



Proposal

Ampac Sea Water Desalination

Model SW25K-LX



Ampac USA

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Table of Contents

<i>System Design Basis:</i>	4
<i>Main System Components:</i>	4
<i>Main System Instrumentations:</i>	4
<i>Functional Specification</i>	5
System Safety:.....	5
System Specifications:.....	6
Design Basis:.....	6
Standard Features	6
Components Make & Materials of Construction:	6
Base Price for SW25K-LX 480V/60Hz/3 Phase	7
Specifications for Ampac USA Seawater Desalination Watermaker	8
Smart on Demand Supply Pump	8
Auto-Flush Screen Filter:.....	8
Multimedia KDF-GAC-Poly Phosphate Quartz Pre-Filter:.....	9
Sediment Cartridge Filter Housing 5 micron:	10
Anti-Scalant Dosing System:.....	10
RO High Pressure Pump	11
Membranes Elements:	12
Pressure Vessels:.....	12
Fresh Water Auto Flush Process:	12
Post Treatment System:.....	12
Ultra Violet Sterilizer:	13
Instrumentations	14
PLC: S200 Series Microprocessor Controller:.....	14
PLC: S1040 Series Microprocessor Controller (<i>Optional</i>)	15
Flow Meters:	16
Pressure Gauges:.....	16
Pressure Valves:	16
Frame:	17
RO system Operating Requirements:.....	17
Electrical	17
Power Consumption.....	17
Additional Specifications:	17
Monitoring:	18
Service:.....	18
Maintenance Schedule:.....	18
Terms:	18
Technical Support:.....	19
WARRANTIES:.....	19
Flowchart design	19



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Proposal
Ampac Reverse Osmosis System For Sea Water Desalination
Application 25,000 GPD-TFC (94.6m³/Day)

January 5, 2018

Proposal No: 1711-15K-008

Contact Name: Mr. [REDACTED]
Organization: HBRK Associates Inc.
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Tel: (212) 971-1306
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Dear Mr. Gordon,

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 40°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.

System can also be installed on ship with the following max. Motion:

- 1) Permanent Trim up to: ±5°
- 2) Permanent List up to: ±15°
- 3) Pitching up to: ±10°
- 4) Rolling up to: ±45°

Make of System: Fully automated Turnkey Sea Water Desalination Watermaker including pre-treatment Modules, Reverse Osmosis System, and Post-Treatment, 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: SW25K-LX, System to produce 25,000 GPD (94,625 LPD) Liters per day

Dimensions: Reverse Osmosis Skid: 108" L x 48" W x 72"H., approx. Weight 1,350 Kgs.

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

The proposal 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
- 8Ft³ Multimedia Anthracite Pre-Filter w/backwash valve, Bypass
- 4"x30" Sediment Pre-Filter 5µm
- Belt Driven High Pressure Plunger Pump with Motor, Pressure Relief Valve and Accumulator
- Horizontal Multi Stage Feed Supply Pump with Safeguards
- 8" x 80" FRP Pressure Vessels
- Count Two 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	25,000 GPD
% Recovery	30%
% 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	62.5 GPM (236 LPM)
Product Flow	21.8 GPM (82.8 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	< 5 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	Hypro USA
Complete Panel for Easy Controls	Ampac USA
Sediment Pre-Filtration rated @ 200 GPM	Hydrosafe 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 Milton Roy	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

Media Make & Materials of Construction:

<i>Description</i>	<i>Name Brand</i>	<i>Material of Construction</i>	<i>Origin</i>
Silica Quartz	Clear Water, Corp.	Silica Sand Density is 2.66, SiO2>98%, and Mohs scale is 7 degree	USA
KDF	KDF Fluid Treatment, Inc.	high-purity copper-zinc formulations	USA
Poly-Phosphate	Pacific Standard, Specialties, Inc.	Soluble Food Grade Polyphosphate Crystals	USA
Activated Carbon	American Carbon, Corp.	Premium Coconut Shell Acid Washed Activated Carbon	USA

