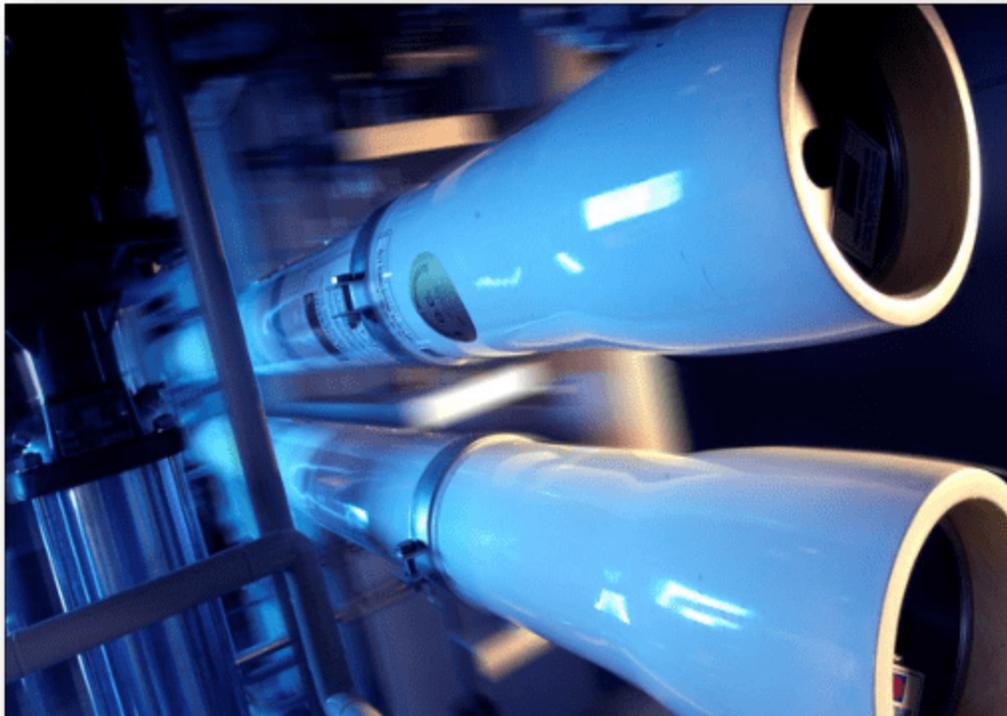




Proposal

**Ampac USA Seawater Desalination Plant
Model SW100K-LX**



Ampac USA

5255-5265 State St.
Montclair, CA 91763 USA
Tel: (909) 548-4900
Fax: (909) 548-4901
Website: www.ampac1.com

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Proposal
Ampac USA Seawater Desalination Watermaker
Capacity: 100,000 GPD-TFC (378m³/Day.)

Date: June 30th, 2017
 Proposal No: 17101-100-010

Contact Name: Mr. Michael Ross
Organization: Island Manager
Address: Red Hook Qrts B3
 St. Thomas, USVI 00802
Tel: 340-514-7702
E-mail: [Redacted]



Dear Mr. Ross,

Thank you for this opportunity to quote you on your Water Purification Requirement. We take pride in our attention to detail with our customers Requirement. Best Design, material and workmanship shall be applied and specified according to the world wide recognized marine practices to ensure reliability, durability and easy maintenance and to comply with Marine Industry and Ship Requirements.

System production is based on the following conditions:

- 1) Air Temp (Weather): From 50°C to -30°C
- 2) Sea water Temp: From 30°C to -2°C
- 3) Machine Room: From 50°C to 0°C
- 4) Relativity Humidity: From 95% to 0
- 5) Maximum Salinity: 45,000ppm NaCl feed water,
- 6) pH Range: 3.0-11.0pH Range.

Make of System: Fully automated Turnkey Sea Water Desalination System including pre-treatment Modules and Reverse Osmosis System fully built on a Powder Coated welded Aluminum Skid with Diamond Plate Base using good industrial practice and following manufacturer's guidelines for every component.

Model of System: SW100K-LX System to produce: **15.8m³/hr** (100,000 GPD) at maximum 45,000 mg/l Salinity

Delivery Terms: Estimated System completion and crating, on average 10-12 Weeks from the day of receipt of formal purchase order and Initial Deposit.

Dimensions: 200" L x 76" W x 128"H., approx. Weight 6,500 Kgs.

Exclusions: Prices do not include shipping, insurance, sales tax, import taxes and duties, installation, and options listed below unless otherwise indicated.

The proposed system includes the following features:

System Design Basis:

Main System Components:

- Double Coated Epoxy Welded Aluminum frame with Aluminum Diamond Plate and will conform to AISC Manual of Construction.
- Auto Flush Spin Down Screen Pre-Filter
- Inlet On-Demand Multi-Stage 316L Stainless Steel Feed Pressure Pump
- Twin 28Ft³ Multimedia Anthracite Pre-Filter w/backwash valve, Bypass
- Twin 4"x30" Sediment Pre-Filter 5µm
- High Pressure Multi-Stage Pump with Energy Recovery, Pressure Relief Valve and Accumulator
- Horizontal Multi Stage Feed Supply Pump with Safeguards
- 8" x 40" FRP Pressure Vessels
- TFC 8" x 40" Membrane Element
- pH Adjust Calcite Post-Filter
- Ultra Violet Disinfection Sterilizer

Main System Instrumentations:

