | | |

* Required feed flow for backwash 280l/min. ** Including permeate to waste.

The noise level will be at 60Hz, full speed 85dBa. The pump is complete made from AISI 316 LP side and Duplex stainless-steel HP side.

Total recovery: 40 %
Average flux rate: 18,7 litres/m²h with a TDS of 35703,1

General: Install shut-off valve in the supply lines. Clearly identify service pipes and electrical wiring.


- A) The feed water quality shall be according to analysis table 1. temp max 35° C.
- B) Max back pressure 2,5 bar
- C) Connect the equipment to an Electrical isolator.

5.3 Interface

The interface between ENWA equipment and the other equipment are made with connection according to 4.2 that are mounted in the supply lines according to ENWA instructions.

5.3.1 Intermediate piping

The piping supplied must be manufactured from a non-corrosive/non-magnetic material.

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Intermediate piping is not included in the delivery from ENWA.

| Piping | Size | Note |
|------------------------------------|--------------------|-------------|
| 1. Suction pipe to feed water pump | Min DN 50 (2") | D |
| 2. Feed water pump to media filter | Min DN 40 (1 1/2") | |
| 3. Media filter to RO-unit | Min DN 40 (1 1/2") | |
| 4. Flush water to RO-unit | Min DN 15 (1/2") | |
| 5. Brine to waste | Min DN 32 (1 1/4") | E |
| 6. Product to waste | Min DN 25 (1") | |
| 7. Product to post filter | Min DN 25 (1") | |
| 8. Product from post filter | Min DN 25 (1") | |

General: Install shut-off valve in the supply lines. Clearly identify service pipes. Consider distance, pressure drop, sound level etc. when designing the supply piping.

D) Max length 10 metre, max height over sea level 2 meter.

E) Install a air gap to prevent back flow of seawater or other contaminated water

5.4 Skids

The RO-unit is mounted on a skid. The skid stands and brackets are made for easy service and maintenance of the unit. The skids, stands and brackets are made of stainless steel AISI 304 or similar. Bolt and nuts are made in acid proof stainless steel (A4)

5.4.1 Steel frame for RO-unit

The steel frame for RO unit is made of stainless steel AISI 304 or similar.

5.4.2 Stand for high pressure pump

The high-pressure pump is mounted and fixed to the RO-steel frame.

5.4.3 Stand for feed pump

The pump has integrated feet

5.4.4 Stand for pre-filter


The sea filter has integrated feet for assembly fixed to the floor.

5.4.5 Stand for chemical cleaning tank

The chemical cleaning tank can be placed on the floor without any stand

5.4.6 Stand for post filter

The post filter has integrated feet for assembly fixed to the floor.

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5.5 Process

All wetted parts are made of non-corrosive plastic, brass, stainless steel or 254 SMO. Pipes and valves are welded or assembled with flange connections where it's possible and treaded connection. Components will be tagged according to ENWA standard

5.5.1 Piping

Pipes are made of non-corrosive ABS plastic, stainless steel or 254 SMO. Brackets fixed to the skid or bracket holders support the pipes.

5.5.2 Valves

Valves are made of non-corrosive ABS plastic or stainless steel AISI 316. The valves are automatic controlled pneumatic valves, solenoid valves or manual operated hand valves.

5.5.3 Pumps

A feed water pump feed the system with raw water. A high-pressure pump pumps the water from the feed water line to the membrane pressure vessel. A feed water filter is mounted on the suction side of the RO to prevent the high-pressure pump from large particles.

- **Feed water pump**

The feed water pump is a close-coupled centrifugal pump with threaded port. The pump has a 2-pole induction motor electric motor with extended shaft directly connected to the pump. All wetted parts are made of bronze. The shaft has a mechanical seal. Seals are lubricated and cooled by the liquid being pumped.