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 SW25K-LX 480V/60Hz/3 Phase	\$ 136,750.00	\$ 136,750.00
Qty. Incl.	Optional Equipment – Not Included Unless Indicated	Unit Price	Extended Price
1	Automatic Operating Programmable logic controller with : <ul style="list-style-type: none"> • Delayed start-up of high-pressure pump • Inlet Solenoid Valve • Low & High Feed Pressure Switches • Supply & Delivery Pumps on/off • R/P Storage Tank Full Pump on/off • Auto Flush Cycle • Pre-Treat Lockout • Hour Meter • TDS/Conductivity Meter 	7,850.00	Included
0	10.4" LCD Touch Screen Display w/HMI Feature	6,750.00	Optional
6	Differential Pressure Gauges (Count 6)	184.50	Included
3	Electric Signal Waterproof Float switch for R/O Pump Shut-off	245.00	Included
1	Nitrogen Filled @ 5000 PSI Stainless Steel Pulsation Noise Dampener.	1,250.00	Included
1	Pressure Relief Valve for Security if Pressure Valve closed	975.00	Included
1	Auto Flush Package to flush system with fresh water after tank full	945.00	Included
Pre-Treatment Equipment - Not Included Unless Indicated		Unit Price	Extended Price
1	Spin Down Screen Pre-Filter with Manual Valve	875.00	Included
1	Anti-Scalant Chemical Injection Mixer, Pulsation Pump & 5 gal.	2,850.00	Included
1	Chlorine Chemical Injection Tablet Feeder	285.00	Included
1	8 Ft ³ Multimedia Anthracite Pre-Filter w/backwash valve, Bypass	8,750.00	Included
2	pH Adjust Post Filtration with Calcite & GAC w/Built-in Bypass	875.00	Included
Additional Options & Equipment - Not Included Unless Indicated		Unit Price	Extended Price
1	On-Demand Feed Supply Pump 316L Stainless Steel 40GPM	3,750.00	Included
1	Recommended Stock of Replacement Filters for One Year	875.00	Included
0	Anti-Scalant Aqueous Liquid (55 gal Drum)	1,650.00	Optional
0	Complete installation in a 20' Container w/AC & Lighting	21,750.00	Optional
1	Crating and Packing	850.00	850.00
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. System Dimensions : 149" X 44" X 105"		Sub-Total	\$ 137,600.00
		Shipping & Handling	TBD
		Total X-Works	\$ 137,600.00

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

Delivery: 8-10 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 USA Seawater Desalination Watermaker

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.

Pre-Chlorination System:

Iron and manganese in water can be oxidized by chlorine, converting them to ferric hydroxide and manganese dioxide. The flocculated material can then be removed by filtration. The higher the amount of chlorine fed, the more rapid the reaction. Some plants have been designed for an initial chlorine residual of 5 to 10 ppm. After filtration the chlorine is removed by the addition of sodium bisulfide, sulfur dioxide, or sodium bisulfide.

Your Water quality as well, contain different kinds of bacteria and ammonia 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: 3" Tablet Injection System
- Capacity: 3.4 l/hr.
- Pressure: 7 bar
- Dosing tank: 01
- Capacity: 7 Tablets
- Material: PE



Smart on Demand Supply Pump

Ampco Marine & Industrial close-coupled Pump line of nickel aluminum bronze pumps are ideally suited for salt water, brackish water, and waste water applications. These alloys offer exceptional corrosion and erosion resistance. Military around the world have used these pumps for over 60 years, along with many commercial applications aboard ships, reverse osmosis, and desalination systems.

Features:

- Heavy-wall construction with tight manufacturing tolerances
- High-efficiency design with fully-shrouded, dynamically-balanced impellers
- Close-coupled on JM, 56J, IEC frame motors
- ABS (American Bureau of Shipping) Design Approval available



Auto-Flush Screen Filter:

- Count One Filter 100 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.



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

Multimedia Pre-Filter will remove any excess Chlorine injected earlier, adjust pH and eliminate any excess bacteria. 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.



The following are specifications of Multi Media Filters:

- 8 ft³ Strong Gel Softening
- 21" x 65" Reinforced fiberglass housing
- 2" PVC piping
- Clack WS2 Digital Auto Metered Backwash Valve with LCD Screen
- Flow rate: 70 GPM (24hr/7 days per week)
- Piping: 2" Sch80 High Pressure PVC piping
- Media: Active Acid Washed Coal Based Carbon (GAC), Anthracite, Silica Quartz
- Reason: Provides water of less than .1 ppm chlorine
- Feature: Fully Automated Operation
- Operation: R/O System will automatically shut down when Multimedia System Backwash.
- Manufacturer: Tank from Structural USA, Valve from Fleck USA

Media Included:

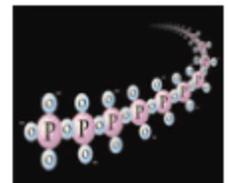
- 1) **KDF Media:** KDF® Process Media are high-purity, granulated copper and zinc-based alloys that treat water and waste water through a process based upon the principle of **redox** (Oxidation-Reduction). Originally, KDF was shorthand for Kinetic Degradation Fluxion.