- Complete Panel for Easy Controls
- Eight Count Stainless steel liquid-filled pressure gauges
- Sea Water Inlet Mechanical Motorized Actuator Valve
- Pressure Sensors for Raw, Brine and Permeate Waters w/Cut Off Pressure Switches
- Pressure Sensors to Halt Operations and Stop Pumps in case of High Module-Inlet Pressure
- High Pressure Relief Valve to reduce Pressure at the High Pressure Pump
- Stainless Steel System Pressure Control
- Stainless Steel Recycle Pressure Valve
- On/Off Main Power Switch
- Automatic Operating Programmable logic controller UL/CE Approved with:
 - Smart Relay
 - Delayed start-up of high-pressure pump
 - Inlet Solenoid Valve Control
 - Low & High Feed Pressure Switches
 - Supply & Delivery Pumps Controls
 - R/P Storage Tank Full Pump on/off
 - Auto Flush Cycle
 - Pre-Treat Lockout
 - TDS Water quality Monitor for Permeate Water Quality
 - Temperature Monitor with LCDE Display
 - Hour Meter
- Chlorine Dosing Feed System
- Anti-Scalant Dosing Feed System
- Clean in Place (CIP) Fully Automated system *(Optional)*

Functional Specification

Complete functional specification shall be provided which describes:

- 1) Operation of unit
- 2) Control loops
- 3) Interlocks
- 4) Alarms
- 5) Startup/Shutdown sequences
- 6) Security

System Safety:

The equipment and system shall be designed considering minimizing hazard. Countermeasures against the system hazard are as follows:

Electrical Safety Devices:

- System will be equipped with a 3 Pole Sensor Breaker
- Instrumentations will be equipped with a Single Phase Breaker and 2 Fuses
- Alarm Horn - Alarm Conditions: *Low feed pressure & High permeate conductivity*
- *Unit Shutdowns include:*
 - *Low feed pressure*
 - *Pretreatment filters in backwash*
 - *Product storage tank full*
 - *High permeate conductivity*

Water Safety device:

- Low Pressure Sensor
- High Pressure Diverter Valve

Monitoring and control devices for system safety:

- LCD Display Screen showing Conductivity, Hour Meter and Temperature
- On-Off Push Buttons
- Panel Mount Liquid Filled Stainless Steel Pressure Gauges
- Panel Mount Flow Meters
- Pressure Control Valves.



System Specifications:	
Quantity	One
Capacity	100,000 GPD / 378.5 m ³ /Day
% Recovery	40%
% Salt Rejection	98%
Design Temperature	25°C
Maximum Temperature	45°C
Membrane Type	TFC (Filmtec)
Pressure Vessels	FRP (Code Line or Protec)

Design Basis:	
Feed Flow Minimum	200 GPM (750 LPM)
Product Flow	69.5 GPM (263 LPM)
Incoming Feed TDS	45,000 PPM (45 PPT)
Incoming Feed Incoming Water Pressure	Through Optional Submersible Pumps
Incoming Feed Water Chlorine	0 PPM
Incoming Feed Water Turbidity	< 1 NTU
Incoming Feed Water SDI	< 3 Maximum
Capacity (Design) Basis	24 Hrs/Day Operation

The proposal system includes the following features:

Standard Features	
High-Pressure Belt Driven Piston Pump with Safeguards	Cat USA
Complete Panel for Easy Controls	Ampac USA
Sediment Pre-Filtration rated @ 200 GPM	Harmsco USA
Liquid-filled pressure gauges for Pre, Post-Filters & Pumps Pressure	Swagelok USA
Low-and high-pressure switches	Square D USA
Powder-coated, Welded Aluminum Frame w/Aluminum Diamond Base	Ampac USA
Fiber glass High Pressure Vessels	Codeline USA
Filmtec Brackish Water TFC Membrane Elements BW30-400FR	Dow Chemical USA

Components Make & Materials of Construction:

<i>Description</i>	<i>Name Brand</i>	<i>Material of Construction</i>	<i>Origin</i>
Skid	Ampac USA	Aluminum ¼" Gauge with Diamond Plate Welded	USA
Paint	Ampac USA	Powder Coating	USA
Screen Filters	Rusco	Poly Carbonate with Stainless Steel Screens	USA
Pre-Treatment Vessels	Pentair/Structural	Non Corrosive 100% Composite Fiberglass Construction	USA
Auto Backwash Valves	Clack USA	Poly Ethylene	USA
Chemical Treatment Tanks	Simona America, Inc.	Polypropylene ½" Thickness	USA
Chemical Pumps & Mixers	LMI or Blue White	Polypropylene	USA
Sediment Pre-Filters	Watts	Glass Reinforced Polypropylene	USA
Reverse Osmosis Pumps	CAT	316L Stainless Steel	USA
Membrane Vessels	Bekaert Progressive	FRP with Stainless Steel 316L End Ports	USA
Membrane Elements	Dow Chemical	Filmtec Thin Film Composite (TFC) consisting of 3 layers, polyester support web, a micro porous polysulfone interlayer, and an ultra-thin polyamide barrier layer on the top surface.	USA
Programmable Logic Controller	RD Specialty Ltd	NEMA4X Enclosure with UL/CUL Processor	USA
Instrumentation	Blue White	FRP & 316L Stainless Steel	USA
Piping Low Pressure	Spears	316L Stainless Steel	USA
Piping High Pressure	Swagelok	316L Stainless Steel	USA

Power Consumption

Pump	HP	Volts	Qty	Watts
R/O High Pressure Pump	100	440V / 460V	1	44.0 KW
On-Demand Supply Pump	7.5	440V / 460V	2	11.0 KW
Instrumentations		440V / 460V	1	2.00 KW
Average Power Consumption	Per 1000 Liters			2.9 KW

Options: (Not included in the above price unless otherwise indicated) All options quoted upon request.

