Lighting & Control Design for Auto Sales

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Executive Summary

Lighting is often an overlooked element of many businesses. Whether for security at an apartment complex, detail rendering in a fabrication setting, or merchandising at an automotive dealership; a quality lighting system can have a significant effect on a business' operations and sales efforts.

This case study follows the process and outcome of designing and implementing a new LED lighting system for a leading multi-brand auto dealership in Des Moines, Iowa. This project shows the many capabilities and benefits of an LED lighting and control system when guided by careful lighting design, control system configuration, and utility rebate knowledge.

We will review each of the following steps and their impacts

- a) Lighting Design
- b) Controls System Design & Configuration



Figure 1: Added lighting to entry façade and entry display vehicles. Lighting is well balanced highlighting but not washing out contours of vehicle.

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Figure 2: Additional entry facade lighting to enhance dealership display and draw attention to entry display vehicles

Lighting Design

Optimize Lot Lighting / Minimize Capital Cost

LED lighting produces significantly more light (known as lumens) for the same amount of power consumption than any other lighting technology. In many scenarios, companies that perform lighting system conversions use a simple rule of thumb of replacing an old fixture with an LED fixture that is half or a third of the former wattage (i.e. power).

In scenarios where optimal lighting is paramount such as automotive display lots, a better approach than the rule of thumb is to begin with a thorough lighting design. In this process, site brightness goals (known as illuminance) come first and fixture wattages and quantities follow. This strategy not only better ensures proper light levels but also helps identify opportunities of further wattage and material reduction opportunities. Likewise, it can highlight areas where current light levels are inadequate.

Quality lighting design is a two-part skill set involving knowledge of design software and application-specific required light dynamics. Furthermore, each site is unique in its layout, daily activity, and lighting needs.

For this campus of dealerships, most of the display vehicles resided in the front lots and vehicles being serviced resided in the rear lots. Therefore, Enlighten was able to create a design that

"Creating this custom design reduced the project's material cost by 21%..."

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projected different levels of brightness (known as illuminance) in the street-facing front lots compared to the rear ones.

Moreover across many of the lots, fixture wattages were not only able to be reduced significantly but fixture quantities as well. Some poles with four 1000-watt, metal halide fixtures were replaced with two 400-watt LED fixtures. That's a wattage reduction of 80%!

In a small number of areas (mostly near the entry façades) lights were added to enhance the display of the dealership and its marquis vehicles. "Some poles with four 1000-watt, metal halide fixtures were replaced with two 400-watt LED fixtures. That's a wattage reduction of 80%!"

In all, creating this custom designed reduced the project's material cost by 21% in comparison to simply replacing fixtures on a one-for-one basis.



Figure 3: Heat map of light design showing various fixtures used to achieve target brightness (i.e. foot candle) levels

Control System Design

Minimize Energy, Maximize Utility Rebate, & Enhance Shopping Experience

For this project, the standard utility rebate was minimal relative to the project cost. It was designed around a flat fee for each fixture replaced. Thus under this path, the fixture reduction strategy actually would have decreased the potential rebate amount. However, a lesser known custom rebate path was also available which was structured in proportion to the energy savings achieved by the new lighting system. Under this custom route, reducing the fixture count (and thus increasing energy savings) improved the potential rebate. Furthermore, any

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other measures that further increased energy savings would also augment the rebate. Thus, Enlighten recommended an advanced motion-based control system that would both further reduce energy use, significantly increase the rebate amount, and also enhance the night-time shopping experience



Figure 4: General lighting at one of several dealerships on campus. Lighting levels designed to recommended national standard.

Simple motion-based control systems are widely available. Most of these systems work on an individual fixture basis. An infrared motion detector is integrated into the lighting fixture. It tells its fixture to turn on at night and to dim to a user-defined level when no motion is present. When motion is detected (human or vehicular), the motion detector triggers its fixture to brighten to 100%. Thus for many night-time applications where occupancy is minimal for a substantial proportion of dark hours, motion controls can saving a significant amount of energy.

Simple motion-detection systems work on an individual fixture basis, with individual fixtures turning on/brightening when each detects activity. More advanced motion-control systems link the activity of different fixtures together. Lights can be configured into motion groups, so that when any light detects motion, all of the lights in the configured group are triggered to brighten to 100%. This provides a much better effect for a potential car buyer to have all of lights in the vicinity brighten to 100% rather than just the single light they are closest to.

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For this client, motion groups were set to dim to 50% of their full wattage/brightness during inactive periods. For the same pole that reduced its previous wattage from 4,000 to 800, these night-time controls provided another 50% reduction in wattage for most night-time hours. In all, that is a drop of 4,000 to 400 watts or 90%!

In addition to motion group functionality, this control system provided a web-based platform where the client can control their lights (turn on/off), view real-time data of individual lights, and troubleshoot power and fixture issues.



Figure 5: Map view of lighting control platfrom

Similar to creating a careful lighting design, executing a detailed controls strategy was paramount. In order to ensure optimal and intended value of the control system, Enlighten took careful planning steps. Custom fixture wiring had to be confirmed and coordinated with the factory. Samples installed and on-site testing was performed. Finally, Enlighten executed a thorough configuration, commissioning, and monitoring process. All of these steps were important but dedication to the commissioning and monitoring process was probably the most valuable. Several live scenarios were found to falsely trigger the motion sensors (e.g. sprinklers, building exhaust fans, etcera). Night-time monitoring and data analysis allowed Enlighten to make final adjustments to minimize these false trigger events and maximize the client's energy savings.

Via the standard per-fixture rebate route, material cost offset would have been approximately 7%. Via the custom route with the added energy savings of the fixture-reduction design and advance motion control system, the rebate increased by a factor of 5 and total material cost offset grew to over 41%.

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Not all utility rebate programs are structured this same way providing significant incentive to increase energy savings through a detailed lighting design and advanced control system. However, having general knowledge of the various rebate program structures as well as an ability to numerically analyze the costs and savings of different potential systems will always help optimize the return any lighting project.

Project Summary

Enlighten's two greatest strengths are its technical understanding of lighting and controls as well its willingness to listen and adapt to the client's goals. This particular project's client wanted to maximize their rebate offset, maintain their lighting levels, and purchase a system that would not soon be obsolete. Not every project requires or benefits from a complex control system and lighting design. However, this project benefited immensely from each of those two efforts, greatly helping the customer enhance their sales lot lighting, reduce their energy expense, and minimize their project spend.

Project Stats

Estimated Projected ROI: 2.2 years* Estimated Lighting Energy Savings: 84%* Material Savings from increased rebate:41% Material Savings from Reduced Fixture count: 21% * This project was just completed so insufficient time has been

to track savings on the electric bills and measure. The above are average calculated figures based on project cost, rebate amounts, and changes in fixture wattages

Contact

For questions on this white paper or general lighting and advance control services contact the below. Enlighten is an LED lighting and advanced controls wholesaler and consultant. We partner with clients to provide and implement lighting solutions for commercial and industrial locations

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