MUERUS RODRIGUES

APPLICATIONS ENGINEER @ MILTERA MACHINING RESEARCH CORP.

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Kitchener, ON

SKILLS

CAD/CAM/CAI

- **Mastercam** : Custom Toolpaths, 3 + 2 and Simultaneous 5 Axis Programming for Aerospace and Automobile clients.
- **Solidworks** : Fixture Design for 3D Printing, Parametric Design.
- **GOM Inspect** : Inspection tool used for measuring Aerospace and Automobile applications, hydrogen fuel cell plates.
- **Rhino + Grasshopper** : Used for reverse engineering applications including grinding wheel orientation calculations.
- **ANCA Toolroom (iGrind)** : Designing standard and complex custom cutting tools.
- **Zeiss Calypso** : Measuring components on Zeiss CMMs.

PROGRAMMING

- **Python** : Used for reverse engineering applications, determining 3D coordinate transforms in space, GUI app for ERP Integration.
- **C#** : Automation for Alicona Measurement Suite Software.

EDUCATION

CONCORDIA UNIVERSITY

MASc. in Mechanical Engineering
Sep 2018 - Oct 2021

HANDS ON EXPERIENCE

- **George Fisher** (+GF+) 5 Axis Milling Machine tool + Heidenhain Control,
- **ANCA** MX - 7 Linear Grinding Machine tool,
- **Zeiss** Micura, CenterMax, GageMax CMMs,
- **Alicona** Optical MicroCMM,
- **Walter** Helicheck Plus,
- **Zoller** pomBasic.

EXPERIENCE

Miltera Machining Research Corp. | Applications Engineer | Cambridge, ON

May 2022 - Present

- Employed 3D Optical CMM to scan **intricate micro geometry**, **addressing the challenges of measurement on standard CMM**. Conducted GD&T Conformity assessment and performed Surface Roughness Analysis.
- Collaborated with clients in the aerospace and automobile industries to **provide tailored tool design solutions for their production challenges**.
- Worked on internal projects focused on **enhancing and modernizing existing systems**, resulting in **improved productivity and minimized downtime**.
- Developed and produced a diverse range of cutting tools, including standard options such as endmills, drills, and reamers, as well as **complex customized tools** like step drills and variable flute geometry tools.

Key Achievements:

- **Toolpath Optimization/ Custom Toolpaths :**
  - Implemented Rhino Application to **rebuild curves and surfaces** for **smooth toolpaths** resulting in **better surface finish**.
  - Generated **custom spline curve links** between toolpaths to **minimize the linking/reduced retracts**. This enhancement resulted in a **remarkable cycle time reduction**, decreasing from 45 minutes to approximately 20 minutes, equating to a **45% improvement**.
- **Pivot Calculations for Grinding Applications :**
  - Utilized Rhino in conjunction with the built-in Grasshopper plugin to **calculate the grinding wheel pivot angles** at each kink of the tool profile curve for customized tool design applications. This implementation **introduced a semi-automatic process** that demonstrated **superior efficiency compared to the manual method**. (more information in portfolio below)
- **Process Development for Machining 3D Printed Components :**
  - Devised an **optimized methodology** to machine 3D printed parts that undergo deformation during the printing process, aligning the actual part to the nominal specifications for **precise machining operations**. (more information in portfolio)
- **ERP Integration using Python :**
  - Built a **windows based GUI application** using **python** to integrate the ERP System to the Cell Manager (order creation for full scale production in a Robot automation cell) (more information in portfolio)
- **Custom Cutting Tools:**
  - Designed and Manufactured custom cutting tools for special turnkey projects for Automobile and Aerospace clients, **reducing cycle time** by **38% to even 50%**, without sacrificing surface finish requirements.
  - Design included variable flute geometry to accommodate various **step profiles** on a single cutting tool, **variable index/helix tools** to reduce harmonics during machining, **polished flutes** for ease of chip evacuation in gummy materials.

Muerus Rodrigues

Portfolio.

Manufacturing Engineer,
Python Developer,
Design Enthusiast

2018-2026

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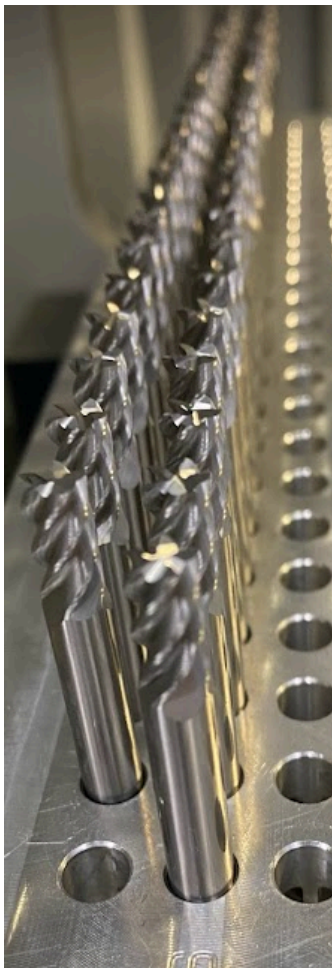
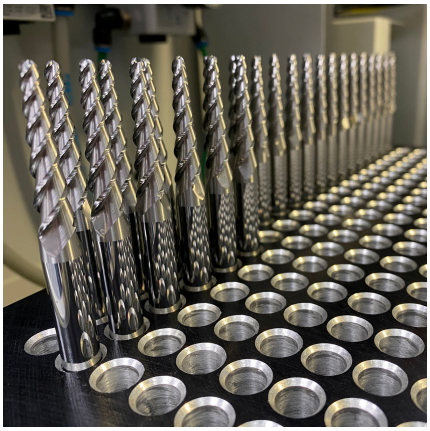
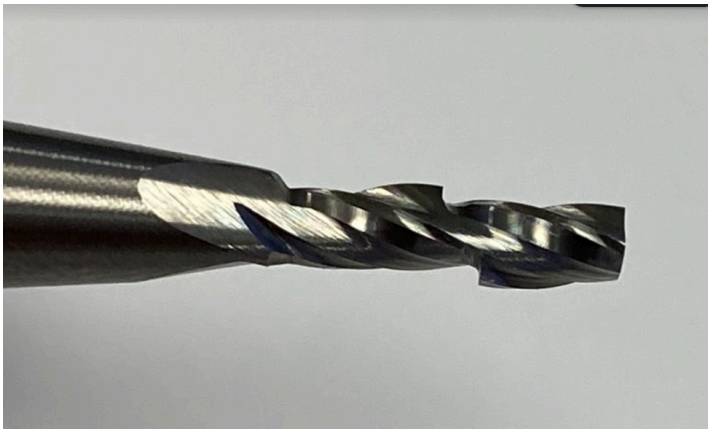
DESIGN AND MANUFACTURING - CUTTING TOOLS




- **Designed and manufactured standard and custom cutting tools** for **aerospace**, **medical** and **automobile** customers,
- **Highly complex** and custom tools include **step drills, step reamers, complex form tools, variable flute design geometry**,
- Designed multiple forms on a single tool to **reduce number of tools** used in the operations For eg: **Bore, slotting, back and front chamfer using a single tool**.
- **Rigorous testing of tools** prior to finalizing the design and shipping to customers,
- **Custom blanking programs** to **control the blank size** of the tool prior to further operations to **control the wear of the grinding wheel** thereby producing precise tools every time during production.
- **Lights out production** of tools ranging from 1mm to 20mm diameter.

