Belimo Pressure Independent Technology Provides Efficient, Long Term Solution for Growing Retirement Community

Shell Point Retirement Community in Fort Myers, FL, is an extraordinary property. With over 400 acres and nearly 2000 residents, it is Florida's largest life care retirement community, combining all the services of a comprehensive staged elder care facility and the amenities of an all-inclusive resort. Also extraordinary is the fact that this sprawling property, which includes a 75-acre island and a wide assortment of medical, recreational, and living facilities, is served almost entirely by one central energy plant. The efficient and seamless delivery of heating and cooling to the outlying buildings is, in no small part, thanks to the nearly 1500 Belimo Pressure Independent Control Valves (PICCV).

Belimo has played an important role in Shell Point's HVAC system since the property embarked on a 20-year multistage expansion several years ago. In addition to numerous new construction projects, this expansion included transference of several independently cooled buildings onto the central plant system. Ultimately the centralized cooling system would include 5 miles of underground piping. This massive system and a desire to resolve existing low ΔT problems led Shell Point Energy Plant Manager, Dan Parker, and Project Development Engineer, John Trowbridge, P.E. to explore Belimo pressure independent technology.

According to Trowbridge, pressure independent control eliminated the need for balancing newly constructed systems, as well as rebalancing systems already connected to the central load. Balancing would have been especially burdensome since all the air handling units already connected to the central plant would require rebalancing at the same time; a daunting challenge for even the most skilled contractor. This, along with the high differential pressures found in some areas of Shell Point, made Belimo PICCVs an appealing solution.

How the PICCV works:

The PICCV combines a differential pressure regulator with a two-way control valve and actuator for electronic flow control. The pressure regulator controls the amount of flow passing through the valve according to the change in pressure. All pressure changes are absorbed by the pressure regulator allowing the differential to be held constant over the control valve section, thereby providing consistent flow. This is different from conventional 2-way control valves, whose operation can be severely distorted by system pressure changes.

"The PICCVs circumvented the issues we had and provided us with a totally self-balancing system," says Trowbridge. "With the PICCVs, we are assured that the ΔT across the coils is at design conditions, working optimally, and pumping energy is minimized."

Because the PICCV has a very high close-off pressure rating, it can easily close off against the higher pressures found at some of the air handlers on the property, making it every bit as reliable as globe valves in many applications, often at a fraction of the installed cost. Even so, Dan Parker, a seasoned veteran in chilled water systems, was prepared for certain flow issues to crop up when the first PICCV controlled system went on-line. He was pleasantly surprised.

"There was no impact on the system whatsoever. No increases in flow, chilled water demand, or pump power," said Parker, adding "that since start-up, no manual balancing has been required thanks to the dynamic system balancing the PICCV provides."

Apples to Apples

Not one person, including Dan Parker, doubted the PICCVs were saving Shell Point money and labor. However, it wasn't until a study conducted by Integrated Energy Concepts Engineering, that the savings were officially and undeniably quantified. Two virtually identical buildings at Shell Point provided the perfect opportunity to compare the operational and construction costs of two separate control valve strategies.

Parkwood and Lakewood residential facilities are identical in every way except for the fact that Parkwood uses PICCV technology while Lakewood has standard Belimo 2-position Characterized Control Valves (CCVs). Otherwise the size, use, and design of the buildings are exactly the same. Both HVAC systems are served by the central plant and have the same 24/7 occupancy/load pattern. Each unit room is conditioned with dedicated air handling units with heating and cooling

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coils. Flow through these coils is controlled by Belimo valves, Parkwood using PICCVs, and Lakewood using the CCVs and a separate balancing valve for each.

Bruce Keeley, PE, of Energy Concepts developed an analysis program to compare the control valve technologies used at Parkwood and Lakewood. Energy Concepts is a mechanical, electrical, plumbing, energy and controls design and consulting firm specializing in energy and financially conscious design services and analysis.

