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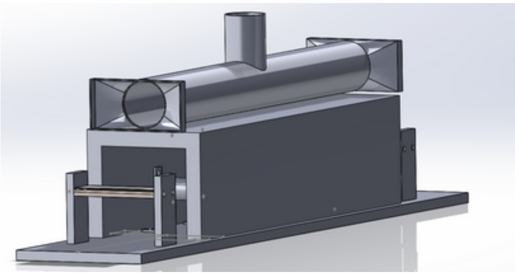
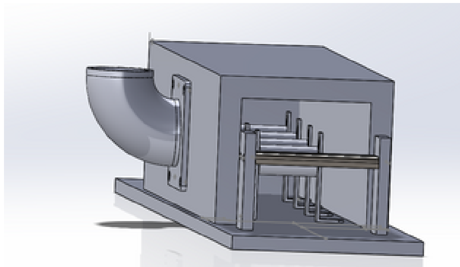
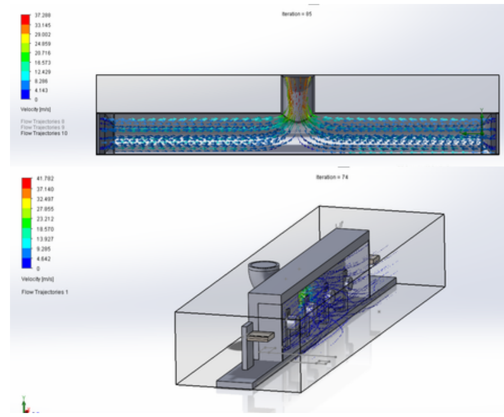
NMC VENTILATION IMPROVEMENT







What?

- Developed a permanent ventilation solution for the NMC coater used in cathode production, addressing user safety concerns caused by temporary ventilation.
- Enhance system efficiency to surpass the previous velocity rate of 2.3 m/s and achieve the lab-standard ACH rate.

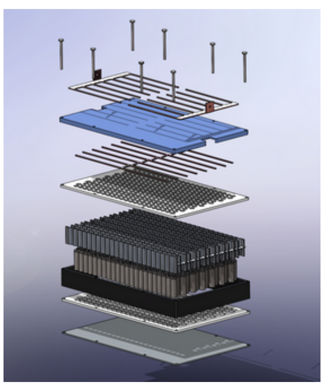
How?

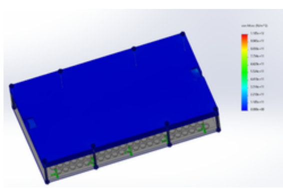
- 3D designed current coater assembly using Solidworks
- Calculated and modeled possible venting routes using **Bernoulli princples** and **CFD simulation**

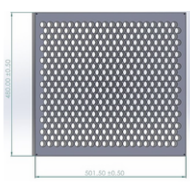
Results

- Engineered an optimized 90-degree elbow design for installation, enhancing airflow velocity to **24 m/s** and meeting ACH laboratory standards.

BATTERY MODULE DESIGN - BATTERY WORKFORCE CHALLENGE







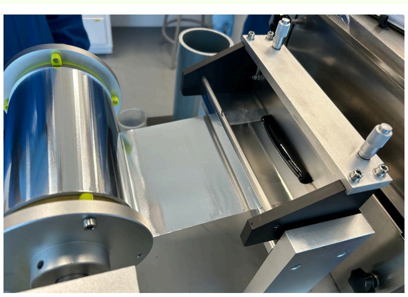
What?

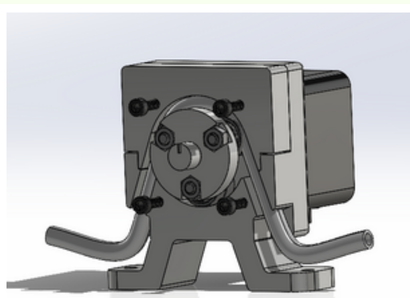
- As a mechanical design member, I worked on the conceptual and design stage of developing the battery module, cell holder, serpentine tubing and material research

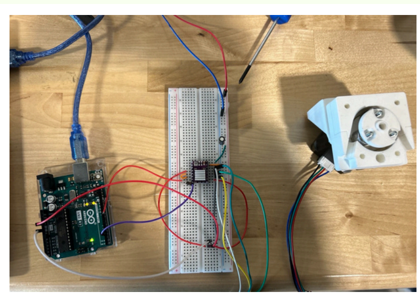
How/Results

- Used **SolidWorks** to design the module assembly, using parametrics for team accessibility
- determined PC filament selection for cell holder ensuring flammability and structural load criteria are met

COATER PUMP AUTOMATION







What?