	Pre-Treatment Equipment - Not Included Unless Indicated	Unit Price	Extended Price
1	Base Price for SW100K-LX - 440V/60Hz/3 Phase	\$ 297,850.00	\$ 297,850.00
Qty. Included	Optional Equipment – Not Included Unless Indicated	Unit Price	Extended Price
1	Automatic Operating Programmable logic controller with : - Delayed start-up of high-pressure pump, Motor Soft Start - Automatic Membrane Flush System - Hour Meter - TDS Water Quality Monitor - Temperature Indicator.	12,500.00	Included
1	HDMI Upgrade with 10.4" LSC Full Color Touch Screen	7.850.00	Included
6	Differential Pressure Gauges (Count 6)	Each 65.00	Included
2	Electric Signal Waterproof Float switch for R/O Pump Shut-off	Each 145.00	Included
2	Permeate & Reject Digital Flow Meter	Each 685.00	Included
1	Dual Post Filtration with GAC & Calcite Post-Filters to adjust pH	875.00	Included
1	Nitrogen Filled @ 5000 PSI Stainless Steel Pulsation Noise Dampener.	2,835.00	Included
1	Pressure Relief Valve for Security if Pressure Valve closed	1,975.00	Included
1	Auto Flush Package to flush system with fresh water after tank full	2,450.50	Included
Suggested	Pre-Treatment Equipment - Not Included Unless Indicated	Unit Price	Extended Price
1	On-Demand Feed Supply Pump ITT Goulds or Ebara SHP, 3Phase 480V	Each 4,750.00	Included
2	Auto Flush Spin Down Screen Pre-Filter	Each 875.00	Included
1	Chlorine Injection System with Mixer & Pulsation Pump	Each 1,875.00	Included
1	De-Chlorination Injection System with Mixer & Pulsation Pump	Each 1,875.00	Included
1	Anti-Scalant Chemical Injection System with Mixer & Pulsation Pump	Each 1,875.00	Included
2	24Ft ³ Multimedia Anthracite Pre-Filter w/backwash valve, Bypass	Each 12,750.00	Included
	Additional Options & Equipment - Not Included Unless Indicated	Unit Price	Extended Price
0	Grundfos Submersible Pump Model 150S150-8 (15HP)	8,750.00	Optional
0	Anti-Scalant Aqueous Liquid (Flocon 130) (55 gal. Drum)	1,450.00	Optional
0	Complete Installation in a 20' Connex Container, including Insulation, Wiring, Lights, and A/C Unit will be fully built inside.	21,750.00	Optional
0	250KW Kubota 3 Phase 440V Diesel Generator	48,750.00	Optional
1	Packaging and Crating	1,875.00	1,875.00
Please note that shipping and handling charges are not included in this quote. Sales Tax will be added to orders shipped in California unless tax exempt Information is provided.		Sub-Total	\$ 299,725.00
		Shipping & Handling	TBD
System Dimensions : SW100K GPD-TFC: 200" X 76" X 128"		Total >	\$ 299,725.00

Exclusions: Prices do not include shipping, insurance, sales tax, import taxes and duties, installation, and options listed below unless otherwise indicated.

Estimated Delivery: 12-14 weeks ARO, Quote is valid for 60 days.

Payment Terms: 60% Deposit. Balance due by ship date. All pricing stated is in U.S. dollars

Specifications for Ampac Reverse Osmosis System 100,000GPD-TFC

- The following specifications include only noted details of the complete RO system. It does not include specifications for all parts, components, and details that are to be included.

(Note: The following pictures are for demonstrating purposes. The final product may be slightly differ)

Submersible Intake Pump: *(Optional)*

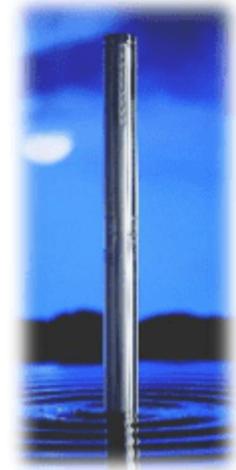
The Grundfos S Pump Series incorporate many protection and applications features giving operators confidence with the flexibility to adapt the pump to many different applications.

The S Pump Series incorporate the following common features:

- Built-in sand bearing minimizes sand damage experienced in most other submersible pumps and increases pump life, as well as offering protection against Up-Thrust.
- All Stainless Steel construction for increased durability and reliability.
- Built-in, jam-free check valves guarantee smooth running, fail safe operation.
- User-friendly cable guard for the easiest installation among submersible pumps.
- Dry-run protection
- High efficiency pump and motor
- Over-voltage and under-voltage protection
- Soft-Start and Overload protection
- Over-temperature protection and High starting torque

Specifications:

- Model: 150S150-8
- Quantity: 2 in Parallel
- Pump Body: Full Duplex Stainless Steel
- Shaft & Impeller: Full Duplex Stainless Steel
- Ports: 3" NPT Inlet x 3" NPT Discharge
- Shaft Seal: Standard Mech. Seal Viton/Carbon/Ceramic/S.S, Casing "O"-Ring is Viton.
- Motor: 15HP 230/380/480 Volt Three phase. NEMA standard totally enclosed enclosure. Rugged design for continuous duty under all operating conditions.
- Approvals: Motor is CE UL Certified to Operate in North America & Europe.



