McCormick & Company’s Distribution Center covers more than six football fields and includes 3,300 light fixtures, but on sunny days, the building’s electricity meter spins backwards. Energy-efficiency measures, combined with a rooftop photovoltaic array of 7,500 solar panels, resulted in a surplus of electricity during the first year of the array’s operation.

**Setting Sustainability Goals**

While McCormick has a long history of stewardship, particularly as an agricultural company, the perfect storm of energy cost increases and customer pressure in 2007 led to the establishment of sustainability goals and an increased focus on reducing the company’s environmental impact. Energy efficiency was a key component of this effort, as reducing energy use lowers utility costs while also reducing environmental impact.

**Lighting**

The first energy-efficiency project, which also had the largest impact, involved replacing hundreds of metal halide high bay light fixtures with T5 fluorescent fixtures. The fluorescent fixtures use 50% less electricity than the metal halide fixtures.

**Energy Efficiency Project Scope**

- Lighting upgrades, replacement of rooftop HVAC unit, conveying system that automatically turns off when not needed, rooftop solar array

**Building AT A Glance**

- **Name:** McCormick Distribution Center
- **Location:** Belcamp, Md. (30 miles NE of Baltimore)
- **Owner:** McCormick & Company
- **Principal Use:** Distribution center for retail products (spices, seasonings and other flavorings)
- **Includes:** Refrigerated storage, office areas, electric fork trucks, warehouse space, conveying equipment
- **Employees/Occupants:** 155
- **Occupancy:** 100%
- **Gross Square Footage:** 368,000
- **Conditioned Space:** 32,000 (20,000 ft² conditioned warehouse, 12,000 ft² office areas)
- **When Built:** 1996
- **Energy efficiency projects took place from 2007–2011. The solar installation was completed in 2011.**
The company upgraded high bay lighting in its manufacturing facilities as well, a project that has ranked as one of McCormick’s highest returning capital projects. The local utility, Baltimore Gas & Electric, provides a rebate for energy-efficient lighting projects, and a tax deduction under the Energy Policy Act of 2005 for energy-efficient lighting was leveraged.

The lighting project provided credibility that sustainability does not have to automatically mean added costs. The company learned that looking at an operation through a “sustainability lens” provides additional opportunities to reduce waste and costs that might not otherwise be discovered.

Several other energy-efficiency upgrades further reduced consumption. Additional lighting upgrades took place in the office and shop areas.

Since distribution centers typically have low occupancy, motion sensors were installed on all fixtures so that they automatically turn off when an area is unoccupied. Metal halide fixtures, on the other hand, cannot be fitted with motion sensors because the lamps take too long to warm up once the fixture is turned on.

The combination of more efficient fixtures and motion sensors reduced lighting costs for the high bay area of the building by approximately 75%. Occupant feedback on this lighting project has been positive because the light quality of the fluorescent fixtures is better than the metal halide fixtures.

Electricity use decreased from 5 million kWh in 2006 to just under 3.1 million kWh in 2008, a 40% reduction. The financial benefit of this project was excellent as well, with the 80% return on investment well exceeding the 25–33% “hurdle rate” for cost justified projects.

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Several other energy-efficiency upgrades further reduced consumption. Additional lighting upgrades took place in the office and shop areas.
Most of the storage area is non-conditioned space; however, the area shown to the left includes approximately 20,000 ft² of conditioned storage.

The office areas used standard 4 ft T8 fluorescent troffer fixtures, while the shop areas had T12 industrial strip fixtures. The office fixtures were retrofitted with new NEMA Premium ballasts and de-lamped to two T8 lamps per fixture, with a reflector installed over the lamps to optimize the optics of the fixture.

The standard 4 ft lamp is 32 watts, but use 12% less electricity. The new 4100K lamps provide a whiter light than the standard 3500K and offset any reduction in footcandles that may result from the delamping.

