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## Sustainable Warehousing

by Gail Dutton

When Walmart Canada opens its first sustainable refrigerated distribution center this fall, it will boast LED lighting, solar panels, wind turbines, and high-efficiency doorways between temperature zones, as well as increased insulation and many other features to increase its efficiency and sustainability. Walmart is at the vanguard of a green trend that, pushed by governments and pulled by customers, is becoming the new face of logistics.



*A combination of simple operational strategies and new technologies have companies seeing 'green.'*

Although organizations moving towards sustainability often say they are doing this “because it’s the right thing to do,” that’s not the only reason. Implementing sustainable practices through an organization tends to generate favorable press and increase customer goodwill. And, the fact that governments throughout the world are strongly advocating for increasingly sustainable practices only adds to the pressure to go green.

There’s another, even better reason, however. “Increased efficiency is really what sustainability is about,” emphasizes Andy Smith, president and COO of warehouse developer Kenco. Companies are implementing LEAN, Six Sigma and LEED practices into their operation to find ways to run operations more efficiently, he says. Although, “A lot of companies do things in the name of being green that drive costs up,” he says, it doesn’t have to be that way.

Facilities can be both lean and green, Tony Hollis, a director in the product development an innovation group at Exel, notes. “Many of the sustainable strategies have a financial savings,” he says. He suggests first establishing a baseline, and then checking some of the third-party web sites (like the U.S. Environmental Protection Agency’s SmartWay Partnership or the U.S. Green Building Council) for sustainable best practices. “You don’t have to do all the research yourself,” Hollis stresses.

To begin, Hollis advises that existing facilities should “look at the return on investment of solutions,” and carefully examine existing practices to learn how they can become more efficient. That includes such mundane things as examining HVAC maintenance schedules, battery charging strategies, minimizing the waste stream and staying abreast of new technologies and government subsidies. The greatest savings, however, come from updating warehouse lighting strategies.

### Lighting

Because in many warehouses, lights are either all on or all off, with few lighting zones, lighting is typically one of the biggest facility costs. Between 75 and 90 percent of a warehouse’s operations costs tend to be attributed to lighting. Therefore, any strategy that uses lights more efficiently is bound to save money.

Walmart Canada’s new, refrigerated distribution center is installing LEDs, which operate at low temperatures and strike instantly. That move is expected to reduce the lighting portion of the energy bill by 50 percent. For most warehouses and distribution centers, however, LEDs aren’t in the game plan. As yet, they are expensive and few are designed for high bay applications.

Instead, facilities are beginning to install high efficiency lighting, timers and motion detectors to light only the sections that are in use at a given time, which may be about 20 percent of the warehouse, Smith notes.

When Goodyear updated its lighting strategy at its Victorville, California warehouse its electricity costs were cut by 47 percent and lighting levels actually improved. The 828,000 square-foot distribution center replaced its metal halide lights with high efficiency T5 fluorescent bulbs, installed motion sensors in alternating lamps, and identified state and federal tax incentives and rebates. Consequently, its return on investment was one month. Simply switching from metal halide to high efficiency fluorescent lights can cut lighting costs by 25 to 45 percent, Hollis notes.

Lumetric has built an integrated, comprehensive approach to lighting that optimizes a variety of energy efficient lighting technologies. The SmartPods, as they are called, can be installed 'as is' or integrated into a network to allow computer-controlled adjustments based upon the amount of sunlight entering a building (a process called daylight harvesting), as well as by zone, motion detection, or a timer. On a sunny day, for example, lights may run at a fraction of the power needed at night or during a rainstorm, according to CEO Cheryl Diuguid.

SmartPods work with readily available high intensity discharge (HID) lights and the new, high efficiency ceramic metal halide lights. Diuguid says the SmartPods generate so little heat that they can be touched safely even after running 24 hours. The system is suitable for refrigerated storage. She says they can deliver 40 percent savings out of the box and, "when daylight harvesting and the automation features are used, you get another 20 percent savings," she adds. "Payback in California—with commercial electricity rates of 12 to 14 cents per kilowatt hour—is 8 to 18 months," depending on incentives.

Natural lighting also is becoming more important as warehouses seek to improve lighting and reduce costs. Skylights lost favor 10 or 20 years ago, but are becoming more popular, along with clerestory windows, Smith says. Newer facilities are more likely to include more office space and even showrooms than similar centers built several years ago. Therefore, they are becoming more architectural in appearance, delivering both function and sensory appeal.

Adding clerestories increases the flexibility of the facility and provides natural light without the problems of leaks that may accompany skylights. Because of its use of clerestories, Watson Land Company's smart buildings received southern California Edison's "Savings by Design" designation. "During daylight hours, the building almost lights itself," according to Lance Ryan, Vice President of Marketing and Leasing, Watson Land Company.

According to Kenco's Deni Albrecht, Senior Logistic Engineer, there are different factors to take into account when trying to establish the return on investment for a lighting project. "There are many variables that can affect ROI, including lighting type (incandescent, fluorescent—T5, T8, T12, etc.), the cost of power, length of 'on' time, current lighting type, and so on. For one recent project, the ROI was a 7 month payback, but for the same customer at a different facility, it was around 22 months."

Albrecht believes LED lighting is a great option for many applications. "They offer excellent energy efficiency, because waste is less than 5 percent of energy consumed. However, because they are expensive, you need to take a hard look at the ROI," he cautions.

