Project Portfolio

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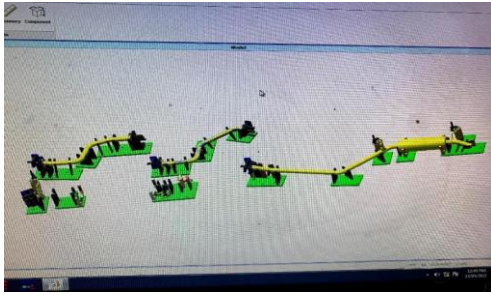
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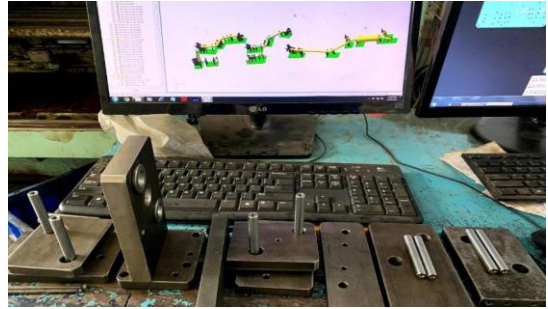https://www.linkedin.com/in/prathmesh-vipra

Chicago

Project 1: Fixtures Design and Manufacturing

3-D CAD Model

Assembly Process

Objective/Aim

- Major project completed during internship at BAPL, Pune, India.
- Design, manufacturing, assembly and quality control of Piping Welding Fixture Assembly.
- Understanding special customer (Faurecia Company) needs and modifying design accordingly.

Technical Details

- Designed and drafted parts for piping fixture assembly using Creo and SolidWorks.
- Fixture used for welding of exhaust piping assembly.
- Coordinated part manufacturing and managed manufacturing process (Milling, Drilling, VMC, CNC) of product parts.
- Performed 3-D dimension error minimization using Coordinate Measuring Machine (Autodesk Inspect Software).
- Conducted quality control checks and made quality reports for product parts.
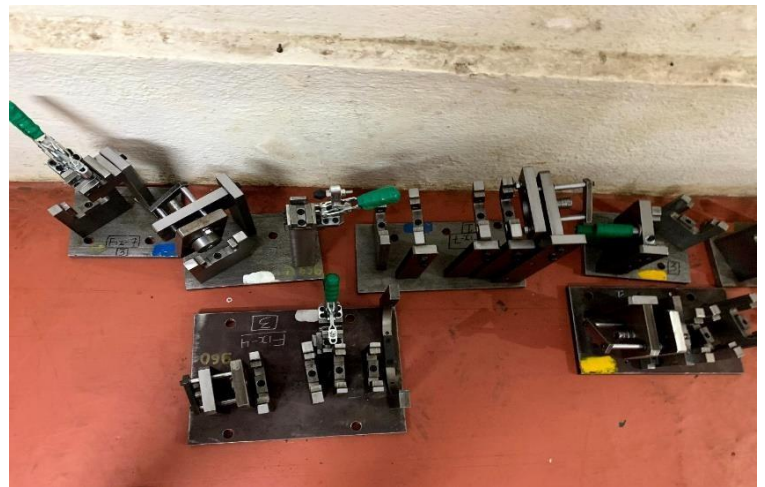
Outcomes/Result

- Successfully designed and drafted parts for the piping welding fixture assembly.
- Created a priority list for part manufacturing resulting in faster assembly process.
- Solved doubts for machine operators regarding part drawings and machine operations.
- Solved part assembly errors and oversaw assembly operations while providing solutions for dimension and fit issues.
- Minimized errors in 3-D dimensions to under 0.3mm using Coordinate Measuring Machine.
- Completed quality reports for all product parts.
- Successfully delivered finished product to customer under stipulated time.

Project 2: Onion Harvester Design Competition (SAE TIFAN)

3D Image of Vehicle Assembly
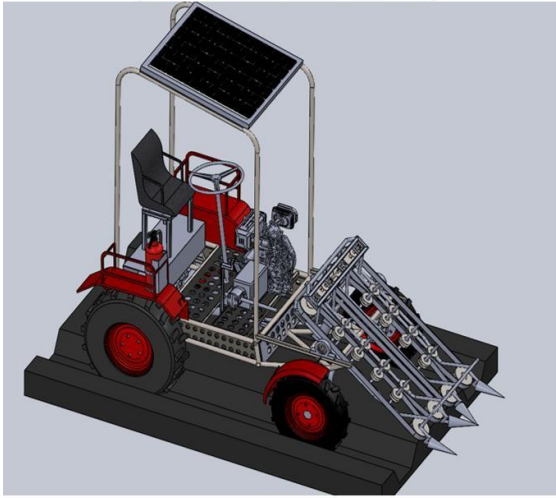
3D Image Of Mechanism
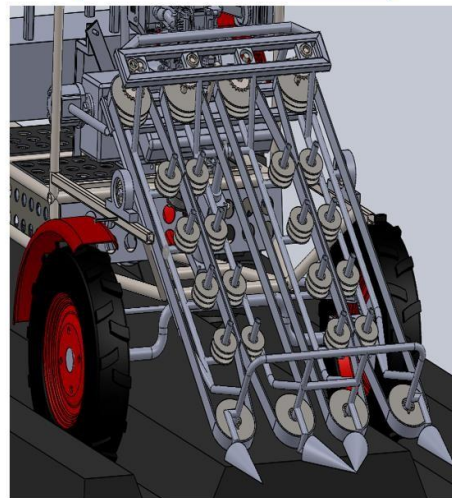
Objective/Aim

