Project Portfolio

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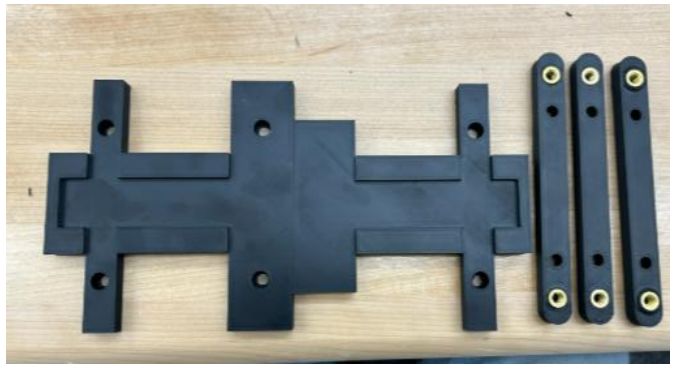
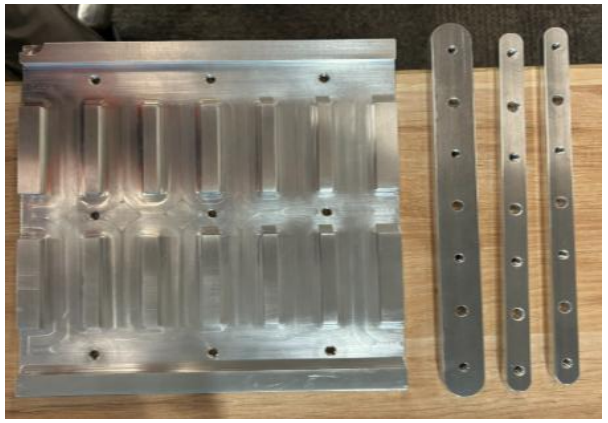
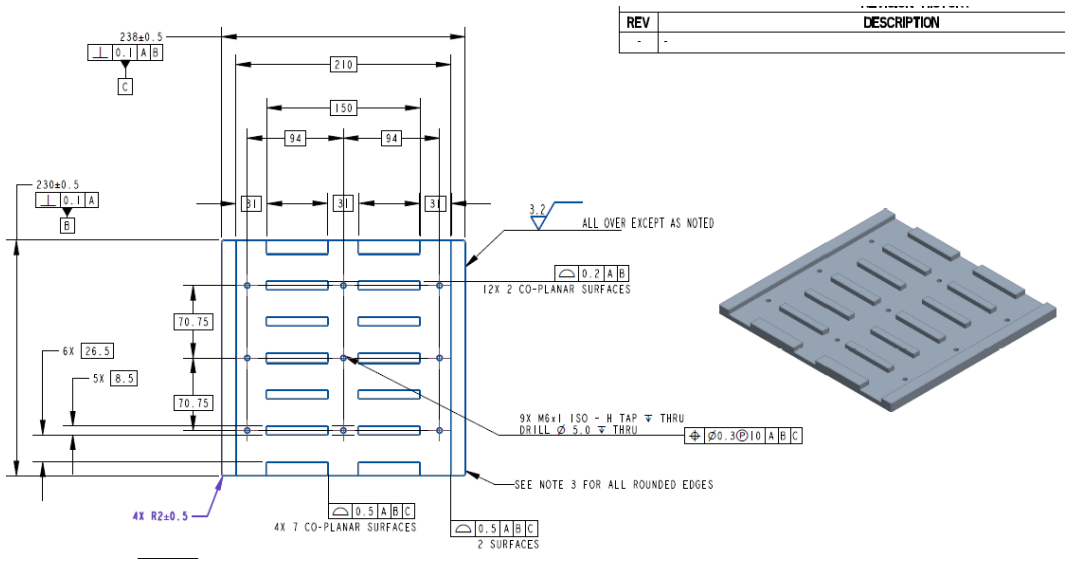
MECHANICAL PROJECTS

Jig for Preparing Test Samples

- **Situation:**
  Manual preparation of test coupons for mechanical validation resulted in inconsistent geometry and poor repeatability.
- **Task:**
  Design a repeatable jig to produce uniform test samples for adhesive and mechanical tests.
- **Action:**
  Modeled jig components in Creo, applied GD&T, optimized material selection, and iteratively improved 3D-printed prototype for strength and manufacturability before transitioning them to machined parts
- **Result:**
  Reduced sample preparation time by 40% and improved test result consistency across multiple trials.