## **Solar**

In the U.S., solar technology is viable in most regions and has relatively low efficiency of 15 to 17 percent for the standard crystalline models on the market now, according to Ned DeWitt, Vice President of Sales for Borrego Solar in San Diego, California. But, as DeWitt emphasizes, "What really matters is whether there are solar projects in the area, because solar power is driven by subsidies."

Without subsidies, solar projects may not be profitable. "Self-sustaining power is very green, but the

return on investment is 7 to 10 years,” Smith elaborates. A client of his is installing one of the largest solar panel arrays in North America on one of its facilities. That organization, Smith says, normally disallows ROIs greater than 15 months. “They did this because it’s the right thing to do, in relation to the pressures driving companies to be more sustainable,” he explains.

If solar power is being considered, DeWitt advises taking a portfolio approach. “Solar companies will perform free feasibility studies to determine whether solar energy makes sense,” for particular sites, he says. The leading states in solar energy currently are Arizona, California, Colorado, Hawaii, Massachusetts, New Jersey, Ohio, Oregon, Pennsylvania and Texas, Dewitt says, because of their subsidies.

## **Automation**

For single level warehouses, Kiva Systems designed a way to bring merchandise to the order pickers rather than sending pickers to the merchandise. When Zappos used Kiva Systems to automate some of its warehouses, those facilities doubled productivity and lowered the defect rate to zero. By eliminating the human presence among the racks, its safety record improved and the risk of pilferage was dramatically reduced. Some other facilities have increased productivity by a factor of three, Mitch Rosenberg, Vice President of Marketing at Kiva Systems, says.

“Kiva Systems is a fundamentally different approach for one tier storage,” Rosenberg emphasizes. It uses small, ottoman-like robots to zip around the warehouse, slip under the appropriate racks, lift them slightly and bring them directly to the pickers. The racks themselves are about six feet high and 40 inches square and can be customized for everything from lipsticks to hockey sticks, including hanging garments and other goods that aren’t amenable to conveyor belts.

The radio-controlled, electric robots get their orders through a central server and can identify the best patterns for movement throughout the warehouse and around objects, using barcodes installed every few feet on the floor as signposts. That helps alleviate the bottlenecks that are inherent with serial assembly lines.

“Pickers can get a new pick every six seconds,” Rosenberg says, so they’re never waiting for merchandise. To ensure accuracy, “Every pick is made with an in-line scanner, and there are visual and audible alarms” if the wrong item is picked.

For further efficiency, the Kiva System also can prioritize good for picking—bringing the heaviest items first, for example—and can stagger their charging patterns. Within the warehouse, Kiva Systems also can provide automatic, dynamic reslotting so more popular items are nearer the pick stations than less popular items. Later, fulfilled orders can be taken to the dock in reverse order of delivery, to increase delivery efficiency.

## **Building green**

“There’s been a massive change in the way industrial buildings are designed,” Watson Land Company’s Ryan, observes. In the mid-1980s, 75 percent of the industrial buildings were devoted to manufacturing. Now that figure has shrunk to about 20 percent, with 3PLs occupying 80 percent of the industrial space.

“That drives the way buildings are designed,” Ryan points out. “For manufacturing, buildings used to be designed as basically square buildings, with lots of parking, limited docking and limited clear height. Now, with much of our manufacturing offshore, buildings are being designed with maximum dock height, large truck yards, and container storage space.

“This change in the way ports and retailers are handling goods has shifted distribution from a push model to a push-pull model,” Ryan says, “and that requires more flexible facilities.”

Meanwhile, as part of its LEED-based sustainability practices, Watson Land Company has replaced the

asphalt around its buildings with concrete. “This reduces our use of foreign oil and (because concrete is light in color) eliminates the hot spots that asphalt creates,” Ryan explains. Additionally, “Concrete is made mainly of sand, water and cement, so it’s renewable. Concrete also is more durable than asphalt, lasting 30 to 35 years, compared to about 3 years for a surfacing coating of asphalt, according to the World Bank. Furthermore, concrete pavement rarely needs repair or replacement.

In Europe, particular attention is paid to indoor air quality as well as to natural lighting, explains Sarah Martinez, Vice President of Sustainability for warehouse developer ProLogis. To address indoor air quality throughout their properties, many companies are using low volatile organic compound-emitting paints and recycled carpeting. Air pressure tests and infrared spectroscopy may be performed to detect heat loss and air leakage.

ProLogis also takes care to situate buildings to take advantage of the local climate. In Arizona, for example, loading bays tend to face north for the shade, while in Colorado they tend to face south to help melt the winter ice. The company also tries to source materials within a 500-mile radius to minimize transportation.

## **Water**

As part of its LEEDs goals, ProLogis has trimmed its landscaping water use by 50 percent through the use of native plants and minimal lawns. It has reduced indoor water usage by installing low flow plumbing. It also recycles 75 percent of its construction wastes.

An Exel facility housing Corporate Express in New South Wales, Australia excels at water conservation. It includes a rainwater harvesting system, dual plumbing to allow rainwater to be reused for flushing toilets, and a system of grass verges to collect storm water, filter it through a French drain styled gravel filtration system and direct it to retention ponds. Various combinations of those approaches are being used in Exel’s U.S. properties, too.

These are just a few of the possible approaches available to increase sustainability. Many others remain in labs and on the drawing boards, not yet commercialized. “There is a lot of advanced technology that is not being implemented,” Martinez emphasizes. wt

Contributing writer Gail Dutton specializes in reporting on the intersection of business and technology.