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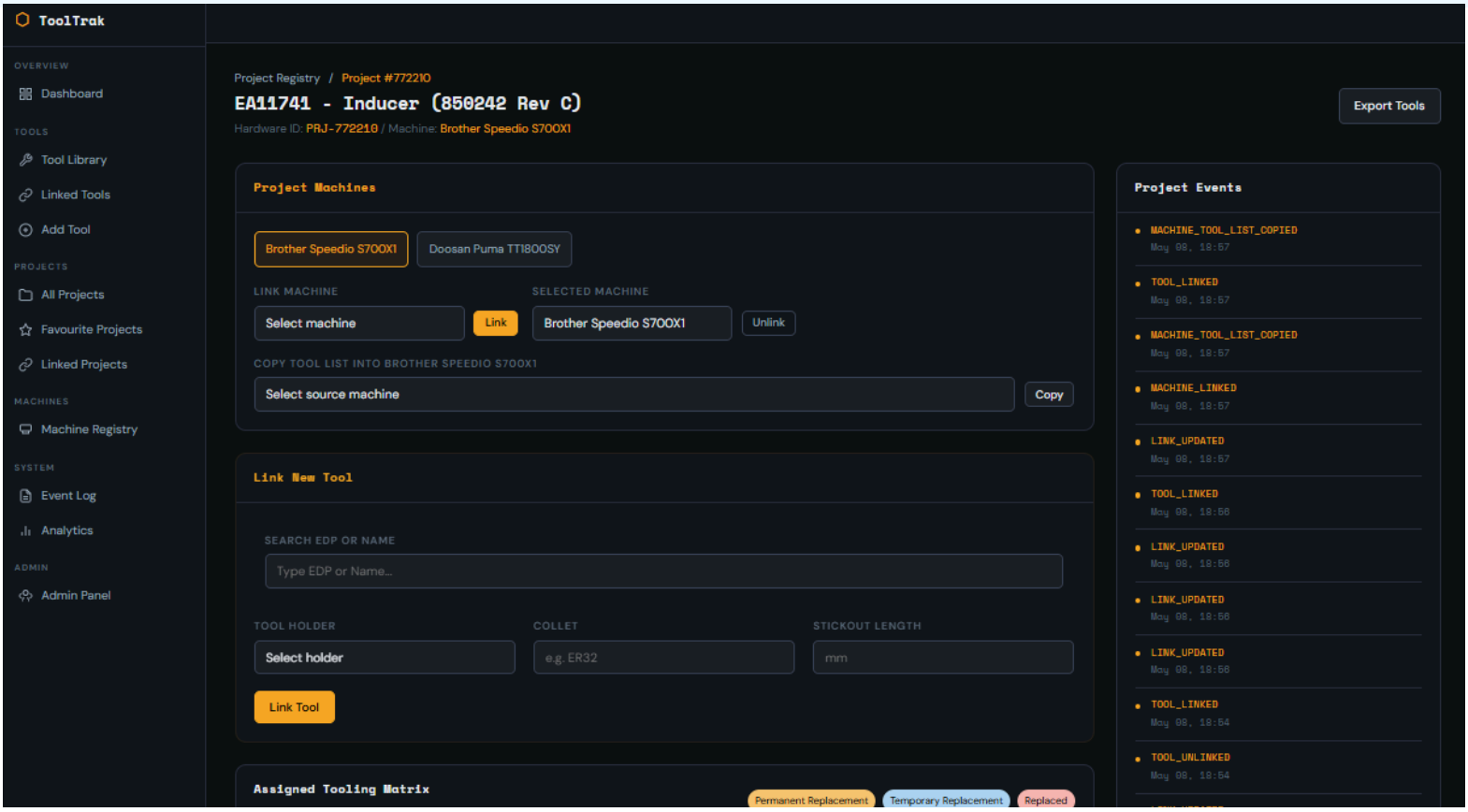
TOOL TRACK (WEB BASED TOOL MANAGEMENT)



Challenge?

- Managing cutting tools across multiple machines and projects was difficult and time-consuming.
- Manual tracking of tool inventory, holders, tool life, stick-out, and revisions often caused errors, delays, and reduced cost efficiency.

Current method

- Tool details were tracked manually in Excel, including tool life, tool usage, stick-out, and other machining parameters.
- Updated sheets had to be printed and shared whenever tools, revisions, or process details changed.

Implemented method

- Developed ToolLink, a Flask-based web application with an SQLite database to manage cutting tools, machines, and projects in one place.
- Engineers, machinists, and operators can view, update, and access tool information digitally in real time from laptops or mobile devices.

Results

- Reduced manual Excel work, printing, and repeated updates.
- Improved tool tracking accuracy and reduced time spent updating tool lists.
- Centralized all project, machine, and cutting tool information under one system, improving productivity and shop-floor communication.

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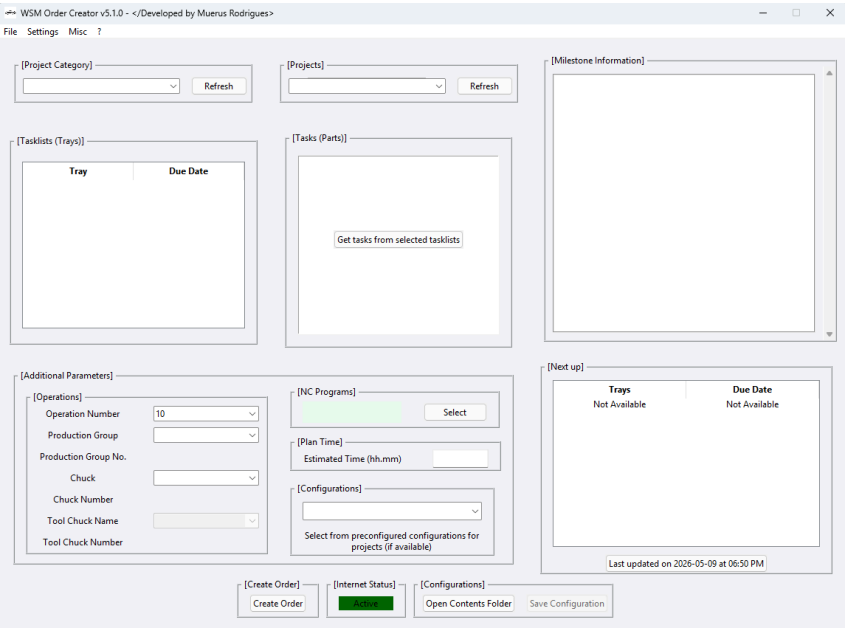
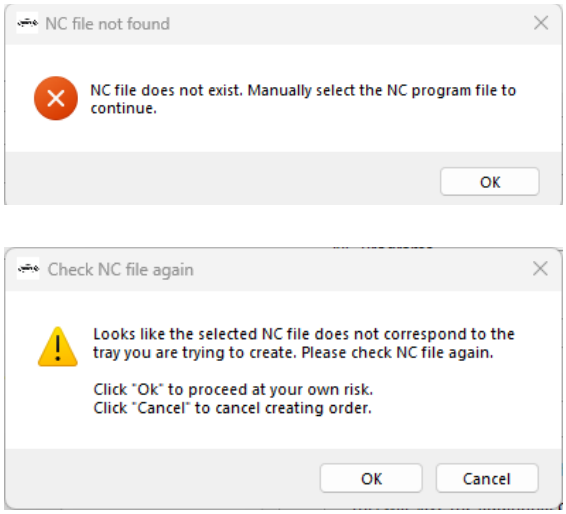
ERP - CELL MANAGER INTEGRATION APPLICATION (PYTHON GUI)



