

# Water Treatment for a Thirsty Planet



**AMPAC USA**  
ADVANCED WATER TREATMENT SOLUTIONS

**Negus Enterprises Ltd.**



With over 20 years of experience in the water treatment field, Ampac USA has become a leader in the supply of skid mounted water systems. Our team has developed and implemented innovative solutions for customers all over the world. From the jungles to the arctic, thousands of Ampac treatment systems are operating today. Always ready to respond, the Ampac team has the flexibility to quickly bring ideas from concept to reality. Listening to the needs of its customers allows Ampac to offer customer driven solutions customized to specific industries.



Ampac systems utilize field proven technologies and top line components to provide plug-and-play solutions. Building products that last in harsh conditions comes from a legacy of hands-on experience and site work. Being out in real world operating environments allows our technical team to understand what works and what keeps working. And where there is no proven treatment solution, we are ready to demonstrate new treatment methodologies with pilot plant studies and bench scale demonstrations.

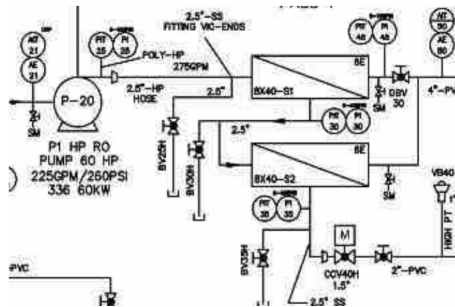


# CAPABILITIES

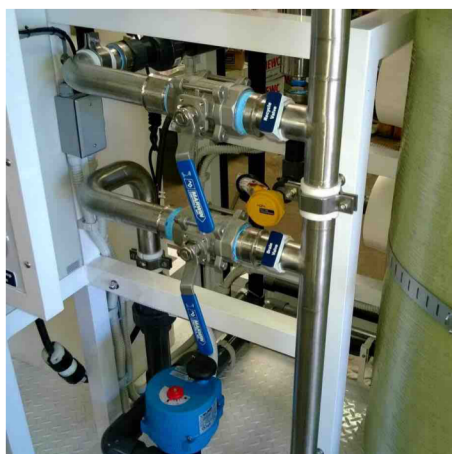
## Adding Value Through Innovation

Specific application capabilities include:

- Reverse osmosis systems for borewell water treatment, water stores or seawater desalination
- Shipboard military RO systems for Frigates and Fast Patrol Boats
- Ultra-filtration systems for separations in food processing such as dairy
- Drinking water treatment such as sub-micron ceramic filtration, ultraviolet disinfection, and ozone injection
- Solar powered treatment plants
- Electrodeionization treatment for ultrapure water
- Lab water systems for medical and pharmaceutical applications



The Ampac engineering team provides design, development, configuration, testing and field support for projects. The engineers are experienced in the design and analysis of membrane arrays, structural assemblies, piping systems and control systems.



The Ampac manufacturing team has capabilities and experience in:

- Welding of aluminum and steel frames
- Welding of stainless steel and duplex piping spools
- Pipefitting in PVC80, FRP, brass and stainless steel
- Electrical work in compliance with NEC accepted practice
- Hydrostatic testing
- Functional testing



At the core of every Ampac water treatment solution is attention to detail in the process design and the material and component selection. It's the balance between relentless refinement and innovative engineering that creates satisfied customers.

Contact Ampac today and our professional staff will review of your water treatment requirements and can provide an equipment proposal.



# PORTABLE WATER SOLUTIONS

## Solar Power Options Provide Flexibility



Faced with unreliable water supplies in Iraq, the US Department of Defense commissioned the supply of 20 solar powered water treatment plants. These treatment plants needed to be self sufficient in power to provide water purification whether or not local electric power is available.



Engineers turned to power from the sun by providing an array of solar panels above the water treatment system and a bank of batteries in the base to smooth the power. To fulfill the mobility specification, Ampac provided solar panels can be lowered and folded down around the machine to provide a 7 foot cube unit that can be transported and deployed by truck (shown at left).



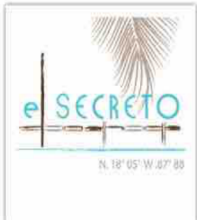
The solar panel setup uses hydraulic power assist to unfold and angle the panels and then connection of the supplied water hoses. Total set up time is 15 minutes by two operators. Ampac USA supplied 19 of the units with components to treat brackish water from borewells; each unit has a rated capacity of 8000 USGPD. One unit was supplied with components for seawater desalination.

