

Warehouse/DC Operations: Why sustainable design still matters

Warehouse and distribution center construction is making a comeback—and so is the desire to get back to green. Our facility design experts offer their take on the evolving benefits and share why sustainable design holds more value than ever.



Prismatic lenses for skylights disperse natural sunlight into a facility more effectively. Combined with photocell sensors on high efficiency lights, such “daylighting” technology can cut lighting costs dramatically.

February 01, 2014

Back in the mid-2000s, when the economy and the construction of commercial buildings were on a tear and energy prices were on the rise, everyone was talking about retrofitting or building green warehouses and distribution centers (DC) packed with energy saving designs. Then, the worldwide recession hit, and the sustainability focus seemed to fade away.

“Interest in sustainable warehouses didn’t fall off the table,” says Ed Klimek, a partner with KSS Architects. “The fact is that all types of new development fell off the table. However, there were still some sustainable projects going on, and there were many companies making those types of long-range decisions.”

The numbers now show that [warehouse and DC](#) construction is making a comeback—and so is [the desire to get back to green](#). After bottoming out in late 2010, quarterly U.S. totals for warehouse construction put-in-place have mostly risen, especially since early 2012.

What’s more, warehouse and DC designers say that most of their projects are steeped in energy saving, sustainable features, and many are getting certified under the U.S.

Green Building Council's LEED (Leadership in Energy & Environmental Design) program. In December 2013, the council announced the 20,000th LEED certification for a commercial project.

"Over the last five years, more and more of our buildings are being built to a LEED certification," says Tripp Eskridge, a senior vice president with Jones Lang LaSalle, a commercial real estate services firm. "There has been greater and greater acceptance of LEED."

Klimek also sees sustainable warehouse and DC design becoming the norm. "Of our work right now, at least 80 percent of it is sustainable, and a good chunk of it is LEED," he says.

There are multiple reasons why green DCs continue to make sense, but the biggest remains energy savings. According to the New Buildings Institute, best practices in the design of lighting and the building "envelope" (the shell of the building, including its roof and walls) can save at least 40 percent on energy use, and up to 50 percent when the effects of a heating, ventilation, and cooling (HVAC) system selection are factored in.

Even for established facilities, there are smart, lower cost ways to go green, such as motion sensors on lighting. Some bigger ticket features, such as photovoltaic (PV) solar panels, can bring quicker payback than commonly thought.

And as the nature of distribution operations changes to accommodate e-commerce fulfillment, DCs are becoming more highly automated—but also in need of labor for piece picking and kitting. This is driving the need for more energy efficient facilities closer to urban areas that are also more "conditioned" than warehouses of the past, in that they need better lighting and a more comfortable air temperature.

While most design experts say that corporate social responsibility programs and branding are sustainability drivers for some companies, they also point out that for many, [the bigger driver behind sustainable warehouses is bottom line savings](#)—whether it's from energy efficient lighting or the ability of a well designed network to slash transportation costs.

Here's a look at the evolving benefits of going green and why sustainable design holds more value now than ever.



After bottoming out in 2010, the value of new warehouse construction put-in-place has been on a mostly upward curve

Big bang for small bucks

When it comes to lower cost ways of being green within the four walls, the most common tactic is to go after lighting. In particular, moving from older metal halide lighting over to newer T8 or T5 fluorescent lighting that is outfitted with motion sensors so that lighting only comes on when needed.

“Your payback with efficient lighting is often less than three years, but lighting is usually around a buck a square foot, so if you have a 200,000 square foot facility, that’s not cheap,” says Eskridge.

When it comes to the electric bill, Don Derewecki, a senior consultant with St. Onge Company, agrees that high efficiency lighting with motion sensors is a smart move, even for existing facilities. “If you have 20-year-old lighting system, it’s probably eating your lunch,” he says.

There are some other relatively low cost means of improving sustainability. Switching to green cleaning products and better management of the waste stream and recycling, for example, are low cost, says Eskridge. “Some of the lower cost methods help the environment quite a bit, and you know that they are the right thing to do,” he says.

White roofs that reflect sunlight have all but become the norm for new, larger warehouses, says Eskridge, but aren’t typically justifiable for an existing building unless a new roof is needed.

