



# PEARL HARBOR NAVAL SHIPYARD

*PcVue controls flooding and dewatering of dry docks with increased safety*

Pearl Harbor Naval Station and Hickam Air Force Base have grown around the historic port, known as Wai'Momi to the native Hawaiians, adjacent to Honolulu on Oahu's south shore. Pearl Harbor Naval Shipyard (PHNSY), located at Joint Base Pearl Harbor-Hickam, is a one-stop regional maintenance center for the Navy's surface ships and submarines. It is the only intermediate maintenance facility for submarines in the Middle Pacific.

Of the four dry docks at Pearl Harbor, dry dock numbers 1, 2 and 3 are located in the Controlled Industrial Area (CIA) and are primarily used for repairing and maintaining nuclear submarines.

These are graving style dry docks comprised of a narrow basin with access to deep water through a floating caisson gateway. Dry dock no. 1 measures 1,001 feet (305 m) from the head side of the caisson, with a width of 114 feet (35m) at the bottom and 138 feet (42m) at the top, and a depth of 32 feet 6 inches (10m) from the mean high water mark to the keel blocks.

To access the dry dock, a ship is floated into the basin, the caisson is positioned at the seaward side and the dock basin is dewatered with large vertical turbine pumps. As the basin empties the pressure of the sea against the caisson creates a watertight seal and allows the ship to come to rest on a dry platform.

Dry dock operators manage this process, known as evolution, with a staff of engineers, electricians and operators responsible for the safe movement of equipment and water in order to ready the dry dock for ship maintenance and repair.

The CIA dry dock operation has been automated using supervisory and data acquisition systems (SCADA) from PcVue, Inc. The SCADA is primarily controlling a network of Limatorque actuators. The actuators are assembled on large gate valves and the assemblies are known as a Motor Operated Valves (MOVs).

The SCADA communicates with the MOVs using redundant Modbus IP networks connected to a redundant MasterStation gateway.

A Modbus serial 485 loop connects the actuators with the MasterStation. Each dry dock is controlled by 19 MOVs with 16 I/O points being monitored and controlled per actuator. This fault tolerant system opens and closes valves to precise percentages and adheres to specific dry dock operational valve position protocols for safe control of water flow.



## BUSINESS OBJECTIVE

- The safe operation of equipment and movement of water
- Improve the safety, reliability and performance of valve control

The dry dock operators are prohibited by the SCADA from performing valve movement until they have received the Ready for Operation indicator. This indicator is a synthesized status derived from monitoring multiple alarm points including power off, over-temperature, over-torque, jammed valve, and other actuator alarm conditions. PcVue's event historian keeps an ongoing log of the control actions as an audit trail.

Triton Marine Construction Corp. (TMCC) is a Waterfront Multiple Award Construction Contractor (WMACC) for Naval Facilities (NAVFAC). TMCC was awarded a task order for improvements to dry dock no. 1 including upgrading the actuators and installing a valve control system. PcVue was commissioned for this purpose in 2012. Dry dock no. 1 was the last of the three CIA dry docks to have a valve control SCADA installed. Previously, a system based on a different SCADA platform had been in operation for dry dock no. 2 and 3. Dry Dock Operations had not been satisfied with the safety, reliability and performance of their existing control system. These concerns prompted the discontinuation of that system and had forced the dry dock operations personnel to go back to more labor-intensive manual operations.

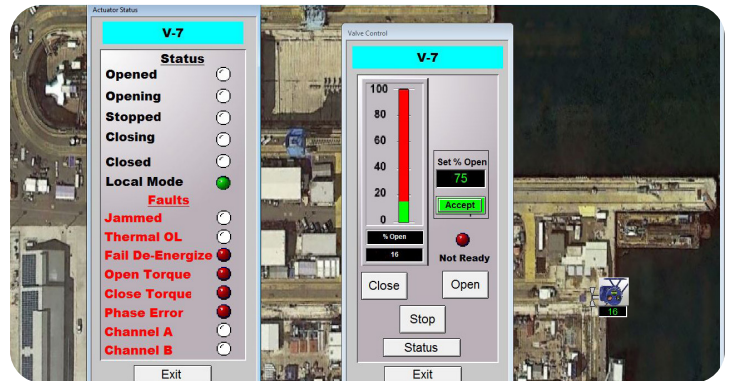
Upon completion of the dry dock no. 1 project and after firsthand experience with PcVue, the Navy was able to confirm that the reliability and performance issues were mitigated. Most importantly, the PcVue system had eliminated the safety concern. While safety is important in any process, at the dry dock the large amount of water flowing through chambers puts dry dock personnel and shipyard workers in harm's way if not carefully controlled.

