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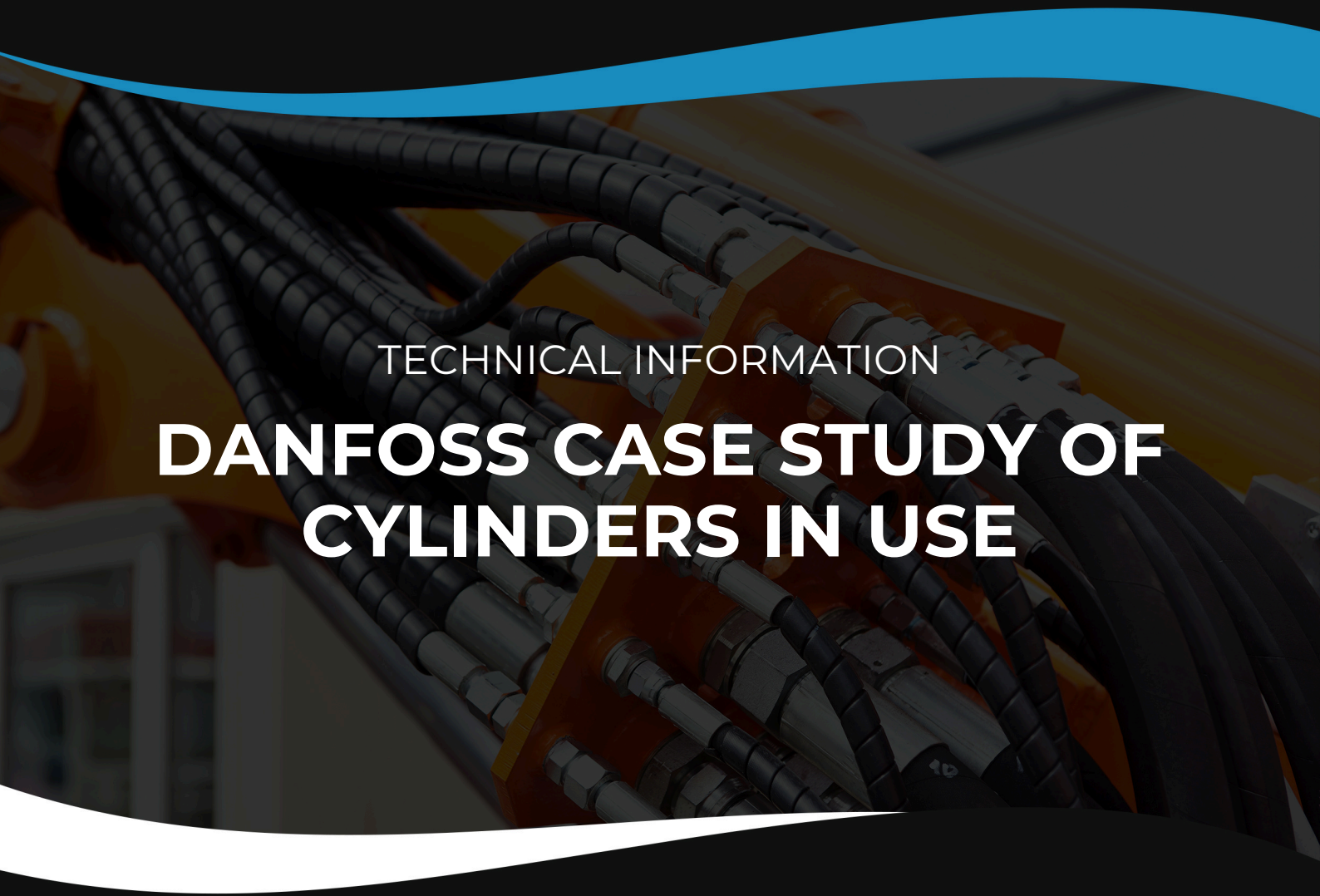

TECHNICAL INFORMATION

DANFOSS CASE STUDY OF CYLINDERS IN USE

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Case Study

Vickers® by Danfoss cylinders have weighty role in **Florida bridge replacement projects**

"Danfoss' collaboration with EHM enabled us to put together a truly unique cylinder solution with exceptional performance. Danfoss' expertise, attitude, and capability have been extremely beneficial to our success."

— Mike Hanley, Vice President of Electro Hydraulic Machinery Company

Customer
Electro Hydraulic Machinery Company

Markets Served
Marine civil engineering

Background

A willingness to bridge the gap between standard product designs and exacting customer requirements landed Danfoss a deal supplying hydraulic cylinders for two Florida coastal bridges. Motorists and boaters passing over and under the Treasure Island Bridge in Treasure Island and the Hollywood Boulevard Bridge in Fort Lauderdale can be assured of smooth bridge operation, thanks to Danfoss hydraulic cylinders.