- User has to pour 10ml chemical mixture into roller assembly manually for 3 minutes, causing quality concerns and slower production time
- Develop a method that automates pouring the mixture into assembly to reduce production time and improve quality

How?

- Research pump methods to achieve volumetric flow of 0.08ml/s
- Design and prototype using 3d printing and Ardunio
- Perform cycle testing to determine failure rate

Results

- Developed a peristaltic pump using a stepper motor and 3D printed assembly, producing a dispense of **0.1 ml/s** consistently in **1 min 30**
- Improved production time by **50%**
- quality issues have reduced by **15%**

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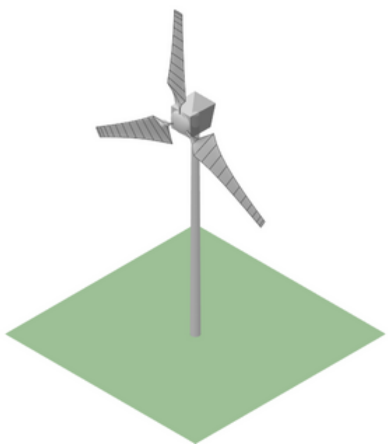
WIND TURBINE DESIGN - CASE STUDY

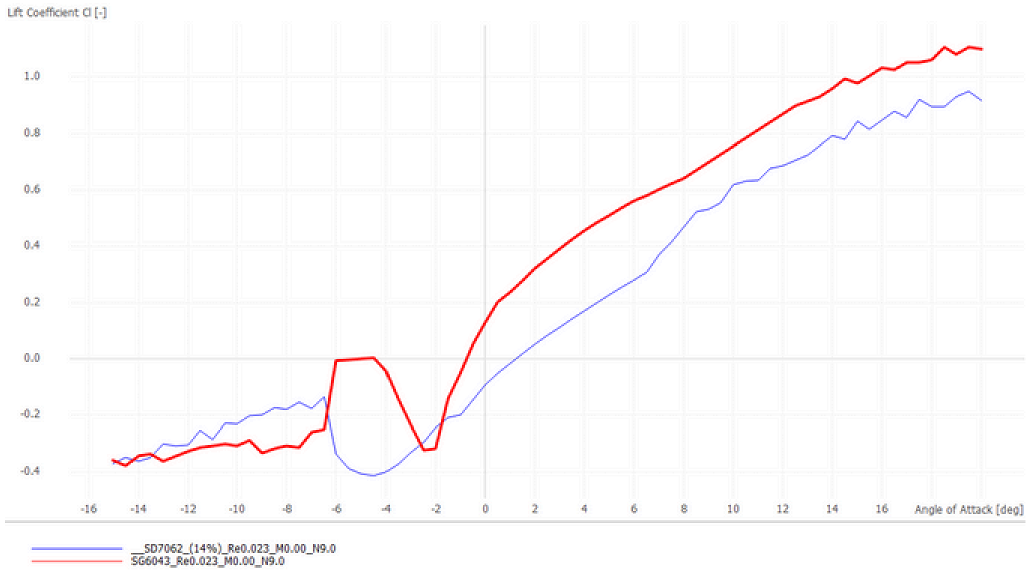
Objective

- Create a wind turbine design, simulating the potential power (Watts) to see if this idea is feasible

Design Criteria

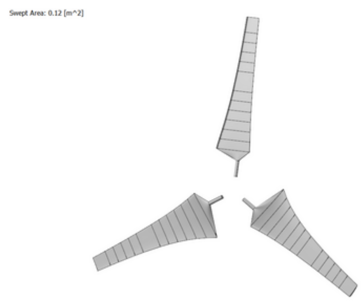
- Tip speed ratio of 5-7
- Turbine to exhbit power output > 1 Watt with wind velocites of 15 m/s
- Within restriction of 20cm rotor diameter

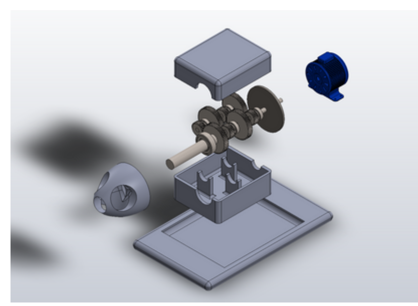




Airfoil Analysis (Research)

- analyzed 2 applicable airfoil models using **Q Blade** for wind velocities between **15-30m/s**, ensuring the design phase references the most optimal airfoil, to allow max Clift/Cdrag, power(watts), RPM and tip speed ratio.