- **Suction Filter**

Feed water enters the unit through a mesh filter. The mesh filter absorbs large particles that would plug feed pipes or cause damage to the pump. Recommended mesh size is 0,5-2,5mm. The mesh filter supplied must be manufactured from a non-corrosive material. The suction filter is not supplied by ENWA.

5.5.4 Pre-treatment Filter assembly

The sand filter continuous separates solids from the water. The water passes the media filter, a wide variety of both organic and inorganic materials (turbidity) are captured in the media bed while allowing the filtered water to pass through. Back flushing removes the captured materials that have been effectively filtered out of the water. When the filtering media has captured enough material the flow of water is reversed through the media bed and the captured material is flushed out.

The pre-treatment filter assembly consists of:

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- **The media filter tank**

The media filter tank is made of carbon steel (P265GH), with in- and outside a non-porous polyethylene lining. The media filter tank is designed and manufactured according to PED 97/23/EEC. The size of the media filter tank is Ø800 and height 2159mm pressure rating 6bar. The media tank is equipped with two connections for in/outlet of water and two connections for filling and emptying the filter media. The media filter tank manifolds and distributor heads are made of ABS plastic.

- **Media**

The pre-treatment media is made of Anthracite N 2 and filter sand from 0,8-1,2mm, 3-5mm and 5-10mm.

- **Back flushing valve**

The automatic back flushing control is a single mechanical two-valve body design set to control the back flush and rinsing of the pre-filter. The water condition control unit is mounted on top of the media filter tank. The water condition control unit is controlled by the RO-control system, which will activate the back-flush functions on the sand filter. The water conditioning control valve body is made of non-corrosive, ABS-plastic. The pipes are made of ABS plastic. When the unit back flushes the rinse water is piped to drain.

5.5.5 Feed water filter

Two (2) cartridge filters BB20" are used as a feed water filter. The feed water filter has a removable cartridge with nominal pore size of 5µm. The two filter houses are made of plastic. The cartridge is made in resin-impregnated cellulose and polyester fibres.

5.5.6 High pressure pump

A triplex plunger pump is used as high-pressure pump. The plunger pumps high pressure side are made of duplex and the low-pressure side is made of AISI 316L. The plunger design gives smoother liquid flow. Seals are lubricated and cooled by the liquid being pumped.


- **Pulsation dampener**

The discharge line of the high-pressure pump is equipped with pulsation dampeners. The dampeners are designed to reduce pressure fluctuations or pulsation. The pulsation dampener is made in galvanize steel and is sprayed with anti-corrosion paint.

5.5.7 Reverse osmosis membrane assembly

- **Membrane pressure vessel**

The three (3) membrane pressure vessel is made of composite reinforced plastic. The membrane pressure vessel has a diameter of 8" and a length of 1,55m. The membrane

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pressure vessel is white. The membrane pressure vessel is equipped with inlets and outlets for media. The pressure vessels are protected against excessive pressure by a safety valve.

- **Pressure control**

A manual operated pressure control valve controls the pressure in the pressure vessels. The pressure control valve is made in stainless steel AISI 316 or similar.

- **Reverse osmosis membrane**

The three (3) reverse membranes is polyamide membrane, spiral wound configuration. The membrane element represents the newest generation of membranes, with 99.7 % average rejection. A service space of 600mm around the RO-unit is a general requirement and a free access to 1200mm space at one end is recommended to be able to change the RO-membranes. The membrane vessel may as an alternative be removed and the membranes changed at another location.

Note 2 the feed water must be free of chlorine.

5.5.8 Membrane cleaning

Cleaning is recommended when the RO unit shows evidence of fouling, prior to a long-term shutdown, or as a matter of scheduled routine maintenance. The source water for chemical solution make up and rinsing should be RO permeate. Major cleaning system components are:

5.5.8.1 Chemical cleaning tank

The RO cleaning tank is sized to accommodate the displacement of water in the hose, piping, and pressure vessels. The tank is designed to allow easy access for chemical introduction and mixing. The RO cleaning tank is a tank of 320l volume made of PE-MD or similar.