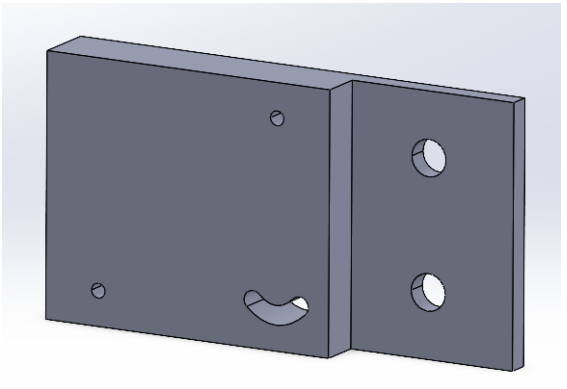


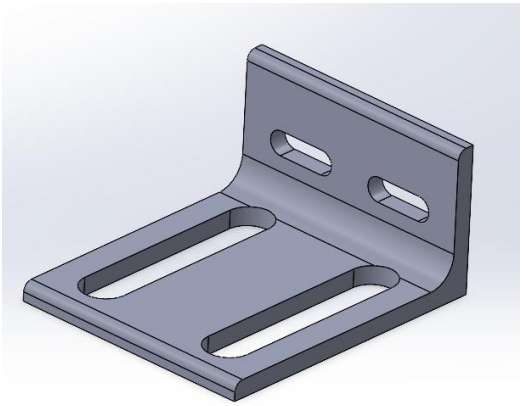
Fixture for Holding Product In-situ Conditions

- **Situation:**
  Product testing required maintaining specific positional and environmental conditions to simulate real-world operation.
- **Task:**
  Design a fixture capable of securely holding parts during in-situ mechanical and thermal testing.
- **Action:**
  Designed a modular holding fixture in Creo; ensured material compatibility with test environment; coordinated fabrication and integrated with test equipment.
- **Result:**
  Enabled realistic testing scenarios, improving data accuracy and accelerating product validation.

Brackets and Upgrades made to Test Bench

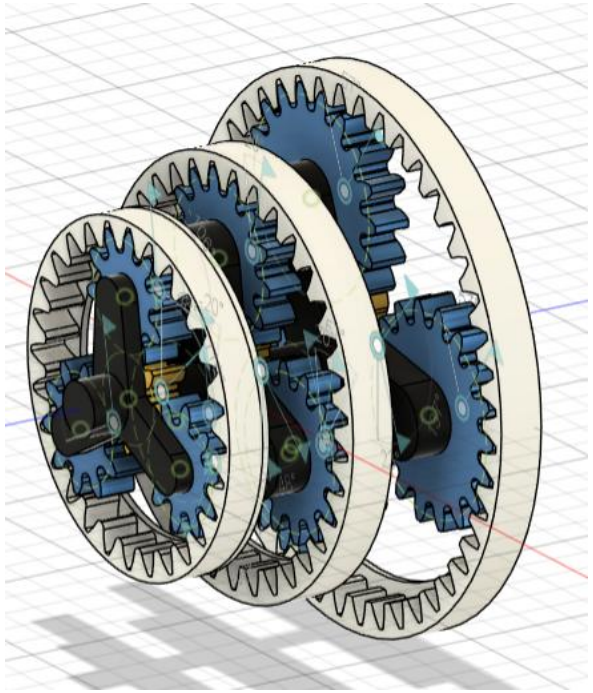
- **Situation:**
  The testing bench setup lacked rigidity, causing vibration and measurement errors during validation.
- **Task:**
  Improve bench stability and accuracy for test repeatability.
- **Action:**
  Designed new support brackets and reinforcements in Creo; made the bench modular using off the shelf parts; and validated upgrades by repeated testing and data analysis.
- **Result:**
  Improved fixture stiffness and reduced error margins, leading to more reliable test data and smoother operations.

