Penn National Gaming's Hollywood Casino, Toledo, OH

CASE STUDY

Entertainment

Facility at a glance

Name
Hollywood Casino

Location
Toledo, OH USA

Facility size
Main gaming - 177,000 ft²
Lower service area - 167,000 ft²

Issue
Increase HVAC energy efficiencies for a large facility

Solution
(21) Daikin RoofPak® systems with energy recovery, (3) Daikin centrifugal chiller systems

Penn National Gaming selects Daikin RoofPak and chiller HVAC systems for LEED® Certification

Daikin HVAC systems contribute to significantly greater energy performance than conventional cooling systems

The ability to provide savings in energy costs and meet a fast-track construction schedule were critical factors in the selection of Daikin HVAC equipment for Penn National Gaming's Hollywood Casino in Toledo, Ohio. The HVAC equipment contributes significantly to the casino, which is expected to earn the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) New Construction (NC) certification at the Silver level. Wyomissing, Pennsylvania-based Penn National Gaming Inc. (PNG), the nation's third-largest gaming company, owns many gaming and racing facilities with a focus on slot machine entertainment.

Percent HVAC Energy Savings Across Overall Facility Savings

Daikin rooftop units and chillers **18.4%**

Cooling towers **5%**

Pumps **5.3%**

Total HVAC energy savings **28.7%**

LEED Certification one of few

The building of the Hollywood Casino, which opened to the public on May 29, 2012, was a high-profile project given its distinction as the second of only a few planned casinos in the state and its unique status as an expected LEED-certified casino, one of only a few in the United States.

"When the Northwestern Ohio Building and Construction Trades Council presented the challenges and benefits of making this a LEED project, we dedicated our resources to learn more about LEED," says John Rauen, vice president of Development at Penn National Gaming.

PNG quickly saw the benefits of the LEED certification in terms of how a sustainable building benefits the environment as well as energy savings. "We engaged the right people and put together the right plan. As a result of the LEED endeavor, we're turning over a highly efficient building to our operators which will benefit them for years to come," Rauen says, noting Toledo Gaming Ventures LLC, the company's wholly-owned subsidiary, operates the facility.

Final Cut restaurant – one of five restaurants within the casino

The Hollywood building at a glance

The main casino level spans 177,000 ft^2 with 2,000 slots, 60 table games, a 20-table poker room and five restaurants—including a sports bar and an entertainment lounge.

The lower service level, at 167,000 ft^2 includes administration, employee areas, a 276-space valet parking garage and a five-level parking deck for 2,450 parking spaces.

Twentyone Daikin rooftop air handler units and three single-compressor centrifugal chillers provide heating and cooling for the entire building and support the facility. Other energy-saving design features include high efficiency pumps, boilers, a building automation system, variable speed heat pumps, and significant use of LED lighting. In addition, between 85 and 90 percent of cement, drywall, wood, cardboard, and steel were made from recycled material. All of these elements support the building's LEED certification.

Situated close to the river and meeting environmental requirements on a brownfield site presented additional challenges

Urban Design Group provided architectural services on the project and has worked with PNG on a number of facilities. The architectural firm of Concord Atlantic Engineers, Inc. (CAE) designed the mechanical engineering. CAE recommended use of Daikin HVAC equipment based on its energy-saving features and past performance on other projects with PNG.

"We have a comfort level with Daikin based on other projects and their ability to meet fast-track construction schedules goes hand in hand with that," says Anthony Caucci, P.E., vice president/director of mechanical engineering at CAE in West Atlantic City, New Jersey.

GEM Inc. provided HVAC system mechanical and electrical installation as well as building plumbing and electrical which included lighting and low-voltage systems. GEM Inc. also erected more than 1,600 tons of structural steel as well as the decorative steel used. All firms credit assistance by TriState HVAC Equipment, the main HVAC representative, in overseeing the specification, procurement details and logistics of the Daikin equipment.

"Daikin and its representatives were a very big help because we had to get specifications for the HVAC units in line very quickly," says Matt Mitchell, LEED AP BD+C, and project manager with Urban Design Group, Atlanta, noting, "CAE spent a lot of time with Daikin representatives to get the details. Getting the rooftop units manufactured and shipped was completed in one of the fastest timeframes of the whole project." Collaboration was essential to complete the project successfully.

The casino is located on the banks of the Maumee River and situated on a brownfield site. "Architects and engineers had the complicated task of determining the location of the building on the 44-acre site while meeting all environmental requirements," says Dan Stark, P.E., project manager, with GEM Inc., in Walbridge, Ohio. Digging only 10 feet into the existing ground was one such requirement. Ground was broken for the project in August 2010 and construction was completed in mid-March 2012 — three weeks earlier than the targeted date. While not considered an official design/build or design/assist delivery method, construction of the casino progressed rapidly, despite record snowfalls. Construction caught up with the design during the early construction phase of pile driving. "We had to make sure the areas we worked on next were completed from the engineering design perspective and ready to install before we worked on it," he says. Some 94 contracting firms were hired for the project, which included more than 2,100 union tradespeople.