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.



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:	1
● Flow Rate:	140 GPM
● Model:	HIF
● Maximum Operating pressure:	150 PSI
● Number of standard 30" cartridge:	1 Count
● Filter height:	55"
● Length of Cartridge Filter:	30"
● Diameter of Cartridges:	2 ¼"
● Porosity:	5micron



Anti-Scalant Dosing System:

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:	3.4 l/hr.
Pressure:	10 bar
Accessories:	Injection valve, foot valve tubing Dosing Tank
Capacity:	30 liters
Material:	PE.
Manufacturer:	Ampac USA / Blue White



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.

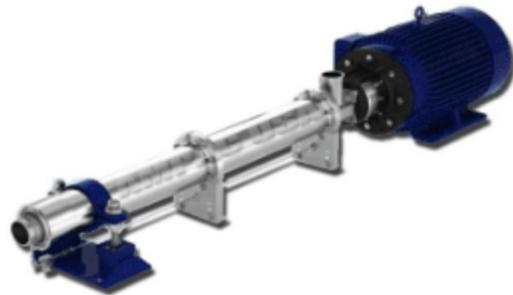
The System will also include FEDCO's Hydraulic Pressure Boosters turbocharger the will increase the efficiency to exceed 80% transfer efficiency. Superior efficiency comes with superior reliability.

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: MSS-1526
- Pump Body: Full Duplex Stainless Steel 2205
- Shaft & Impeller: Full Duplex Stainless Steel 2205
- Stages: 26 Stages
- Flow: 52 Gallons per minute
- System Pressure: 576 PSI
- Efficiency: 57.4 %
- Absorbed Power: 27.3 HP
- Full Load Amps: 67.6 Amps
- Running Amps: 43.4
- Electric Power: 22 KW
- Ports: 2" NPT Inlet x 2" NPT Discharge
- Shaft Seal: Standard Mech. Seal is Viton/Carbon/Ceramic/S.S, Casing "O"-Ring is Viton.
- Motor: 460 V | 60 Hz | Three phase | NEMA standard totally enclosed
- Enclosure: Rugged design for continuous duty under all operating conditions.



Hydraulic Pressure Booster (HPB): (Energy Recovery)

The Hydraulic Pressure Turbo Charger shall be integrated to increase Liquid Transfer Efficiency up to 80%

Specifications:

- Model: HPB-10
- Body: Full Duplex Stainless Steel
- Shaft & Impeller: Full Duplex Stainless Steel
- Ports: 3" NPT Inlet x 2" NPT Discharge
- Feed Flow: 52 gpm
- Brine Flow: 34 gpm
- Pressure: 900 psi
- Brine Pressure: 880 psi Brine
- Outlet Pressure: 7 psi
- Feed Temp: 77 °F
- Feed TDS: 36000 Feed
- SG (calc.): 1.024



Membranes Elements:

- Count 3 Membrane Elements
- Filmtec SW30XLE-440i, 9,850 gpd rating Low Fowling
- Improved FILMTEC™ Reverse Osmosis Membrane Elements offer the
- Highest productivity while maintaining excellent Dissolved Solids Rejection.
- FILMTEC BW30 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: 3 Vessel
- Material of Construction: FRP Composite
- Pressure Rating: 1200 PSI
- Dimensions: 8" x 40"
- Number of Elements per Housing: 1 Element.



Fresh Water Auto Flush Process:

The R/O System will Auto-Flush automatically, through a supplied inlet for Fresh Water, 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.

Post Treatment System:

The pH of the permeate water is expected to be in the range of 5.0 this is rather, acidic. To control the pH, We will have to Re-Mineralize the water by introducing Calcite / Corosex Media Post-Filter to adjust pH level to neutral.

Calcite (Calcium Carbonate) is a naturally occurring calcium carbonate media. One of the advantages of Calcite is its self-limiting property. When properly applied, it corrects pH only enough to reach a non-corrosive equilibrium. It does not overcorrect under normal conditions. Upon contact with Calcite, acidic waters slowly dissolve the calcium carbonate to raise the pH which reduces the potential leaching of copper, lead and other metals found in typical plumbing systems. Depending on pH, water chemistry and service flow, the Calcite bed will have to be periodically replenished as the Calcite is depleted.

Corosex is a very concentrated form of (Magnesium Oxide) that is always blended with calcite to reduce the risk of cementing. We call this blend of Corosex and Calcite, NS Mix. The NS Mix increases the alkalinity of the water to raise the pH value to a neutral state (7.0).