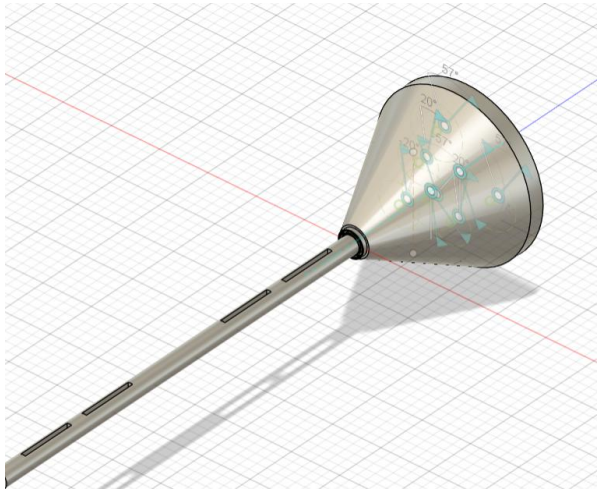


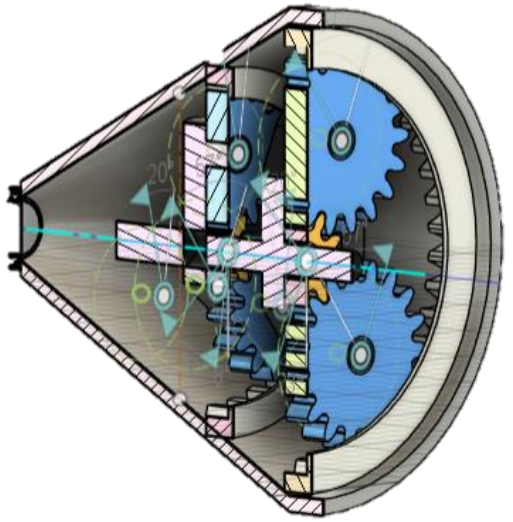


UBC Smart City: Step-Up Gearbox

- **Situation:**
  UBC Smart City team aimed to develop a carbon-neutral streetlight powered by a wind turbine to generate clean energy at low wind speeds.
- **Task:**
  Design an efficient transmission system to convert low turbine RPM into usable generator speed.
- **Action:**
  I created a 3-stage planetary–bevel gearbox using Autodesk Fusion 360; 3D printed the parts to test the torque transmission accuracy; collaborated with electrical and civil teams to integrate the system into the smart streetlight design.
- **Result:**
  Achieved 300× RPM multiplication enabling consistent energy generation at low wind speeds; contributed to a sustainable, net-zero streetlight prototype currently under development.

