Allegion 1 – Electronic Lock Clutch System

Overview
The project assigned to the team was to design and build a lock clutch device for international company known as Allegion. The purpose of the lock clutch device is to provide a simple, interconnected electronic solution. The main objective is to replace the easily broken DC motor with new technology.

Objectives
The objective of the team is to design a new electric lock mechanism that utilizes less moving parts and specifically gets rid of springs and gears.

Approach
- Customer needs were gathered by organizing the requirements given by Allegion and performing research on important considerations for electric locks.
- Several concepts were selected to be researched such as a solid lever, micro air pump, and an electromagnet.
- Several patents have been reviewed to better understand electric locks, and also to make sure that if the design to be implemented by the team is to be similar to one of the patents, proper legal consent is to be acquired as a first step.
- Our sponsor is in China so we were not able to him in person. However, we held several meetings with our sponsor by skype and we gathered much information from him through these meetings.
- We created some CAD models for the pin casing and then 3d printed. Also, we made some CAD models of parts of lock system and assembled them with the pin casing within SolidWorks.
- We generated several prototypes before the final design was selected to get the most exact dimensions possible.
- Testing has been performed on the power consumption by the solenoid along with the original DC motor. Another test has been performed to ensure that the use of a strong magnet to tamper with the lock, does not open the door.
- Our model has met all of the requirements and specifications set forth by our sponsor.
- By using the solenoid instead of a motor/spring system we eliminated the use of springs and gears, which was our sponsor's main concern. We knew our model worked because it still functioned just as well as the motor spring system, and was able to turn the deadbolt.

Outcomes
We improved the lock design in these ways:
- Durability - getting rid of unnecessary parts
- Lowered Manufacturing Cost - more simplistic design
- Reliability - now employs one single linear push/pull design that is easier to replicate consistently rather than rotational motion
- Lowered Power Consumption - with 4 AAA batteries, uses approximately 4W less power