Feed Supply Pumps: *(Optional)*

Magnetic-drive pump (MAGdrive)

Grundfos CRN MAGdrive pumps operate according to a patented, magnetic-drive system that eliminates the need for shaft seals. The power from the motor is transmitted to the pump by magnetic force and not by a conventional coupling. Combined with a hermetically sealed liquid end, the pump is totally leak-free. As all axial forces are absorbed in the MAGdrive system, the pump incorporates a standard ICE or NEMA motor with keyway and deep groove ball bearing.

Main Pump shall be equipped with a VFD (Variable Frequency Drive), Second Pump shall be equipped with a Start Stop Pressure Sensor.

- Quantity: 2
- Type: Multi-stage centrifugal Pumps
- Model: Grundfos 475S
- Capacity: 140 GPM Each
- Head: 60 PSI
- Impeller Material: SS316L
- Shaft Material: SS316L
- Sealing Arrangement: Mechanical seal
- Motor Arrangement: Direct Coupled
- Motor Insulation: CEI-EN standard /Class F
- Motor Rating: 9 KW each
- Power: 480V/3Phase /60Hz
- Manufacturer: Grundfos, Germany



Auto-Flush Screen Filter *(Optional)*

- Count Two, First filter 100 Micron, Second Filter 50 Micron.
- Screen Filters are designed for High particle retention, large filter area, allows long intervals between cleaning.
- Non-corrosive and very durable
- Engineered plastics no metal parts in contact with water.
- Easy maintenance: The filter elements can be easily extracted from the filter housing for rinsing.
- Minimal energy loss: Extremely low head loss at high flow rates.
- Auto Flush Solenoid with Timer Mounted below the filter to flush any sand particles and suspended solids 7 seconds every minute which will prevent maximum protection for the following stage.



Pre-Chlorination System *(Optional)*

Seawater in the defined area is very likely to contain different kinds of bacteria which need special attention to deal with. If bacteria enter the membranes, it blocks the membranes due to bacterial growth as well as slime build up. The blockage ultimately results in decline in productivity and elevation in the differential pressure across the membranes. Pre-chlorination of feed water is considered to be of prime importance under the conditions.

- System include: Tank, Mixer and Injection (Dosing) Pump
- Dosing pump: Solenoid driven positive displacement pump.
- Capacity: 3.4 l/hr.
- Pressure: 7 bar
- Accessories: Injection valve, foot valve
- Dosing tank: 01
- Capacity: 50 liters
- Material: PE
- Manufacturer: Ampac USA / Blue White



De-Chlorination System *(Optional)*

As chlorination of seawater is a must to eliminate bacteria from the water, it is equally important to scavenge chlorine before the feed water enters the membranes. For this purpose sodium Metabisulfite is dosed before cartridge filters. A dosing system is incorporated to ensure the elimination of chlorine in the feed water to membranes.

- System include: Tank, Mixer and Injection (Dosing) Pump
- Dosing Pump Type: Solenoid driven positive displacement pump.
- Capacity: 6L 1/hr.
- Pressure: 5 bar
- Accessories: Injection valve, Foot Valve
- Dosing tank: 01
- Capacity: 50 Liters
- Material: PE
- Manufacturer: Ampac USA / Blue White
- Accessories Included: Suction and Discharge Hoses, Foot Valve, Discharge Check Valve.



Anti-Scalant Dosing System *(Optional)*

Anti-Scalant chemicals are dosed to prevent fouling and scaling in the membranes. Anti-Scalant in feed water increases its concentration with an increase in the % recovery of the system. The anti-Scalant works on the principle of threshold phenomenon that is a small amount of chemical that controls a large amount of scale formation by sparingly soluble salts. Depending upon formulation of raw water, a dose of about 3-6 PPM of anti-Scalant is required to keep the system free from fouling and scaling. Due to dispersion effect, the life of the membrane increases as well as frequency of membrane cleaning decreases.

- System include: Tank, Mixer and Injection (Dosing) Pump
- Dosing Pump Type: Solenoid driven positive displacement pump.
- Capacity: 3.4L 1/hr.
- Pressure: 10 bar
- Accessories: Injection valve, foot valve tubing Dosing Tank
- Capacity: 50 liters
- Material: PE.
- Manufacturer: Ampac USA / Blue White
- Accessories Included: Suction and Discharge Hoses, Foot Valve, Discharge Check Valve



Sediment Cartridge Filter Housing 5 Micron

A fine filtration unit of porosity 5- micron is installed. This Pre-Filter will eliminate all suspended solids up to 5 Micron from getting to the membrane elements.

- Quantity: 3 in Parallel
- Flow Rate: 140 GPM
- Model: HIF
- Maximum Operating pressure: 150 PSI
- Number of standard 30" cartridge: 14 Count
- Filter height: 55"
- Length of Cartridge Filter: 30"
- Diameter of Cartridges: 2 1/4"
- Material: Carbon Fiber
- Porosity: 5 micron
- Manufacturer: Harmsco, USA



Multimedia KDF-GAC-Poly Phosphate Quartz Pre-Filters:

System shall be equipped with twin Media Pre-filters connected in Parallel.

