



Lighting Upgrade In Line with Corporate Goals

Our mission statement for Jacobson Companies indicates that we are deeply committed to delivering excellence for our customers, shareholders and employees, while ‘promoting sustainability and protection of our environment.’ With these pillars in mind, we are always looking for effective strategies for improving energy efficiency, enabling us to dedicate resources to our core business, minimize business risk from rising energy costs, while helping us be better global citizens.

One of our recent energy efficiency projects was a total lighting upgrade of Building 9 in Mechanicsburg, PA. This 462,000-square-foot facility was slated for renovation, as a result of a 5 year contract renewal with our customer Ebro NA, and was part of a Central PA campus energy efficiency review. The aging high-pressure sodium (HPS) lighting, with high warehouse use and poor light levels, was identified for upgrade. We took the opportunity to evaluate all of our lighting options before finally deciding on a solution for Building 9, as well as numerous other sites across the Central PA area.

Company Goals and Lighting Alternatives

“In reviewing the range of possible lighting solutions, our goals were to drastically reduce energy use while improving light levels, -- a key factor in workplace safety,” said Keith Billman, Solutions Design Project Manager. “Working with Green Energy Conservation Technologies, (Green ECT), our project consultant, we considered the full gamut of traditional lighting – high-intensity discharge (HID), high-intensity fluorescents (T5 & T8s), basic LEDs, and intelligent LED lighting systems with integrated controls – to find the best solution for our needs.”

Traditional lighting alternatives did not meet our energy-efficiency and performance requirements, and had the added costs of regular maintenance and re-lamping. Further, add-on control measures that can improve energy efficiency are not that effective when coupled with these sources, so we moved onto LEDs – light emitting diodes. LEDs use much less power than traditional lights to deliver comparable or better light, perform well within a range of environments, turn on/off instantly as needed, have minimal heat impact, and require minimal maintenance within their long lifespan. Further, high-quality LED systems have an expected lifespan of 100,000+ operating hours, as compared to 21,000 for Fluorescents. Unlike traditional lighting sources that fail outright at end of ‘usable life,’ LEDs simply decrease output to approximately 70%. (Further information on comparing lifetimes and lumen output can be found here:

http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/richman_tm21_lightfair2011.pdf)

Plain vs. Intelligent LEDs

We evaluated both plain LEDs, which use a basic fixture, (with a basic LED light source), and intelligent LED lighting systems, which integrated controls and networking into the fixtures, along with providing management software controls. After a thorough comparison analysis of the alternatives (Fluorescent T5s/T8s), we decided on a multi-site rollout of the Intelligent LED Lighting System, starting with Building 9. This option offers the most compelling savings -- estimated to reach 90% over our old HPS lighting-- and impressive light quality, (see before and after photos, below). Locking in a 90% energy savings – particularly in lighting – is an opportunity we didn’t want to ignore. We visited other sites within Pennsylvania where the system is operating and found consistently positive references.

Here is a side-by-side comparison of High-Pressure Sodium and Intelligent LED lighting fixtures and their annual energy usage in a typical facility:

	High-Pressure Sodium Lights	Intelligent LED Lighting System
Fixture Wattage (w/ ballasts)	458 Watts	160 Watts
On Hours per Year	8,760	2,190*
kWh/Year	4,012 kWh/Year	350 kWh/Year
kWh Rate	.11	.11
Annual per-fixture energy cost	\$441	\$38

**(Note: each Intelligent Lighting System fixture uses less power to deliver required light levels, but is typically on only 25% of the time, reducing its overall energy use.)*

With regard to expected lifetime, based upon our normal operating hours, we project up to 15 years before the intelligent LEDs required replacement, which just happens to be the remaining term on the building leases. Contrast this to HPS, HID, and fluorescents -- along with their associated ballasts -- which typically last 21,000 hours for HIF or 10,000 – 15,000 hours for HPS before requiring replacement.

(Additional detailed information is presented in an article by David M. Keith – Lamp Lumen Depreciation – available at the following site: <http://resodance.com/ali/LLD.html>). Further, all of HID, HPS and fluorescent bulbs need to be disposed of properly due to the hazardous materials contained within – an additional expense.

