



David Padgett
Director of Technology

Automated Tooling Design

for PCB Dispensing Application

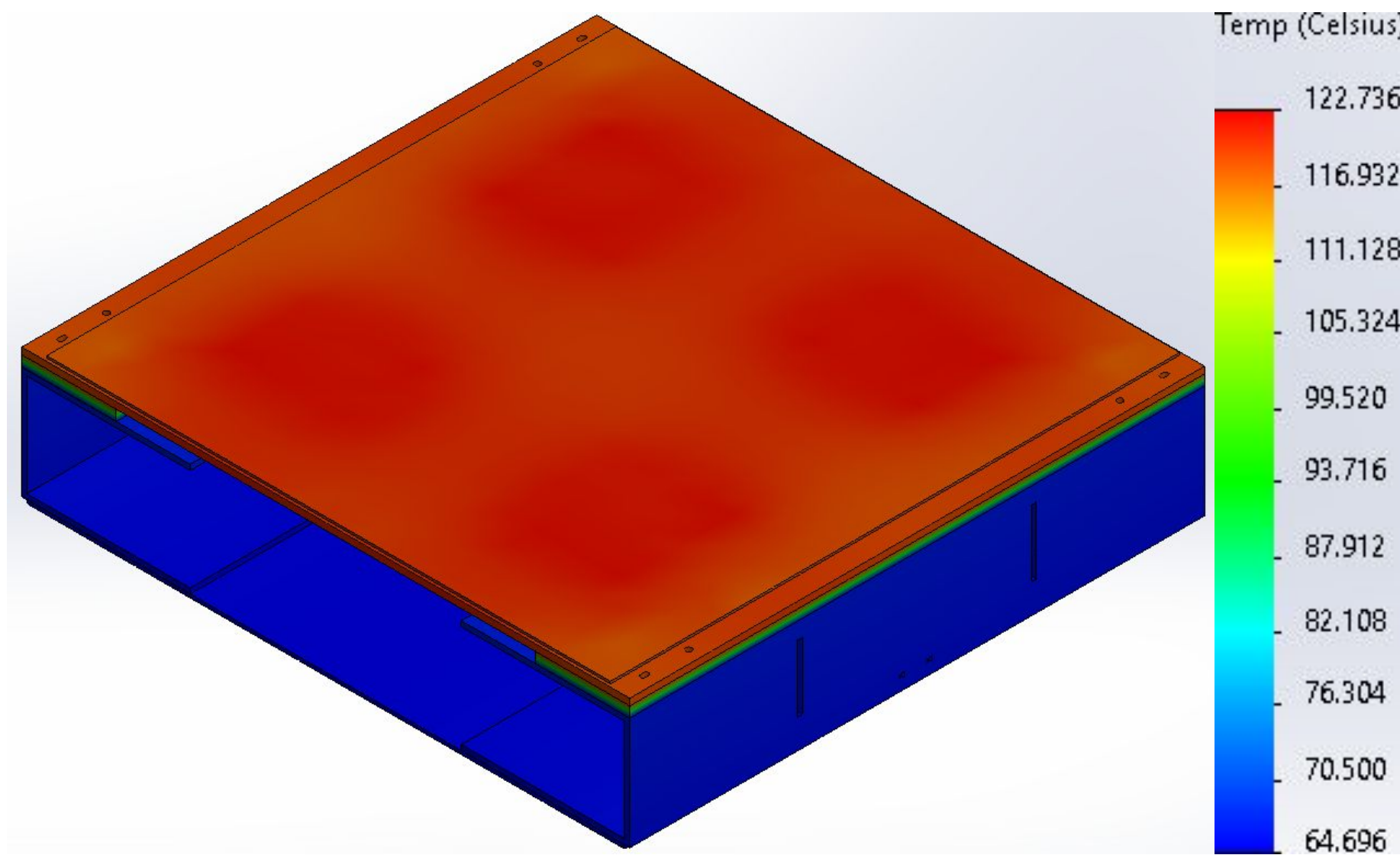


Dr. Scott Shaffar
College of Engineering

Engineering Analysis

Heating Analysis:

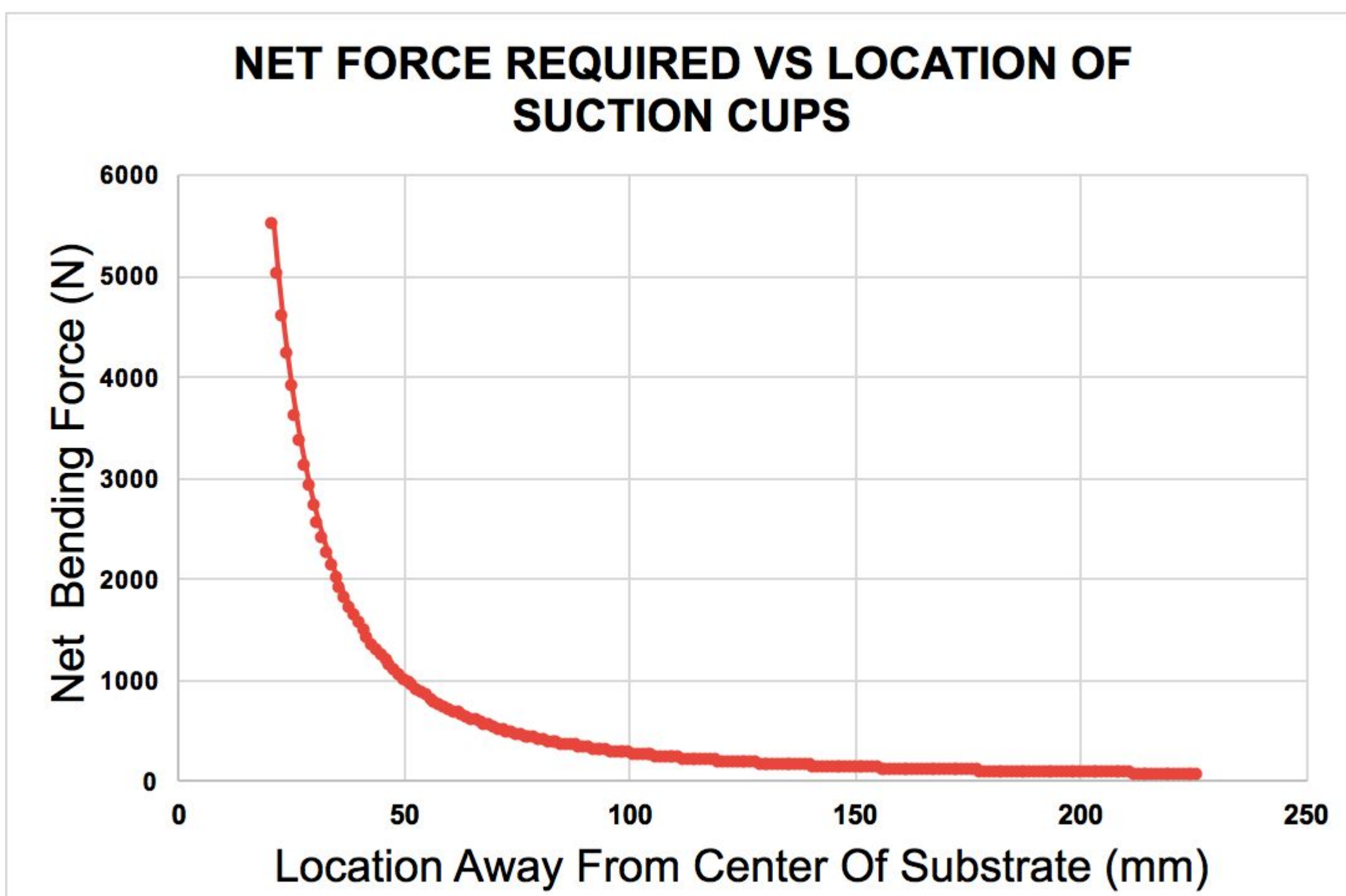
- Evenly distributed heating element to heat the PCB to a target temperature of 120°C prior to dispensing