Prismatic lens for skylights are another effective green feature, Eskridge adds. These lenses scatter light over a broad area, and can be combined with photocell sensors on artificial lighting so that the lights stay off when the natural “daylighting” is producing sufficient light.

Being green, of course, also entails water management. Rainwater runoff from roofs, known as grey water, can be captured and used for lawn care, notes Derewecki. If parking lots or access roads need repaving, new semi-porous paving material can reduce run off.

Installation of circulation fans is another low cost energy saver, adds Derewicki. These fans cut heating and cooling costs by promoting even air temperature.

Encouraging green commuting can also can be seen as a sustainability goal. One low cost tactic, notes Klimek, is to provide designated parking spaces and signs for employees with high efficiency vehicles.

However, bigger ticket systems also tend to produce bigger savings, with quicker payback than many might expect. Solar panels, for instance, might only carry a five year payback, given the right mix of incentives, local climate, and the energy profile of the building, notes Klimek.

In New Jersey, which has a strong solar program, KSS designed a warehouse and office facility for Somerset Tire Service (STS) outfitted with a roof-mounted, 1.2 megawatt photovoltaic solar array. The payback period is expected to be five years, says Klimek, in part because of state incentives, but also because the adjoining office space makes use of the renewable energy.

Not every facility can expect similar payback on big ticket items, but nearly all new distribution facilities today utilize green features such as high efficiency lighting, motion sensors, or daylighting. In other words, adds Klimek, green features are becoming the norm as new construction picks back up.

“There was a time during the recession where there wasn’t a lot of building going on, and much of the activity was in trying to lease existing space,” says Klimek. “Well, we’ve absorbed that existing space, we’re developing again, and much of that new development is sustainable.”

E-impact on sustainability

Whereas the more traditional supply chains featured large warehouses with racks for storing full pallet loads, digital commerce and the move toward omni-channel distribution are driving the need for very rapid fulfillment of small orders. As a result, warehouses and distribution centers now need to excel at tasks such as item sortation, kitting, piece picking, and goods-to-person automation.

To adapt to e-commerce, says Klimek, DCs are using intelligent sortation and conveyor systems, but there's also the need for more labor for final picking, even if the process is partially automated.

"We're doing more e-commerce-centric projects, and as a result, there are more employees in many of the buildings," says Klimek. "So, we're seeing the need for a more 'conditioned' building and also more intensive use of automation, which consumes energy."

In these cases, various sustainable features help make a facility more comfortable and efficient. Skylights can improve lighting conditions without inflating the lighting bill, for instance. Architects are also working more closely with materials handling system vendors to model energy needs and identify high efficiency drives and motors.

DCs of the future are likely to be closer to urban areas, says Derewecki, in part to place consumer goods closer to customers, but also because of a larger pool of potential employees. Mass transit availability can help attract a workforce, especially with the trend of a smaller percentage of young people becoming drivers, he adds.

New distribution facilities in urban areas, says Derewecki, will likely be more high-rise and denser to maximize space. Systems such as automated storage and retrieval systems (ASRS), very narrow aisle (VNA) layouts, and mezzanines make it possible to pack more into a smaller footprint, as do multi-story designs.

Such designs are common in Japan and Europe, says Derewecki, and will likely be seen more in the U.S. "I think that we will go higher and higher, and use more of the cube," he says.

Big picture considerations

One of the biggest opportunities for energy savings falls outside of the four walls and can be found in the design of the overall distribution network, says Derewecki.

"Looking at where your distribution points should be is more important than ever," Derewecki says. "Anytime you can reduce transportation distance, time, and costs for your network, you are also providing a green benefit."

Sourcing strategy, such as whether to nearshore or use domestic sources, can also be part of a network analysis, along with considering alternative modes of transportation, like more rail, or pooling transportation with other companies.

"While there is much that can be done within a warehouse to save energy, optimizing the network is where some of the biggest bang for the buck is," says Derewecki.

Other site considerations also affect sustainability. For example, proximity to public transportation, or availability of state incentives for systems like solar panels, may help

decide which site is best. “Factors like knowing the available incentives are all part of due diligence involved in site selection,” says Derewecki.

Distribution centers, in Klimek’s view, should not be viewed simply as buildings, but as points in a supply chain. “If you really want to affect energy use, bring the building closer to the customer or closer to ports where the goods are unloading,” he says.