- TIFAN stands Technological Innovation Forum for Agricultural Nurturing – annual national level competition organized by Society of Automotive Engineers, India.
- The aim of the competition was to design and field test onion harvester machine while competing with teams from various universities throughout the nation.

Technical Details

- Fabricated a self-propelled onion harvester machine with an 8HP diesel engine.
- Designed a pulley driven belt system for harvesting the onions which runs on a hydraulic pump running from the PTO shaft of the gearbox.
- Used a hydraulic actuation system to adjust the height of the harvesting mechanism.

Outcomes/Result

- Successfully demonstrated actual working of the harvester in the TIFAN competition and presented the design.
- Promoted from Chassis Design Head to Vice Captain of the team.
- Lead college team of 20 members in the annual national competition twice.

Project 3: Design and Development of a Core-XY 3D Printer
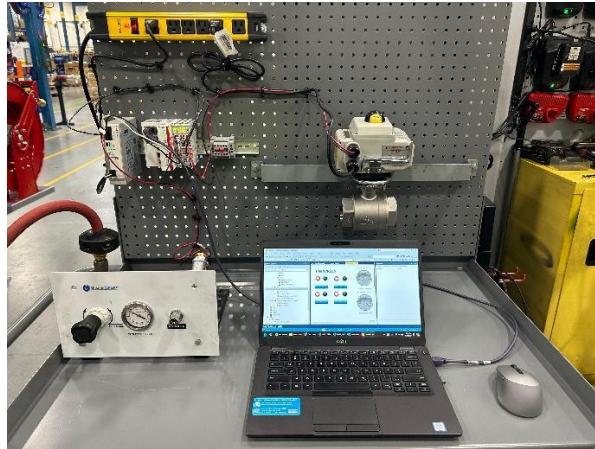

Objective/Aim

- Designing a **Core-XY 3D Printer** using SolidWorks with modularity and future upgradeability.
- Enhancing print quality and speed using a **high-rigidity frame and input shaping**.
- Enabling **multi-material printing** with a swappable toolhead system.
- Optimizing the **Bill of Materials (BOM), Cost Savings and manufacturability** using DFM techniques.

Technical Details

- Implemented modular architecture, allowing easy upgrades and seamless component swaps without major redesigns.
- Engineered a **high-rigidity frame** to withstand high acceleration forces, leveraging **input shaping** for vibration compensation.
- Used a hydraulic actuation system to adjust the height of the harvesting mechanism.

Electrical Parts   **Bill Of Material with Total Cost and equipment link to buy**