Flattening Analysis

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

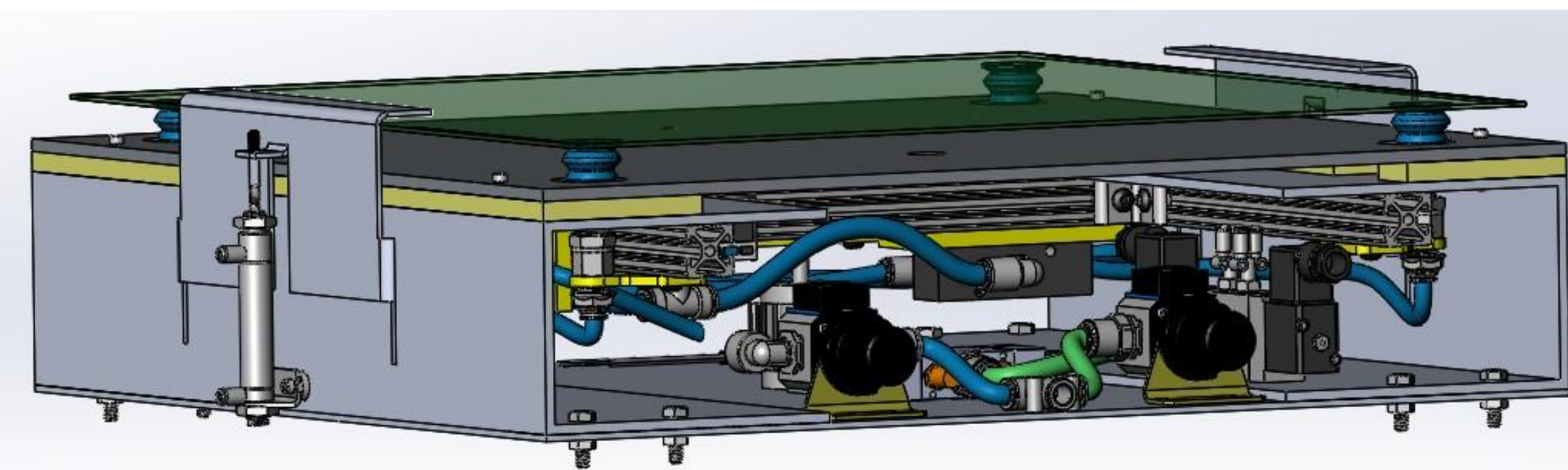
$$F(x) = 2 \cdot \left(\frac{\delta_{max}(6EI)}{x^2(3L-x)} \right)$$



Project Overview

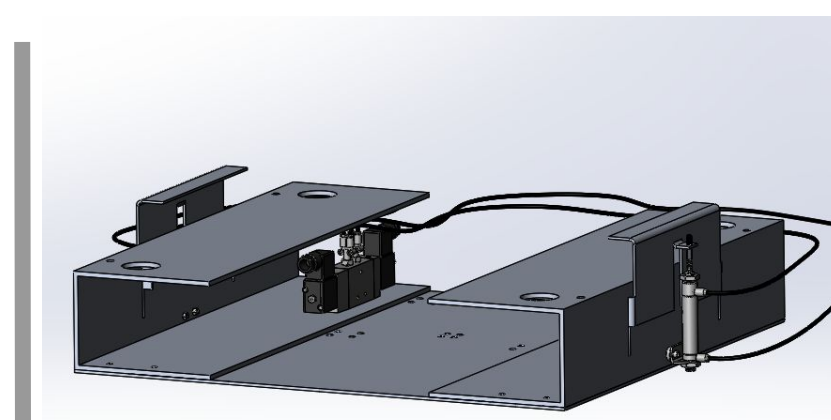
Nordson Asymtek is sponsoring this project to develop a fully automated tooling aid to work in unison with their *Vantage* machine for a Printed Circuit Board (PCB) dispensing application. The tooling aid, placed inside the *Vantage*, must provide an automated loading, flattening, heating, moving, and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

