

SUSTAINABILITY IN CASINO DESIGN AND OPERATION¹

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INTRODUCTION

In the past many business leaders viewed sustainability and profitability as mutually exclusive—if it's good for the environment, it's bad for business. Yet, over the last decade we've witnessed a growing recognition that being "green" isn't being broke. In fact, the opposite is true. Sustainability supports business success. This is especially the case in casino design and operation, where sustainability initiatives foster both cost savings and environmental preservation. The beauty of this dual purpose is that by doing what is best for the bottom line, gaming houses can become stewards for the environment.

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During the design or upgrade of any building, a number of approaches to sustainability should be considered. These range from the use of low-flow fixtures for reduced water consumption to light-colored roofing materials for less heat absorption. In this paper, we narrow our focus to sustainability initiatives that cut casino energy use, highlighting the following strategies: day lighting, energy-efficient gaming systems and electronic gaming machines, access flooring/ductless air-supply systems, lighting and HVAC retrofits, heat recovery systems, cogeneration plants, solar arrays, fuel cells, and wind-generated power. Not only do these strategies cut operating expenditures and reduce energy demands, they create appealing and comfortable interior environments that enhance patrons' gaming experience.

STRATEGIES FOR CASINO SUSTAINABILITY

Day lighting

The concept of the casino as a windowless box has long held sway over casino design. Casinos' traditional lack of windows stem from a combination of sources, including jurisdictional mandates that gaming equipment not be seen from outside the building, manufacturer warnings to keep gaming machines out of direct sunlight, and the practical desire to prevent glare on gaming screens and surfaces. Another reason lies in the mentality that people will spend more time, and more money, in casinos if they are unable to track the passage of time. The thought is that casinos should be cut off from the outside world—no windows, no clocks, and no distractions to sidetrack patrons from their games of choice. Keep them focused inward, and hopefully they won't leave. Or perhaps the windowless floor plan reflects structural issues inherent in vertical casino/hotel combinations. As one commentator noted, "when you have 100,000 square feet of space topped with hotel towers and catwalks up high for surveillance crews, well, windows and skylights can be impractical."

Regardless of why daylight has traditionally been absent from casinos, in the past five years we have seen more designers and operators incorporating natural light into their gaming areas. This turn toward day lighting techniques may reflect the extensive research on natural light that suggests its positive influences on people's actions: fortified with natural light, students perform better in school, employees take fewer sick days and work more productively, and shoppers buy more. With such studies in mind, it isn't surprising to see natural light entering the casino.

In 2008 Turtle Creek Casino and Hotel near Traverse City, Michigan, owned by the Grand Traverse Band of Ottawa and Chippewa Indians, broke from the "cut-off casino" mold by including skylights that run throughout its entire complex—even the casino floor. The immediate effect of allowing daylight to penetrate the casino is up to a 50 percent reduction in lighting needs and thus a substantial savings in energy cost with an equally significant effect is increased profit. At Turtle Creek, natural light helps cut operational costs and attracts more patrons—a win-win situation.

Natural light in casinos has also debuted on the Las Vegas strip. Steven Wynn's Encore, which opened in late 2008, includes filtered daylight on its casino floor. ARIA Resort and Casino, part of the massive City Center complex that opened in 2009, include windows that provide outside views as well as skylights on its gaming floor. City Center executives, such as Vice President of Design Sven Van Assche, connect natural light with the creation of "a pleasant atmosphere." "There is an innate human comfort with daylight in an interior space," Van Assche says. "It heightens the experience, which can be said of any interior space that features daylight."

Entertainment architect Paul Steelman (2009), whose firm designed Sands Macau (completed in 2008), believes that in coming years, "natural light in the casino will be the rule, not the exception." The Sand Macau casino boasts a large expanse of east-facing glass, which allows patrons to witness the changing exterior light as the day turns to night. Natural light "offers more

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Energy-Efficient Gaming Systems and Electronic Gaming Machines (EGMs)

Gaming-machine technology has changed significantly over the past few decades. Classic mechanical designs have been almost completely replaced by computer-controlled machines, and companies such as International Gaming Technology (IGT), WMS Gaming, and Bally Technologies now offer an array of EGMs featuring various themes derived from pop culture—including television shows, films, and celebrities. Most casinos offer a wide variety of EGMs, with each machine dedicated to a single game and theme. If the patron wants to play a different game, he or she has to move to another machine. With the recent development of server-based gaming (Quish, 2011), soon this will no longer be the case.