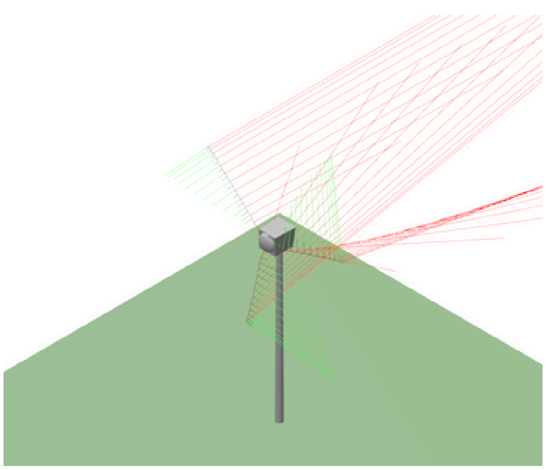


Problem Statement

- Skateboarders have restricted access to possible electrical outlets, resulting in phone batteries being uncharged.
- Skateboarding produces high wind velocities **up to 30m/s** that are unused and I believe can be converted to electrical energy for possible trickle charging for devices.

Blade and Gear box Design

- Designed assembly with **Solidworks**, utilizing airfoil reference SG6043
- Created an assembly of the turbine hub composed of; gear assembly, housing, shaft and electrical generator
- Ensured DFM principles to allow possibility of additive manufacturing
- Total hub and rotor design followed within design criteria of 20cm for diameter and chord height of turbine blade



Testing/Results

- Achieved simulation utilizing **Qblade** for power calculation of turbine, and **ANSYS** for RPM and CFD analysis
- Achieved a theoretical power output of **3.36 Watts/second with a tip speed ratio of 5.4**

What Did I learn!

- This project exemplified the potential of further developing a device capable of utilizing wind velocities when I skateboard, providing an understanding of product design phases, aerodynamics and mechanical design.
- Next Steps are to prototype using additive manufacturing!

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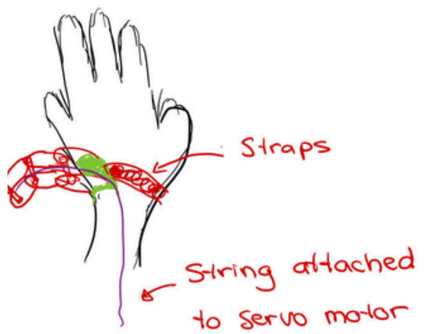
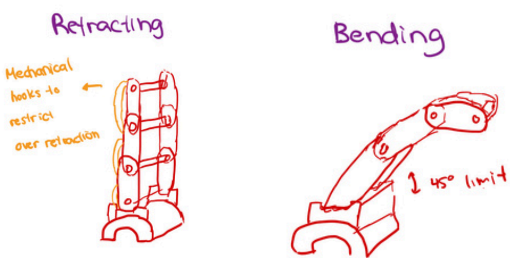
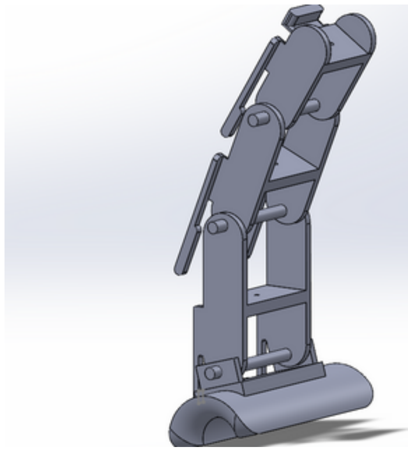
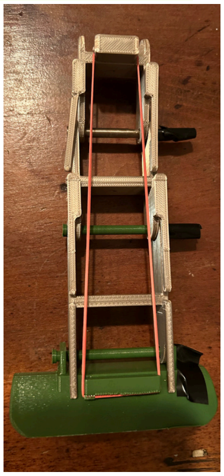
MECHAFINGER - PERSONAL PROJECT









What?

