



# ITT

# PUMPLINES

Innovation ... Technology ... Leadership

A newsletter for users of pumps, controls, monitoring and maintenance services  
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## ITT Pumps and Controllers Onboard New Sea-Based Radar



The Sea-Based X-Band Radar (SBX) on the heavy lift vessel MV Blue Marlin

The U.S. military's latest ocean-going vessel looks less like a fighting ship and more like the answer to an improbable riddle: What do you get when you cross an oil platform with an advanced radar tracking system? The answer is the Sea-Based X-Band Radar, or SBX.

X-band radars are commonly used in speed recognition, weather monitoring and air traffic control. The Missile Defense Agency describes SBX as the "world's first combination of an advanced X-band radar and a state-of-the-art ocean-going, semi-submersible platform."

If ships were animals, the SBX would more closely resemble a six-legged camel than a thoroughbred racing horse. The radar dome (or radome) looks like a giant golf ball on top of a platform the size of two football fields, supported by six steel towers. The radome itself stands more than 103 feet high and 120 feet in diameter. Weighing 18,000 pounds, the radome can withstand winds of more than 130 miles per hour.

Despite its ungainly appearance, the SBX houses the military's most sophisticated missile tracking technology. The SBX can track, discriminate and assess incoming target missiles as small as a baseball from thousands of miles away. The SBX is twin-hulled and self-propelled, allowing it to sustain adverse sea conditions and to be repositioned as needed.

Because of its size, the SBX may be slow moving in the water, but building it was a fast-paced engineering challenge. The engineers responsible for the internal pumps and systems had to address multiple engineering challenges on a tight military timeline.

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#### A Challenging Conversion

Placing a sophisticated radar installation atop a fifth generation oil platform, and combining both into a sea-worthy vessel, was a unique and challenging task. The Missile Defense Agency contracted the SBX project to the Boeing Company, which was responsible for all aspects of construction. The platform had to be upgraded with power generators, cooling systems, electrical infrastructure and other mechanical systems needed to make the platform mobile and sea-worthy. To manage engineering elements of the platform conversion, Boeing contracted with the Glostén Associates, a consulting firm of marine and ocean engineers and naval architects.

One factor made the conversion challenging:

- With a deadline of about two years from start to finish, the conversion operated on a tight schedule with little margin for error.

#### Double Suction Pumps Provide a Cool Solution

SBX required highly durable pumps to handle the corrosive sea water. It also required compact pumps to meet the vessel's tight space constraints.

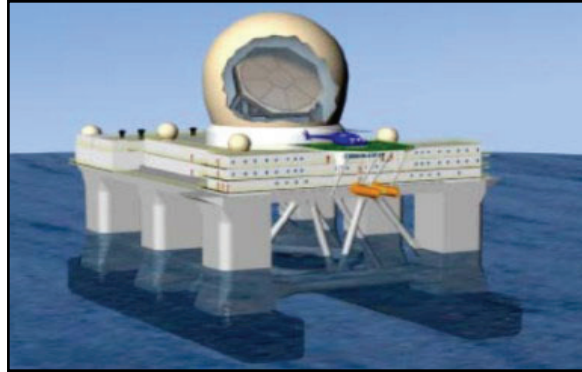
To solve this piece of the engineering puzzle, Glostén reached out to Beckwith & Kuffel, a pump and compressor distribution company based in Washington state with extensive experience in the marine and seafood industry.

"Goulds pumps from ITT were a natural choice for us," said Mark Romero, sales engineer, Beckwith & Kuffel. "We've successfully worked with Goulds on a whole range of projects. They had pumps that were pre-certified by the American Bureau of Shipping and were proven in marine applications."

The pumps chosen for the SBX cooling application were the Goulds 3410 horizontal split-case, double-suction pumps made of Alloy 20 material for optimum service life. The double suction impellers provide an efficient solution for heavy-duty industrial, marine and power-generation applications. The pumps were configured vertically to minimize space requirements.

#### Making Pumps Smart, While Keeping the Electrical Noise Down

After the pumps were specified, it became clear the solution required an additional element. To provide the operational flexibility, the application



**Concept image of the SBX**

demanded a variable frequency drive to be selected.

Here again, ITT proved to be the right choice, said James Burkhart, application engineer, Beckwith & Kuffel. ITT had the variable frequency drive technology in-house with the PumpSmart® product family. "Because PumpSmart is a proven technology and already certified by the American Bureau of Shipping, the lead time for adding a control solution was cut in half, allowing us to maintain the aggressive production schedule," Burkhart said.

PumpSmart controllers prevent pumps from running in upset conditions that cause most pump and mechanical seal failures. It allows pumps to run at slower speeds with better efficiency in turn reducing the stress on bearings and seals for longer pump life. Optimizing pump speeds significantly lowers energy costs.

Typical 6 pulse VFD's generate about 30-40% harmonic distortion, which could easily disrupt the operation of the sensitive electronic equipment on board. The specification called out for lower harmonic distortion levels.

Glostén worked with Adarsh Iyengar, senior application engineer, ITT, to develop a PumpSmart solution that could meet the stringent harmonic distortion requirements. Iyengar looked to ABB, the world's number one supplier for variable speed drives, to obtain the solution.

"ABB already had low-harmonic drives that ITT was looking into to offer with PumpSmart," Iyengar said. "This project just lit a fire underneath our development process. We were able to obtain ultra-low harmonic ABB drives, and customize them to meet specifications for the SBX

## Feature

### ITT Pumps and Controllers **Continued...**

application, with a very fast turnaround." Typical production time on specialized drives like these is about 12 to 15 weeks.

How fast is fast? With an aggressive teamwork approach involving more than 100 conference calls between all vendors, ITT was able to supply a PumpSmart control solution in a mere six weeks. To commission the PumpSmart VFD's, Iyengar traveled from upstate New York to Texas, where the SBX was undergoing rigorous sea-trials. He spent 16 days aboard the vessel, helping to ensure the pumps and PumpSmart controllers would meet the needs of this demanding sea-based application.

With the conversion completed on schedule, SBX set sail in the fall of 2005 for its home port in Adak, Alaska, a small island located in the Aleutian Island chain. Too big to fit through the Panama Canal, the 30,000 ton SBX made its way around the tip of South America through the Straights of Megellan on board the world's largest heavy commercial transport ship, the Blue Marlin and docked in Pearl Harbor, Hawaii. In spring 2006, SBX departed from Hawaii for its home port, available for duty worldwide.



**ITT engineer, Adarsh Iyengar spent 16 days aboard the SBX during trials.**

"The pumping solution is just one example of many engineering challenges the SBX team had to overcome. Through a great team effort and excellent communication between the contractors and subcontractors, SBX has been a true engineering success story completed on a demanding timeline," said Kevin Reynolds, project engineer at Glostien Associates.

#### **Low-Noise Drives for Land Lubbers**

Since the rapid development of a low harmonic PumpSmart solution for SBX, ITT reports that it has implemented the technology in a growing number of non-maritime applications. Typically, customers include airports for pumps located near air traffic control equipment, and hospitals where electronic noise could disrupt sensitive diagnostic systems. But several of the installations are being designed to serve less predictable applications.

"The demand for PumpSmart solutions is increasing rapidly, and we expect increasing demand for low harmonic drives," said Dan Kernan, PumpSmart Product Manager, ITT.

"In addition to obvious low-noise applications, more and more customers employ sophisticated electronics in standard industrial or municipal processes. As that happens, we expect to supply an increasing number of PumpSmart solutions with low harmonic drives."



**The SBX semi-submerged**