5.5.8.2 RO cleaning Pump


The RO unit high-pressure pump is used as the cleaning pump. The pump develops the proper cross flow velocity to scrub the membrane clean.

5.5.8.3 Mixer

Integrated in the cleaning tank is a hand operated mixer mounted for mixing the cleaning chemical with permeates before cleaning operation.

5.5.8.3 Heater

A heater is integrated in the cleaning tank to obtain optimal cleaning temperature 35 degree. Celsius 3-phase 440V/60Hz

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5.5.8.3 RO cleaning filter

The RO feed water filter is used as the cleaning filter. The filter removes fouling that have been displaced from the cleaning process of RO unit stage one.

5.5.8.4 Cleaning agent

The cleaning chemicals are quoted as a recommended option.

5.5.9 Membrane flushing

When the RO unit is stopped the system must flush fresh water through the membrane to rinse the system from seawater. The flush water filter is an activated carbon type of filter the purpose of the filter is to de-chlorinate the flushing water from the storage tank. The flush water filter has a cartridge with nominal pore size of 5µm. The flush water filter housing is made of plastic. A check valve is installed in the flush water piping to protect the storage tank from any reverse flow condition

5.5.10 Post treatment

The unit is equipped with a re-hardening filter that will increase the pH and add minerals. The product water passes the post treatment filter media beds, minerals are dissolved in the water, while allowing the treated water to pass through. The filtering media will be consumed.

5.5.10.1 Media filter tank

The media filter tank Size Ø315 height 1337mm pressure rating 6bar. The media tank is equipped with two connections for in/outlet of water and two connections for filling and emptying the post treatment media. The post treatment tank is made of stainless steel AISI 316. The media filter tank is designed and manufactured according to PED 97/23/EEC. The media filter tank manifolds and distributor heads are made of brass.


5.5.10.1.1 Media

The post filter is filled with calcium rich minerals.

6. Electrical

6.1 Power supply

3-phase 440V/60Hz, max short-circuits current at connecting point 6kA.
(Another alternative on request)

| | | | | |
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6.2 Manoeuvre supply

1 phase 230V/60Hz. Max short-circuits current at connecting point 6kA.

6.3 Electrical enclosures

IP 54 or better and made of powder polyester type painted on cold-rolled steel plate. Terminal strips, circuit breakers, control system etc. are mounted in a cabinet. Sensors and solenoid valves are mounted on the equipment or on a skid.

6.4 Cable support

Cables are attached to the skid.

6.5 Electrical motors

6.5.1 Feed water pump

The pressure pump has a single speed electrical motor

6.5.2 High Pressure pump

The pressure pump has a single speed electrical motor

7. Control

7.1 Control system


The PLC offers excellent capabilities and diverse I/O options. Its 3.5" TFT touchscreen can show over 1024 displays. The PLC supports up to 512 I/Os via on-board and I/O expansion modules.

The PLC offers a rich range of embedded features such as multiple auto tuned PID loops, and internal 120K data table for data logging and recipe programming. Communication options include TCP/IP Ethernet, GSM/SMS, MODBUS and CAN open networking plus remote access for data acquisition and program download.

1MB Ladder code application memory (plus 3MB for images and 512K for fonts) enables the PLC to run complex control and automation tasks.

The 65,536-color touchscreen HMI enables the display of color-coded operator instructions and red, attention-grabbing alarm screens. It can also display graphs according to historical values—to reflect trends of recorded data.

The system will have the following control functions.

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a. TDS Monitor

A conductivity controller opens a solenoid valve to divert product water directly to drain if the preset conductivity is exceeded. High conductivity will set an alarm.

b. Low Pressure Switch

A low-pressure switch controls the pressure in the feed line to the high-pressure pump. After a preset time of pressure below the set point, the system will shut down and the indicator lamp will light until manually reset.

c. Membrane flushing

A programmable timer controls the automatic freshwater flush. When the unit is stopped the system must flush fresh water through the membrane to rinse the system from seawater.

d. High product storage tank level

A level switch controls the level in the product storage tank. Automatically resets when the level drops to restart point. The level switch is not included in ENWA supply, but control panel is prepared for this.