ERP Cell Manager App



Error and Warning prompt (Foolproof design)

Current method

- **Manually** create orders based on the information in the ERP system.
- **Any change in the PO, needs to be manually rectified** in the cell manager.
- **Can take hours** to create orders depending on part quantity needed.
- **High probability of Human error** while inputting data such as **serial number.**

Challenge?

- **Automatically create orders** in the cell manager (application that manages the full scale production robotic cell) using the **up to date production order** from the **ERP System**.
- Any update in the PO such as **change in due date**, **part quantity needed to meet milestone** needs to be **reflected and updated automatically** in the cell manager.

Implemented method

- Utilizing **Python OOP** and **Tkinter GUI Package** to generate **visually appealing windows application**.
- Made use of **ERP API (teamwork)** to get the order info in the **real time** and posting in the cell manager using **XML protocol**.

Results

- **Visual GUI application** creates orders within **matters of seconds automatically**,
- **Foolproof design reduced the human error to "ZERO"**
- **Reduced** the order creation and updating time **by more than 90%.**

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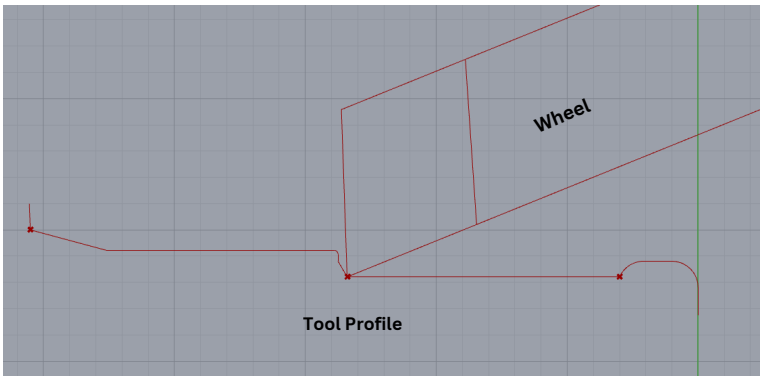
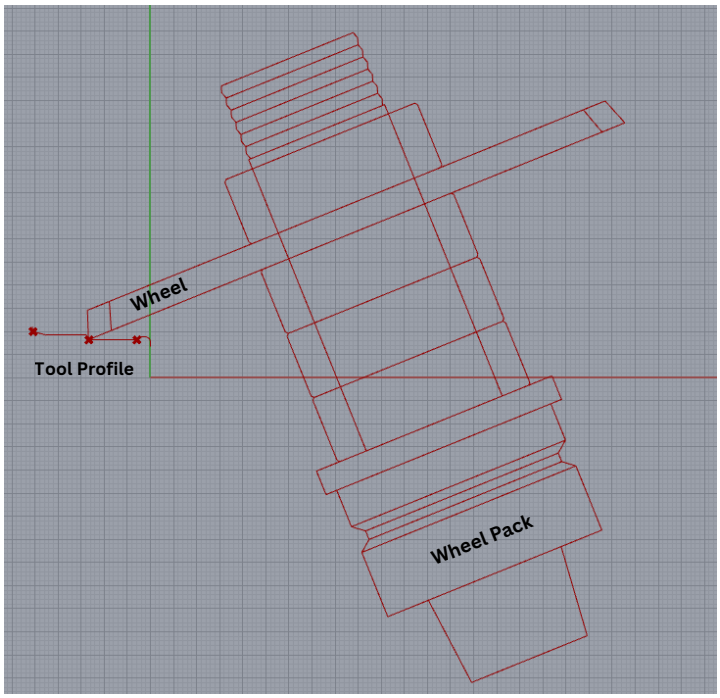
GRINDING WHEEL PIVOT CALCULATOR (RHINO + GRASSHOPPER)



Wheel and Tool Profile (Zoomed in)



Wheel orientation during grinding process

Current method

- **Manually guess the angle** based on **experience and visualization** of the wheel and **wait for the grinding software** to calculate if the path works or if there are any collisions.
- This method can be **tedious** if the tool profile is complex and may take upto **3-5 minutes for calculations**.

Challenge?

- To calculate the **optimal grinding wheel orientation** (Pivot angle) for given tool profile geometry (usually complex)
- **No part of the wheel or wheel pack should collide** into any part of the tool including the tool blank and machine component themselves.

Implemented method

- **Utilizing Rhino + Grasshopper** to calculate the pivot angle, given the pivot point on the wheel.
- This will **visually** let user to check for any collision and **alter the angle just by using a GUI slider**.
- The angle obtained can then be input to the grinding application directly.

Results

- **Significantly reduced the time** to calculate the pivot angle for designing tools with complex profiles.
- **Visualization tool without needing prior experience** to calculate the pivot angles.
- If implemented correctly can result in **smooth motion reducing blending issues at kinks.**

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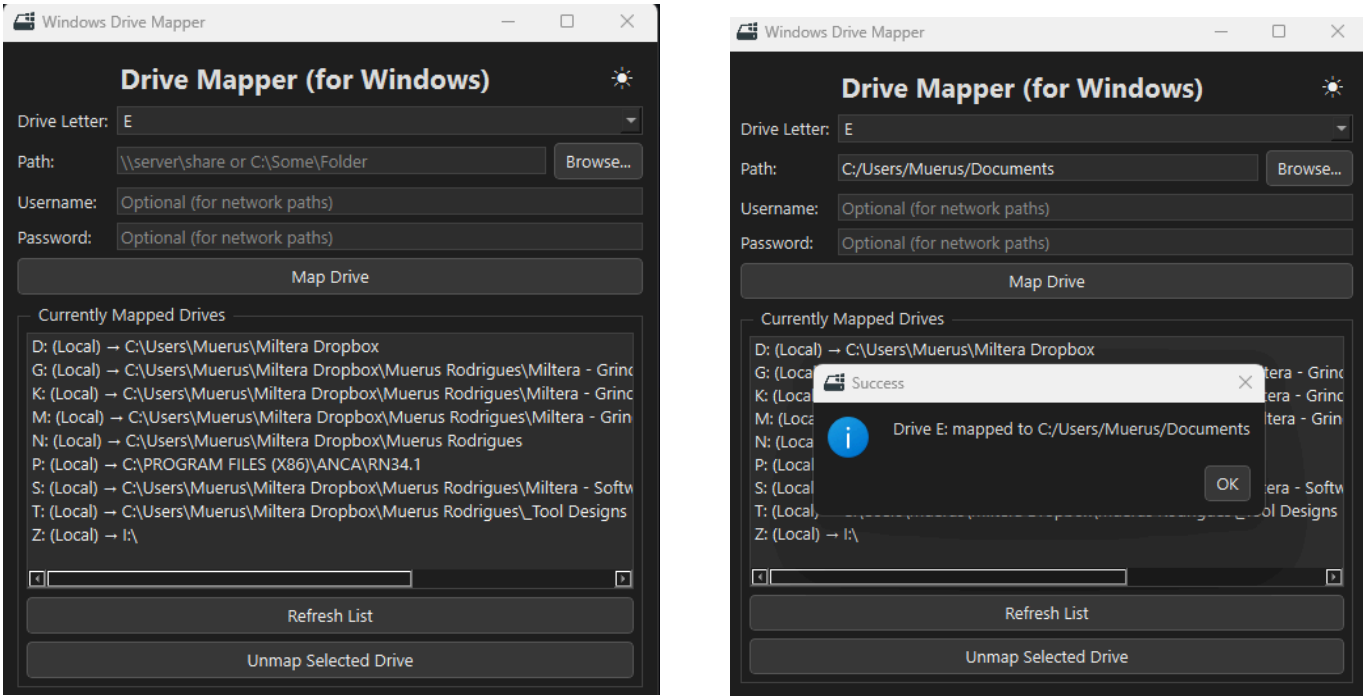
WINDOWS DRIVE MAPPER APPLICATION