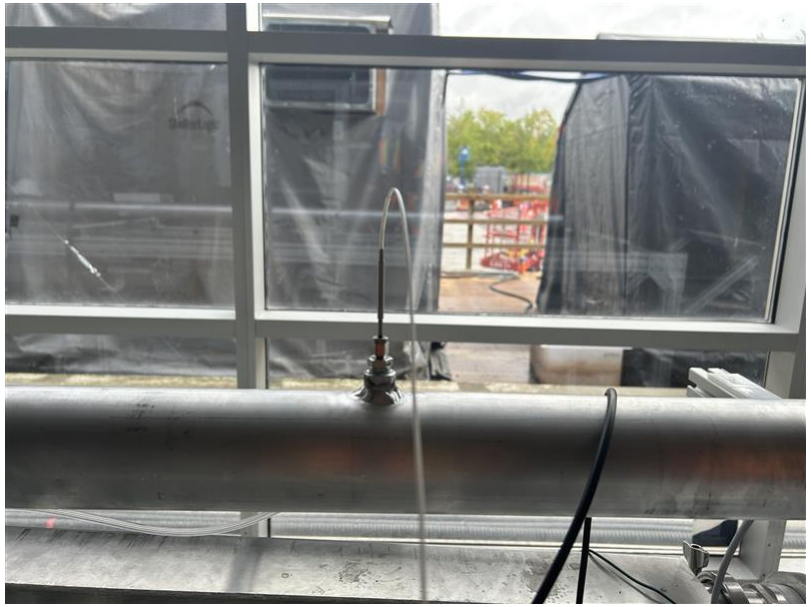






Hot Wire Anemometer Calibration

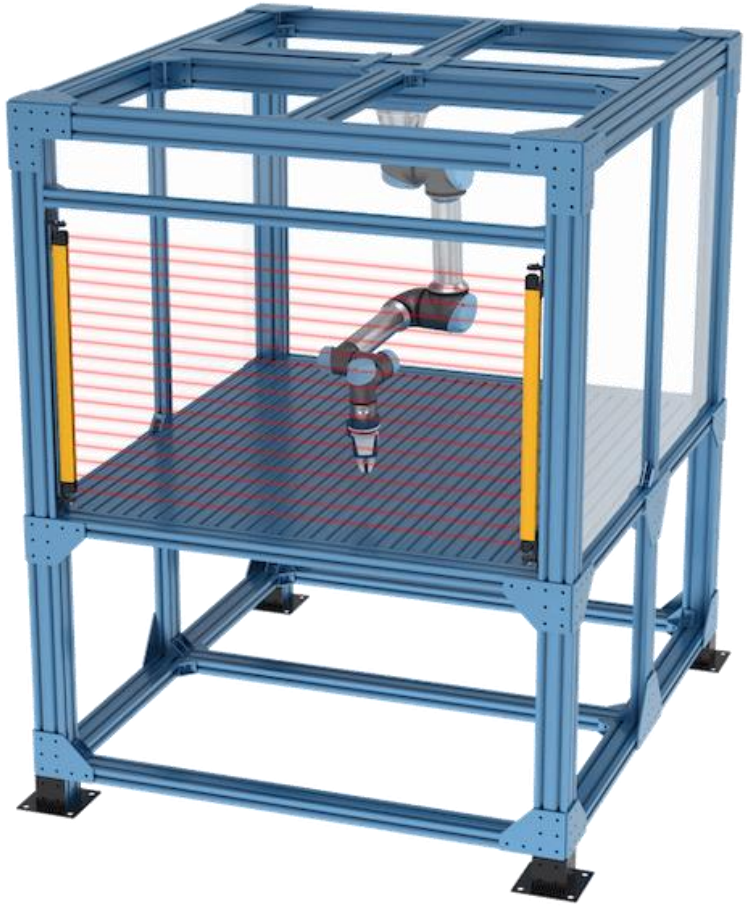
- **Situation:**
  Required accurate airflow velocity measurement for subscale product testing.
- **Task:**
  Calibrate a hot-wire anemometer to ensure precise velocity–voltage correlation under different conditions.
- **Action:**
  Integrated Omega velocity sensor with existing pitot, APT, and DPT sensors; wrote Structured Text in TwinCAT PLC; developed HMI interface for automated data collection.
- **Result:**
  Achieved accurate, real-time calibration with repeatable results, improving confidence in experimental data and system performance.