- I have a family member who is unable to firmly grip objects due to their hand injury, I wanted to design a robotic prosthetic to assist grip strength and add dexterity

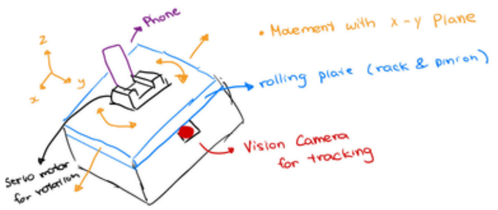
How?

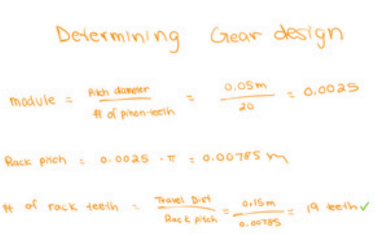
- Research and sketched possible linkage designs with **1 DOF**
- Designed linkage design with Solid works, with the criteria being, **lightweight, feasible for 3D printing and ergonomic**
- Utilized Arduino for a servo motor based ligament system

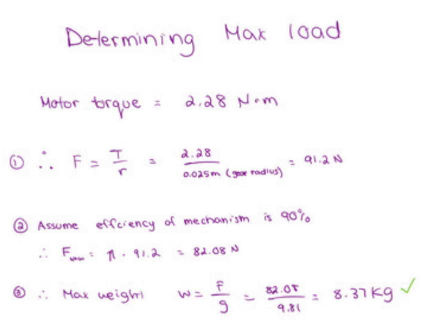
Results

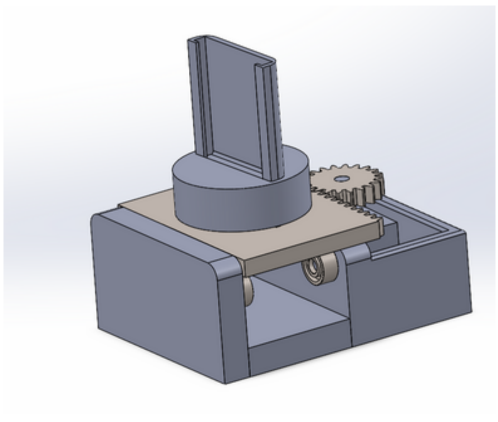
- Successfully able to aid in picking up **objects within 1kg**
- Next steps would be to improve grip strength through selecting materials with higher yield strength and testing new manufacturing methods

MOTIONMATE - PRODUCT DESIGN (WORK IN PROGRESS)









What?

- People using social media, or involved with content creation depend on people to film for them, tracking there movement within a set frame. This product resolves this issue of human aid by creating an automated system to track yourself when recording

How?

- Researched methods of linear and rotational movement through motors
- Complete **gear analysis** to determine necessary torque required to complete both rotations within the X-Y plane
- Design and 3d print protype using **Solidworks**
- Develop code for integrated **computer vision system**

Results

- Developed prototype design for 3d printing
- Calculated a feasible servo motor torque and gear pitch to handle a **maximum of 8.6kg**

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HOOD JIG DESIGN - TOYOTA MOTORS

What?

- Hood jigs are utilized for the assembly line, Team members place the jig in to access the hood of the vehicle in the production line
- Every month, **15 of the 40 hood jigs are needed to be repaired**, causing downtime
- Design a modification to reduce failure rates

