



# AMPAC

ADVANCED WATER  
TREATMENT SOLUTIONS

# USA

## Proposal

### Ampac Seawater Desalination

Model SW60K-LX (73,800 GPD / 11.6m<sup>3</sup>/hr.)



### **Ampac USA**

5255-5265 State St., Montclair CA 91763 USA

International

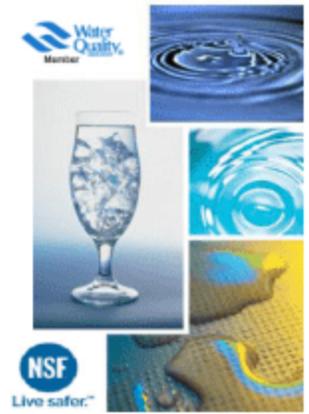
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**Proposal**  
**Ampac Twin Redundant Reverse Osmosis Systems for Sea Water Desalination Watermaker | 60,000 GPD (227 m<sup>3</sup>/Day)**

Date: June 30<sup>th</sup>, 2017  
 Proposal No. 247403

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**Address:** 575 Lexington Ave, FL4  
 NY, 10022  
**Tel:** (212) 971-1306  
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Dear Mr. Kahn,

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.

|   |  |
|---|--|
| <p>System production is based on the following conditions:</p> <ol style="list-style-type: none"> <li>1) Air Temp (Weather): From 40°C to -30°C</li> <li>2) Sea water Temp: From 30°C to -2°C</li> <li>3) Machine Room: From 50°C to 0°C</li> <li>4) Relativity Humidity: From 95% to 0</li> <li>5) Maximum Salinity: 45,000ppm NaCl feed water,</li> <li>6) pH Range: 3.0-11.0pH Range.</li> </ol> | <p>If Applicable Ship Motion:</p> <ol style="list-style-type: none"> <li>1) Permanent Trim up to: ±5°</li> <li>2) Permanent List up to: ±15°</li> <li>3) Pitching up to: ±10°</li> <li>4) Rolling up to: ±45°</li> </ol> |
|---|--|

**System Dimensions:** 168" W x 76" D x 148"H

**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.

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

**Delivery Manufacturing Schedule:** System shall be completed within 10-12 Weeks form the date of your initial Purchase Order.

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
- 28Ft<sup>3</sup> 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 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:
  - 10.4" Touchscreen Color Display
  - 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

Ampac USA Seawater Desalination Watermakers comes fully assembled, tested and include a complete performance test (Factory Acceptance Test) using to validate required performance.

| <b>System Specifications:</b> |                                     |
|-------------------------------|-------------------------------------|
| Quantity                      | One                                 |
| Maximum Production Capacity   | 60,000 GPD / 9.5m <sup>3</sup> /hr. |
| Minimum % Recovery            | 35% ~ 40%                           |
| Average % Salt Rejection      | 98%                                 |
| Average Design Temperature    | 25°C                                |
| Maximum Temperature           | 45°C                                |
| Membrane Type                 | TFC (Filmtec)                       |
| Pressure Vessels              | FRP (Code Line or Protec)           |

| <b>Design Basis:</b>                  |                                    |
|---------------------------------------|------------------------------------|
| Min. Feed Flow                        | 146 GPM (554 LPM)                  |
| Max Product Flow                      | 41.6 GPM (157 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:*

| <b>Standard Features</b>   |                  |
|--|------------------|
| High-Pressure Belt Driven Piston Pump with Safeguards                | Fedco USA        |
| Complete Panel for Easy Controls                                     | Ampac USA        |
| Sediment Pre-Filtration Systems rated @ 140 GPM Each                 | 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 or Blue White    | Polypropylene   | USA           |
| Sediment Pre-Filters          | Watts                | Glass Reinforced Polypropylene  | USA           |
| Reverse Osmosis Pumps         | Hypro                | 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, SiO <sub>2</sub> >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.

