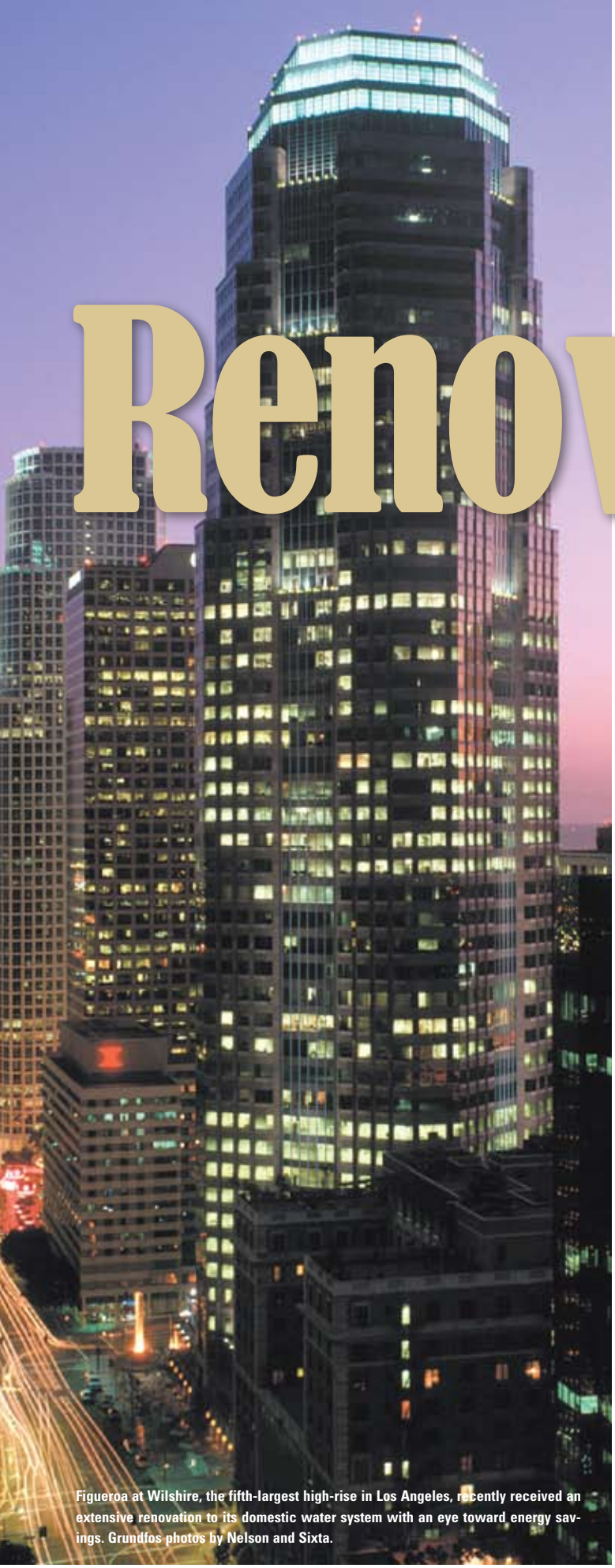

Figueroa at Wilshire, the fifth-largest high-rise in Los Angeles, recently received an extensive renovation to its domestic water system with an eye toward energy savings. Grundfos photos by Nelson and Sixta.

Time for Renovation

PumpMan's energy reduction plan focuses on L.A.'s Figueroa at Wilshire high-rise

By John Vastyan

At what point in the life of a large building do facility managers decide to replace key mechanical systems? The answer to that question depends on many factors, including the age and condition of system components, operational performance and efficiency, and the cost and long-term advantages of system replacement.

Managers at Houston-based Trizec Properties, a large commercial real estate management firm, routinely discuss these questions. Trizec, a new subsidiary of Brookfield Properties Corp., is widely recognized as building owners committed to the cause of energy efficiency and conservation of natural resources.

In 2002, Trizec assembled a nationwide "Energy Team," tasked with the need to assess and reduce the firm's overall energy costs. It also aimed to develop a renovation model for other Trizec buildings, and, most importantly, a strategic energy reduction model for other building owners to follow. The latter of these, ideally, would serve as a model for building owners nationally, not just those that are Trizec-owned.

Trizec's incentive wasn't entirely altruistic. It was spending $100 million a year for electric energy to operate all of its buildings and, for Los Angeles' Figueroa at Wilshire high-rise, the company expensed an additional $20,000 annually for domestic water pump system maintenance, so the incentive and the benefits were very real.