Hardware	M2x10mm self tapping screws	6	Local hardware store	
Hardware	M3 T nuts for 20x20 profile	37	Local hardware store	
Hardware	M3x6mm socket head screws	12	Local hardware store	
Hardware	M3x8mm socket head screws	70	Local hardware store	
Hardware	M3x8mm socket head screws	6	Local hardware store	
Hardware	M4 Nuts	8	Local hardware store	
Hardware	M4 T nuts for 20x20 profile	25	Local hardware store	
Hardware	M4x10mm socket head screws	12	Local hardware store	
Hardware	M4x16mm socket head screws	4	Local hardware store	
Hardware	M4x45mm socket head screws	8	Local hardware store	150
Hardware	M4x6mm socket head screws	8	Local hardware store	
Hardware	M4x8mm socket head screws	18	Local hardware store	
Hardware	M5 T nuts for 20x20 profile	6	Local hardware store	
Hardware	M5x10mm buttonhead	17	Local hardware store	
Hardware	M5x16mm buttonhead	8	Local hardware store	
Hardware	M5x18 Hex Screw with Nut	1	Local hardware store	
Hardware	M5x30 socket head screws with bolts	8	Local hardware store	
Hardware	M4 Thumb Nuts	3	https://www.amazon.com/x16d560d0ced081-M4x12mm-Stainless-Leveling-Fasteners/dp/B01KVL642F?th=1&keywords=M4+thumb+nut+stainless&qid=1627861757	9
Hardware	M4x20 Flat head screw	3	Local hardware store	2
Misc	3x3 round magnets	2	https://www.amazon.com/200PCS-Magnets-3mmx3mm-Neodymium-Permanent/dp/B08P65KXP7 ...	8
Misc	Aluminium bed	1	https://mandalorianworks.com/products/voron-360-standard-bed	142
Misc	DIN 7 rail 1 meter	1	https://www.amazon.com/Slotted-Design-Mounting-Length-Width/dp/B01V50C4GW	8
Misc	310x310 PEI build surface with magnetic sticker	1	https://www.aliexpress.com/i/32568517410536028.html?gatt=1&gatewayAdapt=4ItemAdap	13
Misc	Acrylic sheet 1000x1000x4mm/Poster Board	6	Dollar store or any general store	50
Motion	Full Gantry motion system kit	1	https://www.aliexpress.com/item/32558039641296600.html?spm=a2g0o...	153
Motion	MGN9 Linear rail with block 300mm	3	https://www.aliexpress.com/item/32558039 ...	15
Motion	MGN9 Linear rail with block 400mm	3	https://www.amazon.com/Linear-Sliding-Guideway-Printer-Machine/dp/B08JKHGMP5?th=1	72
Electronics	NEMA14 36MM 20MM Mount	1	https://triplelab.net/products/moons%E2%80%99-nema14-stepper-motors	16

Printed parts List	Print settings	Total cost (approximation)		
2 Motor Mount L		Parts to Buy		1292.88
2 Motor Mount R		Printing		150
Motor Mount Rear		Total		1442.88
Feet FL	4 walls. 4 top layers 4 bottom layers and 60% infill. Material should be ABS variants.			
Feet FR				
Feet RL		**Notes**		
Feet RR		1)Printing cost would be around the price of 1kg of filament if we print it ourselves(approximation based on weight).		
Corner Brackets x14		2) Actual price can be + 150 USD		

Outcomes/Result

- Achieved a future-proof 3D printer design with easy component upgrades.
- Improved printing speed dend accuracy by minimizing vibrations and enhancing motion stability.
- Enabled multi-material capability, expanding printing applications and usability.
- Optimized manufacturing efficiency by refining the BOM and using DFM principles.

# Project 4: PLC based Automated Product Testing

Objective/Aim

- Automated compressor product testing with data monitoring and collection.
- Implementing a fluid dispensing system with automated tracking to optimize resource utilization.
- Integrating PLC, HMI, SCADA, and MES/ERP systems for real-time data analysis and reporting.

Technical Details

- Designed a **PLC-automated station** for compressor product testing, collecting and monitoring data for **30+ products** using **SCADA**.
- Developed an **automated fluid dispensing station** that tracks daily usage and optimizes resource allocation, leading to an estimated **$100K annual savings**.
- Integrated **HMI and SCADA** for real-time data visualization, enabling operators to monitor key parameters efficiently.
- Configured **MES and ERP data connectivity**, ensuring seamless data flow across production and business systems.
- Automated data logging and analysis using **Excel graphs**, enhancing reporting accuracy and trend analysis.
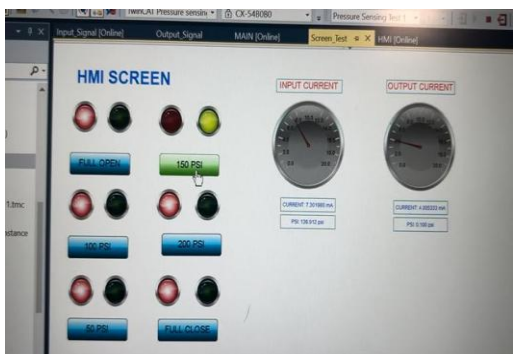
Outcomes/Result

- Achieved **fully automated and monitored product testing** with enhanced process visibility.
- Enabled **real-time tracking of fluid dispensing**, reducing material waste and improving cost efficiency.
- Improved **data-driven decision-making** by providing structured reports and graphical insights for process optimization.

Project 5: Ladle Tracking System

Objective/Aim

- Tracking the lifecycle of molten metal carrying crucible (Ladle).
- Designing automatic ladle replacement alert on a single device.
- Tracking position and movement of all the ladles in the foundry.