For the strip fixtures, new T8 ballasts were installed and 8 ft fixtures were converted to tandem 4 ft fixtures because driving electricity through an 8 ft lamp results in inefficiencies. Reflectors optimize the optics and drive the light down to the floor level.

This project also involved replacing incandescent exit signs with LED signs, reducing the electricity consumption from 40 watts per sign down to 2 watts, a 95% reduction. Vending misers also were installed, which turn off vending machines when no one is present and turns the machines on again as someone approaches. For beverage machines that require refrigeration, the vending miser turns on the compressor periodically to keep product cold.

The final lighting project involved replacing the exterior fixtures. The parking lots and dock areas were lit with high pressure sodium fixtures, notorious for the poor quality yellow light that they produce. This project installed exterior-rated T5 fixtures on all wall packs and pole-mounted fixtures.

Depending on the fixture size, electricity consumption was reduced by 65% to 75%, and the light quality improved. This project also resulted in solid financial savings, as sustainability projects within McCormick are held to the same return on investment standard as all other cost saving initiatives.

HVAC Unit Replacement, Conveyor Upgrade
Another area of energy-efficiency improvement involved the replacement of an older, 50 ton direct expansion (DX) HVAC rooftop unit with a newer one. While this project was not necessarily cost justified, the old unit was failing and needed to be replaced.

What was easy to justify, however, was the cost premium to install a higher efficiency unit versus the standard efficiency. The older unit had a much lower efficiency than even a new unit with standard efficiency. The new high efficiency unit is approximately 30% to 40% more efficient than the one it replaced.

The final area of improvement involves the conveying system. Previously, the system for handling and stretch wrapping pallets of finished goods previously ran continuously, waiting for pallets to be loaded. The new conveying system now operates based on demand. Photoelectric sensors, or photo eyes, detect the placement of a pallet on the conveyor and start the conveyors automatically. The conveyors shut down when the pallets are discharged from the system.

This initiative was implemented at virtually no cost because the photo eyes and line controls were already required for the system upgrade. The only cost incurred was the labor to have the appropriate line controls designed into the system, which were minimal.

Returns on investment for the energy efficiency projects ranged

### KEY SUSTAINABLE FEATURES

- Recycling: Sixty percent of waste is recycled; mostly corrugated cardboard, plastic shrink film.
- Designing In some office areas
- Controls: Motion sensors on lighting, vending misers, photoelectric sensors on conveying system.
- Other Major Sustainable Features: 1.8 MW roof-mounted photovoltaic solar array.
- Location: Latitude: 39˚ N
- Orientation: Building is square with the entrance facing due west. Solar panels on roof face due south.

With the completion of these improvements in 2011, the McCormick Distribution Center reduced its annual electricity use to approximately 2.2 million kWh per year, a reduction of more than 55% from the 2006 baseline. These results were achieved through the normal capital budgeting process, with each project competing against others for limited capital.

Through their excellent financial returns, these projects were selected over many other possible projects. Returns on investment for the energy efficiency projects ranged...
Solar Power

While these energy-efficiency improvements were taking place at the distribution center, McCormick was also completing its first solar energy installation at a manufacturing facility in Hunt Valley, Md.

The company entered into a power purchase agreement in 2008 with Constellation Energy for a 950 kW photovoltaic system.

Under the agreement for Hunt Valley, Constellation owns and maintains the system, and McCormick buys the solar electricity produced each month. The price for the solar energy in the 20-year agreement is approximately 20% less than the price for electricity purchased from the grid, so McCormick is saving money each month on its electric bills and avoided the large, upfront capital expense required for the equipment and installation.

This type of project was enabled because the state of Maryland passed a renewable portfolio standard, which created a market for renewable energy credits. The standard mandates that a certain percentage of electricity produced in Maryland comes from renewable sources and provides a financial incentive for achieving this goal. Constellation owns and sells the RECs from the solar energy produced from the McCormick array.

Based on the success of this first solar installation, the McCormick Distribution Center was evaluated for a second installation. Several factors were considered in determining the feasibility of the site for solar energy: the size and condition of the roof, building ownership and any shading concerns (from equipment or nearby structures, trees).

