Adaptive Motor Frame Mounting Plate for Final Assembly Production

Overview
AC electric motors are used to drive the conveyor belts throughout Ford’s assembly plants. When a motor stops working it needs to be replaced as quickly as possible to minimize down time. Hundreds of motors are used in the plants with varying parameters including size, rpm, and horsepower. In North American plants, there are 19 plates to support these motors. A standardized plate needs to be developed to accommodate multiple types of motors. This will reduce the cost of purchasing and storing back-up motors by allowing similar, instead of identical, motors to be interchangeable. This is a step towards standardization that will reduce long term costs.

Objectives
The main goal is to reduce the number of plates in as many of these assembly plants as possible. This project focuses on motors used in the Final Assembly part of production. The most commonly used motors are selected through analysing and filtering available data.

Approach
- The team first approached the problem through extensive data analysis of the horsepower, RPM, size and frequency of the most common motors in North American final assembly plants.
- Through the data analysis, the team found which motor sizes or frame numbers were “priority” sizes.
- After determining which frame numbers were the most urgent to address, Team Ford began the design process for accommodating these “priority” frame numbers.
- Two design concepts were generated.
- A “Swiss Cheese” design was created to accommodate frame numbers of larger dimensions.
- An “Arm Design” was created to accommodate motors of smaller frame numbers.
- Solidworks models were created of both designs and a finite element analysis was conducted, yielding a minimum factor of safety of about 6.5.
- After machining two rounds of prototypes in the Learning Factory, the prototypes were sent to a Ford Manufacturing Facility for testing by Ford’s manufacturing technicians.
- Ford’s technicians made minor suggestions to improve the design, but approved the general concept and encouraged pursuing implementation.
- Team Ford will now make further recommendations for alterations to the current design as well as paths for future research in the Final Design Report.

Outcomes
Ford leadership is generally pleased with the “Swiss Cheese” and “Arms” design and they hope to implement it in North American Final Assembly plants after some slight dimensional modifications:
- The replacement time for a motor (about 4-5 hours of downtime at a revenue loss rate of $30,000/minute) can now be severely reduced because the mount for a motor will not have to be replaced too when a motor malfunctions and requires replacement.
- The design eliminates the need to order emergency motors (which cost Ford about $30,000,000 in revenue loss during a 2 day downtime in their Ohio Assembly Plant).
- The design will also eliminate the need for a large inventory of motors, after standardization.