Suspended particles in raw water need a sand filter as pretreatment for RO System. This reduces the load on cartridge filters and filters the water down to 20÷25 micron size of suspended solids. As well it will remove Chlorine injected earlier, and adjust pH. Since Multimedia filter has to backwash with raw water, therefore, rinse step has been provided in backwash sequence. The filters will automatically back wash, based on timer control.

Following are the specifications of Multi Media Filters:

- Dimensions: 28 ft³ Carbon Multimedia Pre-filter system w/ 3" ports valve
- Material: Reinforced fiberglass housing (FRP)
- Flowrate: 245 GPM (24hr/7days per week)
- Piping: 3" Sch80 High Pressure PVC piping
- Media: Active Acid Washed Coal Based Carbon, Anthracite, Silica Quartz
- Valve: Fleck 2850 Auto Backwash Valve
- Reason: Provides water of less than .1 ppm chlorine
- Feature: Fully Automated Operation
- Operation: R/O System will automatically shut down when GAC Backwash.
- Manufacturer: Tank from Structural USA, Valve from Fleck USA
- Materials:
 - 40 Lbs. KDF Redox Bacteriostatic Media (To reduce Bacteria)
 - 40 Lbs. Poly Phosphate Media (To reduce corrosion)
 - 40 Lbs. Silica Quartz (To reduce Sediment)
 - 240Lbs. Acid Washed Activated Coconut Shell Bacteriostatic Media.



Media Included:

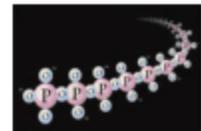
- 1) **KDF Media:** KDF® Process Media are high-purity, granulated copper and zinc-based alloys that treat water and waste water through a process based upon the principle of **redox** (Oxidation-Reduction). Originally, KDF was shorthand for Kinetic Degradation Fluxion.



KDF Process Media enhance the performance, extend the life, reduce the maintenance and lower the total cost of carbon-based Media to follow.

KDF Process Media help control microorganisms by creating an environment that's deadly to some microorganisms and that interferes with the ability of many other microorganisms to function. Either way, the use of KDF Process Media results in the total elimination of some contaminants and a great reduction of a wide variety of others which will protect the RO Membrane elements from Fouling by any bacterial growth.

- 2) **Polyphosphate Media:** is added to mask the effects of high iron concentrations. The Polyphosphate delays the precipitation of oxidized manganese and iron, thereby greatly reducing the layer of scale that forms on the pipes. The effect is called sequestration. The iron or manganese ion is surrounded by a chain of phosphate molecules and is not allowed to precipitate in the water.



- 3) **Granular Activated Carbon (GAC):** GAC filtration is most effective in removing organic contaminants from water. Organic substances are composed of two basic elements, carbon and hydrogen. Because organic chemicals are often responsible for taste, odor, and color problems, GAC filtration can generally be used to improve aesthetically objectionable water. GAC filtration will also remove any excess chlorine. GAC filtration is recognized by the Water Quality Association to maintain drinking water contaminants within the limits of the EPA National Drinking Water Standards.



RO High Pressure Pump

Brand: Fedco High Pressure Pump w/ safeguards

The Fedco MSD series multi-stage centrifugal high-pressure feed pumps provide a new level of reliability and efficiency for Seawater Desalination Watermakers, unique features, such as the patented WATER BEARING thrust bearing, complete duplex SS construction, and maintenance-free design ensure years of trouble-free operation.

The System will also include FEDCO's Hydraulic Pressure Boosters turbocharger the will increase the efficiency to exceed 80% transfer efficiency. Superior efficiency comes with superior reliability.

Standard horizontal base, electric motor drive. The standard horizontal base is 4" x 2" Steel with 2 mil epoxy, powder coated with ½" channel steel supports for maximum weight load and minimum flexing. Bolt-down leveling and vibration shock mounts are standard. All motors are mounted on a two screw adjustable base for easy alignment.



Specifications:

- Model: MS5524
- Pump Body: Full Duplex Stainless Steel
- Shaft & Impeller: Full Duplex Stainless Steel
- Ports: 3" NPT Inlet x 3" NPT Discharge
- Shaft Seal: Standard Mech. Seal is Viton/Carbon/Ceramic/S.S, Casing "O"-Ring is Viton.
- Motor: 100 HP 440 Volt, Three phase. NEMA standard totally enclosed
- Enclosure: Rugged design for continuous duty under all operating conditions.



Energy Recovery Hydraulic Pressure Booster (HPB)

The Energy Recovery Hydraulic Pressure Turbo Charger shall be integrated to increase Liquid Transfer Efficiency up to 80% and reduce energy consumption. All brine passes through the turbine volute and impeller - no wasted energy Double O-rings to ensure reliable valve stem sealing - Retaining plate prevents accidental removal of valve stem from the unit.

Specifications:

- Model: HPB40
- Body: Full Duplex Stainless Steel
- Shaft & Impeller: Full Duplex Stainless Steel
- Ports: 3" NPT Inlet x 2" NPT Discharge
- Valve stem: Duplex SS 2205
- Valve handle: 316 SS
- Multi-turn design allows precise brine flow adjustment



Membranes Elements

- Count 14 Membrane Elements
- Filmtec SW30ULE-400i, 11,000 gpd rating Low Fowling
- Improved FILMTEC™ Reverse Osmosis Membrane Elements offer the
- Highest productivity while maintaining excellent Dissolved Solids Rejection.
- FILMTEC SW30 membrane elements have the highest flow rates available to meet the water demands of both sea-based and land-based desalinators.
- Improved FILMTEC membrane elements combined with automated, precision element fabrication result in the most consistent product performance available.