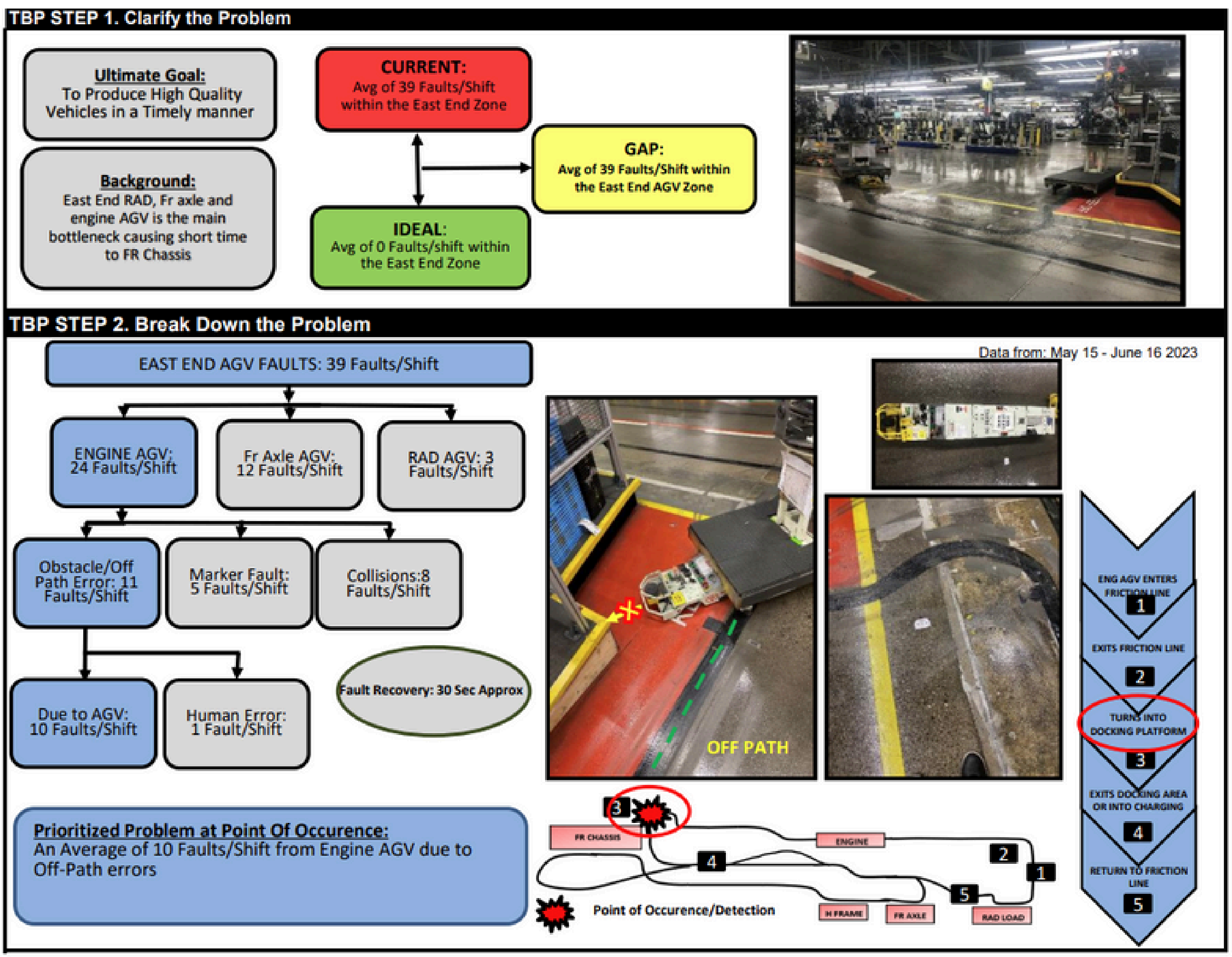
How?

- 3D modeled a hood jig tip that is replaceable, instead of a fixed shaft that is needed to be machined
- Simulated and tested tips to ensure material selection is durable for stress conditions and impact overtime

Results

- Successfully implemented and standardized a 3d printed hood jig tip that can be replaced continuously during production, with a 50% reduction on failure rates per month
- Achieved cost savings of **$5,000** by optimizing existing jigs, eliminating the need for new purchases

ENGINE LINE DEVELOPMENT - TOYOTA MOTORS



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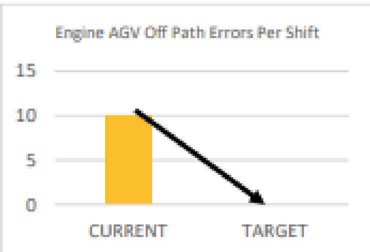
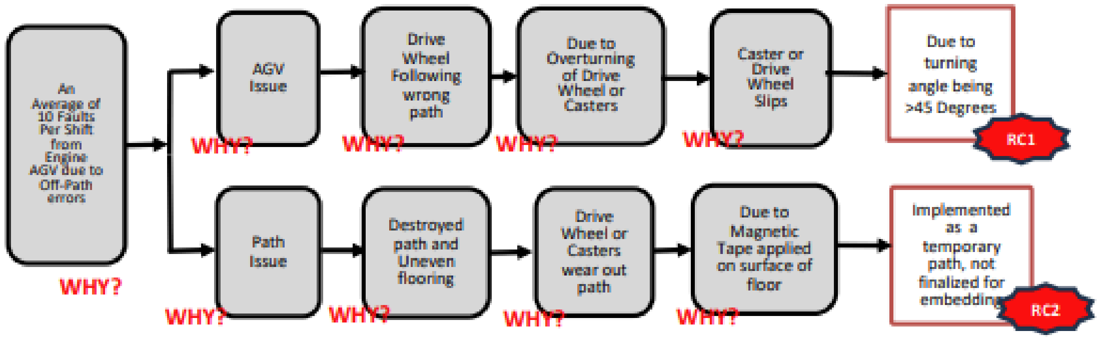
ENGINE LINE DEVELOPMENT - TOYOTA MOTORS

