



Mr. Schmits

## **Integrative Design: Engineering Your Hotel's Mechanical and Electrical Systems for Profitability**

By [Jerry Schmits](#), Director, KLH Energy Solutions

The success of hotels and resort developments hinge on the ability to balance profitability and a first-class guest experience. Achieving this balance requires a responsible mixture of quality equipment, capable facility management, and technology. Combined, these operational components can respond to the demands of hotel guests while delivering a level of energy efficiency that keeps operating costs low. But in order to realize optimal system performance and cost-efficiency, developers need not sacrifice first-cost considerations: intelligent, integrative design that includes sensible master planning can create a baseline efficiency that will pay dividends for the entire lifecycle of the property.

Like most commercial hospitality developments, the primary power consuming systems are HVAC, lighting, and water. These systems are typically designed and engineered to meet the occupancy demands at full capacity, relying on sophisticated controls to manage the respective demand of each system at any given point in time. Inherently, while delivering their intended and designed performance, these systems too often create unintended consequences that can adversely affect each other. For example, lighting and domestic hot water distribution systems emit heat, which increases air temperature. Neutralizing this effect requires additional cooling capacity. These systems often operate against each other, resulting in unnecessary energy consumption. Integrative design accounts for all of the building systems and incorporates them into a synchronized unit working as a whole. This practice makes the most efficient use of habitat, energy, water, and materials, which (when integrated) creates efficiency. It's a common misperception that the notion of increased energy efficiency in building design will drive up the cost of construction—but that outdated thought is not the case anymore.

High-performance buildings are achieved when there is collaboration of all stakeholders across the design and construction continuum before the first structural design renderings are drafted. John Boecker is an architect and a founding partner at 7group, an internationally-recognized consulting firm focused on sustainable design and regenerative development. He acknowledges that technology is critical for managing system efficiency, but asserts that integrated design is key to fully optimizing a facility's total efficiency potential. Over time, technology plays a lesser role in energy efficiency, and is replaced with the synchronicity of systems, people and intelligent design to contribute more to a building's performance (see

Figure 1). Boecker claims that most building performance issues aren't a function of technological limitations, but rather a result of the people operating the systems.

How many times has an architect developed or implemented a sophisticated control system only to find that six months later it's operating in manual mode? When asked about root cause of inefficient building performance, Boecker says: "We don't have a technology problem, we have a people problem. Involving O&M staff in the early stages of building design typically creates ownership and promotes a better understanding of what it is that a developer or building owner is trying to achieve."

