

Project Overview

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Major: Mechanical Engineering

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In the summer of 2017 the P3 program partnered with the Nebraska Industrial Assessment Center (NIAC) to assess 8 Nebraska businesses. The NIAC is a part of an environmental sustainability initiative funded through the U.S. Department of Energy. The program performs free, one-day energy assessments for local manufacturing plants, develops energy saving recommendations for the facilities, and produces reports that detail these finds which are given to the manufacturers. Over the course of the summer, Hossein Derakhshandeh participated in four assessments including a medical device manufacturer, a grain silo, and a plastic injection molding facility. Derakhshandeh was also the lead analyst on one assessment for a construction lumber manufacturer.

Assessment recommendations included lighting and ventilation upgrades. The sum of energy and cost savings from assessment recommendations of the four assessments described in the report can be found in *Table 1*. Derakhshandeh's contributions to the overall reports totaled electrical usage savings of 711,600 kWh/year, for a cost savings of \$57,400/year.

In addition to the assessment recommendations, Derakhshandeh developed a lighting calculator for quickly developing an estimate of savings for lighting recommendations during one-day assessments. The calculator lets users input information gathered during the assessment such as number of bulbs, power requirement of bulbs, and bulb operational hours and outputs a cost of running the lighting. If replacement bulb pricing and power is known, these values can be input as well to output the cost of implementation as well as the expected payback period. This tool will be used by future NIAC students to improve the service provided to clients during the assessment.

Table 1: Recommendations Summary

Assessment Recommendation (AR)	Annual Savings		Implementation Cost (\$)	Simple Payback (years)
	Resource (Unit/year)	Dollars (\$/year)		
Replace fluorescent bulbs and metal halide fixtures	658,400 kWh/year	\$55,200/year	\$106,600	1.9 years
Install occupancy sensors in the warehouse	26,040 kWh/year	\$1,300/year	\$1,300	1.0 years
Upgrade exterior lighting	17,700 kWh/year	\$440/year	\$4,600	10.4 years
Replace current fans with energy efficient directional fans	9,500 kWh/year	\$430/year	\$2,100	4.8 years
Total Sum*	711,600 kWh/year	\$57,400/year	\$114,600	2.0 years

*The overall payback was calculated based on the total sum of all capital investments divided by the total sum of dollar savings from all the recommendations