Final Product

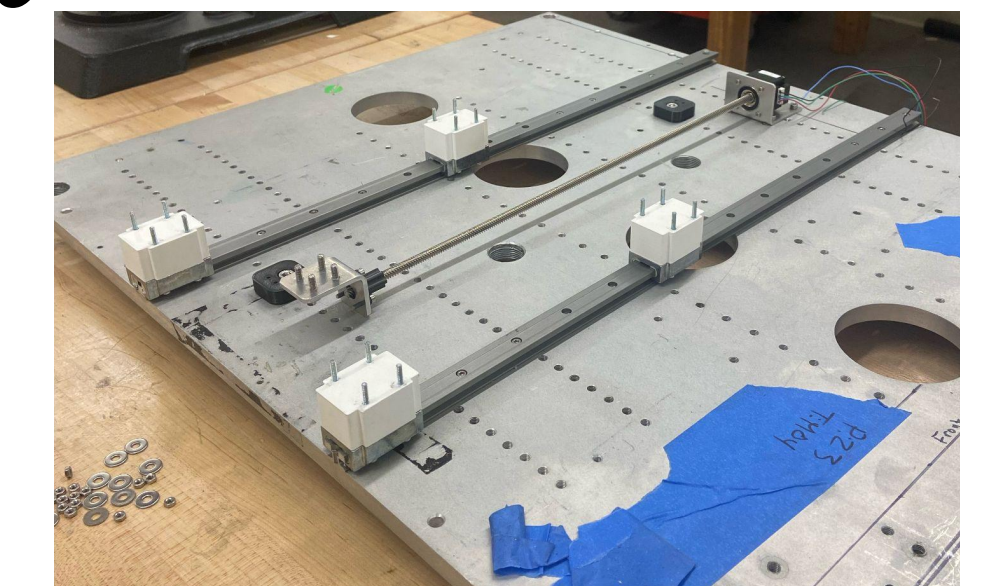


The *Vantage* acts as the power and air source. An Arduino Due, a microcontroller board, manages the inputs and outputs of each subsystem monitored by a user interface (left).