The NS Mix can raise a pH from 5.5 to 7.0 (neutral), and is recommended on any water that has a pH between 5.5 and 6.0. Corosex has the same regeneration and sacrificial properties as Calcite.



Features:

- pH can be adjusted 6.5-10.0 System will have a pH Monitor & Valve adjust to desired pH level with By-Pass.
- ORP can be adjusted up to -700MV
- Prevention of bacteria growth
- Eliminating odor in water
- Boosting cell regeneration
- Balancing acidic levels
- Preventing mold

Re-Mineralization is the process of restoring minerals - again, in the form of mineral ions to make it strong and stable again - except that Re-Mineralization is three dimensional, and the different mineral ions must be replaced having the exact same shape, size and the same electrical charge as those lost in the Reverse Osmosis Process.

Ultra Violet Sterilizer:

Microorganisms in water can cause a multitude of health problems. Ultraviolet System is the natural way to disinfect The Final Permeate Water feeding your Ship Tank. UV light systems penetrate and destroy the harmful organism, disinfecting the water, while removing other drinking water contaminants, and maintaining your ship tank disinfected at all time.



BENEFITS:	UV DESTROYS	RECOMMENDED USES:
COMPLETELY AUTOMATIC	BACTERIA	LAKE OR POND WATER
COMPACT AND EASY TO INSTALL	MOLD SPORES	PRIVATE WELLS
NO CHEMICALS REQUIRED	ALGAE	CISTERNS
LOW OPERATING COST	PROTOZOA	FOLLOWING CARBON FILTERS
LOW MAINTENANCE	VIRUSES	NON-CHLORINATED MUNICIPAL SYSTEMS
NO ADDED TASTE OR ODOR	YEAST	ULTRA-PURE WATER SUPPLIES

Instrumentations

PLC: S200 Series Microprocessor Controller:

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: S1040 Series Microprocessor Controller (Optional)

The SW-24K can be equipped optionally 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 that 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.



Flow Meters:

There will be two Flow Meters installed on the panel of the R/O Systems as follows:

- 1) Product Flow Meter to indicate the amount of permeate produced by the system.
- 2) Concentrate Flow Meter to indicate the amount of concentrate to return to the ocean.

- Blue White Panel Mount Digital Meters for Product, Waste and Blend Model (F-2000RT)
- The meters display the flow rate and the accumulated flow



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



Piping:

- Feed: 2½"
- Product: 1½"
- Reject: 2½"
- Pressurized Piping Fittings Stainless Steel
- All High Pressure Pipes and Fittings will be from 316L Stainless Steel.



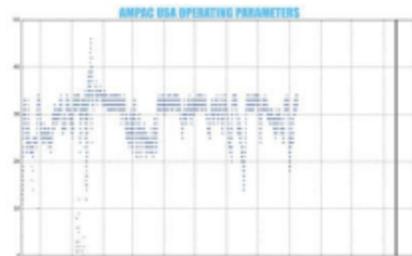
Frame:

- Ampac, Double Powder Coated, Welded Aluminum Frame 0.25 Gauge
- Final Clear Coat
- Skid base Include a welded Diamond Plate
- Skid is Anodized and Double Powder Coated.
- Skid shall have 4 Hangers installed on all 4 sides to facilitate Maneuvering on board.
- Skid will also be equipped with 4 heavy duty lock type wheels that can be removed once unit is in location.
- Equipment including valves, actuators, sensors, gauges and switches shall be fitted with adequate name plates of an engraved type in English Languages. (Please see Picture Below).

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 TDS	Max.	45,000 ppm



Electrical

- Nema 4X rating
- Three Phase 240V/50Hz or as per customer requirement.
- Different power rating will require change in the design that might affect final pricing.

Certification: ATEX, EExd IIC/EEEx II,  II 2 GD, Zone 1, 2, 21 & 22



Power Consumption

Pump	HP	Volts	Amps	Watts
R/O High Pressure Pump	30	400V	18.6	12.20
On-Demand Supply Pump	5	400V	6.7	4.30
Instrumentations	1	220V	1.2	0.26
Total Power Consumption			26.5	16.8

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

21.8 GPM (82.8 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
Anti-Scalant Aqueous Liquid	Liquid	5 gal	625.00	0	N/A
					570.00
Multimedia Pre-Filter	Price/Lbs.	Quantity	Price	Media good for / Number of Years	Total Price Prorated
Anthracite Carbon	2.10	208	436.80	3 Years	145.60
KDF Media	8.50	20	170.00	3 Years	56.70
Poly Phosphate	8.50	20	170.00	3 Years	56.70
					259.00
Total Maintenance Cost per year					\$ 829.00

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.

