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High-Rise Pump System

Applications & Resources: Pumps

Greetings!

I would like to share with you this article featured in HPAC Engineering Magazine about a 52-story high rise located in Los Angeles California. The article reflects solutions PumpMan provided the building's owner, Brookfield Properties.

The objectives of the project were to reduce electricity consumption and maintenance costs, while replacing an inefficient pump and piping system...all without interrupting water service to the building's occupants.

As you read the article, please remember the following:

Our Values are Your Values:

We stand for quality work, treating others as we like to be treated. Open, clear communication with our suppliers and customers, doing the right thing; being fair and honest is our mantra.

Purpose:

Our business is to improve the lives of our customers. This is done by providing the highest quality products and workmanship, resulting in the best possible experience.

Our Vision:

To provide the most professional and reliable services available — with a special emphasis on quality workmanship. We are available to our customers 365 days a year, 24 hours a day!

I hope you will find this article useful to help you make your decision to work with a pump system specialist. Call me personally anytime if I can be of assistance!

Thank you!

Eric Skjarstad

Eric Skjarstad
President

Conserving Energy With a Pump System

High-rise office building's pressure-boosting system saves \$40,000

At what point in a large building's life do facility managers decide to replace key mechanical systems? That depends on many factors, including the age and condition of system components, operational performance and efficiency, and the costs and long-term advantages of system replacement. Such issues routinely are discussed by managers of New York-based Brookfield Properties, a large commercial-real-estate management firm. In 2002, a subsidiary of the firm assembled a nationwide "energy team" to assess and reduce the firm's overall energy costs, which totaled more than \$100 million annually.

One of their holdings is the Figueroa at Wilshire,

the fifth-largest high-rise in Los Angeles, located in Southern California's financial district. Built in 1990, the 1.4-million-sq-ft, 52-story office tower highlights a granite exterior, two 75-ft atria lobbies with granite walls and floors, and an open-air plaza with a 36-ft sculpture that features fire and water.

In 2005, following an energy audit of the firm's properties, (see "System Monitoring" sidebar), the Figueroa's needs moved to the top of the firm's list. The audit showed that the building's multiple issues—high maintenance and energy costs, declining water pressure, option-limiting proprietary controls, and mechanical fatigue of an old pump's steel barrels—would have to be addressed with a new pump system.

Baldwin Park, Calif.-based PumpMan Inc., a pump-system maintenance, repair, and installation contractor, was chosen to establish the new pump system. System-design support was provided by Delta-Q Inc., a manufacturer's-representative agency.

Brookfield managers had known for a few years that the old pumping system needed to be replaced, but time constraints had been a problem. Demolishing and replacing the old system within a tight time frame was more daunting than the expense, but the energy audit confirmed that the job needed to be tackled as soon as possible.

OUT WITH THE OLD

One facet of the project left no room for error. Although replacing the old pump system was considered "major surgery," the main challenge was to install the new pump system without any apparent loss of service to the Figueroa's tenants.

Planning was essential. To ensure continuous water pressure throughout the process, PumpMan

By **STEVEN L. DICKSON**
Grundfos Pumps Corp. Inc.
Olathe, Kan.



The Figueroa at Wilshire in Los Angeles.

Photos courtesy of Grundfos Pumps Corp. Inc.

Steven L. Dickson is the commercial business-development manager for Grundfos Pumps Corp. Inc. He has been with the company since 2000. He has a master's degree in business administration from Baker University in Kansas City, Kan.



A lobby in the Figueroa.

organized a two-phase installation of the new equipment based on the building's low and high zones. The low zone fed floors 1 through 25 and encompassed everything downstream of a pressure-regulation station that managed water from a discharge manifold. The high zone extended from the discharge manifold and supplied water to floors 26 through 52.

The building's 15-year-old constant-speed pump system consisted of two three-pump pressure-boosting systems—one for the low zone and one for the high zone. The low-zone system consisted of one 15-hp pump and two 30-hp pumps. The high-zone system consisted of one 30-hp pump and two 60-hp pumps. Because the old system was split into two zones, two pumps normally were running, even at periods of low demand. The motors ran at full speed and wasted large amounts of energy because there was no speed regulation.