Server-based gaming involves connecting EGMs to a central computer system, so the machines on the casino floor are essentially generic terminals. Different games can be downloaded to these machines, and managers use the central computer server to change games and features such as bonus payouts. This eliminates the need for technicians to manually perform the work, which saves on facility and maintenance costs while enhancing the user experience. Another benefit for casino owners is that, unlike a single game/theme EGM that becomes outmoded as fashions change, the server-based system lets managers update games in a matter of seconds without physically replacing EGMs.

Today few casino operators use pure server-based gaming systems. More common, but still not frequent, are server-supported gaming systems—essentially the step between the single

Streamlined Access Flooring/Ductless Air-Supply System

With traditional gaming floors, wiring and communication can be cumbersome, especially because gaming layouts and EGM configurations change frequently. One standard for casino-floor construction consists of a concrete slab with a trenched grid to accommodate power and data wiring. With access flooring, the entire grid floor system is built on top of the slab, not embedded within it. This allows greater flexibility, quick gaming layout changes, and facility and maintenance cost savings.

HVAC Retrofits

Many casino air-handling systems are designed to operate at maximum or code-required occupancy levels, meaning that the rate of outdoor air brought in and exchanged for indoor air is based on the maximum number of people a space holds at its busiest times. On days with an average number of patrons—which is most of the time—the HVAC system may still operate with the highest ventilation rates. With this in mind, HVAC retrofits on the casino floor generally involve reducing outdoor air rates during low occupancy periods. Often referred to as “Demand Controlled Ventilation,” these HVAC strategies reduce outdoor air ventilation in proportion to indoor carbon dioxide levels, which are monitored by carbon dioxide sensors.

Outdoor air rates significantly impact energy demands and costs as the air brought in from outside must be cooled, heated, and/or dehumidified before it can be introduced into the occupied space. Thus, a retrofitted HVAC system that adjusts ventilation rates in response to indoor air quality conditions is more energy efficient and cost efficient, saving up to 20 percent of operating costs. Additional HVAC retrofits generally focus on reducing motor horsepower requirements by using high efficiency motors, variable speed drives, and similar applications where the casino environmental demands can be achieved by utilizing more efficient mechanical equipment.

Retrofits of HVAC systems to incorporate “smart” building energy management technologies—such as carbon dioxide sensors—are a proven technique to both reduce air-handling-related energy needs and costs without compromising indoor air quality or customer comfort.

Heat Recovery Systems

Energy recovery systems in the casino environment typically take the form of air-side system heat wheels. Gaming spaces require a significant amount of outdoor air to achieve the typical building code mandate, which often approaches a capacity of 100-percent outdoor air during demand periods. Air-side system “heat wheels” are located in the return air portion of the typical rooftop HVAC unit, arranged so the heat energy contained in the return (inside) air is transferred to the incoming (outside) air before it is exhausted. (door air rht inr horse.6

Combined Heat and Power (CHP or Cogeneration)

the spring of 2012) will provide energy for the tribes' Lucky Star Casino in Concho, which comprises a large part of the tribes' \$200,000 monthly energy bill. The hope is that the wind power generated from the farm will more than cover these monthly bills, and leftover energy will be sold as an additional source of revenue.

CONCLUSION

Of the sustainable practices discussed here, many of them come with initial costs. In the case of lighting and HVAC retrofits, ROI is typically short term, less than two years. In other cases, upfront costs and slower ROIs appear to make certain technologies impractical. This is particularly true regarding alternative energy sources such as CHP-, solar-, fuel-cell-, and wind-derived power. Fortunately, an array of local through federal grants, rebates, and other incentive programs help ensure a quicker and more reasona