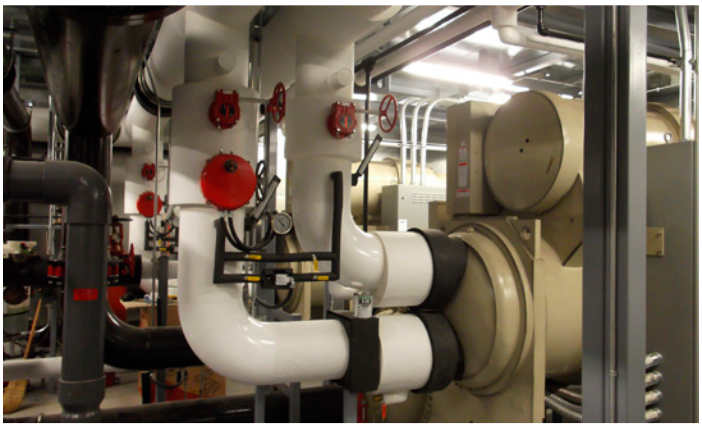
Daikin RoofPak rooftop air handling units incorporating energy recovery wheels provide air to 344,000 sq. feet of space

HVAC configuration

The HVAC design included Daikin rooftop air handlers and water-cooled chillers, cooling towers and pumps, all which significantly contribute to the energy savings. "The Daikin rooftop units and the variable-speed chillers heavily offset the large energy consumption of a casino," Caucci says.

The main HVAC systems use a four-pipe system with Daikin variable-air-volume (VAV) rooftop air handler units that have energy recovery wheels. The 21 rooftop units are situated on the roof of the casino building. In addition, 276 VAV boxes, located in the building ductwork, control individual thermostatic-controlled HVAC zones within the building. "The VAV boxes contribute to the LEED requirement to control air flow," Stark says.

Two separate boiler rooms—one in the mechanical mezzanine level and one at the service level—contain a total of four boilers. "We did a supply air temperature reset on the rooftop units to save on piping and boiler usage. The system uses gas heat in the rooftop units," Caucci says, adding, "Of course most rooftop air handling-units have a supply-air reset, but we programmed additional logic to warm air in lieu of reheat coils on the large gaming floor. Some of the perimeter zone VAV boxes have reheat coils to ensure heating if the main units deliver cold air."



Chillers are housed in a separate steel-enclosed packaged chiller plant with cooling towers, located adjacent to the building.

HVAC installation

The Daikin rooftop units were installed on a just-in-time, staged basis over a three-week period in June 2011. A large crane was mobilized in three areas to lift the rooftop units in three batches onto the building. "The delivery was coordinated to minimize costs. We lifted the units off the trucks from three different pick points. Each week, the crane had to be moved and reassembled in each area," Stark says.

The enclosed chiller plant was also assembled on a just-in-time basis as equipment and materials were delivered in the fall of 2011. "Teams put together the pre-fabricated building in sections with each of the three chillers in its own packaged chiller plant," Stark says. The cooling towers are situated on top of the water-cooled chiller plants, which was assembled within two weeks. GEM Inc. oversaw the LEED-required flush-out and commissioning of the HVAC system, done on a staged basis.

"One of the selling features that makes the Daikin equipment attractive for PNG is its seamless integration with the building automation system of the casino," says John H. Melville, Daikin representative with TriState HVAC Equipment, in West Conshohocken, Pennsylvania. The rooftop air handlers and chillers, as well as all other HVAC equipment such as the cooling towers and pumps, were easily integrated with the casino's Metasys® building automation system (BAS) by Johnson Controls using BACnet® open standard protocol. The Daikin HVAC equipment features unit controllers with the Open Choices™ feature that is compliant with all standard BAS communication protocols.

A unique set of challenges for casinos

Every casino combines a variety of building uses under one roof. These include kitchens, offices, entertainment venues, restaurants and lounges, as well as surveillance areas. Significant planning goes into the code-intensive environment of casino design which must meet strict safety requirements for items such as sophisticated fire systems. Each facility inherently brings a unique set of challenges and technical requirements.

Significant LEED contributor

Adds Melville: "The energy recovery wheels in the Daikin rooftop units are big contributors to the lowered energy consumption compared to conventional systems." The rotating energy recovery wheels, draw outside air across one-half of the wheel while drawing exhaust air across the other half. This process transfers sensible and latent energy between the ventilation and exhaust air, allowing heat to be recovered during the winter months and allowing for free cooling during the summer months.

Energy modeling and analysis by CAE calculated a 13.02 percent energy savings in electricity and gas consumption above the ASHRAE 90.1-2007 baseline for the entire facility including the site. "The ASHRAE energy model uses historical weather data for Toledo and factors all aspects of the facility such as insulation, roofing, lighting, interior loads, and mechanical equipment," Caucci says. To this end, LEED Silver NC certification of the facility is expected after the building has been in operation one year. CAE is overseeing rebates from the local utility company on behalf of PNG, expected to total over $100,000 for equipment purchases which include the Daikin chillers with variable frequency drives (VFD), chiller pumps, and fans.

Energy analysis by CAE also found the Daikin rooftop units and chillers contributed 18.4 percent of the overall energy savings of the facility. "The cooling towers contributed 5 percent and the pumps contributed 5.3 percent. Other energy-saving elements include lighting, domestic water heaters, boilers, insulation and construction materials," Caucci says. 3

A Daikin pre-fabricated modular central plant (MCP) complete with cooling tower and centrifugal chiller system