Chen Wei Liu

Mechanical Engineer & Product Designer

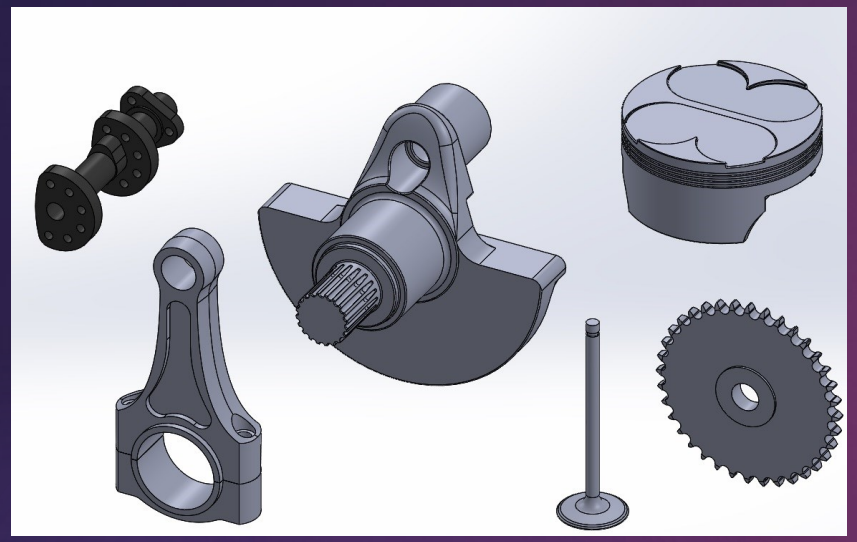
Section 1 – 3D Models & Drawings

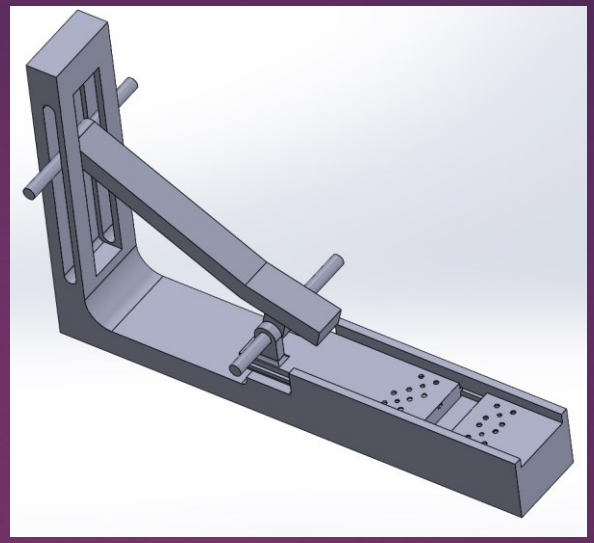
Section 2 – Mechanical Projects

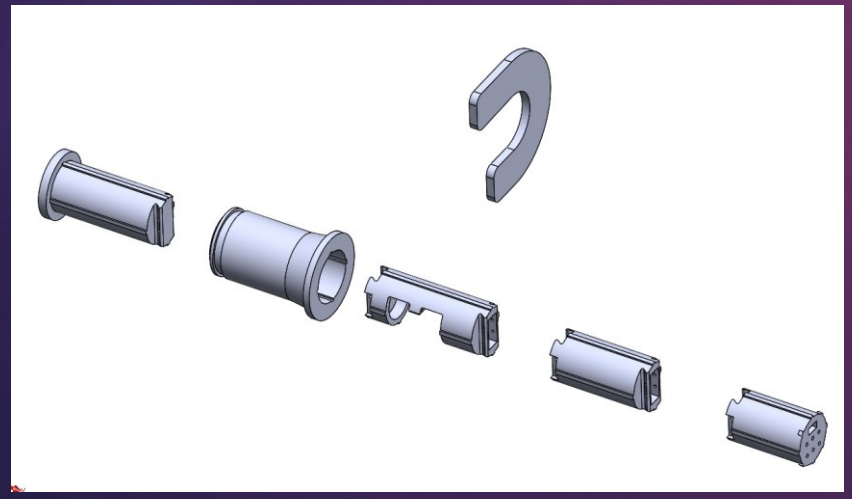
Section 3 - Simulation, Coding projects

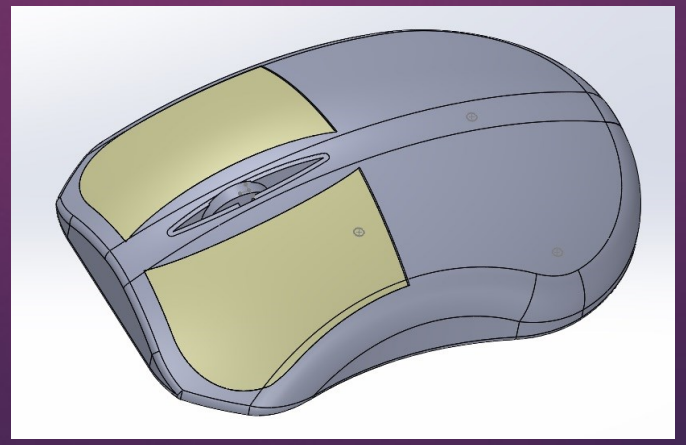
Section 1 – CAD Skills & Drawings

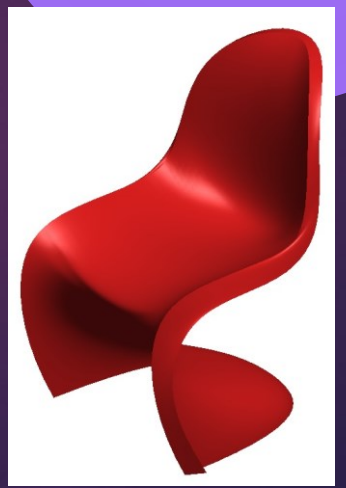
1.Parts Design & Fixture & Drawing Create