TBP STEP 3. Set Target

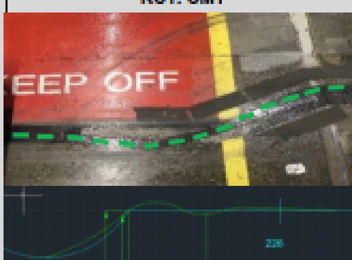
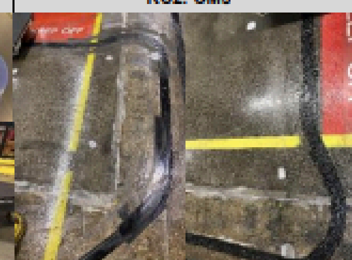


Target: Eliminate the 10 Faults Per shift by August 25th 2023

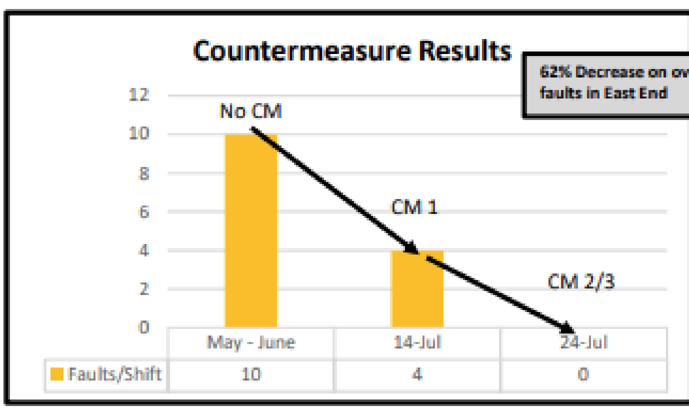
TBP STEP 4. Root Cause Analysis



TBP STEP 5/6. Develop/Implement Countermeasures

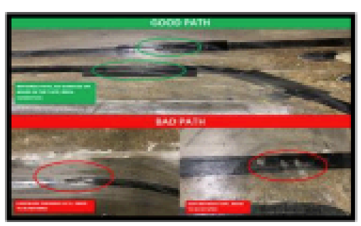
	RC1: CM1		RC1: CM2		RC2: CM3		Not Feasible	
Countermeasure Images								
Description	Reduce the Turning angle from 50 to 30 Degrees		Upgrade Casters from single to double wheeled set		Embedding magnetic path and leveling floor.		Redesign Pathway further into G Street to remove the turn transitioning into platform	
Productivity/Safety	-Reduces off path occurence - Does not interfere with G Street Traffic	O	- Reduces offsets and wheel jams - Improves Stability and Traction	O	- Protect Magnetic Tape -Strengthen Magnetic Signal -Levels flooring out	O	-Resolves overturning -Gradual turn for dolly and AGV, -Interrupts Conveyance Process	X
Lead Time	2 Weeks	O	3 Weeks	O	1 Week	O	2 Weeks	O
Cost/Manpower	$300/No added Manpower	O	$850(For New Casters)/Maintenance	O	$2010/Gryphon	O	$300(additional $2010 if embedding by Gryphon)/No added Manpower	O
Overall	Implementation done July 14th	O	Caster trial completed July 24	O	Implementation Done July 24th	O	Not Feasible	X

TBP STEP 7. Results and Process Evaluation with TBP Step 8. Standardization and Yokoten



62% Decrease on overall faults in East End

Embedded and Reduced Turning Point from 50 to 30 Degrees



Standardization + Yokoten

1. Maintain weekly PFS with Engineering,Production and Maintenance - Track AGV faults, marker location and AGV number.
2. Regular magnetic tape Inspection per shift.
3. Documentation on good vs No good path conditions, share with stakeholders.

Analysis of Personal Objectives

Analysis of Personal Objectives	Eval.
1. Utilize and improve my critical thinking, through various projects in assembly and production	O
2. Aim to improve communication skills and effectively express solutions	O
3. Further improve my understanding of the manufacturing processes in assembly	O