| Qty.  | Description  | Unit Price          | Extended Price |
|---|--|---------------------|----------------|
| 1   | Base Price for SW60K-LX 440V/60Hz/3 Phase  | \$ 214,750.00       | \$ 214,750.00  |
| Qty.  | Instrumentations – Included  | Unit Price          | Extended Price |
| 1   | Automatic Operating Programmable logic controller with : <ul style="list-style-type: none"> <li>• Delayed start-up of high-pressure pump</li> <li>• Inlet Solenoid Valve</li> <li>• Low &amp; High Feed Pressure Switches</li> <li>• Supply &amp; Delivery Pumps on/off</li> <li>• R/P Storage Tank Full Pump on/off</li> <li>• Auto Flush Cycle</li> <li>• Pre-Treat Lockout</li> <li>• Hour Meter</li> <li>• TDS/Conductivity Meter</li> </ul> | Included            | Included       |
| 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   | 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       |
| 1   | High Pressure Pump Motor Variable Frequency Drive  | 650.00              | Included       |
| Pre-Treatment Equipment - Included  |  | Unit Price          | Extended Price |
| 1   | Auto Flush Spin Down Screen Pre-Filter   | 875.00              | Included       |
| 1   | Anti-Scalant Chemical Injection Mixer, Pulsation Pump & 5 gal.   | 1,875.00            | Included       |
| 1   | Chlorine Chemical Injection Mixer & Pulsation Pump   | 245.00              | Included       |
| 2   | 24Ft <sup>3</sup> Multimedia Anthracite Pre-Filter w/backwash valve, Bypass  | 2 x 8,750.00        | Included       |
| 2   | pH Adjust Post Filtration with Calcite & GAC w/Built-in Bypass   | 2 x 875.00          | Included       |
| Additional Options & Equipment - Not Included Unless Indicated  |  | Unit Price          | Extended Price |
| 0   | 10.4" LCD Touch Screen Display w/HDMI & Remote Communications  | 8,750.00            | Optional       |
| 1   | On-Demand Supply Pump ITT Goulds, Grundfos or Ebara 3Phase 440V  | 12,750.00           | Included       |
| 0   | Sand Separator Cyclone   | 1,750.00            | Optional       |
| 0   | Anti-Scalant Aqueous Liquid (Flocon 130) (55 gal. Drum)  | 1,450.00            | Optional       |
| 0   | Recommended Stock of Spare Parts   | 6,961.95            | Optional       |
| 0   | Complete Installation in a Brand New 40" Connex Container including Wiring, Lights, AC Unit will be included inside the container to be installed on site.   | 21,750.00           | Optional       |
| 1   | Crating & Packaging for Export   | 1,250.00            | 1,250.00       |
| 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           | \$ 216,000.00  |
| <b>Generators with installation in 40' containers will be quoted separately</b>   |  | Shipping & Handling | TBD            |
| 40' Container Dimensions : 168" X 96" X 102"  |  | Total X-Works       | \$ 216,000.00  |

**Exclusions:** Prices do not include import taxes and duties, installation, and options listed above unless otherwise indicated.



## Specifications for Ampac USA Sea Water Desalination Reverse Osmosis System

- 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)

### Feed Supply Pump: *(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.

|                            |   |
|----------------------------|---|
| Quantity:                  | 2 Units in Parallel.                    |
| Setup:                     | First on VFD, Second on Pressure Sensor |
| Type:                      | Multi –stage centrifugal                |
| Model:                     | Grundfos CRN15-4                        |
| Capacity:                  | 60 GPM                                  |
| Head:                      | 60 PSI                                  |
| Shaft & Impeller Material: | SS316L                                  |
| Sealing Arrangement:       | Mechanical seal                         |
| Motor Arrangement:         | Direct Coupled                          |
| Motor Insulation:          | CEI-EN standard /Class F                |
| Motor Rating:              | 7½ HP                                   |
| Power:                     | 440V/3Phase /50Hz                       |
| Manufacturer:              | Grundfos, Germany                       |