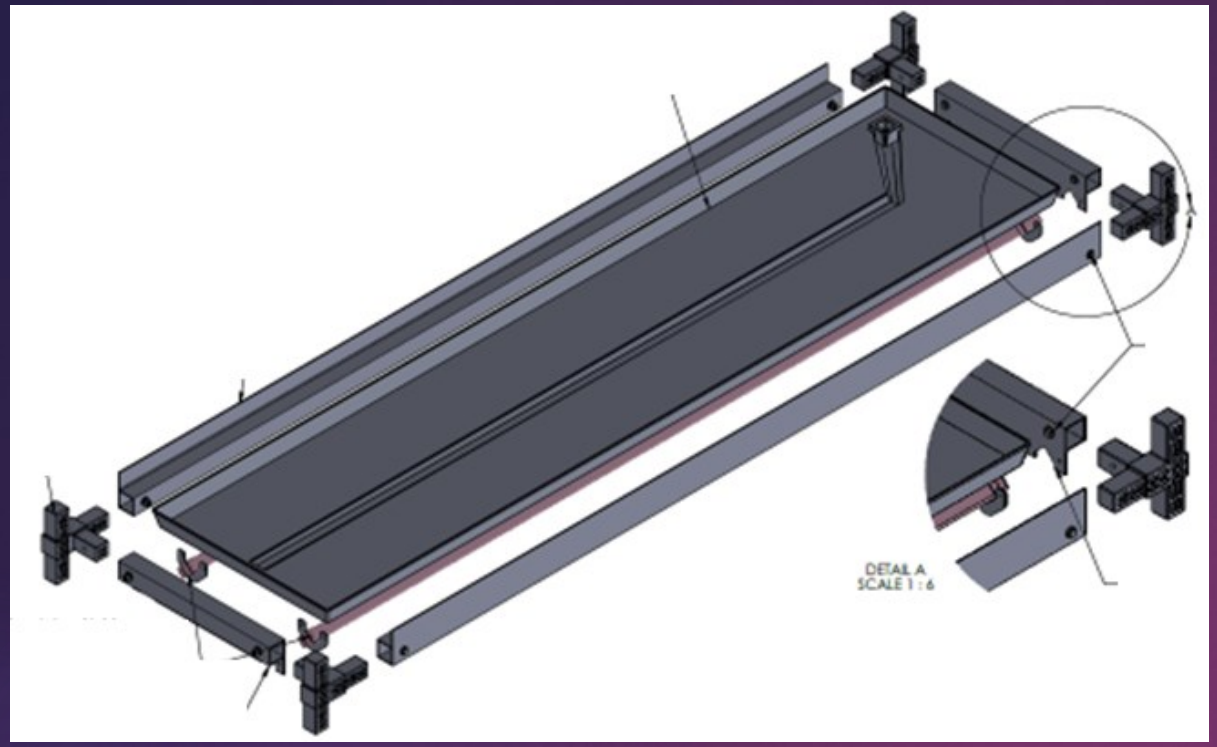


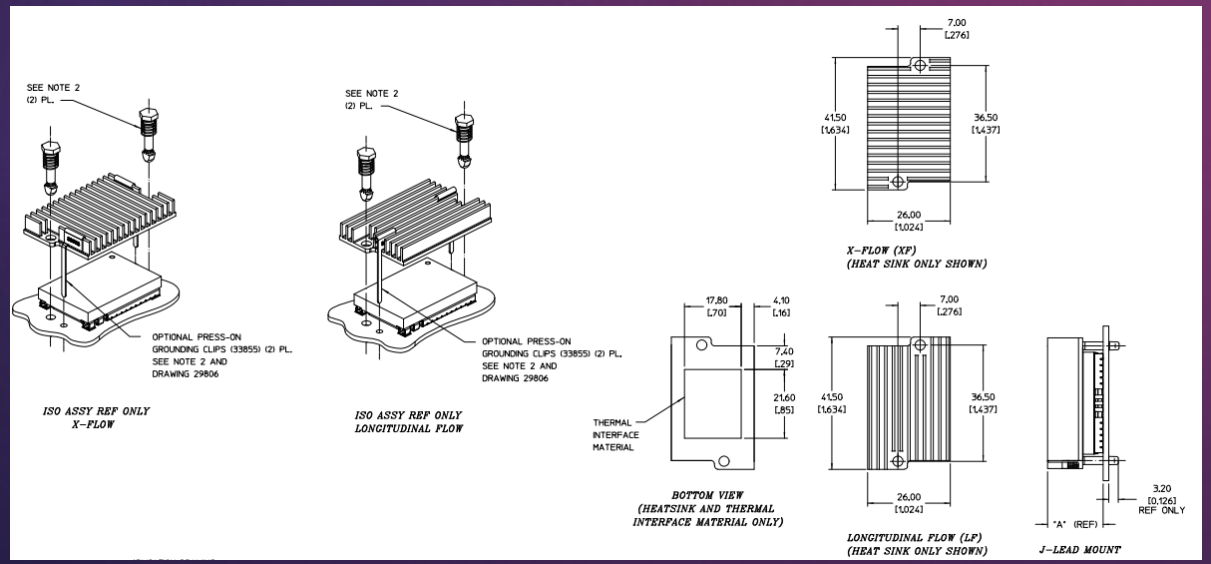


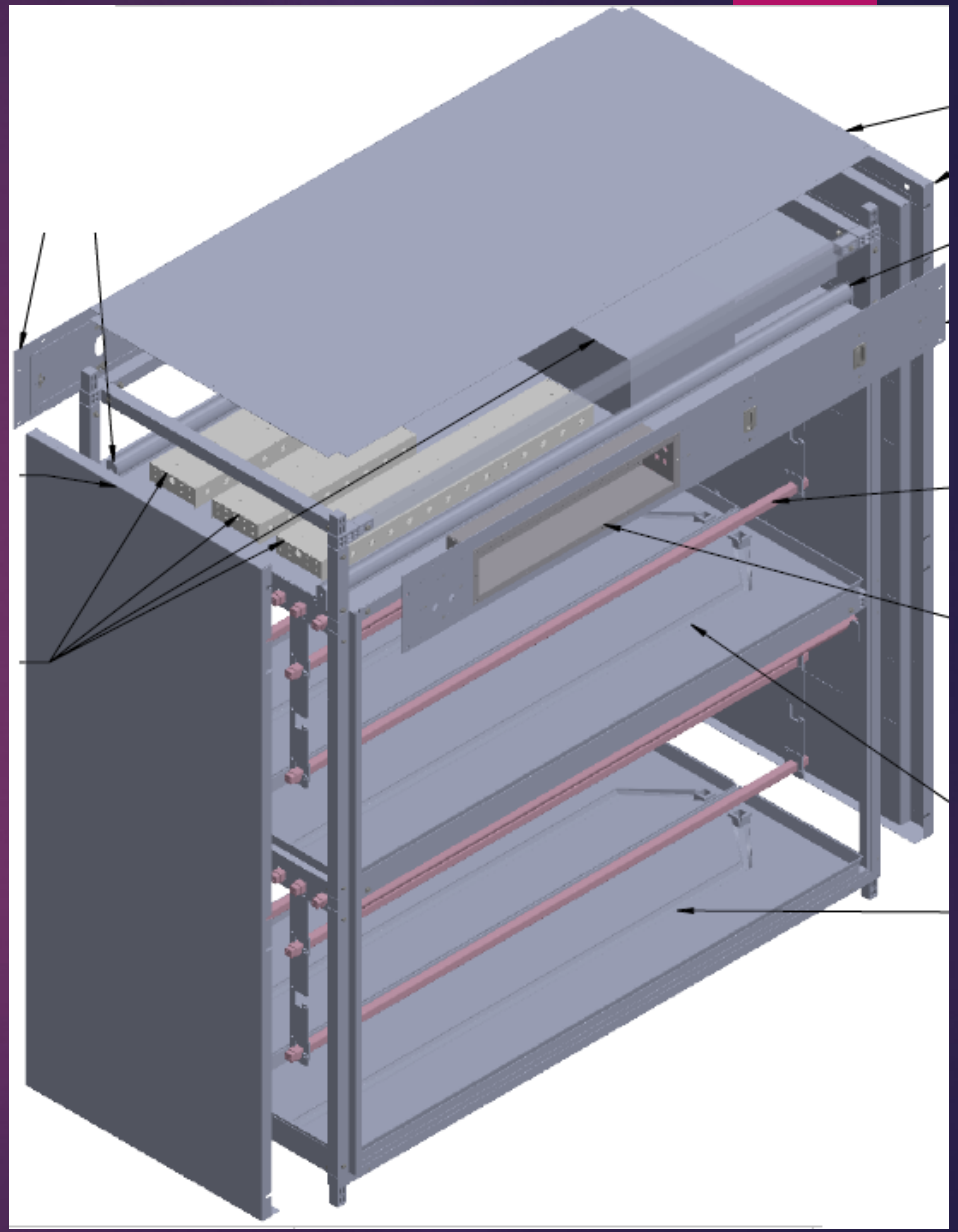


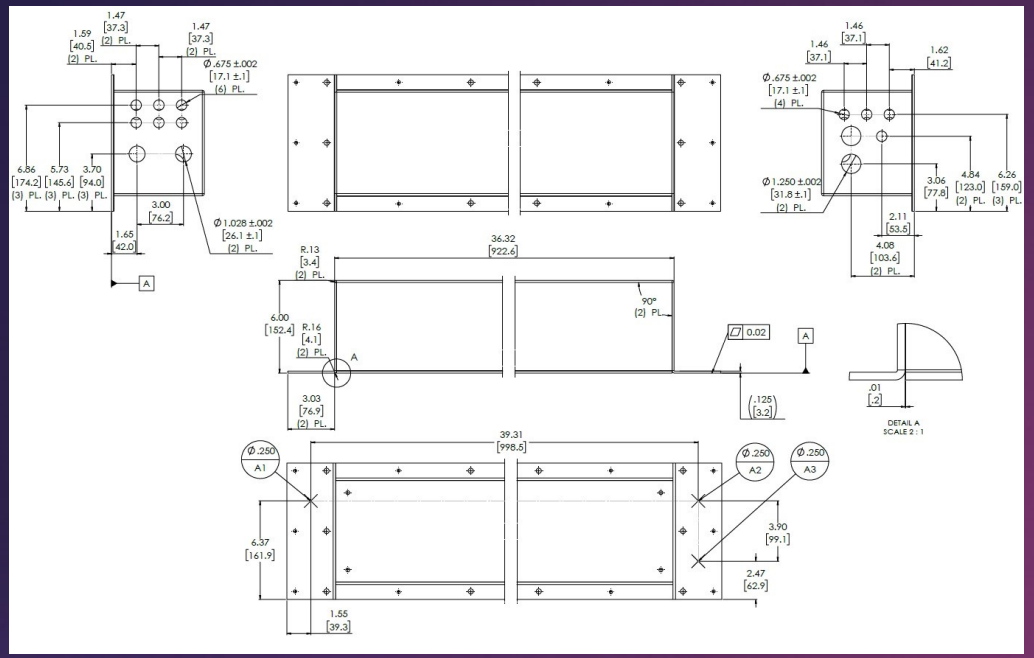


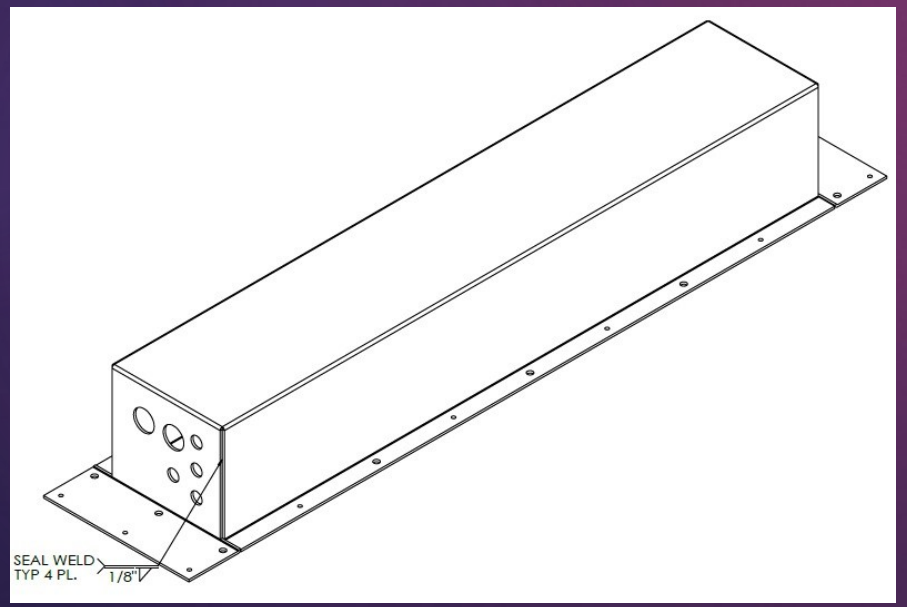


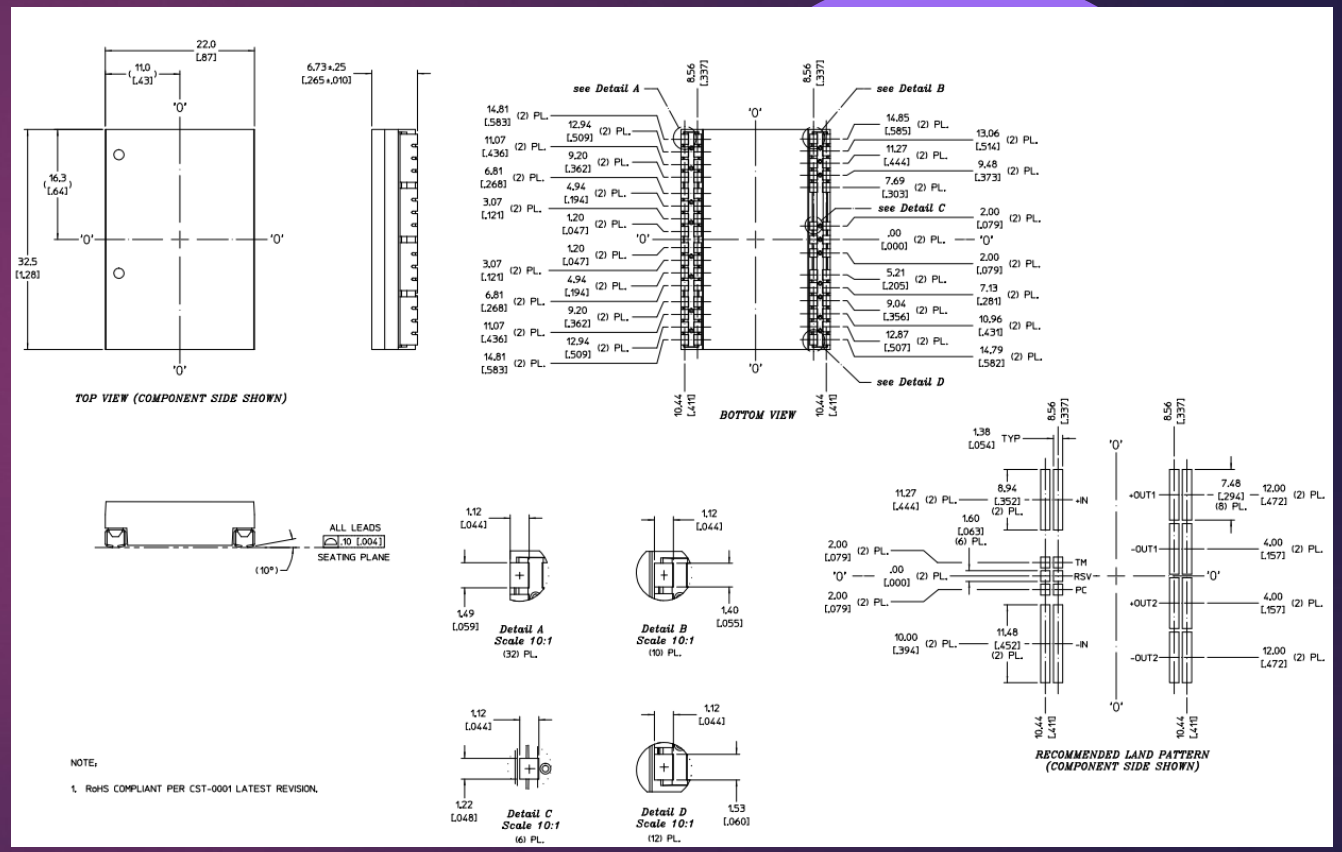

DETAIL A
SCALE 1 : 6


SEE NOTE 2
(2) PL.
OPTIONAL PRESS-ON
GROUNDING CLIPS (33855) (2) PL.
SEE NOTE 2 AND
DRAWING 29806
ISO ASSY REF ONLY
X-FLOW
SEE NOTE 2
(2) PL.
OPTIONAL PRESS-ON
GROUNDING CLIPS (33855) (2) PL.
SEE NOTE 2 AND
DRAWING 29806
ISO ASSY REF ONLY
LONGITUDINAL FLOW
7,00
[.276]
41,50
[1,634]
36,50
[1,437]
26,00
[1,024]
X-FLOW (XF)
(HEAT SINK ONLY SHOWN)
17,80
[.701]
4,10
[.161]
7,40
[.291]
21,60
[.851]
THERMAL
INTERFACE
MATERIAL
BOTTOM VIEW
(HEATSINK AND THERMAL
INTERFACE MATERIAL ONLY)
7,00
[.276]
41,50
[1,634]
36,50
[1,437]
26,00
[1,024]
LONGITUDINAL FLOW (LF)
(HEAT SINK ONLY SHOWN)
3,20
[0,126]
REF ONLY
"A" (REF)
J-LEAD MOUNT