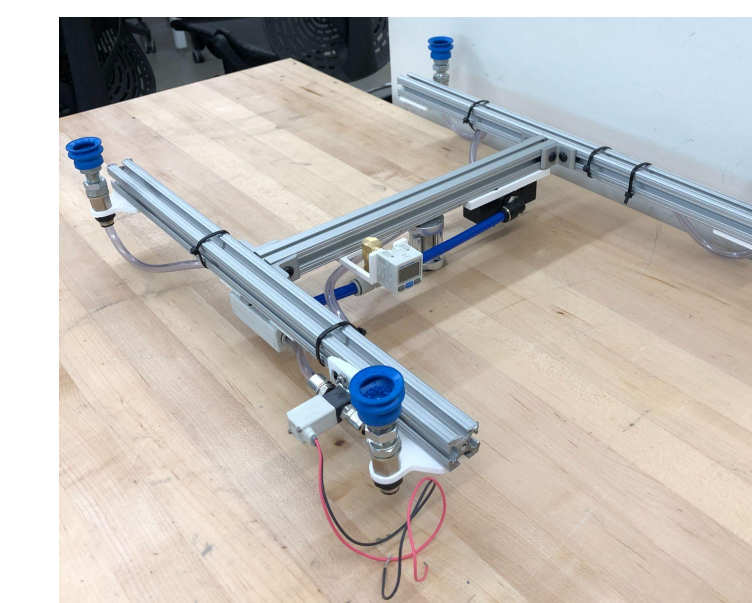
Subsystems



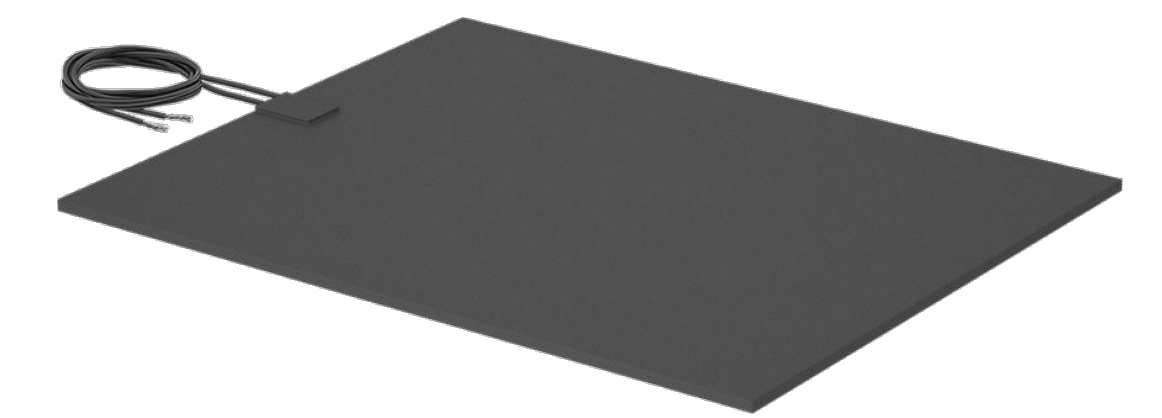
Receiving



Movement

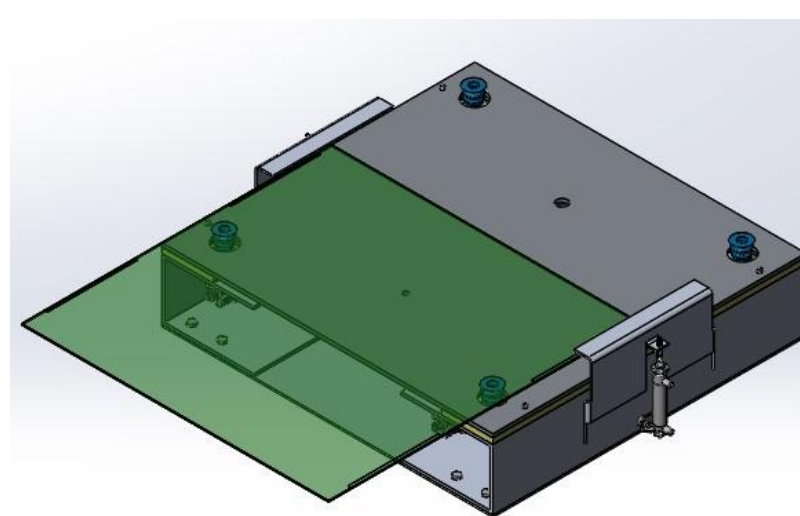


Suction

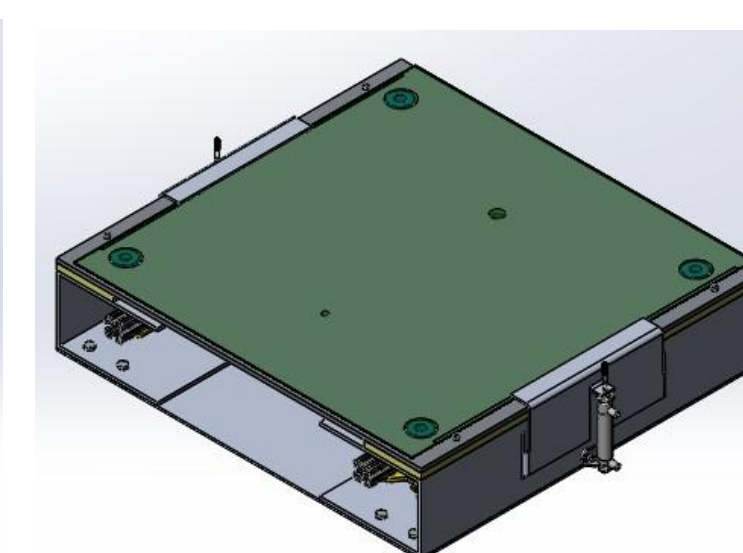


Heating