### Pre-Chlorination System: *(Optional)*

When chlorine is added to waste water, a reaction occurs splitting it into **hypochlorous** acid and hypochlorite ions. The hypochlorite ion does not actively contribute to the sanitizing ability of chlorine (only 1%), but is an extremely strong oxidizer. The **hypochlorous** acid is the active, killing form of chlorine and what does the actual sanitizing. This chlorine molecule easily enters microorganisms through their cell walls and kills the organisms by destroying the sulfur groups on the cell's enzymes, causing the cell's metabolism to stop, resulting in the cell's death and **discoloration**. Not only does chlorine kill bacteria, it does it very quickly. The Association of Analytical Chemists uses a kill time of 30 seconds to completely destroy a given concentration of bacteria as a standard.



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.

|                   |   |
|-------------------|---|
| ● System include: | Tank, Mixer and Injection (Dosing) Pump     |
| ● Dosing pump:    | Solenoid driven positive displacement pump. |
| ● Capacity:       | 3.4 l/hr.                                   |
| ● Pressure:       | 4 bar                                       |
| ● Accessories:    | Injection valve, foot valve                 |
| ● Dosing tank:    | 01  |
| ● Capacity:       | 50 liters                                   |
| ● Material:       | PE  |
| ● Manufacturer:   | Ampac USA / Blue White                      |

## High Performance Liquid-Solids Separation System: (Optional)

The ILB Separator is ideally suited for removing sand, grit and other fine solids for heavy duty systems. Able to withstand the toughest environmental conditions, it offers high pressure capability, high flow rates and high temperature resistance.

The removal of specific unwanted solids from a pumped/pressurized liquid system shall be accomplished with a centrifugal-action vortex separator.

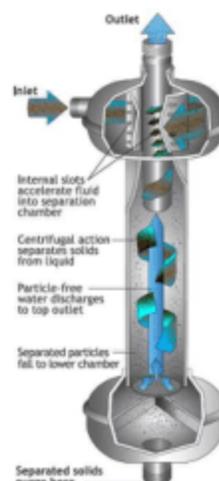
Solids removal efficiency is principally predicated on the difference in specific gravity between the solids and the liquid. Performance is expected to be 98% removal of 74 microns and larger, with significant particle removal of finer particles also likely.

### Separator Design & Function:

A tangential inlet and mutually tangential internal accelerating slots shall be employed to promote the proper velocity necessary for the removal of the separable solids. The separator's internal vortex shall allow this process to occur without wear to the accelerating slots.

Separated particle matter shall spiral downward along the perimeter of the inner separation barrel, in a manner that does not promote wear of the separation barrel, and into the solids collection chamber, located below the vortex deflector stool.

Water shall exit the separator by following the center vortex in the separation barrel and spiral upward to the separator outlet.

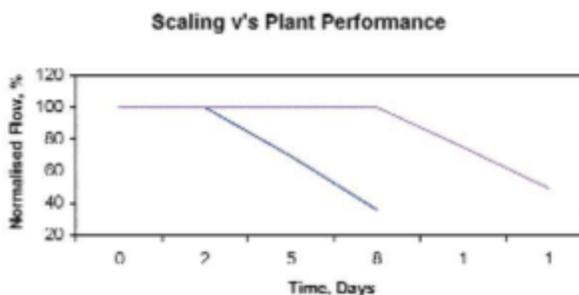


## Anti-Scalant Dosing System:

Scaling means the deposition of particles on a membrane, causing it to plug. Without some means of scale inhibition, reverse osmosis (RO) membranes and flow passages within membrane elements will scale due to precipitation of sparingly soluble gas, such as calcium carbonate, calcium sulfate, barium sulfate and strontium sulfate. Most natural waters contain relatively high concentrations of calcium, sulfate and bicarbonate ions.

In membrane desalination operations at high recovery ratios, the solubility limits of gypsum and calcite exceed saturation levels leading to crystallization on membrane surfaces. The surface blockage of the scale results in permeate flux decline, reducing the efficiency of the process and increasing of operation costs.