Pressure Vessels

Codeline ISO-9001 Certified Vessels utilize a unique shell design which allows the housings to weep, preventing catastrophic failure. Composite construction results in superior impact and corrosion resistance.

- Quantity: 7 Vessels
- Material of Construction: FRP Composite
- Pressure Rating: 1200 PSI
- Dimensions: 8" x 120"
- Number of Elements per Housing: 2 Elements



Post Treatment System

The pH of the permeate water is expected to be in the range of 5. This is rather, acidic. To control the pH, Sodium Hydroxide dosing is recommended to increase the pH of the permeate water.

- System include: Tank, Mixer and Injection (Dosing) Pump
- Dosing Pump Type: Solenoid driven positive displacement pump
- Capacity: 6 l/hr.
- Pressure: 5 bar
- Reagent: Sodium Hydroxide
- Accessories: Injection valve, foot Valve
- Dosing tank: 01
- Capacity: 50 Liters
- Material: PE



CIP (Clean in Place System): *(Optional)*

The cleaning skid is designed for manual operation through a local control box located on the skid. A chemical storage tank is mounted on its own stand and connected to the skid with either hard PVC piping or quick disconnect fittings and flexible hoses. This gives the unit the ability to be mounted in a permanent location or totally portable if desired. The piping is schedule 80 PVC that is hydrostatically tested at the factory. The electrical enclosure is NEMA 4X. All skid wiring is completed and tested before shipment.

Standard Features:

- Skid mounted unit
- Chemical solution tank with cover
- PVC piping
- 316L Stainless cleaning pump
- 5 micron cartridge filter with housing
- Local flow meter
- Tank level switch (CS 8)
- 220V/1Ph/60Hz or 460V/3Ph/60Hz

Available Options

- pH Controller
- Electric heater for chemical tank with temperature controller
- Flexible hoses for cleaning connection
- Wheel mounted skids for smaller units
- Mixer

Applications

- Membrane cleaning
- Descaling



Membrane Cleaning Chemicals:

Acid and alkaline cleaning chemicals are most commonly used for membrane cleaning. Acid cleaners are designed to remove inorganic and iron deposits. Acid cleaning should be performed at a pH of about 2. Alkaline cleaners are designed for removal of biological matter, organic foulants, and silica deposits. Alkaline cleaning is performed at a pH of about 12.

Membrane Cleaning Process:

Reverse Osmosis membrane elements can experience a decline in performance due to the accumulation of deposits on the membrane surface. Mineral scale, colloidal particles, biological matter, and insoluble organic compounds are the usual causes of membrane fouling. When production of a Reverse Osmosis system drops by at least 10 percent, or the differential pressure increases by 15 percent (over normal operating conditions), membrane cleaning should be performed.

Instrumentation

PLC: S200 Series Microprocessor Controller: *(Included)*

The system will come with a complete control panel that include a Series 200 reverse osmosis microprocessor controller features an alphanumeric backlit LCD to display operating conditions, and provides adjustable time delays and set points to accommodate varying field conditions.

The Series 200 controller displays the permeate TDS/Conductivity, Permeate Flow, Concentrate Flow, Pressure, pH level and water temperature, and operating hours along with the operating status of the RO unit. The Series 200 monitors low and high pressure switches, tank levels, and pretreatment equipment. It provides relay outputs for the RO high pressure pump, inlet solenoid valve, membrane flush solenoid valve, and optional relays for permeate divert or remote alarm and auxiliary output.



The Microprocessor or PLC based control system shall monitor and control operation of system and communicate with pretreatment equipment and distribution tank level as required. Skid mounted control panel shall house control system, operator interface controls, solenoids, IEC motor starter(s), step down transformer, high voltage disconnect. Control system shall be fully programmed and integrity tested at factory prior to shipment.

1- Panel shall include:

- a. Backlit LCD display for operating conditions and set points
- b. Lights, pushbuttons, and switches for status and control of system
- c. Conductivity Monitor for feed and permeate
- d. Elapsed run time indicator
- e. Alarm horn
- f. System power switch
- g. Nameplates for device identification
- h. Automatic reject flush indicator and controls

2- Alarm conditions shall include:

- a. Low feed pressure and Low Level
- b. High and High-High permeate conductivity

3- Unit Shutdowns include:

- a. Low feed pressure
- b. Pretreatment filters in backwash
- c. Product storage tank full
- d. High-High permeate conductivity

4- Functional Specification

- a. Complete functional specification shall be provided which describes:
 - 1) Operation of unit
 - 2) Control loops
 - 3) Interlocks
 - 4) Alarms
 - 5) Startup/Shutdown sequences
 - 6) Security



The system will have an automatic operation. All electrical wiring will be in accordance with UL / CE standards.

The Control of:	
Feed Supply Pump	Flow Indicators & % Rejection
Delivery Pumps	Inlet solenoid valve
Automatic flush solenoid valve	pH Monitor
High and Low pressure sensors	RO storage tank level switches (1 or 2)
Two TDS/Conductivity Points	Water temperature
Pre-Treat lockout	Operating hours

PLC: V1040 w/10.4" Touch Screen Controller: (Optional)

The SW-100K is equipped with a Programmable Logic Controller featuring an integrated 10 inch Full Color Graphic Touch Screen Operator Interface.