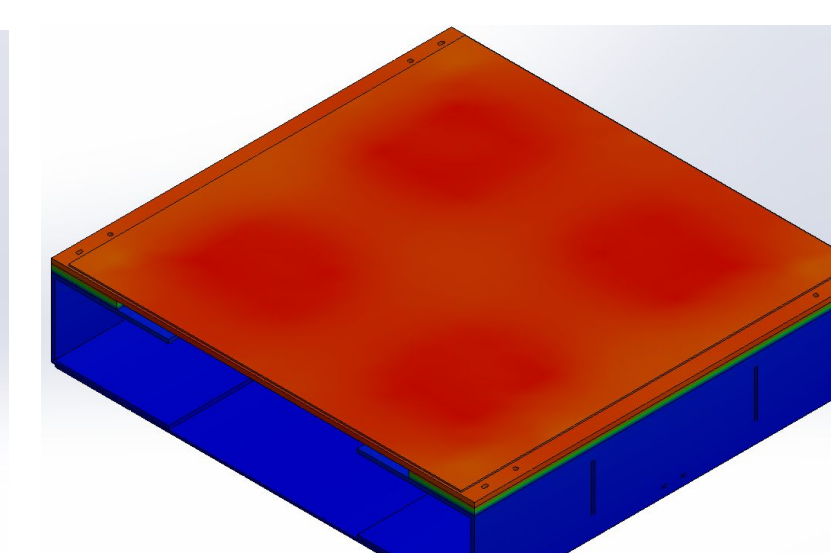
Process Overview



1. PCB is loaded onto the fixture from Equipment Front End Module



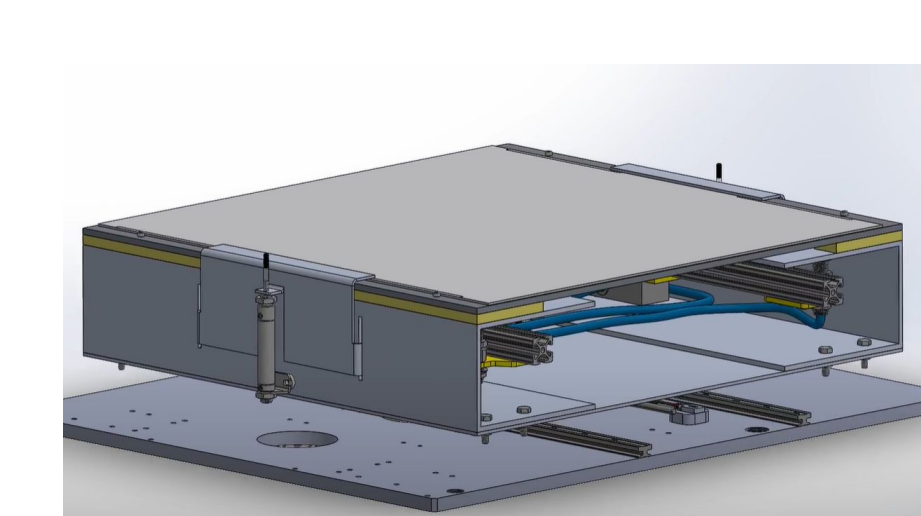
2. PCB is flattened through suction cups and clamps