The effects of scale on the permeation rate of RO systems is illustrated in the following figure. Following an induction period, plant flow decrease rapidly. The length of this period varies with the type of scale and the degree of super saturation of the sparingly soluble salt.



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

**\*\* System will come with 5 gal. Anti-Scalant Container good for 1-2 months.**



## 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:                         | Two in Series  |
| ● 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:           | 4"             |
| ● Material:                         | Carbon Fiber   |
| ● Porosity:                         | 10 & 5 micron  |
| ● Manufacturer:                     | Hydrosafe, USA |



## Full Duplex Optional Multi-Stage 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.

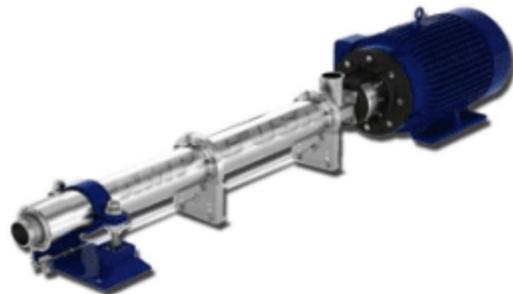
The System will also include FEDCO's Hydraulic Pressure Boosters turbocharger the will increase the efficiency to exceed 80% transfer efficiency. Superior efficiency comes with superior reliability.

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-4029   |
| ● Pump Body:        | Full Duplex Stainless Steel 2205   |
| ● Shaft & Impeller: | Full Duplex Stainless Steel 2205   |
| ● Stages:           | 29 Stages  |
| ● Flow:             | 150 Gallons per minute   |
| ● System Pressure:  | 721 PSI  |
| ● Efficiency:       | 93.6 %   |
| ● Absorbed Power:   | 75 HP  |
| ● Full Load Amps:   | 84.0 Amps  |
| ● Electric Power:   | 58 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:            | 440 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-30
- Body: Full Duplex Stainless Steel
- Shaft & Impeller: Full Duplex Stainless Steel
- Ports: 3" NPT Inlet x 2" NPT Discharge
- Feed Flow: 150 gpm
- Brine Flow: 53 gpm
- Pressure: 850 psi
- Brine Pressure: 820 psi Brine
- Outlet Pressure: 7 psi
- Feed Temp: 77 °F
- Feed TDS: 36000 Feed
- SG (calc.): 1.024



## Membranes Elements:

- Count 9 Membrane Elements (8" x 40") each
- Filmtec SW30HRLE440i, 8,200 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: 3 Vessels
- Material of Construction: FRP Composite
- Pressure Rating: 1200 PSI
- Dimensions: 8" x 80"
- Number of Elements per Vessel: 3 Elements to total 9 Elements.



## 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.



## 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.

## Activated Carbon pH Adjust 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 introduce Activated Coconut Shell Carbon/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.



## Ultra Violet Sterilizer: *(Optional)*

Twin Ultra Violet 28 GPM, shall be installed on the Skid. Microorganisms in water can cause a multitude of health problems. Ultraviolet System is the natural way to disinfect water for home or industry. UV light systems penetrate and destroy the harmful organism, disinfecting the water. To remove other drinking water contaminants.



| <b>BENEFITS:</b>            | <b>UV DESTROYS</b> | <b>RECOMMENDED USES:</b>          |
|-----------------------------|--------------------|-----------------------------------|
| 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         |

## Air Conditioning Unit: *(Optional)*

A/C Unit Applicable only if Unit is containerized.



