



Going Green with LEDs

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Housing more than 2 million inmates, our Nation's nearly 4,000 jails, prisons, and holding facilities face tremendous operating and maintenance costs (Editorial Alert, 2010). The enormous size and complexity of correctional facilities provide an excellent opportunity, however, for finding common solutions to complex problems such as maintaining security while reducing operating expenses.

As a reader of *American Jails*, you know that safety, security, and operational efficiency are top priorities at correctional institutions, many of which face significant overcrowding and budgetary constraints that make meeting these mandates even more difficult. The costs of operating and maintaining correctional institutions are constantly on the rise as utility rates escalate. As more inmates are added to the system, budgets are squeezed. However, many professionals who manage correctional facilities are researching “green practices” and implementing sustainable technologies and strategies such as energy-efficient lighting, zero waste, water efficiency, and renewable energy, including solar electric, solar hot water, and wind.

New models for building design and existing building retrofits have emerged that focus on energy efficiency and conservation. This has been driven mainly by Federal and State policies and the desire for cost savings in a time of fiscal restraint. The benefit of greening correctional facilities is that they will consume fewer resources, create less pollution, and provide healthier environments for the users—inmates, staff, visitors, and administration (Feldbaum, M. Greene, F., Kirschenbaum, S., et al., 2011). Sustainable practices not only reduce the impact on the environment, they reduce operational costs as well.

Green Technologies

Current mandates for green technologies include a Federal Executive Order to “increase energy efficiency; reduce fleet petroleum consumption; conserve water; reduce waste; support sustainable communities; and leverage Federal purchasing power to promote environmentally-responsible products and technologies” (Office of the Press, 2009).

In 2010 and 2011, the American Correctional Association (ACA) adopted both a standard and a policy on “clean and green” practices, instituting an audit requirement for accredited institutions to demonstrate progress toward consideration and implementation of

cost-effective and appropriate green technologies. The ACA specifically cited issues such as recycling, water and energy conservation, pollution reduction, renewable energy, and training (Sheldon. 2011).

Green technologies such as energy efficient lighting, zero waste strategies, and water conservation techniques can result in a savings of up to \$1,000 per inmate annually. Finding the appropriate technologies and methods to create such savings can be quite advantageous. These savings can allow correctional institutions to free up funding, staff time, and facility space for other activities that can improve security and reduce recidivism.

Resource reduction is the number one factor to consider when determining how you can green your prison facility. Considering that there are hundreds of different energy draws and materials that are used in the basic operations of a correctional facility on a daily basis, finding appropriate ways to use resources and electricity in a more efficient manner will translate to a higher rate of savings.

Depending on the situation, the low hanging fruit for energy reduction is typically lighting. Through retrofits and upgrades to energy efficient lighting, correctional facilities will notice a significant and immediate decrease in their energy bills (mwlightenergy.com/green-prisons/).

LED Luminaires and Jail Cells

The selection of equipment and systems for correctional facilities is a challenge for correctional administrators. The equipment and systems selected should match the facility’s desired security, safety, and supervision levels. The systems must withstand inmate abuse, be reliable, easy to maintain, repair and operate, and cost-effective over the useful life of the facility (Carlson & Simon-Garrett, 2000).

The safety concerns of working in a high-risk environment necessitate highly reliable, low-maintenance lighting. And, correctional staff need better, more usable illumination, which is mission critical in a security-sensitive setting. The fewer times a cell light is relamped, the lower the chance that inmates may get a hold of tools or that security is breached in any way. Typically, the safety protocol when relamping a cell is that the officer removes the inmate, tools are inventoried before and after by the officer, and the officer sweeps the tier once completed.

The most important aspect of an effective preventative maintenance program in a correctional setting is limiting the failure of critical pieces of equipment, such as lighting, that may cause security problems. It is always better to schedule a shutdown of lighting than it is for the luminaires to go out when least expected.

Of particular importance to prison facilities managers is the fact that energy-efficient lighting, particularly LED luminaires, provides a focused beam of light ideal for illuminating jail cells for the purpose of monitoring

How Long Is 100,000 Hours?

Based on the length a fixture is illuminated per day, here is what a 100,000 lifetime translates into on an annual basis:

Hours of Operation:	100,000 hours is:
24 hours a day	11.4 years
18 hours per day	14.8 years
12 hours per day	22.8 years
8 hours per day	34.2 years

inmates. Additionally, LED lighting is well-suited for tamper-resistant lighting boxes, meaning that they are both high performing and safe for inmates.

Sustainability and Correctional Facilities

Again, while the primary goal of corrections is safety for the community and for those housed and working within the facilities, increasingly, sustainability goals and strategies are being integrated into the policy and planning initiatives of the corrections community.

According to the U.S. Energy Information Administration, lighting accounts for 33 percent of electricity consumed in jails, reformatories, and penitentiaries. More States are passing legislation to create standards for energy efficiency, solid waste reduction, and renewable energy. However, while these standards or mandates have an impact on all State agencies, departments of corrections are affected in different ways.

Some State correctional agencies view these new requirements as a way to save money, limit the facility's negative impact on the environment, and become innovators in the field.