The size of the building is an important consideration to achieve economies of scale required to result in a price for solar energy that is lower than the grid price. With a power purchase agreement typically lasting 15 to 20 years, the condition of the roof is important because it needs to outlast the solar panel installation. The distribution center’s roof was in excellent condition, but Constellation had a roofer reinforce the seams prior to the installation.

McCormick did not own the building when the analysis started, and the possibility of involving a landlord posed a potential obstacle. However, McCormick had decided to purchase the building when the lease expired in 2010, eliminating this potential roadblock. Finally, with the building roof fairly clear of any obstacles and no other shoring concerns, the building was determined to be a viable site.

The rooftop array maximizes the entirety of the roof, less a 10 ft buffer along the roof edge and access walkways between the rows of panels. The 1,200 kW system, the largest rooftop system in Maryland, was installed in the fall of 2010. The power purchase agreement is based on the one in place for the first Constellation Energy solar project in Hunt Valley.

In its first 12 months of operation, from February 2011 through January 2012, the system generated 2,246,049 kWh of electricity. During this same period, the building consumed 2,229,834 kWh, meaning that the photovoltaic system generated 16,215 more kWh than the building used, becoming a net electricity exporter.

At this point, the excess renewable electricity generated on site does not offset the amount of natural gas consumed at the facility. The facility uses 17.9 KBTU/h of natural gas per year for heating, which is not offset by the solar energy. The ultimate goal is to continue to reduce electricity and natural gas consumption to achieve true net zero energy status.

Conclusion

The McCormick Distribution Center illustrates how leveraging energy efficiency first, and then using renewable energy to generate what remains is required, can reduce a warehouse’s environmental impact in a cost effective manner.

LESSONS LEARNED

Check for Local Utility Financial Incentives. The McCormick Distribution Center’s local utility, Baltimore Gas & Electric, has a Smart Energy Savers program that provides prescriptive rebates for specific types of efficiency upgrades. For example, for every high bay 400 watt metal halide light fixture that is replaced with a T5 fluorescent fixture, customers are eligible to receive a $55 rebate.

The exterior lighting project, however, did not have fixtures matched up to a prescriptive measure. It is possible to still qualify for a rebate by submitting a custom application evaluating the amount of electricity saved. BGE then calculates a rebate. The custom application rebates can be attractive and cover a similar amount as the prescriptive ones.

Search for Government Incentives. Other incentives, such as a tax deduction for efficiency upgrades under the Energy Policy Act of 2005, also may not be well publicized. The best way to make sure that all potential incentives have been identified is to use the DSIRE (Database of State Incentives for Renewables & Efficiency) at www.dsireusa.org/. The database identifies all federal, state, and local energy-efficiency and renewable energy rebates for the entire country. It is the most comprehensive source of financial rebate information available.

Test Projects First with Pilot Initiatives. For lighting upgrades, the facility team estimates what the expected light levels will be versus the existing levels, but buys and installs a few sample fixtures in a small area to validate the assumptions before moving forward with replacing all fixtures in a given area. If light levels are too low or high, the fixtures can be ordered with different ballast factors, an inexpensive method of making slight changes to light levels without having to change the entire fixture count. Changing the fixture count is more expensive than one-for-one replacements because it involves wiring changes.

Contact Permitting Agencies Early. Many permitting agencies do not have much experience with renewable energy projects, and building codes may not address them. These agencies should be contacted early in the process, so no unexpected surprises or delays are encountered during the installation as the regulatory agencies get up to speed. This is more likely to occur in states where incentives are relatively new.

Mc McCormick’s first solar project installed in Baltimore County, Md., did experience a few issues regarding permits, which were resolved in a reasonable time frame. The Baltimore project occurred two years later and fewer issues were encountered.

ABOUT THE AUTHOR

Jeff Blankman is the sustainable manufacturing manager at McCormick & Co., headquartered in Sparks, Md.