### Product Specification:

|                           |  |
|---------------------------|--|
| Style                     | Ductless Mini Split AC With Heat Pump  |
| Compressor                | Toshiba (GMCC)   |
| Refrigerant               | R410A (Pre-Charged)  |
| Cooling Capacity          | 9000 BTU   |
| Power Supply              | 208-230 V / 60 Hz, 1Ph   |
| Input Power               | 1840W (Cooling) / 2010W (Heating)  |
| Input Current             | 8.4A (Cooling) / 9.14A (Heating)   |
| SEER                      | 19   |
| EER                       | 12.5   |
| HSPF                      | 9  |
| Sound Level               | 50dB-high 40dB-Low (Indoor) / 60dB (Outdoor)                                   |
| Moisture Removal          | 2.5 L/hr   |
| Min Operating Temperature | - 20 C / - 4 F   |
| Net Weight                | 41 Lbs. (Indoor)/ 130 Lbs. (Outdoor)   |
| Dimensions                | 46.69 X 10.16 X 13.39 in (Indoor Unit) 35.43 x 12.40 x 33.86 in (Outdoor Unit) |
| Electrical Wiring         | Wire Size from Breaker to Outdoor : 12:3 & Outdoor to Indoor : 16:4            |

# 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-40K can be equipped Optional 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.

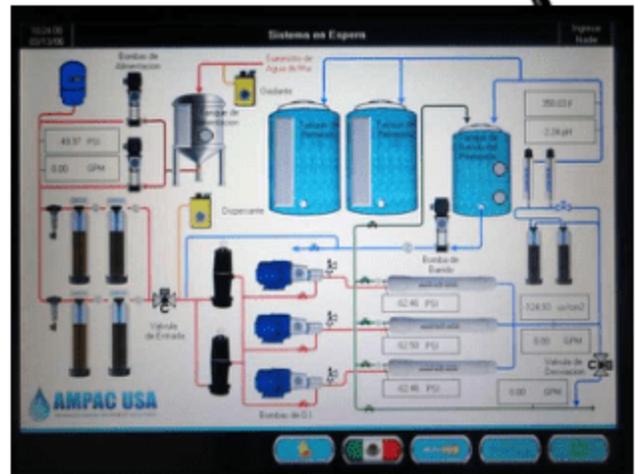
To view specific set point and control options for any piece of equipment simply touch the corresponding image on the graphic screen and all options appear. To return to the main process display, simply touch the "Main" button.

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
- 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 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.



## Pressure Gauges:

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

- In-Let Feed Pressure
- Sand Separator Cyclone Auto-Flush Pre-Filter
- Distribution Pump Pressure
- Multimedia Silica Quartz Pre-Filter Pressure
- Sediment Pre-Filter Pressure
- Booster Pump Pressure
- Membrane Elements Pressure
- Flush Pump Pressure
- Post Filter Pressure



## Pressure Valves:

System will include Two Pressure Valves made by Swagelok or equivalent 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

System Pressure  
Control Valve

Pressure Relief Valve

- 1/8 DIN Aluminum case
- 0.56" high efficiency red LED display.

## Piping:

- Feed: 3" Sch 80 PVC w/Stainless Steel Reinforced Ends
- Product: 2" Sch 80 PVC w/Stainless Steel Reinforced Ends
- Reject: 2½" Sch 80 PVC w/Stainless Steel Reinforced Ends
- Pressurized Piping Fittings Stainless Steel
- All High Pressure Pipes and Fittings will be from 316L Stainless Steel



## Frame:

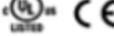
System shall be fully built within a 40' Brand New Connex Seaworthy Container as follows:

- 1- Skid 1: Powder Coated Steel Base to fit Feed Pumps
- 2- Skid 2: Powder Coated Steel Base to fit R/O Membranes & Filtration Process
- 3- Skid 3: Steel Base for R/O High Pressure Pumps
- 4- Skid 4: For Activated Carbon Tank

Features:

- Ampac, powder coated, welded Steel Base Skids
- Skid base Include a welded Diamond Plate
- All Welded Skids shall be Double Powder Coated, then Clear Coat Applied.