All operating conditions and process status are simultaneously displayed on a single process diagram display screen.

The operator interface is virtually menu less, making it easy to locate and adjust all time delays and process set points.

To view specific set point and control options for any piece of equipment simply touch the corresponding image on the graphic screen and all options appear. To return to the main process display, simply touch the "Main" button.

This operator interface is conveniently located on the front of the main NEMA 4X Rated control Enclosure.

Depending on the control options selected, the controller is capable of displaying

- Influent Flow Rate and Accumulation
- Concentrate Flow Rate and Accumulation
- Permeate Flow Rate and Accumulation
- Influent concentrate and permeate Salinity (TDS/Conductivity)
- Percentage of salt rejection
- Percentage of water recovery
- Concentration factor
- Membrane flux and Specific Flux Rates,
- Water Temperature
- System Operating Hours
- Individual Run Times for each motor and valve
- System Flow
- User Defined Flow
- Previous 24 hour flow, and today's running flow totals for influent, concentrate and permeate lines.
- The PLC also monitors Low and High Pressure Switches, Tank Levels, and Pre-Treatment Equipment.
- Data logging is provided for all monitored system variables (i.e. pressures, flows, TDS/Conductivity, pH, temperature & etc.)
- Multi-level security login ensures only qualified personnel is able to make changes to operating set points.
- If secure internet connectivity is provided the system may be remotely monitored and operated from anywhere on the planet. In addition, all trend data is also remotely accessible.



Pressure Gauges

- Liquid Filled Panel Mount Stainless Steel Pressure Gauges after every phase of Production as follows:

- In-Let Feed Pressure
- Auto-Flush Screen Pre-Filter
- Distribution Pump Pressure
- Multimedia Silica Quartz Pre-Filter Pressure
- Ion Exchange Softener Pressure
- GAC Carbon Media Pre-Filter Pressure
- Sediment Pre-Filter Pressure
- Booster Pump Pressure
- Re-Circulation Pump Pressure
- Post Filter Pressure



Pressure Valves

System will include Two Pressure Valves made by **Swagelok** as follows:

- 1) System Pressure Valve to Control Booster Pump Pressure and Concentrate Flow
- 2) Pressure Relief Valve to prevent system from reaching unsafe pressure rating.

Controls

- Complete Panel for Easy Controls
- Automatic operating processor w/ programmable logic controller for all pumps, w/ delayed start-up of high pressure pump and Automatic Flush System
- Liquid Filled pressure gauges
- Low & High pressure gauges
- Permeate & concentrate flow meters Blue White
- 1/8 DIN Aluminum case
- 0.56" high efficiency red LED display.

System Pressure Control Valve



Pressure Relief Valve



ORP Meter (Optional)

- In-line ORP meter would be installed to monitor the product water quality.
- Monitors and controls Oxygen Reduction Potential levels for high output systems.
- Large, bright  display.
- An alarm will sound if the TDS level rises above the user-set level.
- Includes one sensor probe.
- Range: 0÷1000 μ S/cm



pH-Meter (Optional)

The 3671 pH controller with a 2 digit LED display features a two 8 amp relays 1/8 DIN panel mount format, and has been long known as an industry workhorse.

- All solid design
- Low power consumption design, reduced internal heating thus increased reliability
- Heat cycled 100 hours before shipment
- Set points on front panel
- Recorder output
- Temperature indication standard with Pt-100 probe
- Automatic pH temperature compensation 0-100°C
- Set points cover entire span
- 1/8 DIN Aluminum case
- 0.56" high efficiency red LED display.



Auto-Flush Process

The R/O System will Auto-Flush automatically, through the supplied pump, every time the storage tanks fill in order to remove concentrate and trapped colloidal particles on the membrane surface. The flush process will be carried out with fresh permeate water.

Auto Flush Pump



Piping:

- Feed: 3" Stainless Steel 316L
- Product: 2" Stainless Steel 316L
- Reject: 3" Stainless Steel 316L
- Pressurized Piping Fittings Stainless Steel
- All High Pressure Pipes and Fittings will be from 316L Stainless Steel



Frame:

- Ampac, powder coated, welded aluminum frame
- Skid base Include a welded Diamond Plate
- Skid is Anodized and Double Powder Coated.

RO system Operating Requirements:

Operating Limits

- Feed Temp: Max 105 F
- Feed Pressure: Min 40 psi
Max 80 psi
- Chlorine: Max .1 ppm (after carbon filter)
- Feed Ph: Max 11
Min 3
- Feed TDSMax. 45,000 ppm



Electrical

- Nema 4X rating
- Three Phase 440V/60Hz
- Electrical: 100 HP Motor. - 440V | 3 Phase | 60Hz
- Built-in capacitor and overload with automatic reset.
- Motor is CE UL Certified   To Operate in North America & Europe.



Based on the above operating limits the following items will be guaranteed:

73.5 GPM (278.2 LPM) of Permeate product water for continuous 24 hour/day, 7 day/week operation.

Additional Specifications:

- Reject Percentage range between 40 and 60 percent
- Water quality sampling ports for each membrane
- Valve and piping for recycle water and conductivity mixing options
- RO only to backwash when storage tank is full
- RO will flush when idle for preset number of hours.

Monitoring:

- Feed, Reject, and Product Conductivity
- Reject, Reject Recycle, Product and Conductivity Mixing flow rates
- Pressure before and after Carbon Filter
- Pressure before and after Pre Filter
- Pressure after RO pump
- Pressure before and after GAC Post Filter
- Product water temperature.