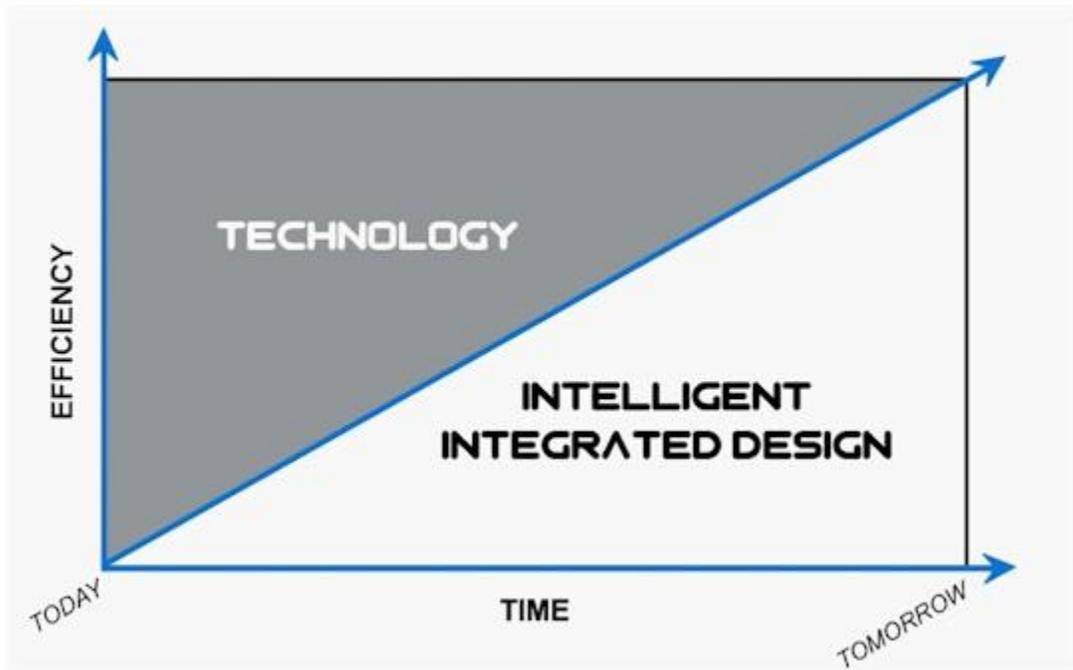


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This collaboration begins at site selection, where factors such as geo-spatial positioning can determine the ability to take advantage of daylight harvesting, thermal sources or prevailing winds. I once visited a beach resort hotel in Florida that had a pool located on the inland side of the property. Shortly after the building was commissioned, the pool-water temperature was found to be so hot during the summer months that the

pool had to be retrofitted with a small chiller in order to cool the recirculating pool water. Likewise, the pool at an adjacent property was located on the ocean-side, where prevailing winds kept the water temperature comfortably cool—and without the unnecessary cost of a chiller.

## **The Effects of Engineering**

Heat is energy. There is no shortage of heat-producing systems found within your hotel—so why not use that heat by-product to your advantage? Laundry operations provide a good opportunity to utilize hot water and steam to heat wellhead source water via an economizer. That's not news. What separates intelligent design from the others is the location of that hot water or steam source, relative to the source where it's being used or reclaimed. Is your plant located in an area that minimizes heat loss throughout the distribution system? Take that a step further: is your heat by-product causing the need for additional cooling or are you venting excess heat through the roof? Neither of these options is a good use of your free energy.

KLH Engineer's John Quillen is an electrical engineer and board member of the USGBC's Cincinnati Regional Chapter. He leads the hospitality market segment for the engineering firm and oversees approximately 50 hospitality projects of various sizes each year. According to Quillen, we're in the midst of a paradigm shift among hotel and resort developers—more attention is being paid to energy efficiency during the design and pre-construction phases.

For example, more than half of the new projects that cross Quillen's desk include requirements for LEED certification or Design to Earn Energy Star parameters. This shows that developers are beginning to understand that hotel operators and prospective buyers are considering the on-going cost of operation just as much as they do the purchase price. Energy efficiency connects directly with bottom-line profits, and engineers can prioritize the needs of developers to meet those needs. For example, every ton of avoided HVAC load creates a permanent reduction in demand, which saves the equivalent of some number of extra guest rooms occupied every day.

Consulting with architects and building owners provides engineers the opportunity to integrate engineering and energy management. Advancements in lighting and HVAC control technology offers developers and owners options that weren't available—or financially feasible—just a few years ago. LED lighting technology has come so far in the last few years, and it's now competitive (from a cost perspective) to fluorescents. On a recent project, Quillen convinced a developer to include a small rooftop photovoltaic (PV) system, which produced enough solar power to operate the LED corridor lighting system. They illuminate every corridor 24/7/365 and they incur no energy costs as a result.

The hospitality industry might be the most demanding of all commercial applications when it comes to demands of HVAC technology. Guest room energy management is critical to the profitability of a property. While programmable thermostats with occupancy sensors are the norm for addressing conditioned air drift, Quillen finds that more developers are taking interest in more aggressive energy saving opportunities. Reclaiming energy from conditioned air exhausted from guest room bathrooms is a great way to cut energy waste and reduce operating costs but Quillen does not see this in many project specs. A second great option for energy reduction is the 'plug and play' racked instantaneous water heaters. Not only are they efficient, they're first-cost friendly, as well.

Creating an inclusive environment involving all project stakeholders from the outset of your project challenges the traditional norms of construction project management for many hotel developers and owners. Boecker recommends identifying the purpose, process, and desired outcome for your project as the first step in any development. He claims that engaging in the integrated design process has proven to reduce on-going operational energy costs up to 50 percent without adding a dime to first-costs. According to Boecker building commissioning is an important part of the overall construction project strategy as a means of ensuring that the installed systems are operating as designed and meet the owner's requirements.

And every building is eventually commissioned—some are done as function of the construction administration phase, and some are completed over a 20-year period. This begs the question: at what point does a building owner want to reap the benefits of a functionally efficient building? For developers and owners who implement intelligent integrative building design practices, the question has already been answered.

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