Intelligent LED Lighting System

So what exactly, is intelligent LED lighting? It's an industrial-grade, LED-based lighting system that includes smart LED fixtures – all with an integrated occupancy sensor and a microcomputer that tracks all key data (power use, occupancy events, etc.). The system provides light when and where needed, turning on when operators are in the area and automatically dimming or turning off when they leave. Fixtures can be set to turn on to full brightness or off to a 'nightlight' mode so the area isn't completely dark when operators enter. Timeouts – the amount of time the fixtures are on after the area is vacated – can be set in any number of increments as well, giving facility staff numerous options in how the lighting system performs for them. (This is in stark contrast to T5/T8 fluorescents, which require a lift to adjust any timeout settings, which are not flexible or granular in the first place. In fact, dimming options are limited to a fixed set of increments, which minimize flexibility and save much less energy.)

The fixtures are wirelessly networked and centrally managed and feed all data to the Lighting management software. The software gathers and presents key information – power usage by aisle/zone/room, occupancy patterns and more – intuitive, web-based charts. This data allows operators to better engineer their layouts based on traffic patterns and activity. The Lighting Management Software is also the management interface for lighting, enabling facility management to establish lighting schedules and behaviors. This allows for great flexibility if product mix changes, hours of operation change, or if the customer changes in the building. With a ten foot cord and being hung by aircraft cable from the purlin, the lights themselves are flexible and easily moved throughout the warehouse where needed if warehouse layout changes.

The Project Details

The project entailed removing 411 HPS fixtures, which were delivering very poor light levels in many areas of the facility, and installing 531 Intelligent LED fixtures. Approximately half of the fixtures were installed in the racked aisles; the balance in the open spaces, with the system delivering consistent light levels of 15 to 20 plus foot candles as required for increased employee safety, (another company mission statement). This compares favorably to the previous lighting, which was unevenly distributed, resulting in under-lit spaces or over-lit spaces prior to the lighting upgrade, which involved re-wiring and configuring the lighting layout to achieve the most even light distribution possible.

From an energy perspective, the Intelligent LED Lighting System is projected to deliver direct lighting energy savings of 90% -- which doesn't even reflect the additional estimated savings from thermal load reduction. Because the previous HPS fixtures used 458 Watts of power each – all of that energy (which is really heat) places additional load on the chiller and climate-control systems. With the lower-wattage lighting system and the occupancy-based lighting, the system uses significantly less energy and, consequently, the chiller systems do not have to compensate for the removal of that additional thermal load.

In addition, the Intelligent LED Lighting System we installed has been proven to have the highest allowable utility rebates available for any lighting incentives. Along with Local, State and Federal tax incentives, the project payback was calculated to be 16.2 months – an impressive timeframe for any energy efficiency project. Green ECT recycled the old fixtures and has certified the removal and disposal of the hazardous waste associated with the bulbs and ballasts of the old fixtures. Additionally, Green ECT has provided a 9-year warranty for the entire LED lighting system and the lack of maintenance over 9-years will provide additional savings for our operation.



Environmental Impact – savings reflects what will be saved with the new lighting system compared to the old one.

What about the environmental impact? We expect reductions of:

- Total greenhouse gas emissions by **1,385,488** pounds per year
- Carbon dioxide by **1,367,753** pounds per year
- Sulfur Dioxide by **11,854** pounds per year
- Nitrous oxide by **5,471** pounds per year
- Particulates by **410** pounds per year

The annual energy savings are:

- Enough to supply **83** homes for one year
- Equivalent to planting **754** acres of trees
- Equivalent to burning **72,035** gallons of oil
- Equivalent to burning **729,468** pounds of coal

Looking Forward

With the facility slated to become fully operational on March 1, 2012, we look forward to having comprehensive data available over the coming months. But the Intelligent LED Lighting System has consistently been delivering these savings levels in other facilities in PA – as evaluated and confirmed by leading utilities – so we are confident that our results will be comparable. And we are on track to roll out this system to numerous other facilities, as well. At Jacobson Companies, conducting business with our mission goals in the fore front of our operation is the foundation that sets us apart from our competition.

About Green ECT

GREEN Energy Conservation Technologies Inc. is an advanced energy conservation solutions company that specializes in energy and cost reduction technologies for commercial, industrial and retail businesses. You can take control of your spiraling electrical bills, caused by increased demand, inefficiency and rising rates while improving the efficiency of your working environment and improving your bottom line. Green ECT can be contacted at: (877) 744-4208