Windows Drive Mapper Application

What?

- Designed and built a Windows desktop application to map and unmap local and network drives with a modern UI (including dark mode).

How?

- Developed the app using Python with a PyQt-based interface.
- Implemented logic to prevent duplicate drive-letter assignments.
- Integrated Windows networking commands/APIs for reliable network drive mapping.
- Added validation, error handling, and user-friendly status feedback.

Why?

- Getting to frequently used file and/or folders can be time consuming, instead mapping can get to that in one click.
- Addressed the lack of a simple, user-friendly interface for managing mapped drives, particularly for non-technical users.

Impact?

- Improved user experience with one-click drive mapping and dark mode support.
- Reduced configuration mistakes by automatically preventing duplicate drive letters.

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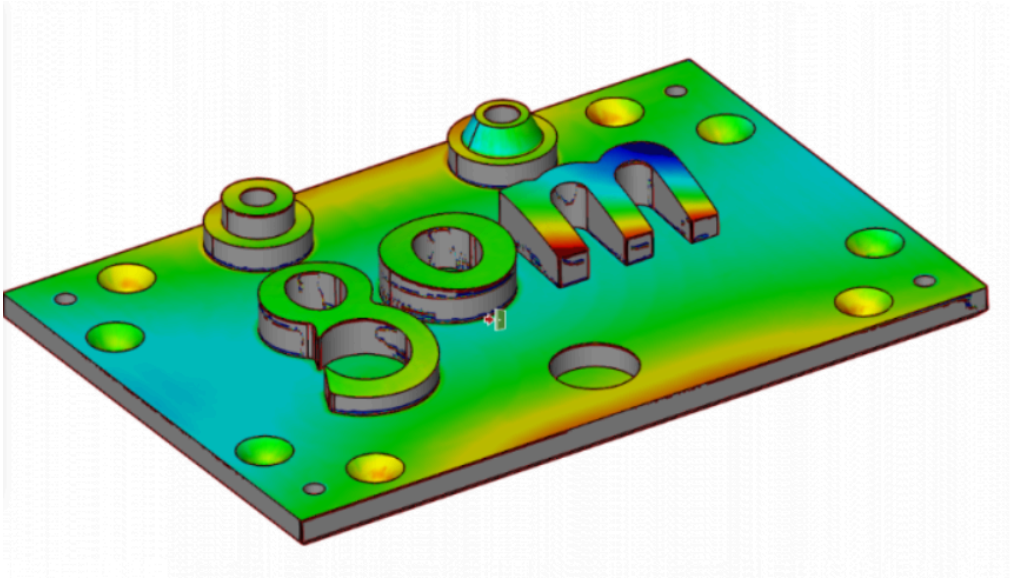
PROCESS DEVELOPMENT FOR ACCURATELY MACHINING 3D PRINTED PARTS



Deviation between Actual and Nominal (GOM Inspect)

Challenge?

- Like most manufacturing processes, **3D printed parts always deviate** from the nominal, for eg. due to sagging or thermal cooling. This deviation is acceptable in most cases.
- However, **when it comes to Aerospace applications it cannot be ignored**. Machining those 3D printed parts **can be tricky given the deviation in 3D space consisting of 6DOF**.
- How to **determine the deviation** so that the **part can be located accurately in the 3D Space**?

Current method

- There is **no known method available** and most of them are not available openly **due to proprietary restrictions.**

Implemented method

- **Utilized Optical MicroCMM to scan the 3D printed part in 3D space** in a known Coordinate System.
- **Developed algorithm** using GOM Inspect and Rhino + Grasshopper to **determine the actual location of the part in the 3D space**,
- This location was then used to **transform the toolpaths in Mastercam** to **accurately machine 3D printed parts.**

Results

- Utilizing this method, **any 3D printed part can be machined accurately within tight tolerance neglecting the effect of 3D printing deviation.**
- Determining the deviation can also be used to **transform the part to be 3D printed so the deviation can be minimized.**

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AUTO TASKS CHECKER (PYTHON SCRIPT)

Current method

- As parts/ cutting tools gets manufactured (by trays), **manually** check off corresponding tasks in ERP System.

Challenge?

- **To check off completed tasks** in the ERP can be **time consuming**, especially, when **hundreds of repetitive tasks** are involved.
- **High probability** of **missing tasks** to check off, that can **cause issues with tasks dependent** on predecessors.

Implemented method

- Utilizing **ERP API and Python**, created script that **automatically checks off all the tasks** in a given tray.

Results

- Time involved in checking off tasks in **minimized**, taking just **matter of seconds to complete.**
- **Human error** is **significantly reduced.**

AUTO TIMESHEET UPDATER (PYTHON SCRIPT, MS EXCEL)

Current method

- **Manually fill timesheets** in ERP system from scratch notes (Excel, OneNote, Evernote, etc.)

Challenge?

- **To reduce time** consumed in filling timesheets,
- **Avoid filling timesheets twice** from scratch notes to ERP system.

Implemented method

- **Utilizing ERP API, Python and MS EXCEL**, created script that **automatically creates timesheet entry** in the ERP System.

Results

- **Eliminated** having to fill in timesheet twice,
- **Time saving** in the process.

