Automated Tooling Design for PCB Dispensing Application

Project Overview
Nordson Asymtek is sponsoring this project to develop a fully automated tooling aid to work in unison with their Vantage machine for a Printed Circuit Board (PCB) dispensing application. The tooling aid, placed inside the Vantage, must provide an automated loading, flattening, heating, moving, and unloading mechanism for the PCB with a user interface displaying the current stage of the process.

Final Product
The Vantage acts as the power and air source. An Arduino Due, a microcontroller board, manages the inputs and outputs of each subsystem monitored by a user interface (left).

Subsystems
- Receiving
- Movement
- Suction
- Heating

Process Overview
1. PCB is loaded onto the fixture from Equipment Front End Module
2. PCB is flattened through suction cups and clamps
3. Heat PCB
4. Vantage dispenses adhesive onto PCB
5. Transport fixture to second position and dispense adhesive
6. Return to original position, stop heating, release suction and clamps

*Entire process occurs inside Nordon’s Vantage Machine

Engineering Analysis

Heating Analysis:
- Evenly distributed heating element to heat the PCB to a target temperature of 120°C prior to dispensing

Flattening Analysis
- The force required to flatten the PCB determined the size and location of the suction cups

$$ F(x) = 2 \cdot \frac{8}{x^2(3L-x)} $$

Acknowledgements
San Diego State University
Dr. Scott Shaffar
College of Engineering

Design Team
Top (Left to Right): Abdullah Alani, Jose Hernandez, Eric Galvan, Zachary Chow
Bottom (Left to Right): Aziz Hanna, Chad Bicoy (TL), May Aldhaies (TL), Shervin Shabanpour, Denver Chan, Abdullah Alhajeri
TL = Team Lead

Testing
Verification testing was conducted on each subsystem to confirm specified design outputs met design input requirements. These critical specifications control flatness, temperature, and positioning.