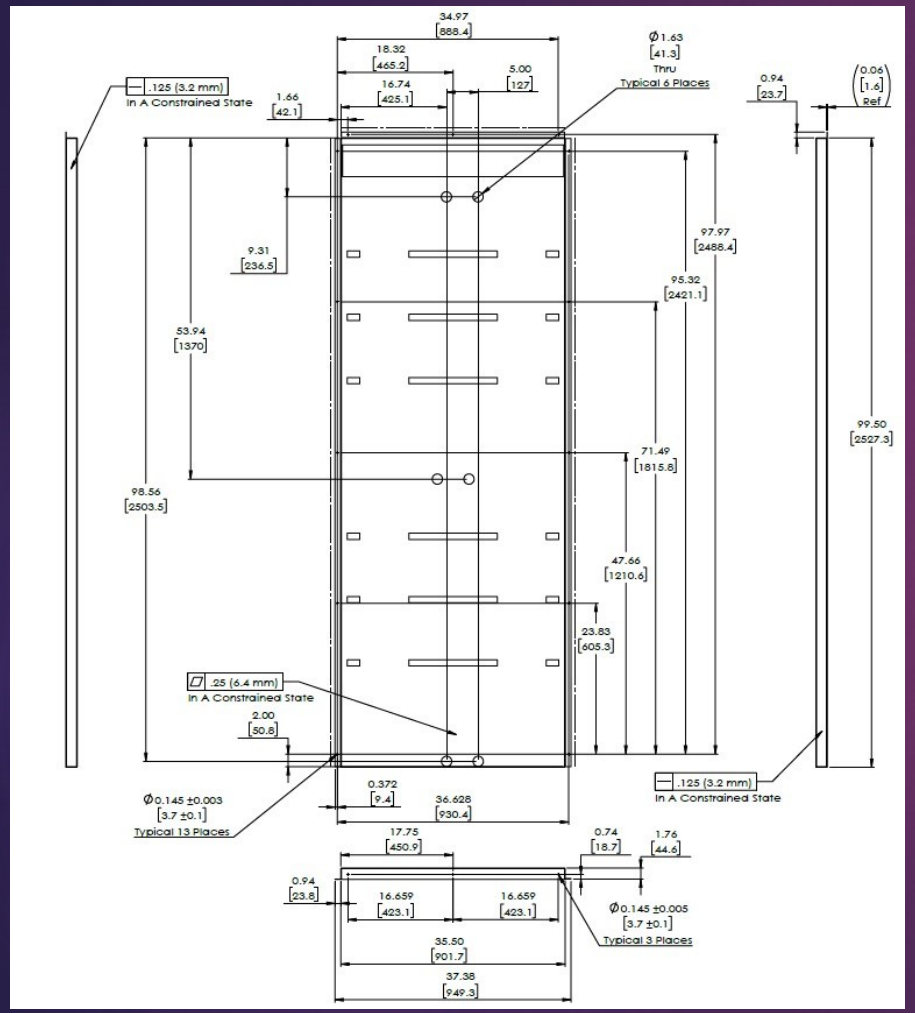


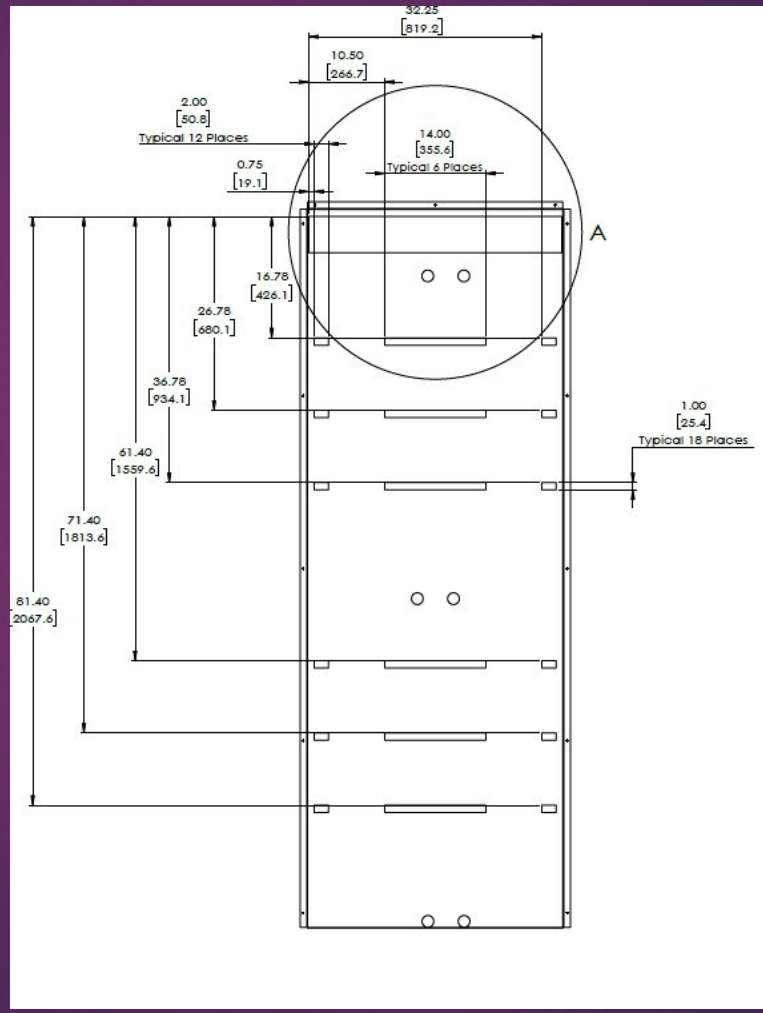

DETAIL A
SCALE 2 : 1

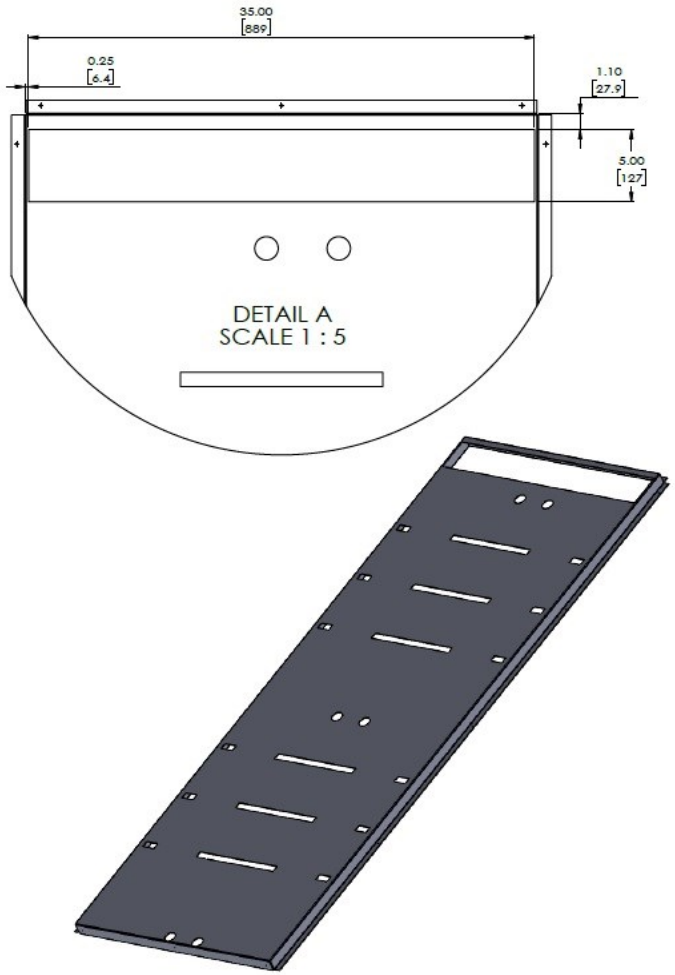

SEAL WELD
TYP 4 PL.
1/8"


TOP VIEW (COMPONENT SIDE SHOWN)
BOTTOM VIEW
see Detail A
see Detail B
see Detail C
see Detail D
ALL LEADS
SEATING PLANE
Detail A Scale 10:1
Detail B Scale 10:1
Detail C Scale 10:1
Detail D Scale 10:1
RECOMMENDED LAND PATTERN
(COMPONENT SIDE SHOWN)
NOTE,
1. RoHS COMPLIANT PER CST-0001 LATEST REVISION.

1.Parts Design & Fixture & Drawing Create







Section 2 – Mechanical Projects

