Lumax Lighting 2: LED Industrial High Bay Light Fixture

Overview
The problem that our sponsor, Rich Taylor, presented to the team was to design a light fixture for an industrial setting using high power LED lights. The challenge with these LEDs is that they get so hot in a very little time period that the LED will fail and not work anymore. Therefore, the team had to design the light fixture so that the heat would be dissipated from the LEDs effectively through use of a heatsink.

Objectives
The team’s objectives for this project were to design and fabricate two light fixtures based on the criterion that was provided by the sponsor. After the team selected what was decided to be the best LED module for the application, the objective was to get the junction temperature, or temperature of the LED pad, to be below a temperature of 135°C in a 50°C ambient room temperature.

Approach
- The team went on a site visit and customer needs were reviewed.
- A patent search was conducted to gain ideas and insights to different LED light fixtures.
- Selected best LED module to best fulfill customer needs and goals.
- A CAD design was created by each member of the team and best design was derived from the five different designs.
- A thermal FEA test was performed on the CAD design in order to check how hot the fixture would get.
- Fabricated two fully functional prototypes.
- Tested the fixtures and junction temperatures until temperatures reached steady state using thermocouples in order to verify the FEA analysis.
- After analyzing the results, the team can guarantee the LEDs in an ambient temperature of 45°C, 5° short of the goal, but still better than LED high bay light fixtures already on the market.

Outcomes
- This light fixture is a new, unique light fixture that will be a competitive product on the market, which is designed to be extruded in three parts using two different dies.
- The unit cost for the fixture is low enough that the sponsor will be able to make a significant profit while selling the fixture at the industry standard price.
- The light fixture will dissipate heat more efficiently with the manufactured, extruded model due to less air gaps within the assembly of the fixture, which decreases efficiency of the dissipation of heat.