Small water treatment systems are available mounted in a hardshell plastic case for the ultimate in portability. Pictured above is a full seawater system capable of 8 GPH drinking water production at 68 lbs weight. Borewell water systems are lighter. And UF / UV systems are even smaller and light enough for backpack carrying. These small systems can be AC or DC powered and are good candidates for solar power emergency systems.



# SEAWATER DESALINATORS

## Land Based and Naval



El Secreto boutique resort is located on the Belize coast 50 miles from San Pedro. Opened in 2012, the intimate resort retreat offers a distinctly relaxed, yet sophisticated experience on Belize's Ambergris Cove. Accessible only by boat and tucked away in its own private beachfront enclave, El Secreto has 13 'barefoot luxury' villas. The remote location required developers to be self sufficient for both power and water supply.

The source of water available is through beachwell supply with a salt content of 34,000 ppm total dissolved solids (TDS). Ampac USA supplied the El Secreto with a skid mounted seawater reverse osmosis system integrating two separate 12,000 GPD trains on the one skid. The two trains can be operated on a duty - standby cycle or both can be operated at the same time for 24,000 GPD production. Feed water is pretreated by a granular activated carbon filter for removal of organics and sediment and by an ion exchange softener bed. The reverse osmosis membranes efficiently reduce the salt content by over 99% to provide clean drinking water compliant with potable water standards. Post treatment provided on skid is done by a neutralizing remineralizer, a ceramic sub-micron filter, and by ultraviolet disinfection. The combination of ceramic filter and ultraviolet light provides the utmost security of water supply for guests at the resort.



Ampac supplied an automated 3000 GPD seawater desalinator for land-based installation for the Ecuadorian Air Force on Galapagos Island. The unit takes seawater from an open ocean intake and processes it to safe drinking water quality with the final processes of sub-micron ceramic filtration and ultraviolet disinfection.

The Gumdoksuri Fast Patrol Boat (Class PKG-B) is a 200 ton displacement vessel entering service in South Korea Navy. The vessel features twin water jet propulsion, suitable for high speed pursuit and patrol. The first hull of a planned 20 ship fleet was launched in 2013 from the Kangnam Shipbuilding yard in Busan, Korea. Based on maximum mission length and the crew size, the freshwater specification called for capability of 5000 gallons per day potable water. Key to the supply requirement was a hatchway dimension of 20 inches by 20 inches necessary for installation and service of the watermaker. Ampac USA provided a compact semi-modular watermaker with main frame of only 52" wide by 18" deep x 18" high allowing it to fit through the hatchway. The small size is possible by utilizing the new improvements in reverse osmosis membranes productivity and high efficiency pumps. Ampac performed final commissioning of the watermaker at the shipyard in Busan.



# SEAWATER DESALINATORS

## Marine and Offshore

MARINSA de MEXICO SA de CV is a major provider of marine and offshore service vessels for the oil and gas industry in the Bay of Campeche. The Marinsa charter fleet includes fast supply vessels, offshore supply vessels, crew boats and pilot boats. When Marinsa committed to fleet expansion with the additional Offshore Supply Vessels Marinsa Amethyst and Marinsa Turquoise, the ships underwent refit work to provide the capabilities needed for offshore drilling. Fresh water generation on board is needed to provide water for drilling mud mixing, for cementing and for all the potable requirements of the crew who can be offshore for weeks at a time. Fresh water demand is expected to fluctuate widely depending on the mission scope, but regardless, Marinsa needs a reliable source of fresh water supply. And the equipment needed to be supplied quickly to match an aggressive shipyard schedule.

Ampac USA supplied Marinsa two 40,000 GPD watermakers, one installed on each of the new OSV's. To simplify the installation, each watermaker was supplied as three modules. The main module included the control center, the instruments, and the prefiltration. The RO membranes were racked in a separate module. The high pressure pumps were mounted on the final skid. Fully automated operation is from the color touchscreen mimic display, showing and recording all operational parameters.



The USCGC Dallas (WHEC 716) served the United States for 44 years in a wide variety of military, search & rescue and humanitarian missions. In 2012 the Dallas was decommissioned and transferred to the Philippines under provisions of the US Foreign Assistance Act. The ship was renamed the BRP Ramon Alcaraz (FP-16), as a Philippine Navy Gregorio del Pilar class Frigate. The Alcaraz has 3250 tons displacement with overall length of 378 feet. The propulsion system features both 2 x 18000 horsepower Pratt & Whitney gas turbine jet engines and 2 x 3500 horsepower Fairbanks Morse diesels.

In 2013, the Philippine Navy installed a modern Ampac RO type watermaker on the Alcaraz to replace the aging evaporator system. Ampac USA provided a complete RO system with pre- and post-treatment for a safe and reliable 6000 GPD production of potable water. The digital control system allows straightforward operation and the full complement of safety shutdowns.





