

Case study

Danfoss helps boost capacity of Panama Canal

Besides supplying components, Danfoss also supervised their installation. The job included tackling the problems of removing old equipment and welding new components to unknown materials nearly a century old.



Location:
Panama City, Panama

Segment:
Dams

Problem:
Improve and upgrade lock operation and reduce maintenance

Solution:
Rely on Danfoss to supply 116 new systems consisting of several custom-designed products

Results:
Panama Canal officials pleased with Danfoss' achievements in products and project management

Background

The historic Panama Canal offers smoother sailing since a 2004 project to upgrade the canal's water flow control system was completed, using Vickers by Danfoss solutions.

The five-year project boosted the canal's transit capacity by approximately 20 percent. The Panama Canal is a vitally important passageway for all navigation between the Atlantic and Pacific Oceans. In fact, since its opening in 1914, over one million ships have passed through the canal.

The canal has three sets of locks—Miraflores, Pedro Miguel, and Gatun—that bridge uneven waters by lifting ships 85 ft. (26 m) to the level of Gatun Lake and lowering them back to sea level. Water levels in the locks are controlled by a complex system of culverts and rising stem valves. To modernize mechanisms dating back over 90 years, 116 new systems consisting of several custom-designed Vickers hydraulic power units and Vickers custom cylinders were needed to improve lock operation and reduce maintenance.

Challenges

Key concerns of the Panama Canal Authority were how to get the equipment down inside the walls of the canal, cut out and remove the old system, and weld and mount the new system into place. Besides supplying the components, Danfoss teams supervised their installation and fabrication—including rigging, welding, mounting, positioning, interfacing controls, and commissioning startup. During this challenging process, they also solved the problems caused by the removal of old equipment and welding new components to unknown materials nearly a century old.

Solutions

The in-depth research into installation requirements combined with ingenuity enabled the project team to get the job done. Showcasing the application knowledge and Danfoss' ability to go beyond supplying components and delivering complete turnkey projects.

The project team was instrumental in putting together a winning, well-thought-out system proposal which was technical in detail, but written with the spirit of cooperation, flexibility, and communication that the Panamanians desired.

The proposal included system alternative ideas, design improvements, suggestions, and technologies that went above and beyond the original project specifications. Since the project spanned five years, also included were modifications and improvement provisions to allow for new technologies and product developments as they became available.

Results

Specific Vickers products that were utilized successfully in the project included:

Vickers custom stainless steel power units—Used to power vertically mounted cylinders that open and close the canal's rising stem valves, which control water flow through the culverts. Each unit had a redundant-style, dual 30-horsepower electric motor pump grouped with Vickers PVM050 load-sensing, pressure-compensated 50cc variable displacement piston pumps.

Vickers custom cylinders with Altiox 300-rod coating and integrated magnetostrictive-type position sensor—Connected to submersed valves under brackish water. Specified for total immersed operation, the cylinders incorporate 260 mm (10.2 in) bores, 180 mm (7.1 in) rods, and 5,486 mm (216 in) strokes, with backup limit switches and cushions.

Custom steel-control manifold, consisting of Vickers slip-in cartridge valves and a patented Valvistor® EPV16 proportional valve—Developed to provide optimal control and positioning over the cylinder.



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