Case Study ID

05-0042

ENERGY OFFICE

Case Study Series

Vending Machine Energy Savings

There are many no and low cost ways to cut the energy use in a facility. In this case study, the focus is on vending machine applications that can save, on average, 60% of typical vending machine electrical use. Vending machines are a gold mine for savings in buildings that are not occupied around the clock.

In this case study you will learn about vending machine control technology, see actual data from two Michigan school districts and get enough information to reduce your own vending machines energy consumption.

Background

Vending machines are found in all kinds of facilities today and the demand for them continues to rise. Very seldom does anyone evaluate the cost of operating a vending machine. A refrigerated vending machine operates 24 hours, seven days per week. In addition to consuming 2,500 to 4,400 kilowatt-hours (kWh) of energy per year, vending machines add to cooling loads to the spaces they occupy. With average electricity costs of about $0.08/kWh, that amounts to $200 to $350 per year in operating costs not including increased cooling loads. Energy consumption and cost will vary depending on type and size of each vending machine.

There are two primary ways to reduce operating cost while maintaining the operation of the machines. These methods are upgrading or eliminating display lighting, and occupancy sensing.

Upgrade lighting A typical vending machine with a lighted front display panel uses two or three 4-foot high-output T12 fluorescent lamps powered by conventional magnetic ballasts, drawing as much as 150 watts of power. This continuous load consumes 1,314 kWh per year for an annual cost of $105 (at 8¢ per kWh). The heat from the lights also increases the machine's refrigeration load. In one test, disconnecting a vending machine's lights cut energy use by 35 percent. However, users' attempts to get operators or vendors to disconnect the lights don't always meet with success. Retro-fitting the light fixtures with energy efficient T-8 lamps and electronic ballasts will reduce the energy consumption. Pair this retrofit with a simple timing mechanism to turn the lights off in unoccupied hours to achieve additional savings.

Occupancy sensing There is at least one product on the market that utilizes passive infrared technology to cut power to vending machines while an area is unoccupied. This stops the compressor from cycling and the fluorescent lights from burning. This device will also monitor room conditions and allow the machine to operate as required to keep the contents at a temperature not much different from that of regular operation.

In typical operation, power is cut to the vending machine after the area has been vacant for 15 minutes. The device is designed so that a machine in a room that's around 70 degrees Fahrenheit will be shut down for up to two hours if no one walks by. At that point, the machine is turned back on to run a compressor cycle, after which it turns back off if the occupancy sensor indicates that the area is still vacant. When someone approaches the machine, the sensor sends a signal to turn the lights and other electronic components back on, and the compressor runs a cooling cycle if needed.

The controller ensures that after the machine is re-powered, the compressor is allowed to run a complete cooling cycle before it is powered down again. A sensor also determines whether the compressor is running and prevents the machine from shutting down until the cycle has been completed. Both of these features ensure that a high-pressure start, which would strain the compressor, does not occur. An indicator light goes on if the compressor has been running for more than 12 hours—a signal that maintenance may be required. Savings, as claimed by the manufacturer and users, for vending machines equipped with these devices range from 25 to 75 percent, depending on usage patterns, occupancy in the area, and ambient conditions.

Sample Outcomes in two school districts

Two Michigan school districts have experimented with these approaches to reducing vending machine energy consumption— Grandville Public Schools and Belding Area Schools. Both districts have achieved ENERGY STAR Building Labels, placing them in the top 25% in the nation for energy efficiency, and both have been recognized for their approach to efficient building operation.

Grandville Public Schools installed VendingMiser® equipment for all 42 of their refrigerated vending machines in the summer of 2003. They have estimated that these devices have already paid for themselves in energy cost savings. In addition to energy cost savings they have identified at least one vending machine that was malfunctioning causing the compressor to run continuously and costing the district a considerable amount of expense. This machine has been repaired and is now functioning properly.

Belding Area Schools has installed VendingMiser® equipment for all 22 of their refrigerated vending machines. Belding plans to disconnect the fluorescent lights in all of their machines. In addition to energy cost savings they too have identified at least two vending machines that were malfunctioning causing the compressors to run continuously. These machines have been repaired and are now functioning properly.

Both districts report that the installation process is simple including plugging the vending machine into the VendingMiser® and then into the standard wall plug. The motion sensor for the unit also requires mounting. Approximate cost to implement was less than $200 per machine for both districts.

The information below was collected by the Belding and Grandville facility staff, thru the use of watt meters, general knowledge of the buildings and maintenance records.

		Machine 1	Machine 2	Machine 3
Constant Values	Traffic Volume	Low	Low	High
	Cost of Electricity (per kWh)	$0.0826	$0.0826	$0.083
Before Installation	Status of Display Lights	In Use	In Use	Not In Use
	Consumption (kW per hour)	0.438	0.43	0.36
	Annual Consumption (KWH)	3,837	3,767	3,154
	Annual Cost	$316.93	$311.15	$261.75
After Installation	Status of Display Lights	In Use	In Use	Not In Use
	Consumption (kW per hour)	0.18	0.081	0.22
	Annual Consumption (KWH)	1,577	710	1,927
	Annual Cost	$130.26	$58.65	$159.96
Savings Information	Energy Saved	2,260	3,057	1,226
	Cost Savings	$186.67	$252.5	$101.8
	Overall Reduction	59%	80%	39%

Machine 1– Grandville Public Schools. This machine is located in West Elementary in a fairly low traffic area. Low traffic in the vicinity of this machine will increase the potential for energy cost savings.

Machine 2– Grandville Public Schools. This machine is located in the transportation building in a fairly low traffic area. Low traffic in the vicinity of this machine will increase the potential for energy cost savings.

Machine 3– Belding Area Schools. This machine is located in the Belding Middle School common area just outside of the gymnasium. The occupancy rate in this area is approximately 50%, which is fairly high for a school building. Because there is so much traffic in this area this machine will naturally have a lower savings potential.

Both districts plan to continue monitoring these devices and collecting data to show the energy savings that they have achieved. This will also help them to identify any machines that malfunction in the future.

Note: Although data represents a small sample size, results are consistent with manufacturers claims. This case study is not intended to endorse this product or company in any way, rather to provide information about an energy saving technology.

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March 4, 2005