INNOVATIVE DESALINATION VESSEL OPENS UP NEW FRONTIERS IN OIL AND GAS

by Babcock International Group, Marine Division – Integrated Technology

A groundbreaking seawater desalination vessel has been developed to offer alternative water solutions to industrial and municipal clients, but recent studies have highlighted applications beyond this for the offshore oil and gas industry. Water Standard, who developed of the SDV concept, is now in discussions with several IOCs in response to requests to support their production operations

THE SEAWATER DESALINATION Vessel (SDV), designed by Babcock's Marine division, integrates state-of-the-art water treatment technology and power generation systems on a mobile floating platform and can treat volumes of water from 10,000 to 200,000 cubic metres of water per day. The vessel-based design provides a mobile, environmentally responsible, drought-proof solution, which can provide cost-effective short or long-term solutions with redeployment capabilities.

SDV technology can be based on any floating water platform, including ships or barges, and the first SDV will include the conversion of an existing suitably sized vessel that can be moored one to four kilometres from a platform. The SDV can operate in a variety of sea state and seawater quality conditions and in any water depth.

Proven reverse osmosis (RO) equipment has been adapted for use on the SDV, which has been used in marine environments, land-based installations, and on military and cruise ships for years. It is being combined with proprietary environmental intake and discharge systems to offer a customisable and reliable water supply.

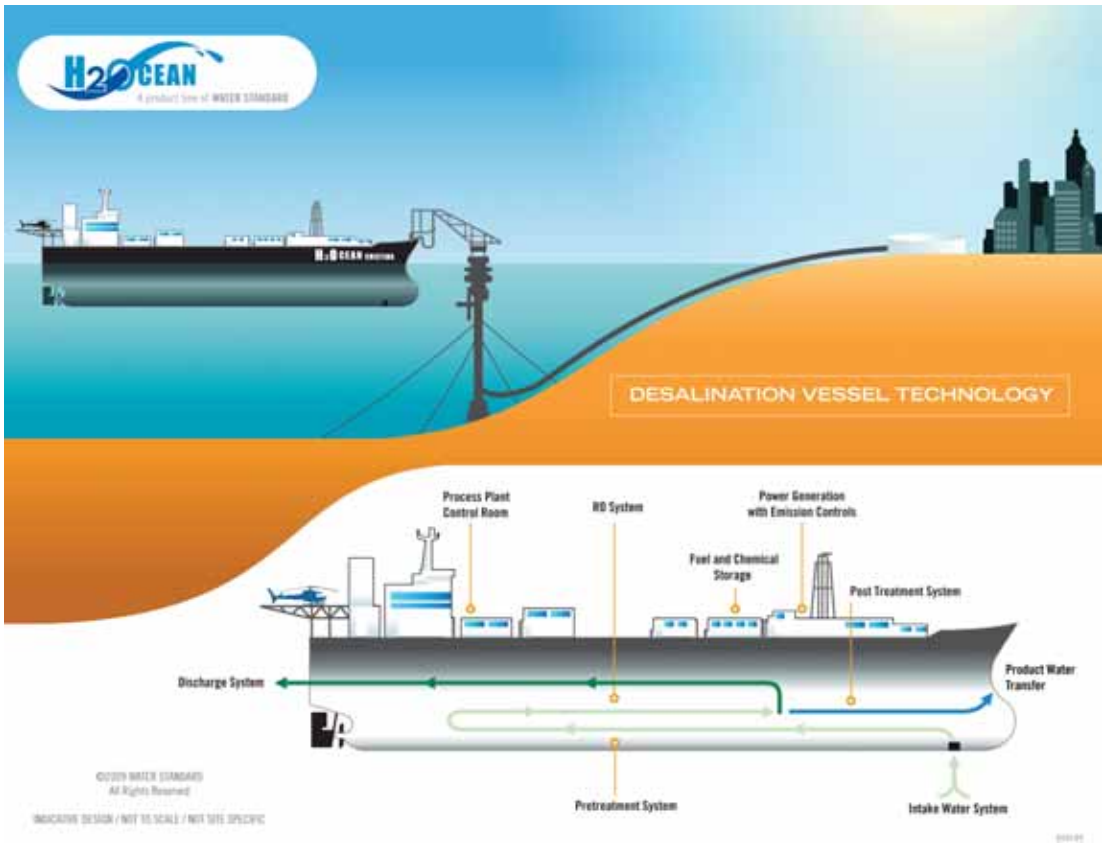
Reliable, environmentally compliant marine diesel generation technology is used to generate power onboard with full emission compliance, eliminating the need for the SDV to be near to, or connected to, a land-based power grid. The vessel's power requirements can be designed to meet specific needs and, should additional power sources be required during peak production or during drilling, the vessel can be moored near a drill site or field to provide additional power as well as water requirements.