- Language

Display and identification of the equipment as well as text on the operating panel will be in English language

7.1.1 Remote supervision and control

The remote supervision and control of the control system makes it possible to view signal values, the unit can be manoeuvred from the remote system. The communication is done by potential free relay contacts. Signals:

- General alarm


Instrumentation

7.1.2 Pressure gauges

The pressure gauges are liquid filled, Ø63mm face, Bourdon tube type gauges with stainless steel wetted parts. Gauges are mounted depending on the configuration of the system. Pressure gauges scale “bar”.

Following equipment is equipped with pressure gauges:

- RO Pre-filter inlet and outlet
- Membrane feed
- Reject

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7.1.3 Conductivity Meter

The unit is equipped with a digital display conductivity meter which provide constant readings of the water conductivity and temperature in the permeate piping. The conductivity sensor is in the permeate line. The transmitter has two analogue and two logic inputs. The first analogue input is for the connection of conductivity electrodes. The second analogue input is used to connect a temperature probe. Two relay output contacts are provided on the instrument. They are configured as a limit controller. To obtain analogue (continuous) controller outputs, the analogue outputs are configured accordingly.

- **Conductivity-electrode**

The Conductivity cell is made of a plastic screw-in body, and the electrodes embedded in it. The electrodes are made of stainless steel. A temperature probe is fitted in the cell.

7.1.4 Flow Meter

The unit is equipped with flow meters. The flow meters are in-line variable area principle. The flow meters are made of non-corrosive plastic.

Following equipment is equipped with flow meters:

- Product outlet

8. Service

8.1 Alarms

To provide automatic process check-up and to facilitate failure corrections, the control system has been provided with pre-programmed alarms. When an alarm condition is detected, the critical functions are stopped. Visual signals are given, and an alarm text will be displayed on the operating panel. The operator can reset and restart the process from where it was interrupted.

Alarm:


- High conductivity in the product system
- Motor protection high pressure pumps
- Low pressure HP-pump inlet
- Power failure


9. Documentation

9.1 EC declaration of conformity for machinery

Complies with the requirements of Machinery Directive 2006/42/EC.

Complies also with applicable requirements of the following EC directives:

|  | Customer: | Customer reference | | Our reference | | | | | | | | | | | | | | | | | | | | |
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| <p>2004/108/EC, EMC (electromagnetic compatibility) 2006/95/EC, LVD (low voltage directive) 2014/68EC, PED (pressure equipment directive) MED 2014/68/EU (pressure equipment directive)</p> <p>Where appropriate, notified body (EC type-examination/full quality assurance system)</p> <p>9.2 Operator and service manual 1 set of Operator and service manual is included Layout drawing P-I drawing Electrical drawing</p> <p>9.3 Component specifications Data sheet components</p> <p>9.4 Spare parts and consumables Spare parts and consumables are quoted as a recommended option.</p> <p>10. Testing</p> <p>10.1 Mandatory Testing</p> <p>10.1.1 Installation Testing</p> <ul style="list-style-type: none"> Ocular inspection Test of Inputs Test of Outputs <p>Documented evidence: Function Test Certificate</p> <p>10.1.2 Operational Testing</p> <p>11. Document History</p> <table border="1"> <thead> <tr> <th>Date</th> <th>Issue</th> <th>Description/Reference</th> <th>Written/Updated by</th> </tr> </thead> <tbody> <tr> <td>September 6, 2019</td> <td>1</td> <td>First issue</td> <td>T.D</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | | | | | Date | Issue | Description/Reference | Written/Updated by | September 6, 2019 | 1 | First issue | T.D | | | | | | | | | | | | |
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