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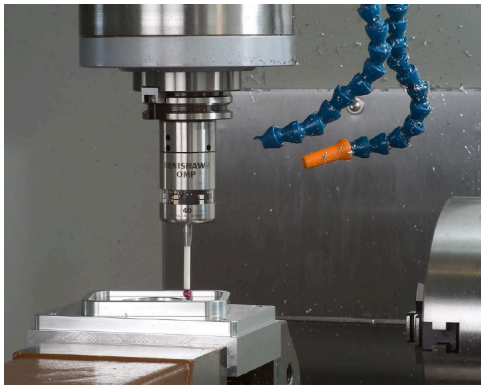
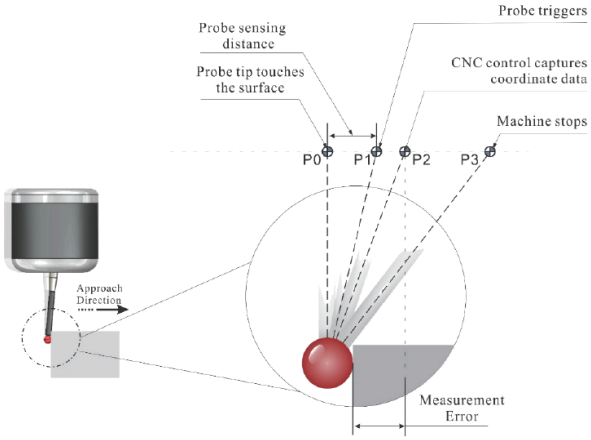
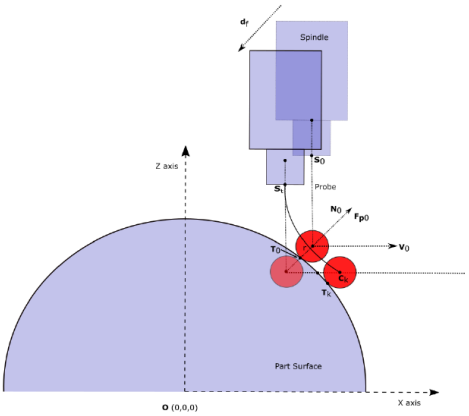
MECHANICAL ENGINEERING AT CONCORDIA UNIVERSITY

THESIS : AN ACCURATE ON MACHINE SURFACES MEASUREMENT USING FEA METHODS







What?

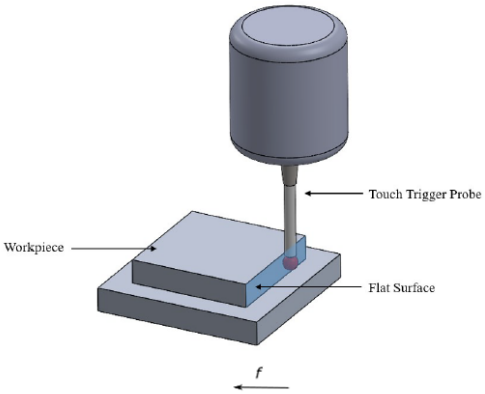
- Predicted the sensing distance (measurement error) of probe taking sliding effects into account.

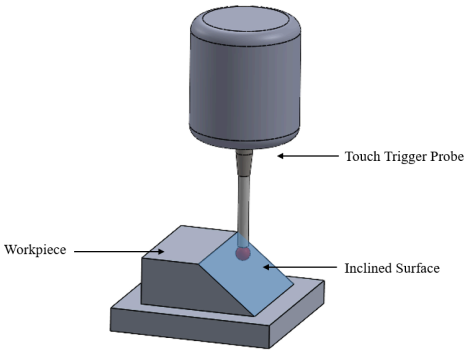
How?

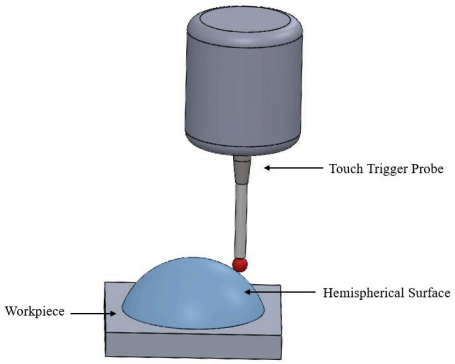
- Implemented **FEA** method to avoid simplification of probe geometry.
- Computed sensing distance in case of flat, inclined and complex curved surfaces.
- **Compensated the predicted error** to **improve measurement efficiency.**

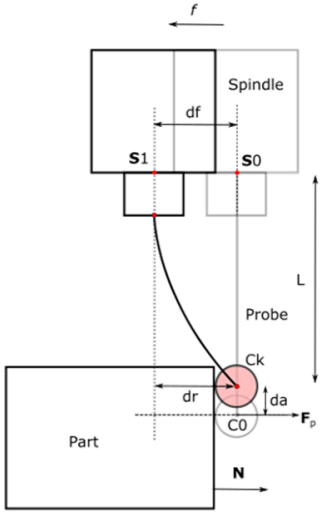
Results

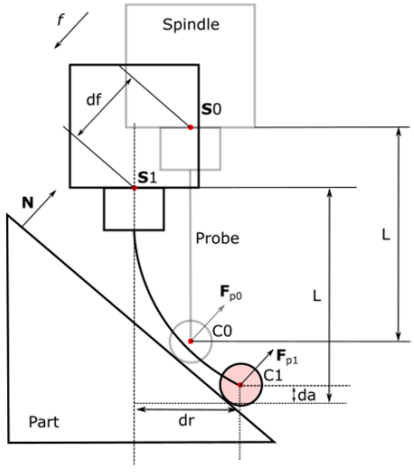
- **Led to 27.7% improvement** in measurement results taking into account sliding effects of the probe.
- Developed a **novel algorithm** to predict the measurement uncertainty.

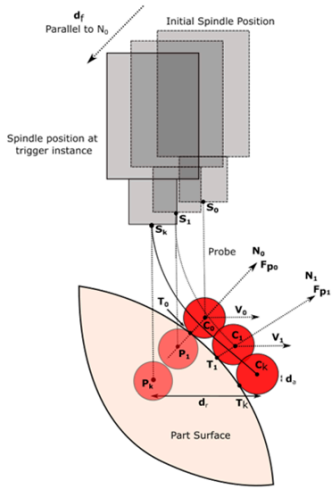












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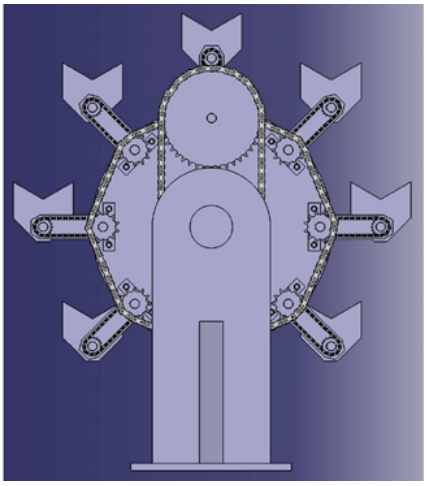
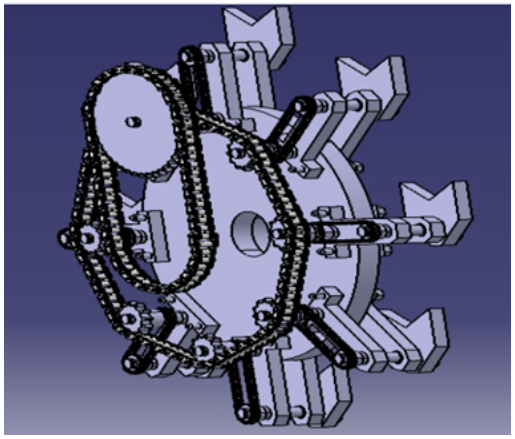
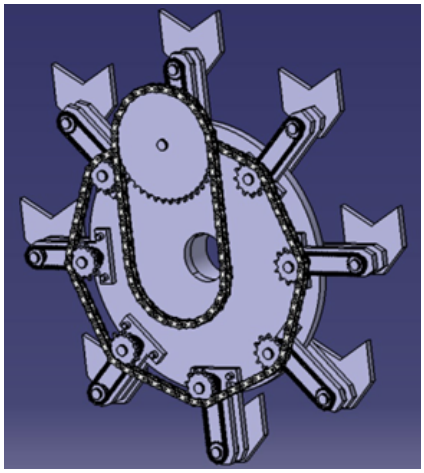
MECHANICAL ENGINEERING AT CONCORDIA UNIVERSITY

DESIGN OF MULTIPLE ARM PIPE PICKER (CATIA V5)







What?