# FOOD PROCESSING

## Washing, Processing and Packaging Water

The Italian based confectioner Ferrero Rocher recently opened a new US\$190 million production facility in San José de Iturbe, Guanajuato, Mexico. The 40,000 square meter operation has the ultimate capacity to process 35,000 tons of chocolate products annually.

Chocolate forming moulds are used, and the mould trays have to be carefully cleaned for reuse. The cleaning must meet the highest level of sanitation, must not leave any water spots on the moulds, and must not burnish the shiny smooth mould surface so that finished product drops out without sticking.



The mould cleaning machines imported from Switzerland require a water quality of less than 20 microsiemens / cm<sup>2</sup> conductivity for proper operation. Ampac USA provided a brackish water treatment system to provide 12,000 GPD of the high purity soft water required. An extensive pretreatment process included twin softeners for the raw borewell water followed by a multi-media filter and micron filters. Ampac was on site for the initial commissioning and operator training at which time the produced water quality was demonstrated at 2 microsiemens / cm<sup>2</sup>.

Agua Modelo de Culiacan SA de CV has been providing clean and safe bottled water in Sinaloa since 1957. In western Mexico, Sinaloa is a semi-arid agricultural region where the summers are very hot and humid. The raw water source is a series of private borewells operated by Agua Modelo. Ampac USA supplied the Agua Culiacan with a 84,000 GPD skid mounted RO watermaker system. Feed water is pretreated by a granular activated carbon filter for removal of organics and sediment. Additional pretreatment by twin cartridge filters further reduces the solids to 5 microns or less. The reverse osmosis system then uses membranes to reduce the salts and the hardness. Ampac provides a skid mounted solution that allowed quick installation. The control system starts and stops the treatment processes on demand and provides all necessary safety shut-downs for unattended operation.



Garrafón rojo.

El principio de una vida sana



# MEDICAL INDUSTRY

## Lab Quality Water




The BSN Medical plant in Reynosa, Mexico produces a range of products for casting, bandages and compression therapy. Lab grade water is necessary to ensure complete purity in the final products. The ASTM D1193-6 standard establishes four grades of lab water. The most pure is Type I which is commonly used in lab research and in the medical industry. The Type I water required by BSN must have a resistivity of at least 18 megaohm-cm and must have total organic carbon below 50 parts per billion. At Reynosa, the borewell water source water has a heavy load of fine silt (photos at top left). To purify this silty water to a Type I standard for medical products, Ampac USA supplied a containerized 60,000 GPD treatment plant.



Thorough pretreatment was necessary, including chlorine dosing for disinfection, cyclone grit separator, granular activated carbon media filter, a second cyclone, and twin 5 micron sediment filters. Stainless steel multistage pumps then drive the water through reverse osmosis membranes where the soluble contaminants are removed with over 99% effectiveness. Final polishing treatment is by a bank of deionization resin tanks. The final water produced meets the 18 Megaohm water standard and can be used safely in the manufacture of the bandages and casts where sterility is essential to prevent infection.

BioSpectra is a leading contract manufacturer and producer of biological buffers and laboratory reagents. At their two facilities in Bangor and Stroudsburg, PA, BioSpectra manufactures pH stabilizing biological buffers for the pharmaceutical industry. These biological buffers offer low UV absorptivity, minimal reactivity, stable pH and high solubility in water for use in various biological applications. In both facilities, Biospectra requires deionized water meeting the ASME type I high purity standard of greater than 18 Megaohm-cm resistance.

Ampac USA supplied 1000 GPD lab water systems to meet the requirement. The automated, low pressure reverse osmosis membranes reduce the dissolved solids down to "distilled water" levels, and then mixed bed resin canisters finish the treatment to the deionized level. These units have a glass door and key protection against inadvertent adjustment.

Ampac cabinet purification systems can supply 8 gallons per hour Water for Injection according to US Pharmacopoeia standards. A storage tank in the base provides sterile water on demand. A circulation pump is constantly treating the tank water through the ultraviolet disinfectant to ensure the highest quality water.