1. Design 10+ Cooling Solutions for High Power Converters

WHAT?

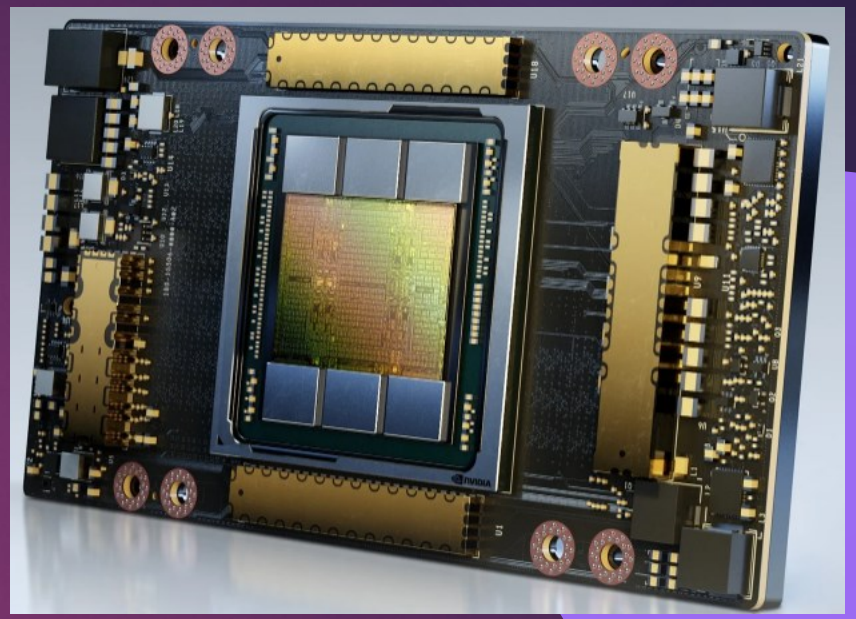
- Design cooling solution for PCB industry standard
- Power converter runs 100~1000(A) continuously.

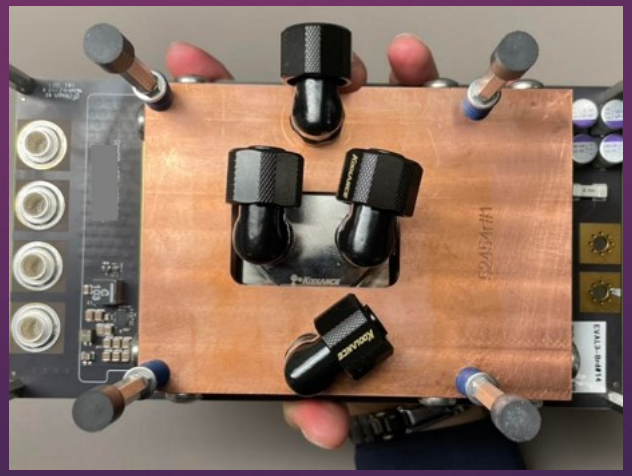
HOW?

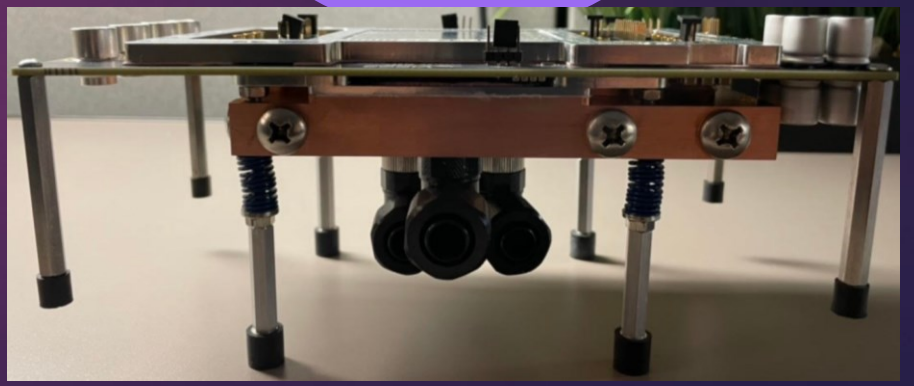
- Solidworks to design 3D models
- Perform static analysis on the assembly
- Create detailed drawings with GD&T
- Development installation procedures
- Create BOMs
- Work with machine shops and make orders
- Test assemblies

RESULT?