- Designed a multiple arm pipe picker to replace an existing single arm pipe picker.
- Performed a **needs analysis** to initiate the design process

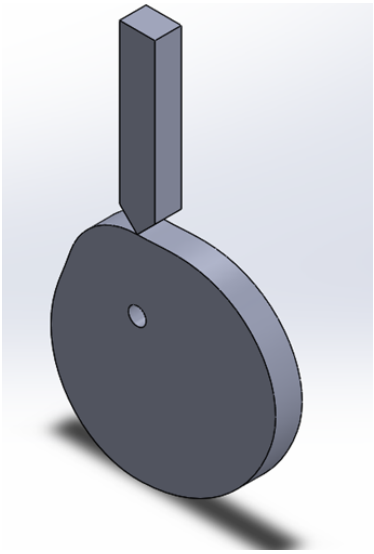
How?

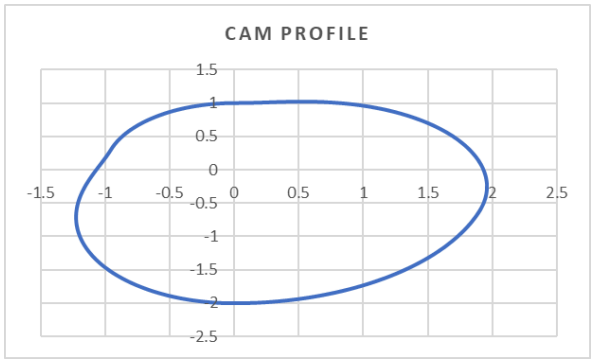
- Used **parametric** features in **CATIA V5** to design.
- Performed static analysis to withstand the pipe load.

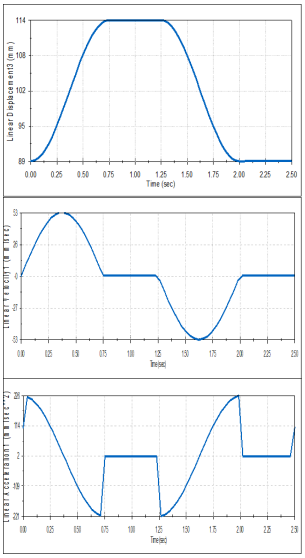
Results

- Increased the efficiency of pipe picking process **by 35%**
- **Achieved the goal** to hold the arms vertically at all the positions during the process.

CAM AND FOLLOWER DESIGN (EXCEL, SOLIDWORKS)







What?

- Automated Cam and Follower design using Excel and Solidworks

How?

- Performed calculation and obtained cam profile in Excel using VBA.
- Imported design points to Solidworks using Design Tables.
- Performed motion study to compare the results.

Results

- Reduced the overall design time **by 30%** compared to hand calculations.

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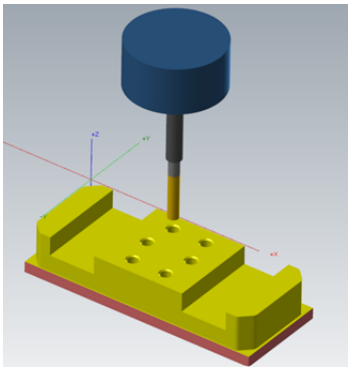
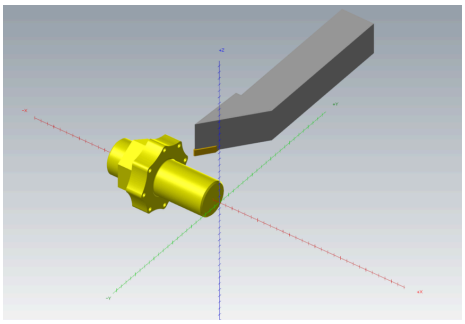
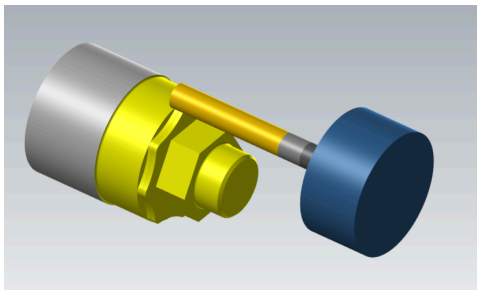
CAD CAM PERSONAL PROJECTS (SOLIDWORKS, MASTERCAM, CAMWORKS)







What?

- Created 3D models and generated optimized toolpaths for multiple cad cam projects (Lathe, Mill)

How?

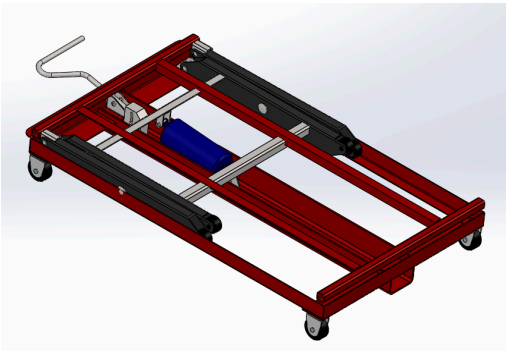
- Studied the print and determined the operations and the order in which they should be performed.
- Used appropriate cutting tools, feeds and speeds parameters for efficient toolpaths.

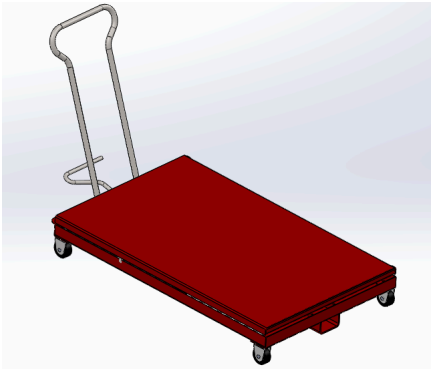
Why?

- To improve CAD CAM Skills
- To understand the available toolpaths and their use based on the application and requirements.

DESIGN AUTOMATION OF SCISSOR LIFT (SOLIDWORKS)

Original Design





Modified Design

What?

- Created variations in Scissor Lift Assembly as per customer specifications.
- Modified the length, width and height of the assembly
- Automatically renamed the part file names as per customer name and order number input.

How?