All of the pumps had vertical turbines that used pressure-reducing valves to control discharge pressure. The valves were needed to taper the discharge pressure at each pump to avoid dangerous overpressurization. The old system discharged 500 psi at the building's lower floors while delivering 150 to 200 lb of water pressure to the upper floors. The system used the valves, as well as multiple regulators, every eight or nine floors.

IN WITH THE NEW

During Phase I of the project, PumpMan techni-

cians installed a new 4-in. pressure-regulation station to temporarily feed the low zone with the high-zone pump system. This enabled the high-zone system to maintain pressure throughout the building while the low-zone system was shut down and removed from the mechanical room.

Having the entire building rely on the old high-zone pump system while the new system was assembled and installed at the site of the former low-zone pump system was a calculated risk. The week-long project's success or failure balanced on this point. However, it was important to avoid interrupting water service to the tenants' businesses. When the low-zone system was disconnected and the high-zone piping was reconfigured to feed the pressure-regulation station, the building's water service needed to be shut down only for about 12 hr.

During Phase II, water service was shut down again for about 8 hr. During this time, PumpMan technicians turned off the high-zone pump system, disconnected all of the piping, and reconnected the domestic piping to the new four-pump pressure-boosting system.

Schedule 40, Type 316 stainless-steel pipe was used to replace the high-zone piping. Type L hard copper tube was used to supply the new system and the low zone. When the technicians tied the new high-zone piping into the existing building piping, the building was drained, the piping and electrical wiring were disconnected from the existing high-zone pump system, and the main and emergency power were reconnected to the new system.

PumpMan technicians installed an automatic emergency-power transfer switch that would allow the new pump system to operate at a reduced

System Monitoring

Brookfield performed before-and-after system monitoring of voltage and current as part of its energy audit. The "before" monitoring included a full week—24/7—of gathering data electronically from the Figueroa's two existing pump systems. The same monitoring was performed on the new pump system after sufficient time was allowed to tune the controls.

On average, the old system used 5,000 kwh of electrical power per week, while the new system used 1,350 kwh per week. With an average cost of 11 cents per kilowatt-hour, the savings added up to more than \$20,000 per year. The total equipment running hours dropped from an average of 184 hr per week for a six-pump system to 60 hr per week for a four-pump system.



The new four-pump pressure-boosting system.

capacity if the building was to lose its main power supply. Wiring the switch into the new pump system was critical for the rooftop equipment, to which makeup water was supplied for 10 cooling towers.

After the new pump system operated smoothly for a week, the old high-zone pump system was removed from the mechanical room.

CONCLUSION

The new system has a variable-speed drive, which



The low zone's new pressure-regulation station.



The high zone's original three-pump pressure-boosting system.

can power any of the system's four pumps. The pumps operate in a lead-lag arrangement, activating one pump that speeds up and slows down as water demand changes. Each of the four pumps is "rotated in" to act as the lead pump. Other pumps come online at full speed as demand dictates, while the lead pump continues to operate on the variable-speed drive to maintain a constant system discharge pressure. The pumps do not require pressure-reducing valves because the variable-speed drive ensures that discharge pressure does not fluctuate by more than a few percentage points, even with quick changes in demand.

Running only one pump on a variable-speed drive has reduced energy consumption and is expected to extend pump life and performance. Because of the new installations, the Figueroa's domestic-water pump system receives water from the city's supply at 50 psi and increases the pressure to 380 psi to push the water to the upper floors. An added benefit is that noise levels have been reduced.

Prior to the installations, the project was expected to save between \$15,000 and \$20,000 in operating costs. During the first year of operation, about \$40,000 was saved in energy and maintenance costs for the pump system. The expense of routinely repairing the old system has been eliminated.

Just a short note regarding the operation of the Grundfos BoosterpaQ System you installed here at Fiqueroa at Wilshire Building. The pumps, the variable frequency drive, along with the sequence of operation, have been running trouble-free for just over a year now and I wanted to express our satisfaction with the booster pump system and to PumpMan for your planning and execution of this difficult booster pump system replacement. The installation and equipment are truly a showpiece. The pump system has proven to be reliable and efficient, saving energy and repair costs. Please give me a call to discuss the extension of the annual preventive maintenance agreement we currently have with PumpMan.

Sincerely,
Marty Zuno
601 South Fiqueroa Street
Los Angeles, CA
United Engineering

Trust PumpMan for specialized pump system maintenance, repair, and new installation.

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