Subsequently, the shipyard elected to retrofit the SCADA in dry dock nos. 2 and 3. An RFP (request for proposal) was issued for the troubleshooting and upgrading of the control system. The system integrator replaced the SCADA and was able to leverage the object-oriented reusability features of PcVue and minimize the bid cost by using common objects developed for dry dock no 1.

The retrofit for dry dock nos. 2 and 3 was completed in a matter of a few weeks in 2013 by Russell Risch, a PHNSY lead electrician for Dry Dock Operations, whose team operates the dry docks, had PcVue configured to be identical to the previous dry dock no. 2 control system. It was important that they shouldn't have to change the operational processes to accommodate the new system but rather be able to illustrate their processes in the way that the operators are certified. "Our graphical display reflected exactly how our operations work, so that minimal operator training was required," said Russell, "It can be expensive and time consuming when processes change to accommodate new equipment and systems, particularly when technicians have to be re-trained and re-certified."

Jeff Hutchings, who was responsible for integration, said, "The architecture of PcVue was ideal for this application. We had multiple MOVs to control and by utilizing the Application Architect feature with symbols and branching, we were able to minimize both the configuration time and the possible points of human error on configuration."

His team that configured the application also benefited from PcVue's objected oriented project methodology. They developed objects to PHNSY standards including animated graphical objects known in PcVue as symbols and mimic templates, which provided a



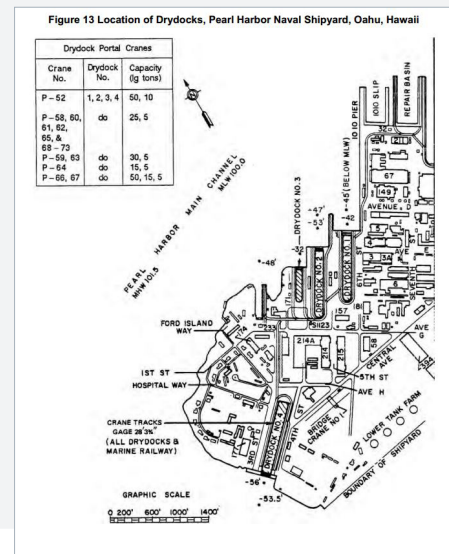
consistent graphic and navigation look and feel. Jeff noted "We took advantage of the branching concept in PcVue to minimize the number of mimics required by invoking the graphics and all the variables and tags that are tied to it in the context of the MOV to be controlled. This work really paid off when we were also able to reuse and apply the same configuration objects that we developed for dry dock No. 1, when we bid dry dock nos. 2 and 3, - saving both us and the Navy lots of time and money."

Jeff continued, "Everyone is quite happy with the results of the MOV control system upgrades. There was a commitment to not only meet the specification of the projects, but also in working closely with the dry dock personnel to really satisfy their operational needs. For instance, the PcVue application was very flexible and was able to be adapted quickly to the dry dock personnel's requests. Each time that an improvement was mentioned it would be reflected in PcVue in a very short time."

Steve Yuhl, General Manager of Triton Marine Construction in Hawaii noted, "We work hard to maintain excellent relations with Shipyard Operations. We had an outstanding and dedicated team collaborating with the shipyard engineers and operators on the delivery of the control system. We had nothing but positive feedback from our customer on the project. The Navy is quite rigorous in their commissioning but with PcVue the controls buyoff went very smoothly."

## KEYS TO SUCCESS

- Prohibit operation of valves until safe
- Prohibit operation of valves when the alarm indicator is on
- Adhere to existing US Navy procedure for operation of dry dock valves
- Provide fault tolerant system
- Develop common objects for standard interface across dry docks
- Minimize graphic screens for ease of maintenance



## RESULTS

PcVue resolved safety, reliability and performance concerns

Operator interface in PcVue solution mimics previous system to eliminate need for recertification of operators

PcVue was commended for conformance to Dry Dock Operations requirements






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