BY CHARLES A. "SKIP" GRIFFIN JR.

Griffin

Seafaring Solution for Regional Water Supplies

For many years, people in coastal communities have gazed out on the ocean with the same thoughts as the sailors on Samuel Taylor Coleridge's ancient mariner's ship: "Water, water, everywhere, nor any drop to drink." No practical means existed to tap the neighboring sea for potable water demands.

With the advent of ship-based desalination, modern sailors' thirsts have been quenched. Cruise lines and military vessels regularly use reverse osmosis equipment to generate onboard potable water supplies. These same technologies will soon be available to supply water to people on shore—without the environmental and economic shortcomings long associated with onshore desalination plants.

Water Standard Company℠ has spent the past six years developing the Seawater Conversion Vessel (SCV)—an ocean-going ship that houses a self-contained seawater desalination plant. The SCV includes a multi-depth intake line and pump station to draw water from the sea; microfiltration, reverse osmosis, and posttreatment systems to convert the seawater to potable water; a sophisticated mixing and dispersion system to properly dispose of the brine; and a variety of means by which the potable water can be transported to shore.

Water Standard Company is working closely with the national engineering firm PBS&J as its program manager to introduce the SCV to regions seeking enhanced water supplies. In addition, team member Acciona Water will support projects globally. The technology is gaining attention in US coastal areas and in several other nations seeking safe, reliable water—up to 200 mgd.

ONE IF BY LAND, AND TWO IF BY SEA

The SCV offers many advantages over land-based desalination facilities. For example, it eliminates a range of potential effects associated with constructing a land-based desalination plant: from the negative impact to traffic, air and water quality, and protected species, to the extra costs and time required to manage archeological and cultural sites or potentially hazardous soils.

Other potential deal-breakers linked with land-based plants are also eliminated, such as the challenge in finding an acceptable shoreline location for intake structures or disposing of brine in an ecologically responsible way. The SCV can operate out of view—meaning no visual, noise, light, and vibration effects.

The SCV complies with all environmental regulations and permit stipulations. However, the reduced complexity of associated permits shortens the overall delivery time. A typical SCV can be built, delivered, and operational after approximately two years from the time permits are obtained. Once in operation, the vessel can be moved to avoid storms and no effects would be felt from earthquakes, other natural disasters, or rolling power brownouts.

MINIMIZED IMPINGEMENT AND ENTRAINMENT EFFECTS

Two key concerns for any system that draws water from the sea are impingement and entrainment at the seawater intake. For the SCV, impingement is prevented by the intake's extremely low velocity. Entrainment is minimized through the use of a special screen at the end of the intake designed to comply with Clean Water Act, Rule 316 (b) governing intakes (USEPA, 2001).

The SCV's biggest advantage is its location in the open ocean where sea life is less abundant. Furthermore, the depth of the intake is adjustable, so it can be extended to a depth below sunlight penetration—and, thus, below the zone where most sea life exists. The location of the intake can be further refined, based on input from regional marine science communities, to minimize impact.

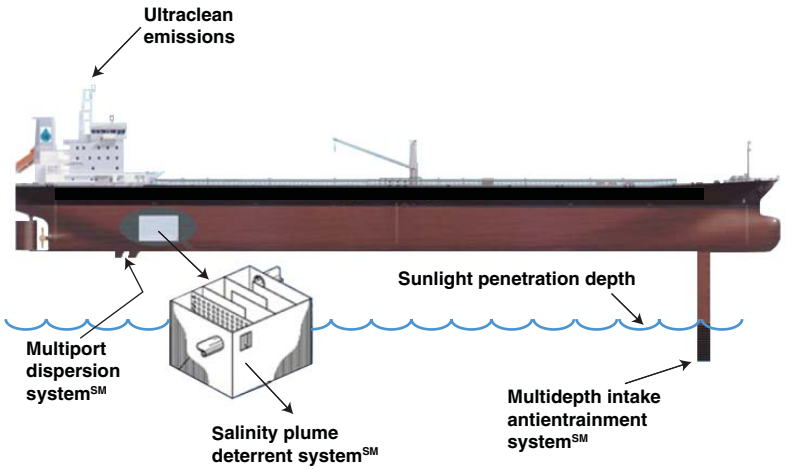
The intake's location several miles offshore also avoids water polluted by runoff and debris so that less pretreatment is required. In addition, the vessel's membrane-based pretreatment system does not use chemical coagulants or flocculants.

CLEAN AND GREEN

Brine, the twice-concentrated byproduct of desalination, is diluted

with ambient ocean water inside a large mixing chamber in the SCV's hold. Dilution ratios are stipulated by regional permits and with the input of the local marine science community. Plankton-friendly, low-head Archimedes pumps move the brine into the ocean through multiple discharge ports along the ship's bottom hull. Open ocean discharge minimizes salinity differences and effects on marine life because the diluted brine discharge occurs near the ocean's surface instead of as a plume that settles on the ocean floor, as with conventional land-based plants.

Clean technology is also used to provide power for the ship and its desalination processes. The SCV's gas turbine engines run on biodiesel, a sustainable fuel that produces ultraclean air emissions at very low costs.



Source: Water Standard Company℠

Treated water line from Seawater Conversion Vessel not shown

FROM SHIP TO SHORE

In highly sensitive shoreline areas such as the Monterey Bay National Marine Sanctuary in California, there is a prohibition on constructing ship-to-shore water transfer pipelines. Therefore, a tug barge, such as those used in food transport, can be used to deliver desalinated water to the shore.

The tug barge can deliver to multiple locations in a matter of hours. The barge does not need to dock or drop anchor. Instead, it is kept stable by satellite-based dynamic positioning equipment so that the vessel never touches the ocean bottom. The barge can also transport water in varying frequencies and quantities—a much more flexible delivery system than that offered by hard piping. The water delivery locations can more easily accommodate the existing piping, thus potentially reducing the need for large water distribution system improvements.

COASTAL, GLOBAL INTEREST

In California, urban growth and the ever-present threat of multiyear droughts have led water districts to take bolder steps to address potential water shortages. Desalination ranks high among the alternative water sources considered by regional water purveyors, and some water districts have invested millions of dollars to investigate land-based desalination plants. Given the ecological benefits and overall cost savings potentially linked to the SCV, the technology has attracted great interest.

In October, the Monterey Peninsula Water Management District's (MPWMD) board of directors voted unanimously to add the SCV to its matrix as an alternative water source. The MPWMD manages, augments, and protects the production of water from the Carmel River—which is stored in the San Clemente and Los Padres Reservoirs—and groundwater pumped from municipal and private wells in Carmel Valley and the Seaside Coastal Area. The district's other supplemental water sources include aquifer storage and recovery and land-based desalination projects.

With a technology such as the SCV, desalination soon may leave the realm of wishful thinking and become one of the world's primary means to augment clean, environmentally responsible, reliable global water supplies.

—Charles A. "Skip" Griffin Jr. is a senior vice-president in PBS&J's Encinitas, Calif., office. PBS&J is a national engineering and science firm that specializes in the planning, study, design, and construction management of large water and wastewater projects. Griffin can be reached at (760) 753-1120 or cagriffin@pbsj.com.

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