# CONSTRUCTION

## Water for Work Camps and Industry

In 2009, Melones Oil Terminal Inc commenced a \$90 million program to develop a bunker fuel transfer facility at Melones Island. Prior to construction, the island was an uninhabited rock outcrop 8 nautical miles from the Pacific entrance of the Panama Canal. The finished facility comprises 16 storage tanks and a T-shaped pier configured for the simultaneous berthing of tankers and bunkering barges. Now completed, the terminal stores and distributes bunker and diesel fuel to vessels transiting the Panama Canal. Fresh water was needed during construction, for mixing concrete and other needs. Ampac supplied a containerized seawater RO desalinator that was placed on site beside the storage tanks and genset for a complete system. The seawater supply was from a submerged stainless steel pump suspended off the pier. The Ampac system is designed for automated operation. The multimedia filter backwashes automatically after initiating a temporary system shutdown, and after backwash the RO restarts without the attention of an operator. Level switches in the storage tanks also start and stop the RO system automatically to maintain full tanks of fresh water supply. Furthermore, this Ampac system is designed to operate without the requirement of chemical dosing, so there is no transport, storage or handling of liquid chemicals.



The Oyu Tolgoi mine development in Mongolia represents a decade long \$10 billion investment for majority owner Rio Tinto. The mine combines open pits and underground extraction. It is located in an unpopulated desert area about 80 km from the Chinese border. Once at full production of 430,000 tons copper annually, it will represent 30% of the country's GNP and about 3% of the global copper supply. Initial production started in 2013 and is expected to ramp until full operation by 2018. Project management company Fluor has built the housing for up to 10,000 workers. Two Ampac 75,000 GPD brackish reverse osmosis treatment plants provide fresh water for the camp boiler feed, for cooling water make-up, for the kitchens and for showers & washing. The raw water source is from deep borewells in the desert. The hard water was dosed with scale inhibiting chemicals to prevent membrane fouling. Final treatment by ozone and UV is included on the skids.





# INDUSTRY

## Manufacturing and Industrial Water

In 2011 the University of Virginia in Charlottesville began construction of a new chiller facility. Five 1200 ton chillers in the North Chiller Plant were at the end of their useful life and were being taken out of service. To ensure an adequate and reliable supply of cold water to the U.Va Medical Center, the new East Chiller facility was sized for three 2000 ton chillers initially and ultimate capacity of 10,000 tons. Total project budget is \$36.5 million.



Circulating water in the chillers will have elevated levels of salts and hardness as it is concentrated through evaporation. To avoid scaling, manageable concentrations are maintained by "blowdown" discharge of a portion of circulating water and the addition of pure "make up" water. The University required a treatment plant to purify the blowdown waste for reuse as make up water. The benefits are both the reduction of wastewater to the city sewer system and the reduction of freshwater requirements.

Ampac USA supplied the University with a 72,000 GPD skid mounted reverse osmosis package. Feed water is the raw blowdown water

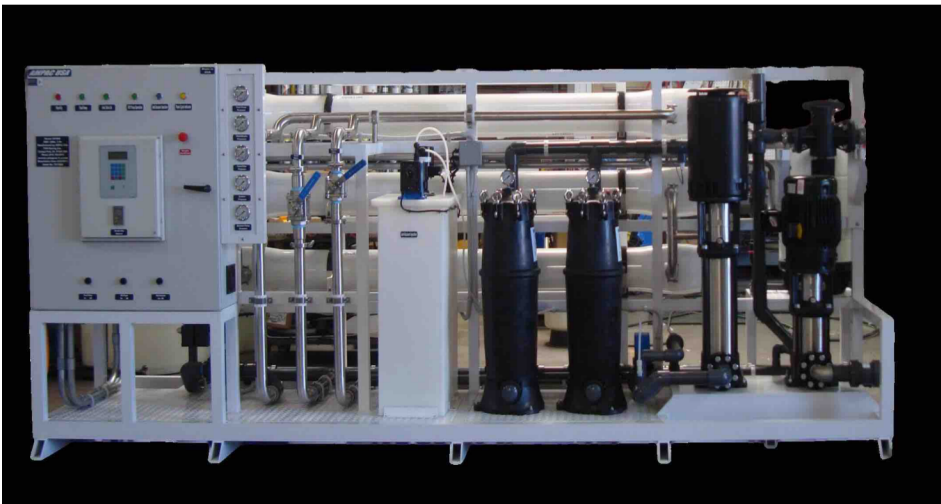
from the chillers at up to 5000 ppm TDS. Based on a recovery of 50 to 60%, the Ampac system provides ultrapure water at 5 ppm TDS or less for reuse in the chiller circulation. To remove organics and possible trace oil and grease, an oversized granular activated carbon filter is included in the pretreatment. To avoid RO membrane fouling from sparingly soluble salts, an automated dosing system of scale inhibitor deters micro-crystal growth of foulants.