A specific study of particular interest to the oil and gas sector has been the adaptation of the base design with an RO plant that would provide treated water for: pre-injection via sulphate removal for reduced souring, low-salinity waterflood, fresh water for drill mud, potable and sanitary water for crew, and the treatment of produced water in order to meet industry standards prior to disposal or reinjection. These solutions can be designed from the same system in conjunction with each other, with minor modifications.

In these applications the vessel would be moored within the specific oil field utilising a mooring system, such as a detachable turret system or a dynamic positioning system. Treated water can be transported to the platform via transfer flex hoses or seabed pipelines. Shuttle ships or self-propelled barges would be considered if the application required a centrally located water treatment and production ship and the shuttle ships/barges act as feeders to multiple locations within a field with limited life.

Working closely with Water Standard's engineers and other specialists from water treatment technology companies, Babcock initially developed a number of vessel concepts to enable economic models and technical feasibility studies to be evaluated. Once the optimum concept design was evaluated and developed to a suitable level of maturity, Babcock was then commissioned by Water Standard to undertake the preparation of the basic design to DNV classification approval level, including naval architecture, structural analysis, mechanical systems, electrical installation, and statutory submissions.

A 50,000 tonne deadweight operational tanker in good condition has been identified



Schematic illustration of the seawater desalination vessel

for conversion as the first SDV and will accommodate a 50,000-68,000 cubic metre per day RO plant and new power generation plant of sufficient capacity to power the RO plant. Particular challenges facing the engineers have included the marine engineering of a process that, at the scale involved, is normally land-based and providing a maintainable plant in a marine environment within the significant space restraints involved. Additional challenges have included allowing for spares and consumables to be delivered and stored so that the vessel can provide the necessary reliability to meet shore demands.

Under the current design the vessel has seven cargo holds, a conventional engine room, and accommodation for 30 personnel. The existing equipment in the engine room is to be retained for transit of the vessel between locations.

The RO plant consists of a pre-filtration system, two large pump rooms, a first pass RO system, a second pass RO system, and a final limestone remineralisation system. The plants, including all the interconnecting pipework and storage tanks, are installed in the vessel's cargo hold spaces. Further storage and dosing skids are to be installed in the vessel for all the additional chemicals required for the freshwater production system.

The new power plant required to power the RO plant is to be located in new machinery compartments sited above the vessel's main deck. With approximately 25MW of installed power, this plant consists of seven new diesel generators, high voltage switchboards, low voltage switchboards, transformers, and all the auxiliary equipment needed to operate the power plant.

Each diesel engine exhaust is fitted with an exhaust gas boiler to recover waste heat, which is used to heat the vessel's fuel oil. New additional fuel oil bunker tanks are fitted in one of the ship's hold spaces, providing additional storage necessary to ensure that the vessel maintains sufficient fuel for 90 days when fully operational. The existing fire fighting, bilge and ballast systems are also to be upgraded to suit the vessel's new role.

With the design fully developed and approved, discussions are now taking place with shipyards to undertake the conversion work and complete the first SDV. Additionally, a number of parallel studies have been undertaken to evaluate the suitability of the concept for use in a variety of worldwide locations encompassing different operating conditions and climates.

For more information

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