General Motors 2 -- Aluminum Sheet Destacking

Overview
General Motors, along with other auto manufacturing companies, are transitioning from steel based vehicles to more aluminum based vehicles. The aluminum blanks at the beginning of the stamping line are non-ferrous, meaning non-magnetic, and therefore magnets cannot be used to separate the sheets. These aluminum sheets sometimes stick together when lifted up by the robotic arm apparatus. Our team was tasked with finding a solution to the problem that will result in 100% effectiveness, meaning that the aluminum blanks will never stick together.

Objectives
Find a solution that will ensure that the aluminum sheets at the front of the stamping line will be lifted up individually without sticking, 100% of the time. Fabricate and test the prototyped solutions to see which solution provides the most effective results.

Approach
- Visit Lordstown, Ohio facility to gain insight into the original aluminum destacking process
- Research viable solutions and select which ones to design further
- Selected Orientation Offset, Mechanical Finger Separator, and Screw Separator Mechanism
- Design the selected solution prototypes using SolidWorks
  - Construct an experimental model simulating the original GM production line and solution prototypes
  - Determine which performance parameters effectively measure the destacking reliability of a solution
- Study the separation force needed, and the amount of sheets separated in each individual lifting
- Collect 10 data points for each testable prototype
- Calculate 90% Confidence Interval using a “Student’s t distribution” for separation force, sheets lifted

Outcomes
- Recommend going forward with advanced prototyping of either/both physical separator solutions
- This is because physical separators separate sheets with 100% reliability when applied properly
- No statistical difference between reliability of original system and Orientation Offset, with respect to destacking
- While Orientation Offset reduced lift force, it did not significantly improve destacking. Useful for manual lifting
- Screw Separator operates on same principle as Mechanical Finger, which was tested
- Implementation of defect bin will result in significant cost savings compared to total line shutdown
- Recommend testing advanced prototypes for reliability and durability over longer periods to test