Technical Details

- Designed a RFID based tracking system for molten metal carrying crucibles (Ladle) in the foundry.
- Each ladle is attached to an RFID tag with a unique ID. RFID tag readers connected to a Node MCU controller are placed at all the movement sites in the foundry.
- When a ladle movie past the RFID tag, the reader reads the unique ID and records the location of the ladle.
- The Node MCU controllers are connected to servers via Wi-Fi connection.
- The Blynk app stores all the data on its server and is accessible from any device such as smart phones, computers, etc.
- A number of times a particular ladle is used is tracked using the RFID tags and lifecycle of the Silicon Carbide coating is tracked. Once the life of the coating runs out, Blynk app notifies us with a warning to replace the ladle.

Outcomes/Result

- Successfully made a small-scale working prototype of the system in the lab using Arduino coding and Blynk app.
- Able to track ladle lifecycle and position on the Blynk app on the smartphone.

# Mini Project: Engine Heat Shield Drill Jig

- Modelled the drill jig in Creo parametric software as part of internship at BAPL Pvt. Ltd.

- Assembled the drill jig using Creo View Express and dowels and bolts.
- Tested the part fitting in the jig and making few machining operations to ensure constraint in motion.

Mini Project: Hose Crimping Fixture

- Took CMM readings of hose crimping fixture using Arm type Coordinate Measuring Machine.
- Analysed the readings and reduced the deviations of the actual prototype from the model using shims and machining operations.
- Completed the project during the training phase of internship at BAPL Pvt. Ltd.
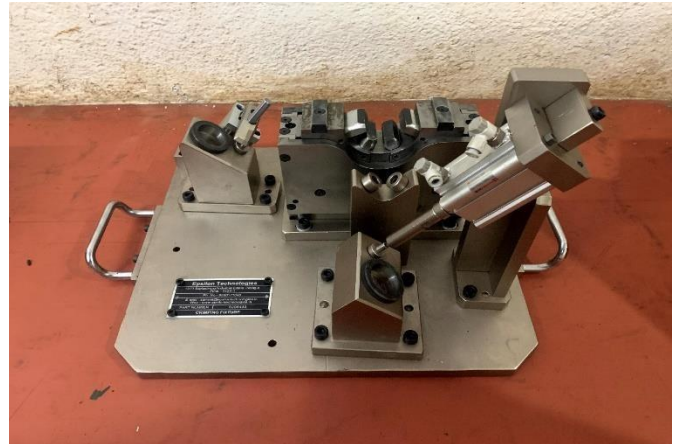

Mini Project: Hose Crimping Fixture

- Interpreted the circuit diagram and assembled the entire pneumatic circuit.
- Used solenoid actuated DCVs which were used to actuate cylinders for clamping of the part which needed to be tested for leakage.
- Completed the project during the training phase of internship at BAPL Pvt. Ltd.
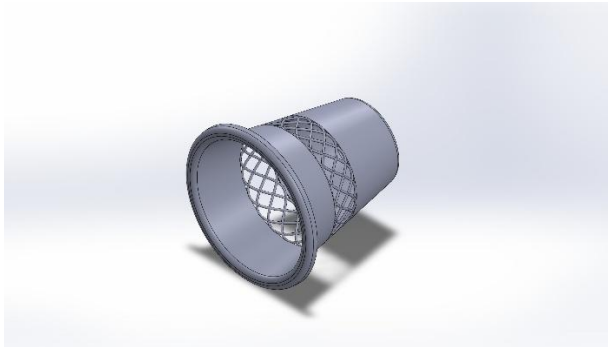
Course Projects and Miscellaneous
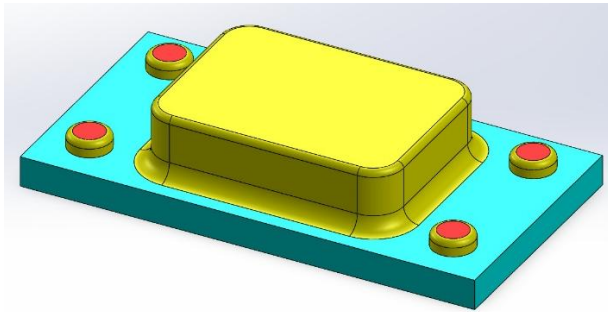
Sheet Metal Forming Mold
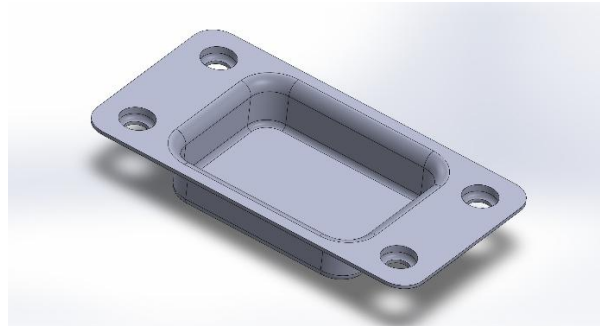
Design Sheet Metal Final Part

Dustbin

Eyebolt

Spanner

Geartrain