Vickers by Danfoss products have a weighty role in the projects in which the former bascule bridges—deemed no longer structurally sound—were being replaced with hurricane-enduring bascule bridges. The Vickers by Danfoss cylinders provide the force and precision to raise the bridge spans for navigational clearance and to lower them down again for motorist traffic.

Challenges

Electro Hydraulic Machinery (EHM) Company of Pembroke Park, Florida, was contracted to supply hydraulic power systems for the bridge replacements.

Although EHM has used competitive cylinders in its work in integrating systems for moveable drawbridges, the company was looking for a more custom solution to problems it had encountered.

"We coupled standard Danfoss cylinders with power units we supplied for the Mantoloking Bridge in Mantoloking, New Jersey, and we were happy with their performance," said Michael Hanley, EHM's vice president.

"Because of this good experience, we decided to return to Danfoss for assistance with cylinders for the Treasure Island Bridge. This time, however, we hoped to work with Danfoss to incorporate our custom sealing and cushioning systems into its cylinder designs."

VICKERS by Danfoss

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"In the past, we approached other cylinder manufacturers to incorporate our ideas into their cylinders to help eliminate hydraulic leakage and allow deceleration at full extension or retraction. Unfortunately, they were unwilling to collaborate with us to co-design cylinders."

Solution

EHM discussed the project parameters with Danfoss' Kevin DuPont, product sales manager—Southern region, who consulted with Danfoss' production facility in Eindhoven, Netherlands, to lay groundwork for the collaboration project. EHM and Danfoss engineers began working together to co-design and build 16 massive cylinders with EHM's sealing and cushioning systems for the Treasure Island Bridge.

"The Danfoss team helped us calculate the size and spacing of valves required in our four-valve cushion system along with the clearance area and pressure drop needed around the angles of the cushion spear. Danfoss' collaboration with EHM enabled us to put together a truly unique cylinder solution with exceptional performance. Danfoss' expertise, attitude, and capability have been extremely beneficial to our success," Hanley said.

In the meantime, EHM was so impressed with how easy it was to do business with Danfoss, that Hanley again turned to Kevin DuPont just one month later. EHM needed eight similar cylinders for the Hollywood Boulevard Bridge. Production was soon under way for the additional cylinders.

Results

After passing Danfoss and EHM performance tests, the Danfoss cylinders were installed on the Treasure Island Bridge and tested again prior to the bridge's commissioning. The cylinders performed flawlessly and have been doing so since their installation in May 2006. Installation of Danfoss cylinders on the Hollywood Boulevard Bridge took place in November 2006, and they are currently operating exactly as intended.

Cylinder specifications for each project are as follows:

- **Treasure Island Bridge**—Eight cylinders each with 200 mm bore (7.87") x 1,969 mm stroke (77.50") x 160 mm rod diameter (6.30"). Pin-to-pin, fully closed length is 3,216 mm (10'6"). Pin-to-pin, fully extended length is 4,912 mm (16'1⅜"). Eight cylinders each with 220 mm bore (8.66") x 1,969 mm stroke (77.50") x 160 mm rod diameter (6.30"). Pin-to-pin, fully closed length is 3,216 mm (10'6"). Pin-to-pin, fully extended length is 4,912 mm (16'1⅜"). Rod coating for corrosion protection is Danfoss ABC-G2 over C1045 carbon steel. The standard-range coating in Danfoss' portfolio of Application-Based Coatings (ABC) is a galvanic nickel chromium/sulfamate plating for general purpose applications and provides good wear, as well as corrosion resistance. EHM custom seal designs help improve environmental safety around public waterways. In the unlikely event of an out-of-control cylinder during raising and lowering operations, EHM four-valve adjustable cushions protect the bridge structure from damage due to sudden impact.
- **Hollywood Boulevard Bridge**—Eight cylinders each with 200 mm bore (7.87") x 2,794 mm stroke (110") x 125 mm rod diameter (4.92"). Pin-to-pin, fully closed length is 3,760 mm (12'4"). Pin-to-pin, fully extended length is 6,554 mm (21'6"). Rod coating for corrosion protection is Danfoss ABC-P2 over 316 stainless steel. The mid-range coating in Danfoss' ABC portfolio is a metallic oxide plasma-sprayed coating for fresh and salt water and corrosive environments and provides excellent wear, as well as corrosion resistance. EHM custom seal designs help improve environmental safety around public waterways. In the unlikely event of an out-of-control cylinder during raising and lowering operations, EHM four valve adjustable cushions protect the bridge structure from damage due to sudden impact.

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VICKERS by Danfoss

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