From a sustainability standpoint, correctional facilities are 24-hour, energy-intensive structures that focus on security, with most existing structures constructed with little regard to efficient lighting, heating, and cooling. New models for contemporary building design and existing building retrofits that focus on energy efficiency and conservation continue to emerge. This trend has been driven mainly by Federal and State policies and the desire for cost savings in a time of fiscal restraint.

LED Background and Advantages

LEDs, short for light-emitting diodes, have been available for more than 40 years. These small, solid-state devices can be used to produce millions of different col-

RSW Regional Jail Warren County, Virginia

The \$56 million RSW Regional Jail currently under construction will be located in Warren County, Virginia. The jail, scheduled to be completed in mid-2014, will serve the counties of Warren, Rappahannock, and Shenandoah, with initial capacity for 375 inmates. Due to each county's need for a jail, the facility is a collaborative effort designed to serve all three counties. Additionally, in Virginia, regional jails qualify for 50 percent of eligible reimbursement of construction costs from the Commonwealth.

The jail will contain cells and dormitories to house inmates, and will also have support space that includes food service, laundry, intake and release, medical services, recreation and education, central storage, visitation, magistrate, administration, and staff services. An initial staffing plan for the 375-bed jail has approximately 95 employees in the building each day covering all shifts for the 24-hour facility.

Utilizing a modern design approach and incorporating similar materials used on surrounding structures, care is being taken to address the massive front façade of the building. Creative design will be used to break up the space, providing an aesthetic complement to the Highway Overlay District zoning through its commercial building appearance. The building is planned to have both one- and two-level areas, with a total gross square footage of approximately 175,000 square feet.

One sustainable feature of the jail, which is pursuing LEED certification, is the installation of

LED luminaires in each cell and minimum-security dormitory room. High-abuse LED luminaires were specified to help reduce energy costs and consumption. LED luminaires also make day-to-day operations more secure. Because of the highly demanding nature of this application, the cell requires a high security light fixture.

Each cell and dormitory is installed with a 50-watt ceiling mounted LED fixture that includes a separately switched nightlight, combining energy efficiency with reduced maintenance costs. The light levels of the 5-watt LED night light are activated by the officers at night to allow the inmates to sleep under lower light levels. This adjustment minimizes vandalism by inmates agitated by excessive brightness when they are trying to sleep. Additionally, while these night lights can be dimmed down to 20 percent of full brightness, they may also be adjusted up to 100 percent brightness for bed checks.

Additional sustainability features will include the use of a vacuum-assisted flushing system that will result in a 50-percent reduction of potable water usage; use of a cistern for collecting rain water for re-use in the laundry facility and to feed the HVAC cooling tower; a highly insulated building envelope; use of high-recycled content and regionally manufactured materials; and a requirement that the general contractor recycle more than half of all the construction waste.

ors and brightness levels of light, while using significantly less energy than traditional lighting methods. Within the past few years, LED technology has advanced to the level where they can match or outperform traditional light sources.

Due to their long life, LEDs are virtually maintenance free and offer energy savings. In addition, they re-strike instantly after a power interruption and can be controlled with occupancy sensors to offer even greater energy savings. An LED does not “burn out” like a standard lamp, so individual diodes do not need to be replaced. Instead, they gradually produce lower output levels over time. In fact, well-designed LED luminaires may operate between 50,000 and 100,000 hours, and still deliver at least 70 percent of their initial performance at their “end of life.” In a well-designed LED luminaire, if one diode fails it does not result in a complete fixture outage. Additionally, LED lighting for general use provides:

- Durability: LEDs are solid-state devices containing no moving parts, no filaments, or fragile glass to break, thereby eliminating the risk of damage during transportation, installation, and operation, even in the toughest environments. Unlike conventional light sources, LEDs are not subject to sudden failure or burnout.
- Longer life span: LEDs last longer than fluorescent or other traditional light sources.
- Green: LEDs are considered sustainable because they decrease the need for additional electric power generation. Additionally, LED luminaires also have an environmental advantage in that they contain no mercury and are RoHS compliant. (RoHS means Restriction of Hazardous Substances and is a European directive that bans the sale of electronics products on the European market that contain more than a defined level of hazardous substances, including lead, mercury, cadmium, and others.)
- High source efficacy: Efficacy is a term normally used in cases where the input and output units differ. In lighting, we are concerned with the amount of light (in lumens) produced by a certain amount of electricity (in watts). Efficacy equals lumens per watt. Significant advances in LED efficacy have recently been introduced. As a result, the lumen output of these LEDs has substantially increased.

The U.S. Department of Energy has noted LEDs as the future of lighting because of their extremely long life span when compared to incandescent lighting—in many cases lasting ten times longer. In addition, LEDs consume considerably less energy and are clean burning, thus significantly reducing potentially harmful carbon emissions.



Conclusion

Safety for inmates and personnel within a correctional facility is of paramount concern to operations managers. However, during this time of ever-decreasing budgets, they must also be mindful of opportunities for fiscal savings to reduce long-term operating costs. Renovations, such as LED lighting retrofits in cells or the installation of LED luminaires during new construction, are an excellent way to meet both ongoing challenges. Every day in this country 200 new cells are constructed, providing ample opportunity for LED luminaires to shine (<http://heartsandminds.org/prisons/facts.htm>). ■

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