

Self-balancing system, front-end support make the numbers work for KPMG island office

► When KPMG, the global audit, tax, and advisory services firm, approached Omni. B.V. for a new building to house some 200 of its accountants and tax advisors on the island of Curacao in the Netherlands Antilles, it asked for an innovative HVAC system that would save on energy, be quiet in operation, meet precise indoor comfort conditions, and be part of a green building.

Henk Soeterboek, former engineering director for Omni B.V., a local mechanical engineering and installation firm in Willemstad on the island of Curacao, met those challenges and believes he has designed the most energy-efficient new building on the island. A recent analysis by KPMG revealed that the company's energy use is no more for the new, 30% larger building than it was for their previous, smaller building.

AN INNOVATIVE HVAC SYSTEM

Completed in 2007, the three-story KPMG office building is kept cool by an HVAC system Soeterboek designed, which includes a Taco Load-Match single-pipe system. "It's super comfortable," says Soeterboek of the building, despite the island's tropical high humidity climate.

In addition to LoadMatch from the U.S., the building's internationally-supplied HVAC system includes Daikin chillers (Belgium), Solid Air distribution supply grilles (Netherlands), Thermocore cold water pipe (U.S.), Carrier modular air handlers (Brazil), and ASI Controls for the building management system (U.S.).

ENERGY USE AND HUMIDITY CHALLENGES

The most critical requirement — and the most challenging — was for the building to consume as little energy as possible. That's because tropical Curacao has some of the highest electricity rates in the world: almost 65 cents per kWh for commercial customers, after a recent 25 cent kWh increase charged by the local power and water utility Aqualectra.

Humidity is a major factor in keeping any building on the island of Curacao comfortable for inhabitants, as humidity averages about 70% rh. Outside climate conditions place a very high load on the island's A/C systems, especially fresh air requirements. Relative humidity in the KPMG building was an upfront concern for Omni B.V. because of dynamically changing water temperatures — the temperature cascade — experienced by the LoadMatch system.

Careful selection of the Carrier AHUs for the KPMG building was required due to the relative humidity requirements, and heat recovery equipment was a must — not only for relative humidity but for energy savings as well.

THE LOADMATCH SYSTEM

LoadMatch has a proven track record of maintaining very comfortable relative humidity levels even in very humid climates, like Florida and Louisiana, so concerns about the temperature cascade with the Load-Match system have been unequivocally answered. With proper sizing of the cooling coils to account for the cascade, and system diversity from one installation to the next, humidity levels in LoadMatch-equipped buildings have been very good.

"After careful analysis and support from Taco," says Soeterboek, "we were convinced that humidity problems were not going to be a major issue with the LoadMatch system."



A single-pipe system kept HVAC system operating costs low, even in the humidity-laden tropical air of Curacao in the Netherlands Antilles.

Omni's engineers had heard about the LoadMatch system and read about installations using LoadMatch and were impressed with the system. Omni also learned that Taco provides extensive front-end design support. According to Soeterboek, Taco provided "super support" to him throughout the project.

Taco's LoadMatch system is self-balancing, combining a single-pipe hydronic system (with a decoupled secondary piping circuit to each terminal unit) with circulators for zone control, providing the required flow to all heating/cooling units in a building at all times. LoadMatch eliminates the need for most control and balancing valves, reduces first costs of installation (about 30% less pipe is needed), and uses smaller, more efficient LoadMatch circulators to save energy. As a result, lower pump head and less horsepower are required to move water through the building loop.

According to Henk Soeterboek, the LoadMatch distribution system has been an unqualified success, and there has been no need to balance any water flows. In fact, when measured after the initial first nine months of operation, the building remained right on design specifications. Soeterboek and his colleagues have been extremely pleased with the results.

"Since system startup, the building has remained uniformly comfortable and load shifting from one side of the building to the other side takes place without any complaints," he reports.

Omni B.V. has been closely monitoring the building's indoor comfort levels during the hottest months of the year. The building total COP is +/- 3.1, taking into account all additional loads like the 13 air handler motors at 3.0 hp each, the building management system, and the 13 LoadMatch circulators at 1/2 hp each. Total building fresh air is +/- 14,000 m³/hr (8,400 cfm), of which 72% is recovered by the Daikin-supplied VAM heat recovery system.

Asheville resort digs deep to deliver dehumidification to underground spa patrons

► The Grove Park Inn Resort & Spa is nestled in the Blue Ridge Mountains of Asheville, NC. It has long been a favorite vacation destination for much needed R&R and romantic getaways, especially during the hot southern summer season. Words cannot fully explain

the beauty, size, and opulence of The Grove Park Inn; one must experience the many rooms, restaurants, and balconies first-hand to really appreciate the craftsmanship and attention to detail. It's easy to see with a pedigree as long as theirs why service and ultimate satisfaction are at the top of the inn's must-do list.