- Using DriveWorkXpress captured the dimensions and features to be modified.
- Setup the input form to gather the dimensions, customer name and order number.
- Setup rules to modify the original assembly and created new part files.

Why?

- To automate design process with varying parameters. For eg. Length and Width, Materials.
- To reduce the time taken in designing the same part with minor to complex variations.

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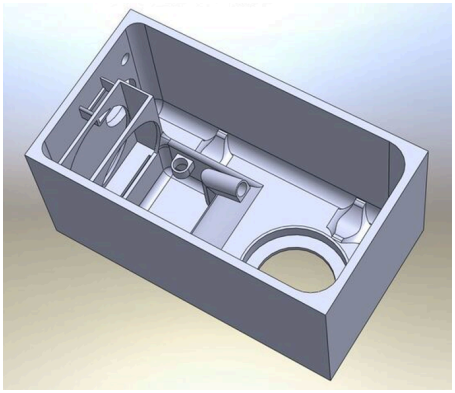
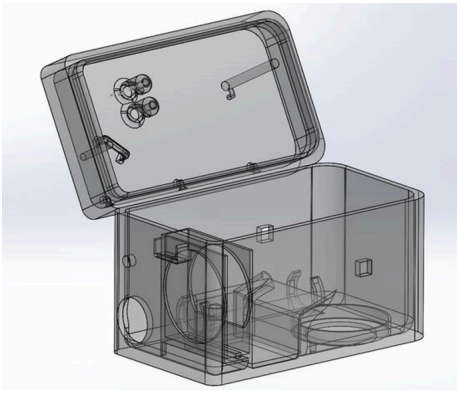
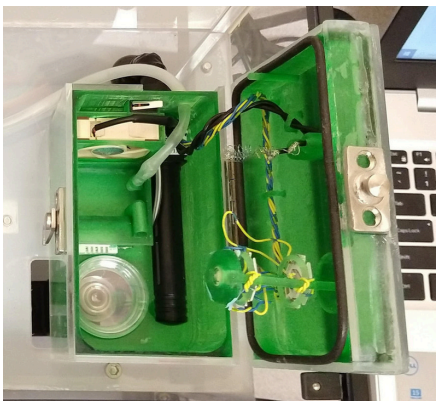
MECHANICAL ENGINEERING AT CONCORDIA UNIVERSITY

DESIGN OF A INCUBATION CHAMBER (SOLIDWORKS)







Challenges?

- Maintain 37 deg Celsius, 85-95% humidity and 5% CO2
- Live image feed of cell growth with 400x zoom
- Design to 3D print, simple and cost effective design

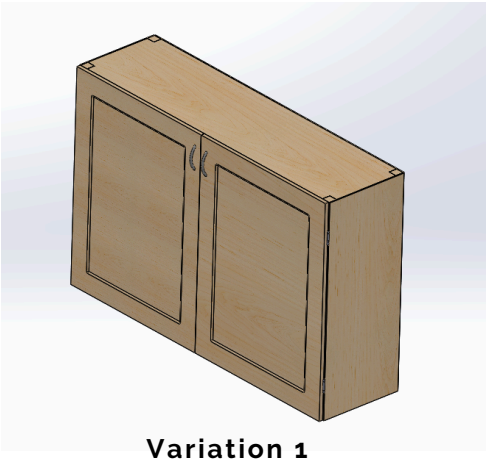
How?

- Used DFA to make sure of easy disassembly if needed .
- Used GD&T to design especially the openings as the device was suppose to be seal packed.

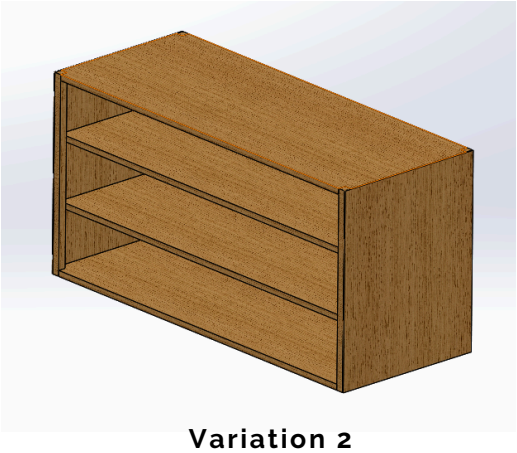
Results

- The design was shrunk to about 30% then its previous predecessor.
- All design conditions were maintained in around 20-30 minutes.

DESIGN AUTOMATION USING DRIVEWORKSXPRESS (SOLIDWORKS)



Variation 1



Variation 2

Variation 3

Challenges?

- Automate the design of same product (Shelves) with different configurations (Eg: different material, number of shelves).
- Generate variations whilst reducing time for designing.

How?

- Used DriveWorksXpress to capture parts/features to be modified.
- Setup form controls to input design parameters.
- Setup rules to modify parameters dependent on others

Results

- Significantly reduced time of designing to a matter of seconds.
- This can now be used to generate "unlimited" variations in design.