The Bellefonte Nuclear site is in the very northeast corner of Alabama near the town of Hollywood. Ampac USA supplied four separate brackish water treatment plants to the Bellefonte site. Three package plants are rated at 10,000 gallons per day (GPD) each and one is rated at 18,000 GPD. All four process borewell water down to < 5 ppm pure water for use at the plant.



Battery manufacturing produces wastewater with lead contamination. To comply with recent waste disposal regulations in Ecuador, production facilities are starting to implement water treatment systems for reuse of water and for disposal compliance. Ampac recently supplied a 6600 GPD package system for Fundametz and a 30,000 GPD system for Bosch battery plants in Ecuador.





# WATERSTORE

## Drinking Water Systems for Bottlers

Ampac USA has supplied hundreds of Water Store RO systems to local bottlers in the US and all around the world. The most important aspect is the reliable supply of safe, clean purified water. Ampac can supply systems customized to meet specific requirements and handle specific inlet conditions. Common features implemented on skid are:

- Ion-exchange softeners
- Carbon filters for chlorine removal

- Ultraviolet disinfection
- Ozone treatment
- Storage tank recirculation treatment
- Delivery pumps with pressure tanks
- Filling stations
- Sub-micron ceramic filtration
- PLC controls for automatic control of backwashing and monitoring of water quality



4,500 GPD



15,000 GPD



10,000 GPD



72,000 GPD



# SPECIAL PROJECTS

## Custom Water Treatment Applications



The Radiator Springs Racers attraction opened 2012 in Disney's California Adventure Park in Anaheim California. Based on the theme of the 2006 Disney Pixar movie CARS, the opening culminates many years of planning and construction. Considered among the most expensive theme park attractions ever built, the cost is estimated at over \$200 million.

Before racing in open top slot-cars, the riders are taken through preparation where half the cars get a tire change at Luigi's Casa Della Tires and half go through Ramone's House of Body Art. In the paint shop, the vehicles are given a fresh coat of paint by a mock up of a mechanized paint sprayer. The paint nozzle is actually shooting water at high pressure made to look like paint.



To ensure the water nozzles would not scale and the freshly "painted" cars would not dry with water spots, Disney needed a reliable water treatment system for the Radiator Springs attraction.

Ampac USA had already supplied 19 previous treatment skids for the various Disney parks worldwide, so was familiar with meeting the exacting corporate standards. The treatment package is rated at 10,000 GPD of soft spot-free water. The feed supply is Anaheim city water, which is first pretreated for chlorine removal. The reverse osmosis process cleans the water down to about 3 ppm total dissolved solids and then twin ion exchange resin tanks polish the water to deionized water standards for completely spot free performance.



Certain medical water purification systems require the use of certified non-leaching materials. The photos below shows blue LEXAN piping used on an Ampac 4500 GPD for Vipsmed in Moscow, Russia.



Dairy whey and milk solids treatment uses Ultrafiltration membranes at low pressure to concentrate solids for separation and reuse as animal feed or soil amendment.





# REFERENCES

Some of Ampac USA Customers



NATIONAL ARMY OF COLOMBIA



# REFERENCES

Some of Ampac USA Customers



# CONTACT AMPAC USA

## For all your Water Treatment Requirements



Contact Ampac for custom water treatment requirements. Package plants from small to large, providing solutions for fresh water, seawater, wastewater, borewell water, deionized water, medical lab water, or drinking water.

Contact: [custom@ampac1.com](mailto:custom@ampac1.com)



Contact Ampac for parts and supplies. A vast selection of filter elements, membranes, housings, pumps, fittings, valves and instruments in stock. And when we don't have what you need, we can get it quickly.

Contact: [parts@ampac1.com](mailto:parts@ampac1.com)



Contact Ampac for Technical Water requirements. Offshore systems with seawater inlet and boiler feed quality outlet can be supplied with double pass RO in one simple and compact package.

Contact: [tech@ampac1.com](mailto:tech@ampac1.com)



Contact Ampac for unique packaging and frame requirements, such as the L-Frame unit pictured above. From residential systems to large factory units, from 100 GPD to 300,000 GPD.

Contact: [info@ampac1.com](mailto:info@ampac1.com)



Contact Ampac for portable spot-free rinse water systems. Dolly mounted units are easily moved and can be used for car lot washing, boat washing or window washing for complete spot free drying without rub down or squeegee wiping.

Contact: [mobile@ampac1.com](mailto:mobile@ampac1.com)



Contact Ampac for containerized systems. A wide variety of treatment systems can be supplied in ISO shipping containers. Containers can be provided with air conditioning, interior lights, power generators, remote monitoring or insulation.

Contact: [custom@ampac1.com](mailto:custom@ampac1.com)



# AMPAC USA

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