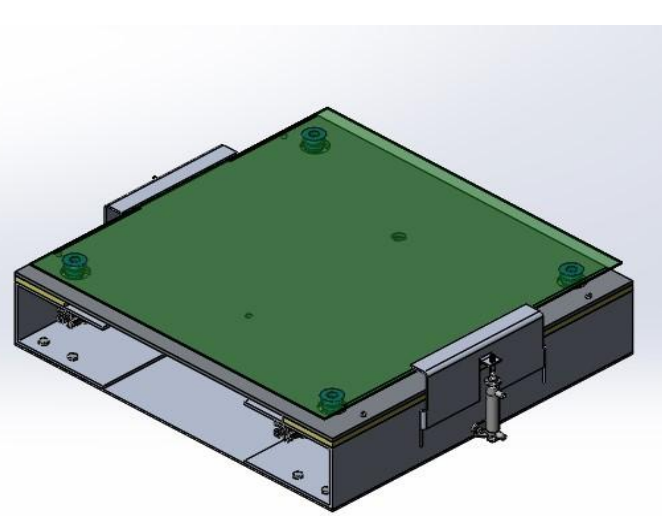
3. Heat PCB



4. *Vantage* dispenses adhesive onto PCB



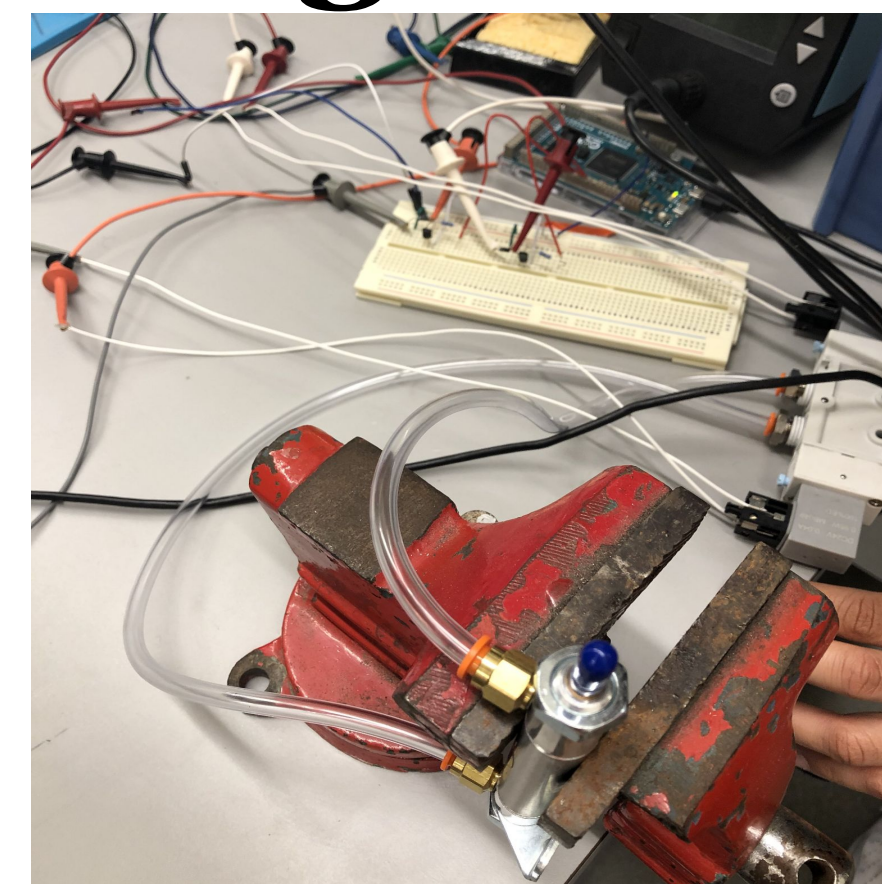
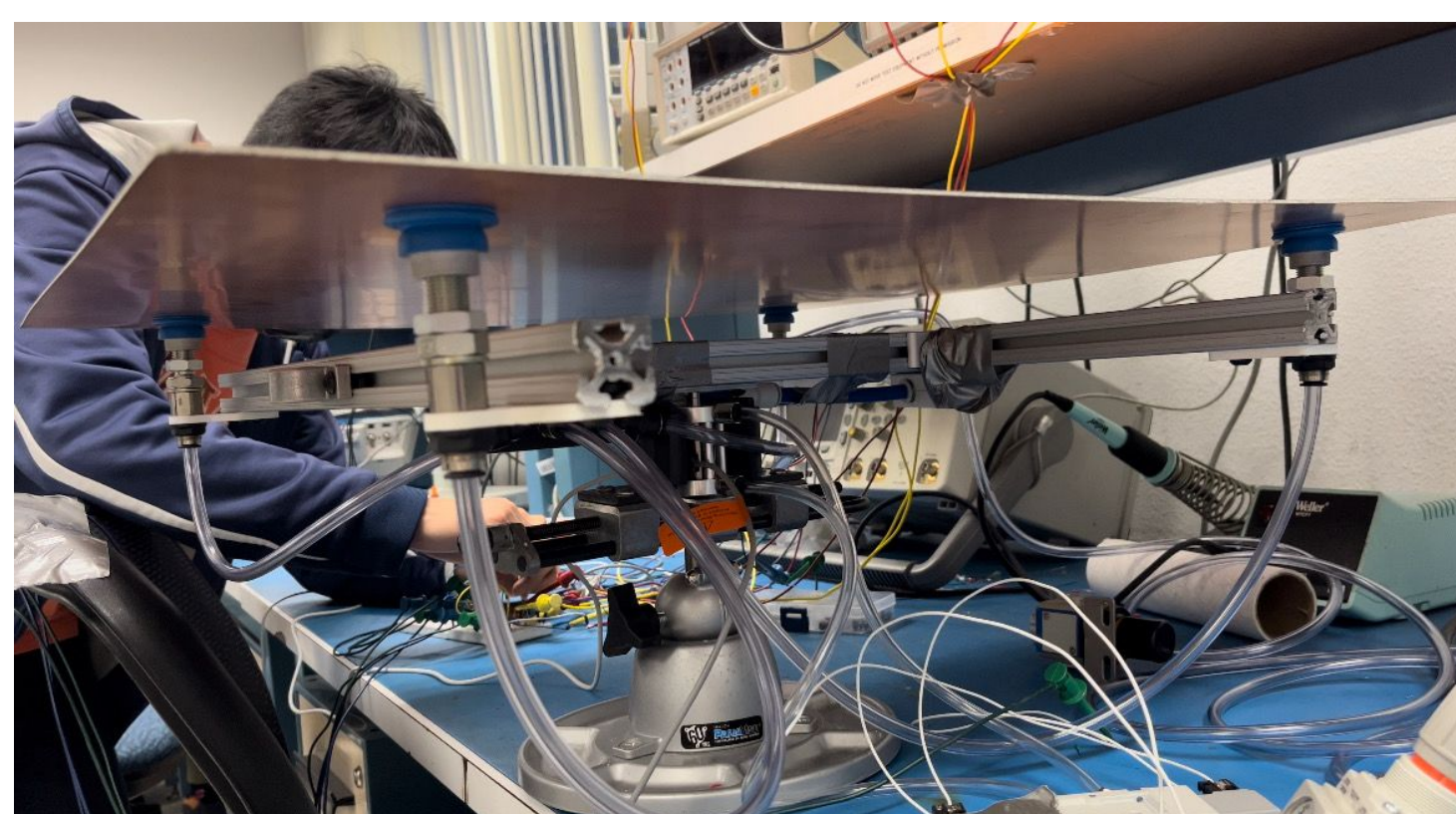
5. Transport fixture to second position and dispense adhesive



6. Return to original position, stop heating, release suction and clamps

*Entire process occurs inside Nordson's *Vantage* Machine

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.

Design Team



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

TL = Team Lead

Acknowledgements

San Diego State University

Dr. Scott Shaffar
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Dr. Sridhar Seshagiri

Nordson Asymtek

David Padgett
Alon Dagan