Service:

Ampac USA will be available for product support, including spare parts and service for the Operational life of the system for a small annual fee to be agreed upon after the first year. If RO operation does not meet the specifications listed above, Ampac USA will be able to respond with product support in a timely manner.



Maintenance Schedule:

Description	Size	Micron	Price	# Services Annually	Total Price
Two Hydro Safe Pre-Filter	4" x 30"	5	285.00	2	570.00
Two Hydro Safe Pre-Filter	4" x 30"	5	285.00	2	570.00
Anti-Scalant Aqueous Liquid	Liquid	5 gal	625.00	2	1,250.00
					2,390.00
Multimedia Pre-Filter	Price/Lbs.	Quantity	Price	Media good for / Number of Years	Total Price Prorated
Anthracite Carbon	1.75	1320	2,310.00	3 Years	770.00
KDF Media	8.50	100	850.00	3 Years	283.33
Poly Phosphate	8.50	100	850.00	3 Years	283.33
					1,336.67
Total Maintenance Cost per year					\$ 3,726.67

Electrical Power Container:

Electrical Power Container package shall include two John Deere 250KW Diesel Generators, Bolted. One Prime Continuous and second shall be on Standby controlled by Automatic Transfer Switch, container shall also include two fans one for air intake, and the second for air suction.

GENERATORS - DIESEL: John Deere: 250 kW Open Set:

- John Deere 250 kW Open Set
- Full Load: 400 Amps
- 6090HF Engine
- PDG 274K Alternator
- Remote Oil Drain Valve Installed w/ Hose
- Residential Grade Aluminized Automotive Muffler
- Exide 24MSXX Marine Grade 1000 Amp Battery
- Assembled, Wired, and Mounted on a Steel Skid with Anti-Vibration Motor Mounts
- Low Oil Pressure and High Coolant Temp Shutdowns are Standard
- CK-4 Spec 15-40 Diesel Oil & 50/50 Engine Coolant are included.

AUTO CONTROLLERS: Deep Sea Electronics: DSE 7310 Engine Auto Controller

Deep Sea USA 7310 Auto Controller INSTALLED - 2 wire auto start engine controller. Engine controller includes full shut down protection monitoring for low oil pressure, high water temp, over/under rpm and Hz. Controller also includes hour meter, and engine rpm.

FUEL TANKS:

250 Gallon UL-142 Single Wall Steel Fuel Tank 250 Gallon UL-142 Listed Single Wall Fuel Tank 80" x 46" x 16"

ELECTRICAL OPTIONS:

Automatic Transfer Switch: 3 Phase 250.0 kW 277/480 Three Phase 277/480 250.0 kW Main Service Disconnect Breaker 350 Amps Mounted in NEMA 1 Box.

SHIPPING:

Freight – to be paid by Client or End User. Ampac USA can arrange for shipping or Client can utilize their own freight company.

RETURN POLICY:

In the unlikely event there is an issue with your generator, we will work with you and our network of suppliers and dealer repair centers to ensure your generator is running as it should. Ample time should be allotted for this by the customer. After all reasonable on site repair options have been exhausted and if the generator is still not performing properly, PDG will authorize a return for repair or replacement. All returns for any other reason will be charged a 20% restocking fee plus any damages incurred to the unit by the customer. Return shipping will be the sole responsibility of the customer. Thank You for choosing Powerhouse Diesel Generators.



Terms:

Payment Terms: 60% Deposit. 40% due before delivery date. All pricing stated is in U.S. dollars.

Exclusions: Prices do not include shipping, insurance, sales tax, import taxes and duties, installation, and options listed below unless otherwise indicated.

Warranties:

Ampac USA warrants the system to be free from any defect in material of construction and workmanship for a period of one complete year from the date of commissioning of the unit, but not later than eighteen months from the date of shipment, under the following conditions:

1. System is operated within parameters as stipulated in the manual.
2. A proper log duly filled on daily basis is maintained with the client & sent to Ampac USA on monthly basis.

Note: Ampac USA does not guarantee the product water to be free from bacteria unless an Ultra Violet Disinfection System or an Ozone Generator or both are installed on the Skid.

Technical Support:

Ampac USA will have technical support available for the period of one year included in this proposal as well [REDACTED] includes the information you need to select, specify, install, and operate any Reverse Osmosis system from Ampac USA. In addition, it contains relevant technical information about the Components used by Ampac, case studies, references, and Authorized Sales and Service Representatives Worldwide.



Monitoring:

Ampac USA can monitor all R/O Systems remotely. Pricing for this service will be quoted separately if needed.



Installation & Commissioning:

- Supervision for installation, Commissioning, start up and operator training services with first production runs will be provided free of charge.
- Flight, accommodations and transportation shall be provided by client.

Finally, thank you for your Business. Hoping to have a long term business relationship between both our companies. If you have any further questions. Please do not hesitate to contact us anytime @ (818) 700-8015.

Best regards,

Sammy A. Farag

Sammy A. Farag, CEO

Ampac USA

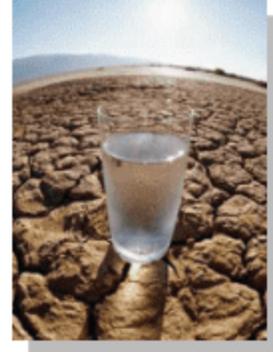
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Ampac USA Sea Water Desalination System 100,000 GPD