Named after the intersection in Los Angeles it inhabits, Figueroa at Wilshire is the fifth-largest high-rise in Los Angeles, located in the heart of Southern California's financial district. Built on in 1990, the 1.4 million square foot, 52-story office tower features a Brazilian Rose polished granite exterior, two 75-foot high atria lobbies with granite walls and floors and an open air plaza with 36-foot tall fire and water feature.

Grundfos photos by Nelson and Sixta.

Energy Audit With Teeth

According to Wayne Harner, Trizec's vice president of engineering, the needs of this building moved to the top of the company's list in 2005 following a rigorous energy audit of all Trizec properties. Harner said "multiple issues," including high maintenance and energy costs, progressively deteriorating water pressure in the building and apparent mechanical fatigue to the old pump's steel barrels—would be addressed with the new pump system.

Jim Krachmer, chief engineer for the building, chose Baldwin Park, Calif., based PumpMan Inc., a pump system maintenance, repair and new installation contractor, to perform the replacement and installation project. System design support was provided by Derek Johansson from Delta-Q, Inc., the Southern California manufacturer's rep agency for Grundfos Pumps.

"We'd known for a few years that the old pumping system would have to go," Krachmer said. "We just didn't know when we'd tackle the job. The logistics of demolition and replacement, and accomplishing it all within a very tight timeframe, were more daunting than the expense to do it. The energy audit confirmed the need to get it done, and to move the job to the top of the list. Trizec's emphasis, for years, has been keenly focused on energy analysis and ROI."

To put teeth into the analysis, the company did before-and-after system monitoring of voltage and current.

"Surprisingly, the key challenge wasn't replacing the old equipment with the new pumping station," Krachmer said. "The tough part was to make all of the changes—which we considered 'major surgery'—with no apparent loss of service to the building's many tenants. This was one facet of the project that left no room for error."

Planning was Key

"Setting the fine points of this plan—analyzing every step of the procedure—took significantly more time than the actual installations," said PumpMan, Inc., president Eric Skjarstad. "We had so many meetings to develop the details that, by the time we were ready to begin the work, there was almost a sigh of relief."

Figueroa at Wilshire's new booster pump system, variable speed booster pump system and low zone pressure regulator system installation completed.

"To assure continuous water pressure throughout the change-out process we had decided on a two-phase installation for the new equipment based on low-zone, and high-zone work," said PumpMan field supervisor Mike Woodward. He explained the high zone extended from the discharge manifold to supply water to floors 26 through 51. The low zone branches off the discharge manifold through a pressure regulation station; everything downstream of this is considered the low zone, which feeds floors 1 through 26.

The building's 15-year-old pressure-boosting pump station consisted of two Syncroflo triplex booster pump systems—one for the low zone and one for the high zone. The low zone system consisted of a 15 HP pump and two 30 HP pumps. The high zone system consisted of one 30 HP pump and two 60 HP pumps. All of the pumps were vertical turbines using pressure-reducing valves to control discharge pressure.

"The previous constant-speed booster pump systems were terribly inefficient and oversized," Delta-Q, Inc.'s Johansson said. "Pressure reducing valves were required to reduce discharge pressure at each pump, avoiding dangerous over-pressurization. This was very inefficient.

PumpMan, Inc., field service supervisor Mike Woodward, left, and lead mechanic Elmer Brady test the control panel.

The old system discharged at 500 PSI at the lower level while delivering between 150- and 200 pounds of water pressure at the top, using multiple regulators, and pressure reducing valves every few floors. "In the new configuration, we were able to reduce system discharge pressure to 380 PSI, providing proper pressure to the upper floors and eliminating the need for pressure reducing valves at the pumps," Johansson said.

"The first phase of the project was to install a four-inch Cla-Val regulator station in order to temporarily feed the low zone with the high zone pump system," PumpMan's Woodward said. "This allowed us to shut down the low zone booster pump system and remove it from the mechanical room. With a few changes to the steel structure, we were able to use the existing seismic pad from the low zone booster pumps as the place to install the new Grundfos BoosterpaQ."

Since this project was a retrofit with an eye toward energy efficiency, the laundry list of components isn't a very long one. The projects bill of materials also included Victaulic Style 77e grooved, galvanized-coated couplings and fittings for the Schedule 40 stainless steel pipe used on the high-pressure side. Copper pipe was used on the low pressure side and

also downstream of the low zone pressure reducing station. These were held together with Victaulic Style 606e couplings, also galvanized-coated. Integrated into the Grundfos control panel were a Danfoss variable frequency drive and check valves. The whole thing was topped off with pressure sustaining valves, relief valves and pressure regulating valves from Cla-Val.