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.



WARRANTIES:

- All Water Treatment related materials and electrical controls are made in USA.
- Ampac USA is a registered US California Based S Corporation License Number 68-0495190
- Ampac USA has adopted ISO9001 & NSF 61 Standards for quality control assurance system
- Ampac USA have extensive experience in training. Ampac USA can offer training in the following languages: English, French, Spanish, Arabic and Russian

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.

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

5255-5265 State St.

Montclair, CA 91763 USA

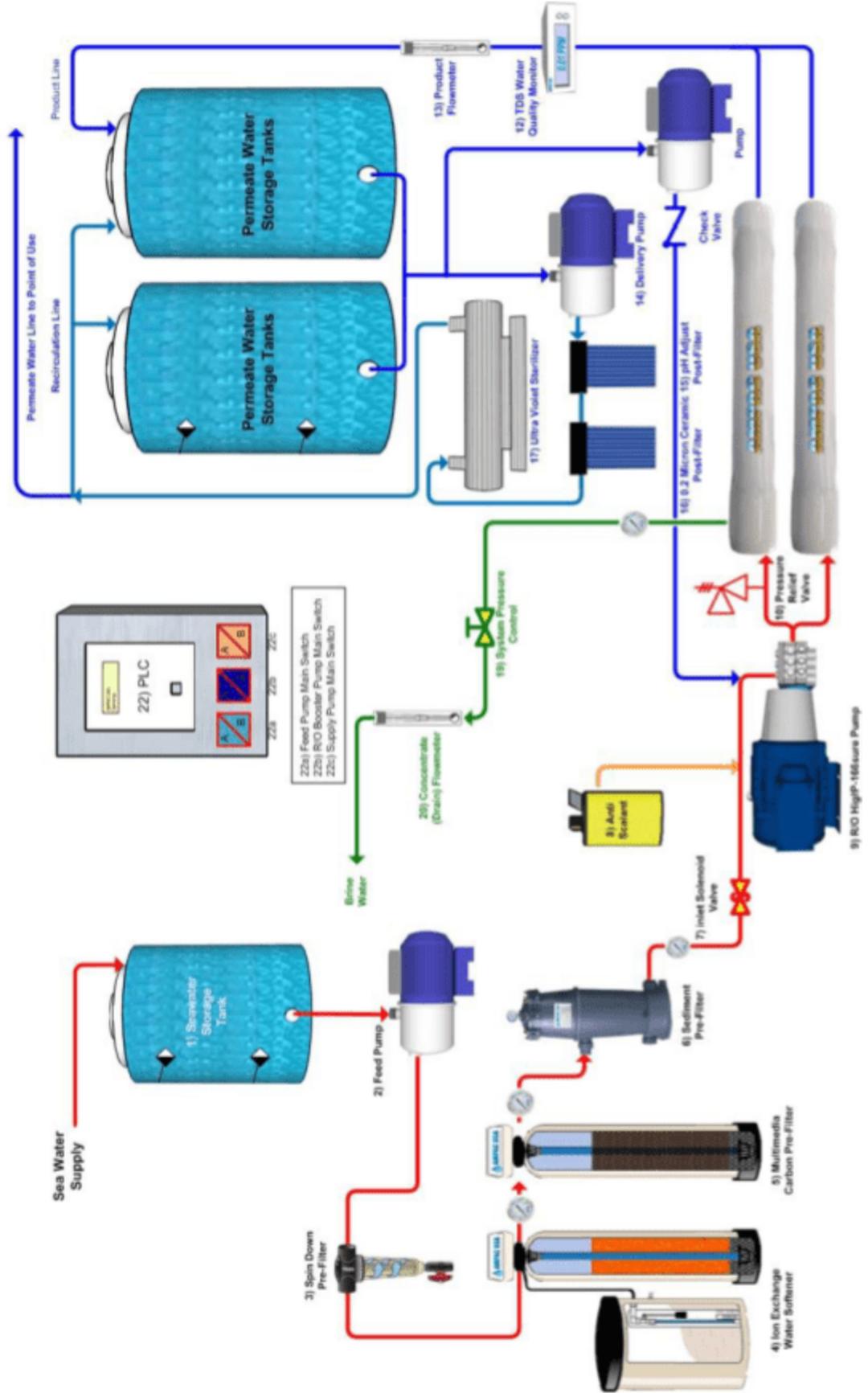
Tel: (909) 548-4900

Fax: (909) 548-4901

Email: [REDACTED]

Website: [REDACTED]







Ampac USA Standard Seawater Desalination System to produce 20,000 GPD