- Assemblies are ready for application engineers to perform electrical testings







2. 3D Print-Trumpet

WHAT?

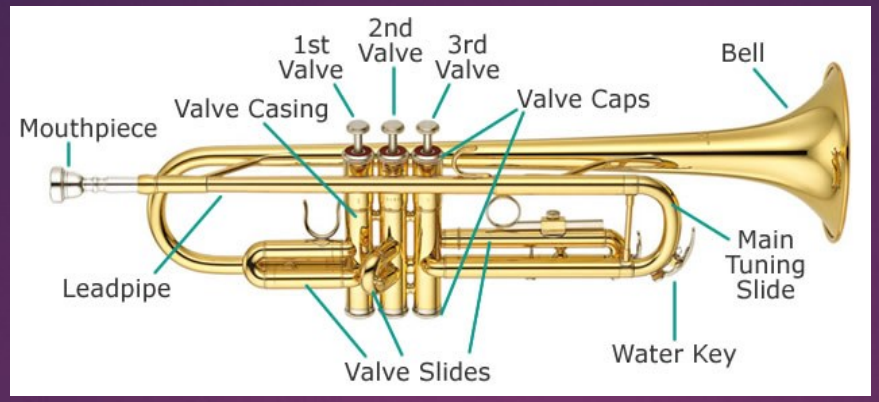
- Design a trumpet CAD model to be ready for 3D print

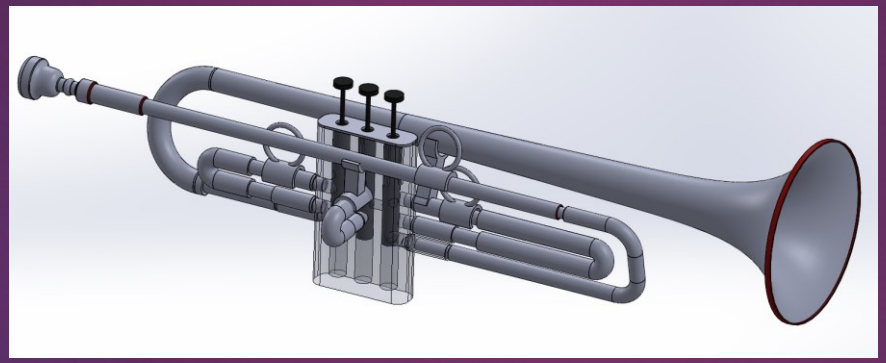
HOW?

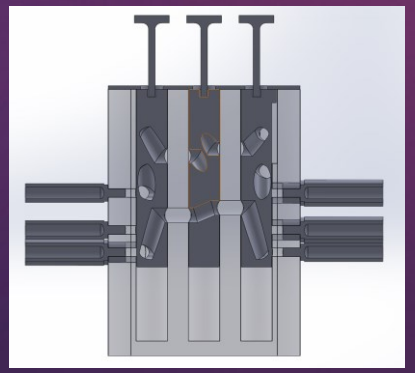
- Apply FDM process on Startasys FORTUS
- Apply SLA process on Formlabs Form 2

RESULT?

- Troubleshoot for fragile parts and redesign
- Able to play the trumpet







3. 3D print-DUT(Device Under Test) Fixture Design

WHAT?

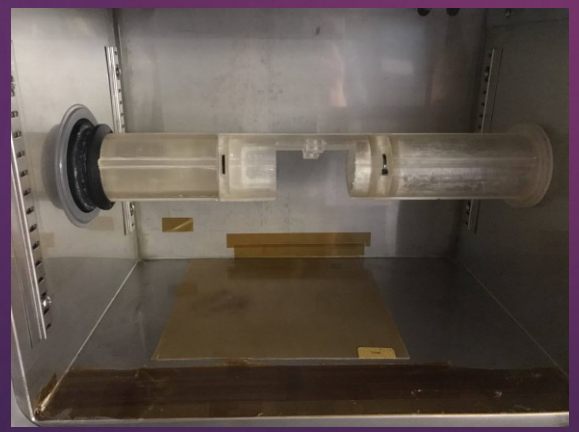
- Existing DUT device does not have inner slots for cables to pass through which lead to not air tight and accumulation of humid.

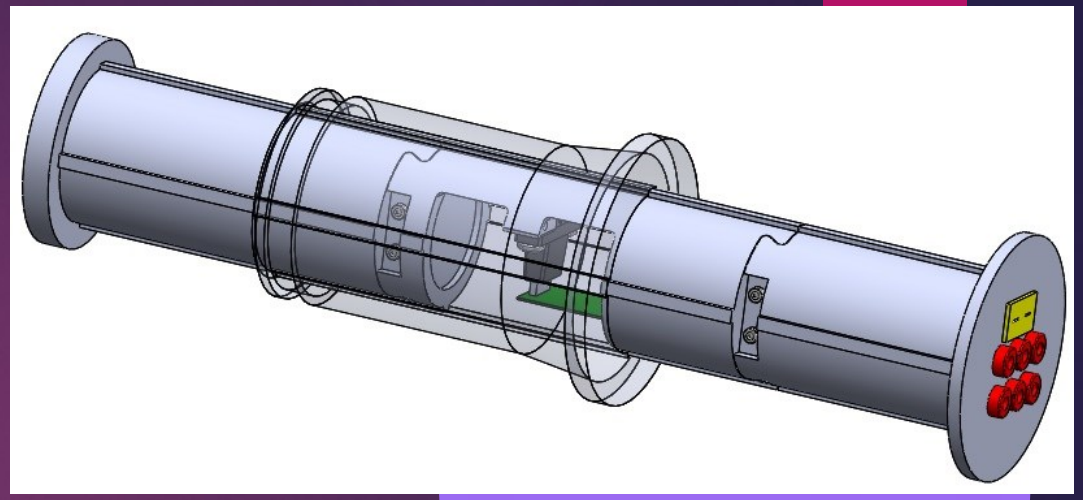
HOW?

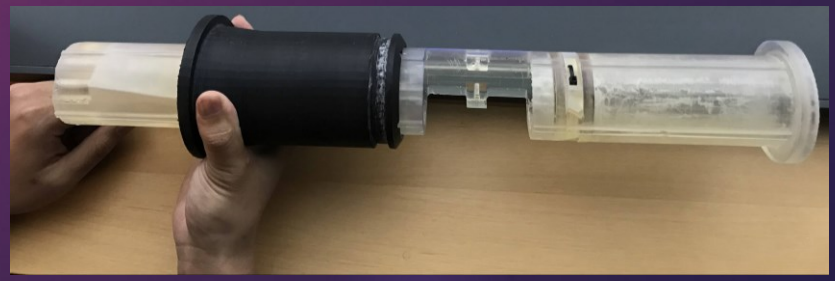
- Used Solidworks to design an assembly which has four pieces and use fasteners to tighten
- Apply SLA process on Formlabs Form 2

RESULT?