During phase one, PumpMan technicians installed a new pressure reducing station. "We did this because, just as we planned, we used the existing high zone system to maintain pressure throughout the whole building," Woodward said. "And, then, when we disconnected the low zone system and reconfigured the high zone piping to feed the pressure regulation station, the building water service was shut down for just 12 hours."

Krachmer said having the whole building relying on only one of its systems for a whole week while the new system was being assembled onto the site of the former low zone pump system was a well-planned, calculated move. And not without a certain element of risk.

"This was the critical point on which the system's success or failure swung, all in the effort to avoid any major business interruptions to our tenants," he said. "The next weekend, we shut down the building water service. PumpMan technicians then turned off the high zone, disconnected all of the piping, and reconnected all of the domestic piping to the new Grundfos BoosterpaQ."

Most of this work, orchestrated tightly to happen fast, was accomplished between 10 p.m. on a Friday, and 6 a.m. the next day. A team of technicians worked to tie in the new high zone system piping to the existing building piping. This required draining down the entire building, disconnecting the piping and electrical from the existing high zone booster pump system and connecting the new pump system to the existing piping and reconnecting the main power and emergency power to the new system.

A Class 300 Rating

"On the high pressure side of the system we're pumping at 380 PSI but the building engineer required a rating of 600 PSI for safety," Woodward said. "Schedule 40, 316 stainless steel pipe was used to replace all of the high zone piping. Type 'L' hard copper tube was used for the supply to the new system as well as downstream of the pressure regulation station (low zone). After a week of smooth pump operation, we were given approval to remove the old high zone pump system from the mechanical room."

Ultimately, PumpMan technicians removed the building's existing high- and low-zone water booster pump systems and installed one Grundfos Quadruplex BoosterpaQ.

Today, the office tower's domestic water pumping system receives water from the city's supply at 50 PSI, increases it to 380 PSI to move it to the upper floors, and regulates the pressure down as it returns to street level.

Because the old system was split into two zones, there were normally two pumps running, even at periods of low demand. And because there was no speed regulation, the motors ran at full speed, wasting large amounts of energy.

PumpMan installed a new PRV station to regulate pressure going to the low zone, and an automatic emergency power transfer switch that allows the pumps system to operate at reduced capacity if the building loses its main power supply.

Today, Johansson said, the new system's variable speed drive can power any of the four pumps. Pump operation is a lead-lag arrangement that first activates one pump, which speeds up or slows down as water demand changes. Each of the four pumps is "rotated in" as the lead pump on the variable drive.

When demand dictates, other pumps come online at full speed, while the lead pump continues to operate on the variable speed drive to maintain a constant system discharge pressure. The system doesn't require pressure reducing valves for the pumps themselves because the drive ensures that discharge pressure doesn't fluctuate by more than a few percentage points, even with quick changes in demand.

Another facet of the PumpMan installation was to enable the system to run at reduced capacity powered by the building's emergency power system: "We installed an automatic emergency power transfer switch which was wired into the pump station," Krachmer said. "This was important for tenants, but critical for the rooftop equipment where we supplied make-up water for ten cooling towers."

According to Johansson, the new pump stations will virtually eliminate maintenance costs. Running only one pump on a variable speed drive will greatly reduce energy consumption and is expected to extend pump life and performance. An added benefit is that noise levels were reduced significantly.

The energy and maintenance savings have been measurable, and included some good surprises, Krachmer said: "Prior to the project, we expected to save between $15,000 and $20,000 in operating costs. But during this first year of operation, we saved about $20,000 on energy used to power the booster pump system, and another $20,000 in maintenance," he said. "We were repairing the old system routinely, and that became a huge expense that we've now eliminated entirely." ■

John Vastyan is a freelance writer in Manheim, Pa.

Figueroa at Wilshire Fast Facts

Address: 601 Figueroa St., Los Angeles
Owner: Brookfield Properties Corp.
Constructed: Mar. 1988- Sept. 1990
Floors: 53
Height: 717 ft. (219 m.)
Architect: Albert C. Martin Associates
Awards: Building Owners and Managers Association awards for 1994 and 1995; Rose awards for Outstanding New Office Building (1991) and Outstanding Public Art (1992); the 1992 Business and Industry Award for Excellence in Architecture, and the U.S. Environmental Protection Agency's ENERGY STAR label.