MANUFACTURING PROJECTS

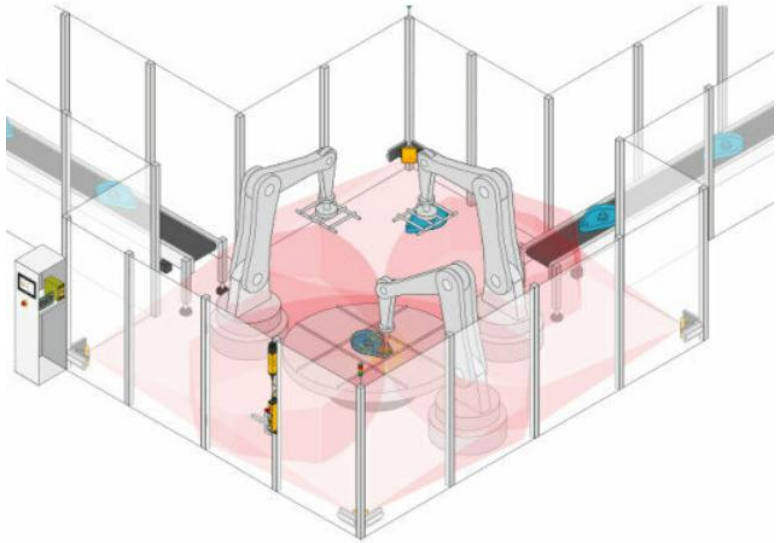
Enclosure for Shopfloor

- **Situation:**
  Inspection of manufactured parts was performed in a separate quality room, causing up to 3 days of delay and high scrap costs due to production bottlenecks.
- **Task:**
  Reduce inspection lead time and improve workflow efficiency by enabling on-floor quality checks without compromising the stability and accuracy of the measurement equipment.
- **Action:**
  Conducted a detailed Value Stream Map and time study to identify root causes of downtime; proposed relocating the inspection machine to the production floor; designed a temperature-controlled HDPE enclosure in Vention to ensure measurement accuracy under shop floor conditions; collaborated with suppliers and management.
- **Result:**
  Reduced inspection time from 3 days to **7 minutes**, eliminated unnecessary transport and waiting waste, and contributed to **$200,000 in annual scrap cost savings** through faster feedback and improved process flow.



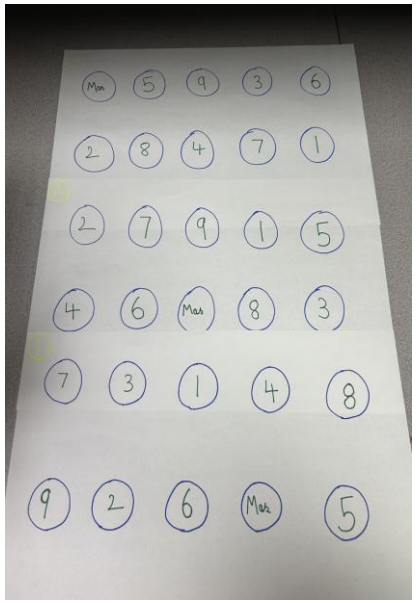
PSEN motion sensor radar

- **Situation:**
  Needed a safety system to detect personnel within cobot product assembly zones during mechanical testing.
- **Task:**
  Implement a reliable motion detection system integrated with the PLC for automated safety control.
- **Action:**
  Configured and programmed a PILZ PSEN motion sensor; implemented a state machine in Python for PLC communication; developed an HMI page for live safety status monitoring. Designed brackets in Creo for the sensors.
- **Result:**
  Enhanced operator safety by 100%; improved system responsiveness and reduced downtime from false triggers.



GR&R

- **Situation:**
  The QA department relied on inspection gauges that had been in use for years without revalidation, creating uncertainty around the accuracy and trustworthiness of measurement data.
- **Task:**
  Assess the reliability of existing measurement systems to determine if they still produced consistent and repeatable results across operators and devices.
- **Action:**
  Planned and executed a full GR&R study following MSA (Measurement System Analysis) methodology; collected data from multiple operators and measurement runs; analyzed repeatability and reproducibility using statistical tools to quantify variation.
- **Result:**
  Verified the capability of critical measurement gauges, ensured confidence in inspection data, and established a periodic verification process to maintain long-term measurement integrity.



Inspection Location	Sub Categories	%Contribution	Total GR&R (%Contribution)
Middle	Equipment Variation	24.69	34.14
	Appraiser Variation	9.18	
Top	Equipment Variation	12.76	13.95
	Appraiser Variation	1.79	
Bottom	Equipment Variation	47.15	47.79
	Appraiser Variation	0.64	

Wheels and Shell Manufacturing for RC car Remodeling

- **Situation:**
  A university design project required improving the performance and cost-efficiency of an existing remote-controlled car model.
- **Task:**
  Redesign major components to enhance performance, manufacturability, and aesthetics while minimizing overall project cost.
- **Action:**
  I led mechanical design using SolidWorks; designed new wheels and shell; I performed tensile and 3-point bending tests to select suitable chassis materials; 3D printed and thermoformed the shell for improved rigidity and finish.
- **Result:**
  Reduced overall cost by 26% and improved vehicle handling and durability.