- Test engineer is able to use the device to complete the testing procedure.







Section 3 – Simulation & Python

1. Simulation – CFD, Enclosed farming environment

WHAT?

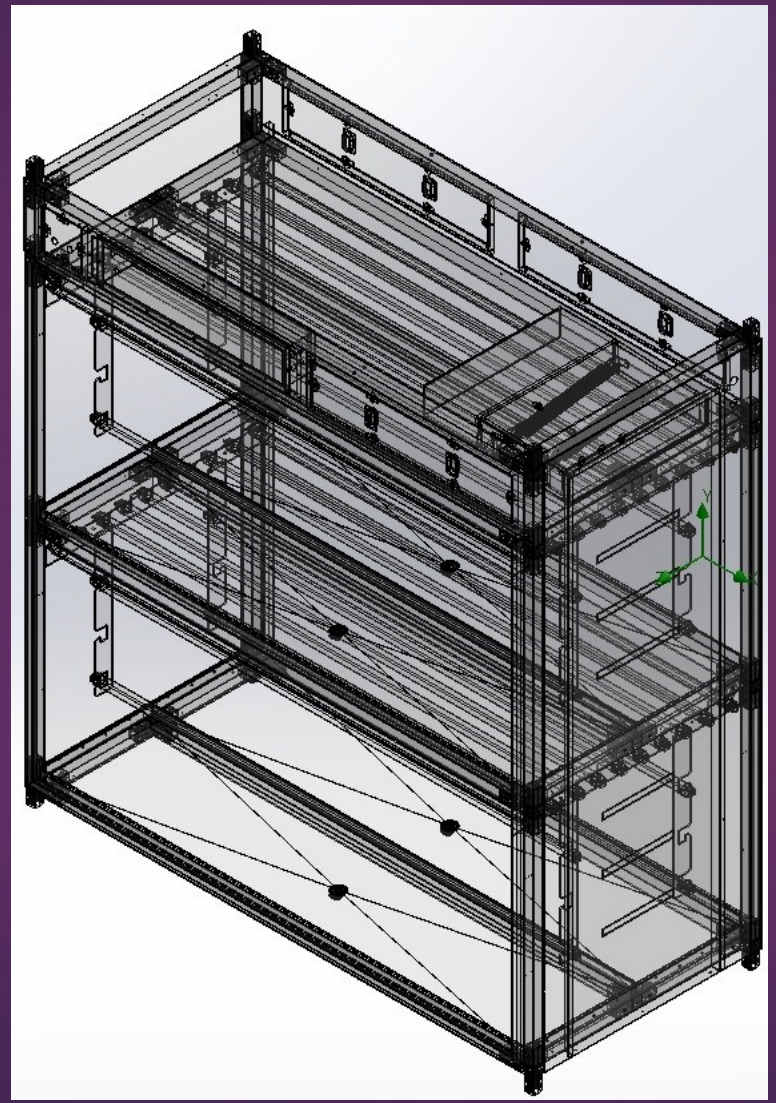
- Perform CFD simulation on an enclosed, two-story farming unit
- Optimize duct design to have similar air distribution on top and bottom layer

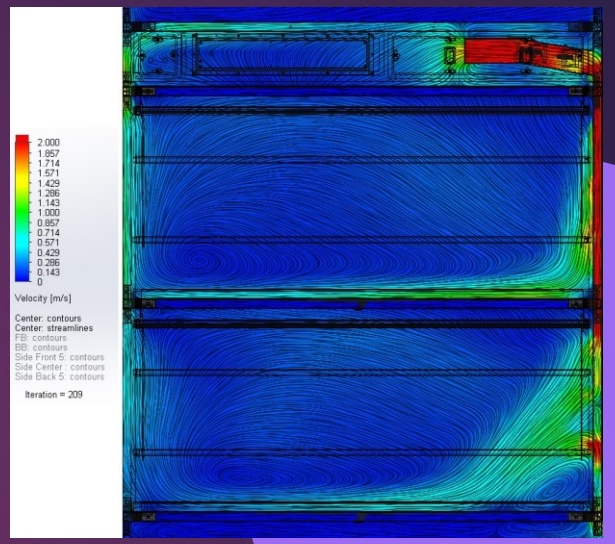
HOW?

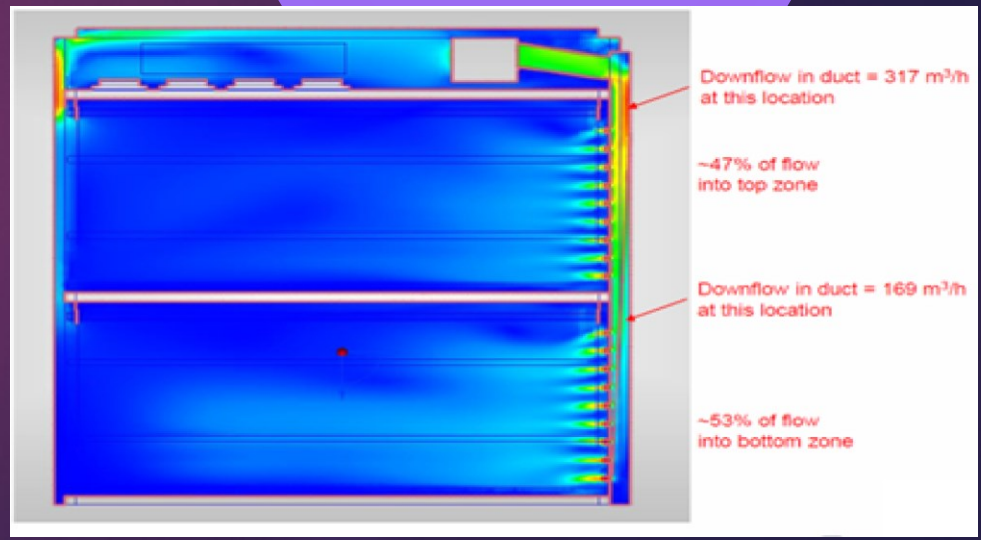
- Use Solidworks Flow Simulation to run simulation
- Collect results and optimize CAD design

RESULT?

- Air distribution close to 50% to 50%
- Air velocity meets the plants requiremnts







2. Robot Work Cell Design

WHAT?