## Electrical

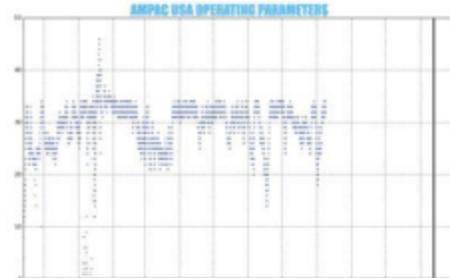
- Nema 4X rating
- Three Phase 440V/50Hz
- Electrical: Approvals: 50 Hp Motor. - 208/230V/480 3 Phase-60Hz
- Built-in capacitor and overload with automatic reset.
- Motor is CE UL Certified  To Operate in North America & Europe.



## 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: Min 3.0  
Min 11.0
- Feed TDS Max 45,000 ppm



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

**51.3 GPM (194 LPM) of Permeate product water for continuous 24 hour/day, 7 day/week operation.**

### R/O Plant Container: *(Optional)*

Brand New Seaworthy 20' Connex Container, Epoxy Coated and fully insulated, contains R/O Unit equipped with Split A/C Unit for Climate Control and Ceiling Lightings.



### Additional Specifications:

- Recovery Rate average 45%
- Reject Rate Average 55%
- Water quality sampling ports for each membrane
- RO only to flush at Start and storage tank full
- RO will flush when idle for preset number of hours.

### Monitoring:

- Product Conductivity
- Feed, Product and Reject flow rates
- Pressure before and after Carbon Filter
- Pressure before and after Pre Filter
- Pressure before and after RO pump
- Pressure before and after Membrane elements
- 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   | 4                                | 2,500.00             |
|  |            |          |          |                                  | <b>3,070.00</b>      |
| Multimedia Pre-Filter                  | Price/Lbs. | Quantity | Price    | Media good for / Number of Years | Total Price Prorated |
| Anthracite Carbon                      | 2.10       | 1320     | 2,772.00 | 3 Years                          | 924.00               |
| KDF Media                              | 8.50       | 40       | 340.00   | 3 Years                          | 113.30               |
| Poly Phosphate                         | 8.50       | 40       | 340.00   | 3 Years                          | 113.30               |
|  |            |          |          |                                  | <b>1,150.60</b>      |
| <b>Total Maintenance Cost per year</b> |            |          |          |                                  | <b>\$ 4,220.60</b>   |

**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.



## Suggested Spare Parts List:

Ampac USA Suggest to have the following List of Spare Parts on Board:

| Part #                     | Parts Description                           | Qty | Price    | Total           |
|----------------------------|---|-----|----------|-----------------|
| <i>Sterlight:QS-600</i>    | Quartz Sleeve for UV-600                    | 1   | 285.00   | 285.00          |
| <i>Sterlight:S600RL-HO</i> | Replacement lamp for a Sterlight UV         | 1   | 349.95   | 349.95          |
| <i>BBU-150-PS</i>          | BBU-150-P5 Pleated Sediment Filter 5 Micron | 1   | 285.00   | 570.00          |
| <i>Valve Kit, PVKR-40K</i> | Pump Valve Kit Repair, PVKR-60K             | 1   | 950.00   | 850.00          |
| <i>Valve Kit, PSKR-40K</i> | Pump Seal Kit Repair, PSKR-60K              | 1   | 975.00   | 875.00          |
| <i>Valve Kit, PPKR-40K</i> | Pump Plunger Kit Repair, PPKR-60K           | 1   | 1,250.00 | 950.00          |
| <i>Gaskets</i>             | Set of Gaskets for head gasket, GGKR-60K    | 1   | 975.00   | 799.00          |
| <i>Flocon</i>              | Flocon 135 Anti-Scalant 55Gallon Drum       | 2   | 1,385.00 | 1,385.00        |
|                            | <b>Total</b>                                |     |          | <b>6,739.95</b> |

## 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.

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

**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

Note: **Supervision for installation, Commissioning, start up and operator training services with first production runs will be provided free of charge. Flight, accommodations and transportation will 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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Website: [REDACTED]





Sample Pictures (SW60K-LX) Containerized Seawater Desalination Unit



Sample Pictures (SW60K-LX) Seawater Desalination Unit