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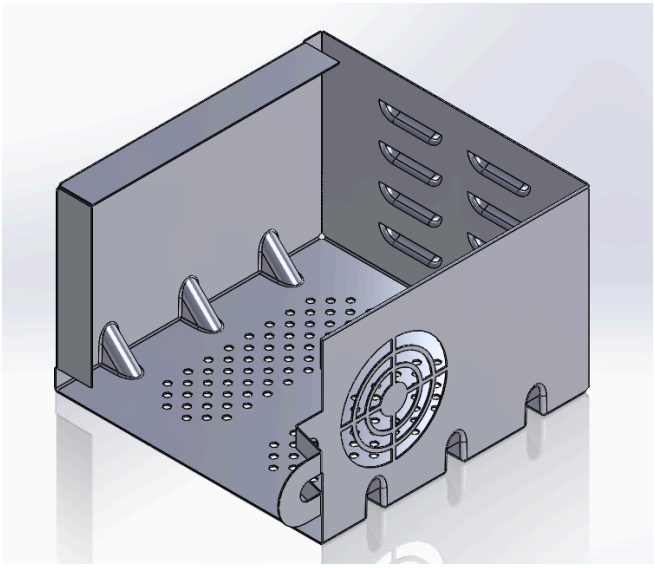
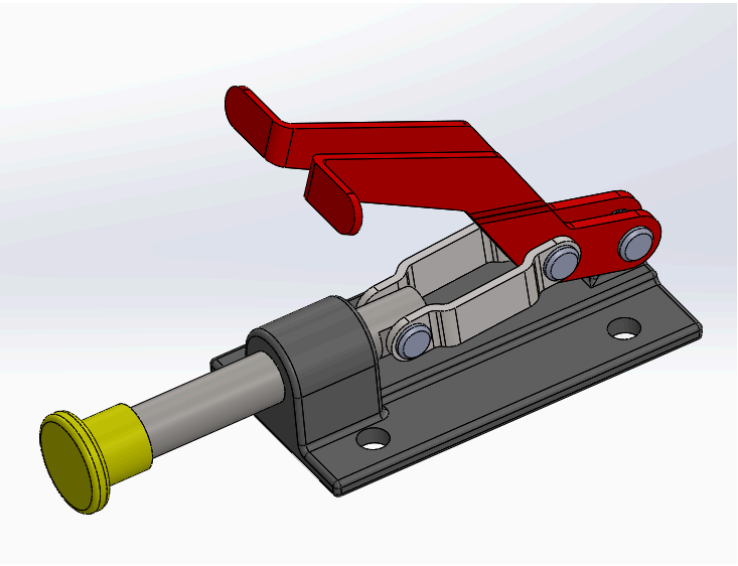
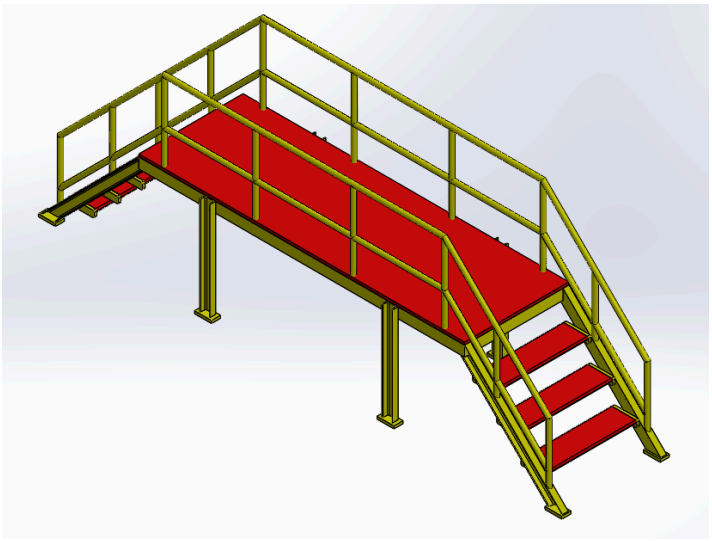
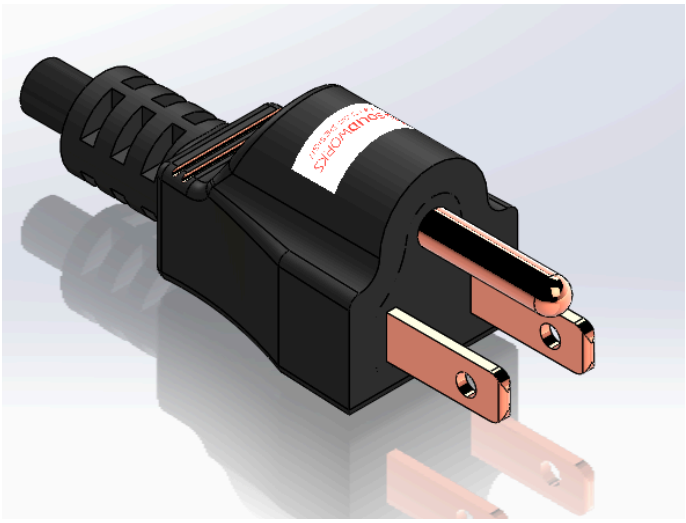
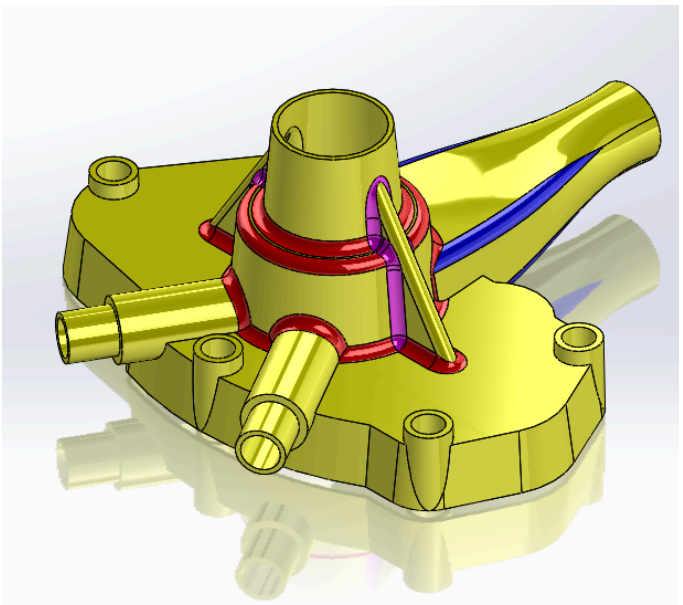
DESIGN PORTFOLIO (SOLIDWORKS)

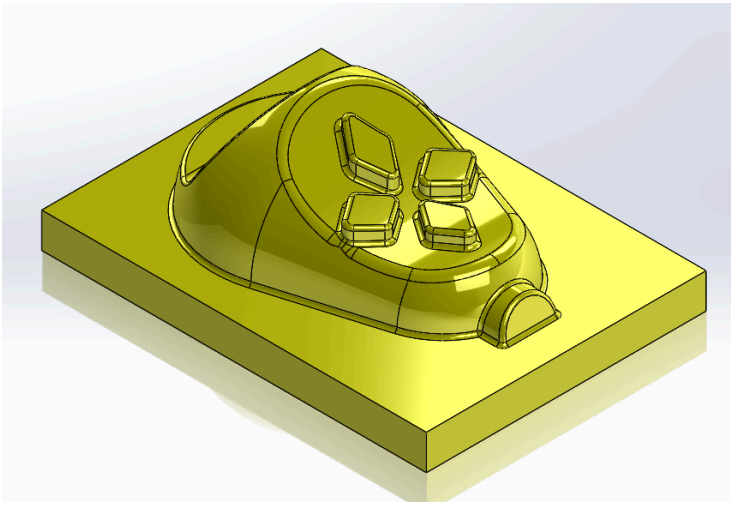












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CERTIFICATIONS

SOLIDWORKS

• DriveWorksXpress Associate	DriveWorks Ltd.	3rd March 2022
• Solidworks : Become a Certified Associate Today	Udemy	5th Oct 2018
• Solidworks : Become a Certified Professional Today	Udemy	12th Feb 2021
• Solidworks : Advanced Drawing Training	Udemy	14th Feb 2021
• Solidworks : Sheet Metal Essential	Udemy	15th Aug 2021
• Solidworks : Design Study and Optimization	Udemy	2nd Dec 2021
• Solidworks : Surface Modeling	Linkedin	10th Feb 2022

AUTOCAD

• The complete AutoCAD 2018-20 Course	Udemy	15th Feb 2021

CNC / MACHINING

• Metal Cutting Technology E-learning	Sandvik Coromant	15th Feb 2021
• STEM : Principles of Machining	Mastercam	23rd Sept 2021
• 2020 : 2D Mill	Mastercam	18th Mar 2021
• 2020 : 3D Mill	Mastercam	13th Oct 2021
• 2020 : Lathe	Mastercam	3rd July 2021
• DFM Masterclass (CNC Machining)	Fictiv	30th Jan 2022

MANUFACTURING

• Engineering Drawings for Manufacturing	Linkedin	24th Nov 2021
• Kanban Boards	Udemy	12th Oct 2021
• Geometric Dimensioning and Tolerancing (GD&T)	Udemy	23rd Feb 2021

MICROSOFT OFFICE SUITE

• Microsoft Office 2016 Essential Training	Udemy	24th Jun 2020