Jaime Huffman, executive spa director, said The Grove Park Inn needed significant repairs right after WWII. During the war, the Inn had worked with the U.S. government to house foreign diplomats, wounded seamen, and returning combat soldiers. The Sammons Corporation of Dallas purchased the resort in the 1950s and soon had the inn fully restored. Two wings were later added for a total of 512 rooms plus an assortment of craft and meeting rooms, world class dining, shopping areas, and of course, the spa.

Huffman gave the credit for the spa's world class rating to Elaine D. Sammons who took the leadership role after her husband passed on. "Mrs. Sammons announced in 1998 that she wanted to build the finest resort spa in North America," said Huffman. "The spa took twenty-three months to build and opened in February, 2001. Since then it has exceeded our expectations by delivering a level of tranquility and restoration our guests truly appreciate."

UNDERGROUND PAMPERED COMFORT

The majority of the spa is subterranean and the bottom two floors had to be carved out of the mountain using dynamite so as not to obstruct the view from the Inn. It's situated below the main inn and measures 43,000 sq ft. At a cost of nearly \$50 million, there are few spas that can even come remotely close to its size and magnificence. There are two tunnels leading to the spa, and once inside it's a labyrinth of pools, whirlpools, indoor treatment rooms, couples' rooms, and an assortment of specialty areas, including 20 water features, seven fire pits, and 16,000 sq ft of amenity areas.

McCracken & Lopez, P.A., headquartered in Charlotte, NC, were the consulting engineers chosen for the spa project. They really had their work cut out for them not only because it was one of the largest spa centers in the world, but it also included unusual aesthetic consideration not typically found on projects of this type.

"The design of the spa was such that it was one of the largest aquatic facilities in the world and the space was divided into many smaller areas, making it truly unique," noted Dick McCracken, the chief engineer on the project. "But the architectural requirements meant that we really had our work cut out for us to make it all happen."

The spa space is divided into a variety of pool areas that include a private male and female cold and hot pools, a men's and women's hot pool, a central large pool, and saltwater brine pools. The separate pool areas are connected by open walking areas.

"It's difficult enough maintaining critical water and air temperatures along with desirable humidity levels when each of the spaces is individually enclosed," remarked McCracken, "but the complexity of the task is multiplied when all the spaces are open to each other."

McCracken said the largest challenge was to install the mechanical system were it could not be seen nor heard but designed to deliver constant comfort conditions without fail.

UNDERGROUND HUMIDIFICATION CHALLENGES

The solution McCracken & Lopez came up with was to locate the mechanical room directly below the spa, acting as a sub-basement. While this required extensive construction, the result was direct access to the individual pool areas for the space conditioning air with no ducting vis-



Multiple dehumidification units allowed for scheduled downtime while maintaining this underground spa's precise humidity requirements.

ible to the patrons.

It was also decided that separate dehumidification units would be needed to maintain the unique temperature and relative humidity conditions in each spa section. McCracken, working in conjunction with Richard Archer, account manager for Trane Commercial Systems of North Carolina, decided on PoolPak dehumidification systems for the project.

As a representative for PoolPak products for many years, Archer has had plenty of experience with indoor pool installations and knows not all dehumidification equipment is up to the task.

"Most dehumidification units generally work well for a few years after installation but begin having problems because of the corrosive chloramine environment," said Archer. "We've found the PoolPak units have few problems in this area because of how they are built." Archer also commented that Grove Park Inn required that the Spa run 24/7, with virtually no interruption in comfort.

A total of six PoolPak dehumidifiers were installed having a combined moisture removal capacity of 382 lb/hr with each unit ranging in capacity of 11 to 90 lb/hr. The combination of PoolPak SWHR and AWW models allowed flexible capacity to maintain the many pools and waterfalls within the area. Multiple units also made it possible for scheduled downtime of individual units without interruption to the space conditions.

The four dual-fan SR units control the main body of the spa while the PoolComPak AWW units manage the men's/women's hot tub and cold plunge areas. Humidity levels are kept on the lower side, between 50 and 55% rh, while the water temperatures range from 84° in the lap pool to 103° for the hot tub, down to 65° for the cold plunge pools.

McCracken said despite the enormity and complexity of the installation, the commissioning went well with few problems. The PoolPak units operated as designed and continue to operate efficiently with few interruptions and down time. But McCracken is still awed by the magnitude of the project.

"When you consider the size of the spa with all its open spaces, pools and waterfalls, along with the temperature and humidity variations throughout the space, it truly is a project worthy of the Grove Park name." **ES**