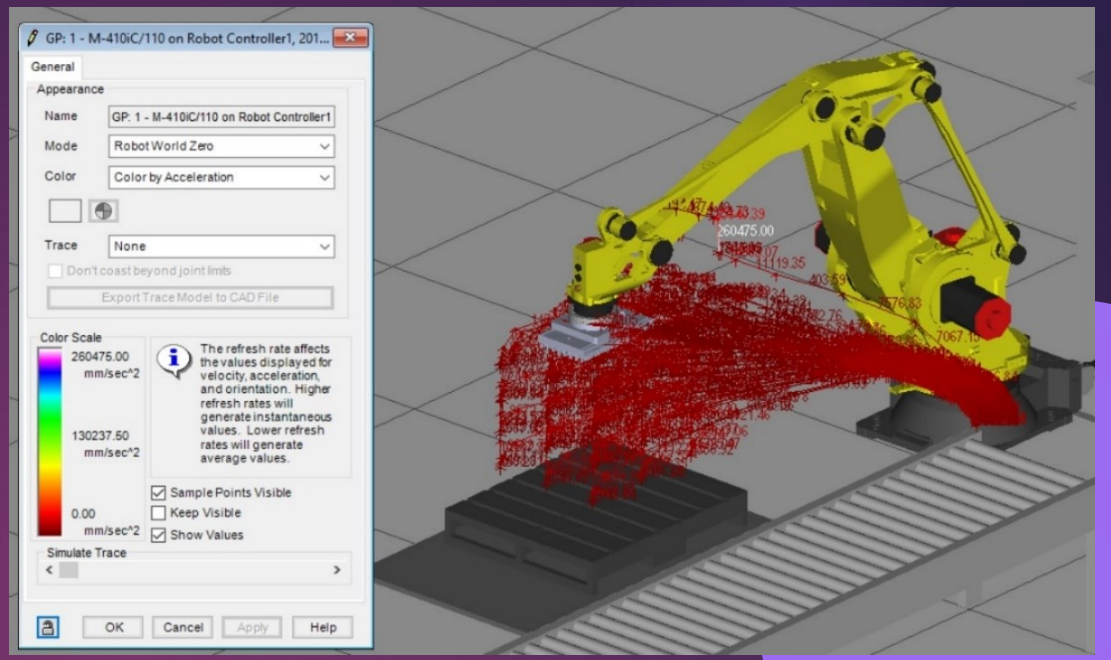
- Design a robot cell to complete a palletizing tasks
- Input conveyor and palletizing area is 2 meters long
- The weight of each card box is 5 kilograms

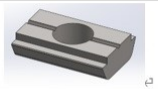
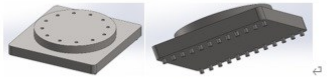
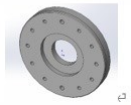
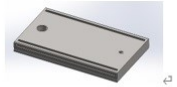
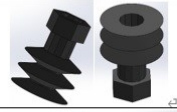
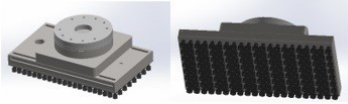
HOW?

- Create appropriate robot path
- Dynamics analysis
- Design end effector using Solidworks
- Create PLC diagram
- Develop G Code

RESULT

- Robot cell is able to complete the task



	Picture
1.Bolt	
2.Holding Brick	
3.Holding Part	
4.Robot Gripper	
5.Vacuum Gripper	
6.Assembly (Total Mass: 5.8 KG)	

Dynamic Calculations

- The force needs to be generated, for the lateral movement, $F_{lateral} = M * \frac{(g+a)}{\mu} * s$

-M: Box weight(kg) -g: Gravity (m/s^2)
-a: Robot Acceleration (m/s^2) -μ: Friction Coefficient -S: Safety factor

M = 5 kg
g = 9.8 (m/s^2)
a = 14 (m/s^2)
μ = 0.7 (cardboard friction coefficient)
S = 2

$F_{lateral}$ = 5 kg * $(\frac{9.8\,(m/s^2) + 14\,(m/s^2)}{0.7})$ * 2 = 340 (kg*m/s^2)

$P_{lateral} = \frac{F}{A} = \frac{340\ (kg * m/s^2)}{145\ (suction\ cups) * 4.729 * 10^{-5}(m^2)} = 49584\ (N)$

In total, I have 238 cups, total Newton I need is $\frac{49584\ (N)}{145} * 238 = 81386.15(N)$

81386.15 (N) = 11.8040 (PSI)

I need an air compressor to at least generate 11.8040 (PSI) for lateral direction.

- The force needs to be generated, for the vertical movement, $F_{vertical} = M * (g + a) * s$

-M: Box weight(kg) -g: Gravity (m/s^2)
-a: Robot Acceleration (m/s^2) -S: Safety factor

M = 5 kg
g = 9.8 (m/s^2)
a = 8 (m/s^2)
S = 2

$F_{vertical}$ = 5 kg * [9.8 (m/s^2) + 8 (m/s^2)] * 2 = 178 (kg*m/s^2)

$P_{vertical} = \frac{F}{A} = \frac{178\ (kg * m/s^2)}{145\ (suction\ cups) * 4.729 * 10^{-5}(m^2)} = 25958.68\ (N)$

In total, I have 238 cups, total Newton I need is $\frac{25958.68\ (N)}{145} * 238 = 42608.04(N)$

42608.04 (N) = 6.179(PSI)

I need an air compressor to at least generate 6.179 (PSI) for vertical direction.

Result:

Lateral PSI: 11.84(PSI)
Vertical PSI: 6.179(PSI)
The air compressor needs to generate 12 PSI to not let the box drop.
The air compressor I select which can generate 120 PSI, in this way we can know that the robot can carry the box without dropping the box.

3. Coding – Python

RESULT

- Able to mange a random CSV data into a usable file which can generate different visualizations based on different request.
- Initiate to develop an automation process using Python to generate DXFs of PCB outlines, holes, and trenches from Altium into JSON with software development department

1. Explore/Read and Scrub DataSheet

```
#import some libraires into Jupyter Notebook
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

```
#!head Parking_Violations_Issued_Year_2017.csv -n 10
```

```
nyc_df = pd.read_csv("NYC Tickets.csv", encoding='cp1252')
```

```
#make sure the file is implemented
nyc_df.head(3)
```

	Summons Number	Plate ID	Registration State	Plate Type	Issue Date	Violation Code	Vehicle Body Type	Vehicle Make	Issuing Agency	Street Code1	...	Days Parking In Effect	From Hours In Effect	To Hours In Effect	Vehicle Color	Unregistered Vehicle?	Vehicle Year
0	5092469481	GZH7067	NY	PAS	7/10/2016	7	SUBN	TOYOT	V	0	...	NaN	NaN	NaN	GY	NaN	2001
1	5092451658	GZH7067	NY	PAS	7/8/2016	7	SUBN	TOYOT	V	0	...	NaN	NaN	NaN	GY	NaN	2001
2	4006265037	FZX9232	NY	PAS	8/23/2016	5	SUBN	FORD	V	0	...	NaN	NaN	NaN	BK	NaN	2004

3 rows × 40 columns

```
#check the data shape, how manny rows and columns
nyc_df.shape
```

```
(99999, 40)
```

```
#want to make sure if that works or not
test1 = nyc_df['Issue Date'].dt.day_name()
test2 = nyc_df.loc[2, 'Issue Date'].day_name()
print(test1);
print(test2);
```

```
0           Sunday
1           Friday
2          Tuesday
3        Wednesday
4           Monday
           ...
99994      Tuesday
99995      Tuesday
99996       Monday
99997       Friday
99998    Wednesday
Name: Issue Date, Length: 99999, dtype: object
Tuesday
```

```
#create a new column called "DayOfWeek"
nyc_df['DayOfWeek'] = nyc_df['Issue Date'].dt.day_name()


#for this plot, I can find out which days people get the tickets most often
day_order = ["Monday","Tuesday","Wednesday","Thursday","Friday","Saturday","Sunday"]
nyc_df['DayOfWeek'].value_counts().loc[day_order].plot(color = 'black');
nyc_df['DayOfWeek'].value_counts().loc[day_order].plot(kind='bar', width = 0.5, color = 'orange', figsize = (7,7));
```