"The goal was to evaluate PICCV technology. The identical buildings at Shell Point provided an exquisite opportunity for a comparative case study on the pressure independent technology against straight characterized control technology," said Keeley.

In addition to a series of theoretical calculations, the firm conducted a series of random onsite tests to confirm the results of the analysis. These tests demonstrated that the program had, in fact, accurately predicted the flow of chilled water to each of the buildings (within 7% of range) under all normal operating conditions.

Taking into account Bin hours, brake horsepower and kWh cost, the analysis showed that Shell Point is enjoying an annual savings of $1,882.00 in the Parkwood building as a result of using the PICCVs. Table 1 shows the resulting calculations that are based on the operating parameters of the two buildings. (Due to the use of a 222 tank Ice Storage System on this project, additional chiller savings are not reflected in the annual figures as noted. A system that does not use Ice Storage would yield higher annual savings.) The PICCVs promote substantial savings in chiller-energy consumption by maintaining the system's design differential temperature (ΔT), and completely increasing the efficiency of chiller plants.

TABLE 1

2 Position Valves	Yearly Operational Savings
PICCV over 3-Way	$4,342
PICCV over 2-Way	$1,882
Modulating Valves	
PICCV over 3-Way	$4,342
PICCV over 2-Way	$998

In terms of installation costs, a separate comparison demonstrated substantial savings by using the PICCVs. The total cost for installing all the heating and cooling coils with PICCVs at Parkwood was $83,031.00 versus the $101,889.00 installed costs of the CCV/coil balancing assemblies at Lakewood. This is a savings of over 18% in installed costs at the Parkwood facility, which is referenced in Table 2.

TABLE 2

2 Position Valves	Cooling	Heating	Totals
3-Way CCV	$78,567	$77,272	$155,838
2-Way CCV	$51,321	$41,160	$101,889
2-Way PICCV	$41,871	$41,160	$83,031
Modulating Valves			
3-Way CCV	$78,567	$77,272	$155,838
2-Way CCV	$56,669	$55,877	$112,545
2-Way PICCV	$46,737	$45,864	$92,601

Cost Estimates

In addition to these savings, the analysis demonstrated that the pumps serving the Lakewood and Parkwood facilities are not needed under low load conditions; the central chilled water system differential pressure is sufficient. This makes it possible to achieve further operational savings by installing a bypass with check valve and isolation butterfly valve so that building pumps may be turned off during low loads. It was also determined that with PICCV technology, the piping design for the risers in the chilled water distribution for future buildings could be reduced in size. Smaller piping systems are not only less expensive, they have less heat gain—another potential area for operational savings.

PICCVs – All the Way!

Shell Point found remarkable success using the PICCVs from the beginning and has continued to incorporate the technology into every new construction and renovation project. Facilities that have or will have all PICCV control include:

Facility	# PICCV
Parkwood Independent Living Apts.	200
The Arbor Assisted Living	350
Eagle Preserves Independent Living Apts	300
Nursing Pavilion *(under construction)*	475
Medical Center	40

in addition to these facilities, Dan Parker and his staff are systematically changing out standard 2-way valves and balancing valves with PICCVs, whenever old valves need replacing or servicing. Eventually, Parker says, every building at Shell Point will utilize pressure independent technology.

"It's just a good valve," says Parker. "Out of all the ones we have installed, I don't recall a single one failing. They don't leak and they provide proper comfort and flow. And then there's the savings."

Parker continues to observe flow rates to all his buildings and has noted that when temperatures are in the high 80's to upper 90's, flow rates are consistent throughout the property, regardless of control strategy. However, once the temperature starts to drop, the reduction in GPM to the PICCV controlled buildings is quite evident. In all of these buildings, Parker says that the PICCVs still maintain a perfect 8 to 11 degree temperature drop, regardless of load, so he knows he is not over pumping.

"If I had PICCVs everywhere, I could reduce all the pumping I have and it would really knock down my GPM," said Parker.

That's a goal Shell Point can easily justify, given the irrefutable savings and reliability the PICCV has already provided to this growing senior living environment.

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