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Sidhant Vaidyanathan

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EDUCATION

Master of Applied Science in Mechanical Engineering — September 2021 – December 2023
University of British Columbia (UBC), Vancouver, Canada — **GPA:** 85.6 / 100
Thesis: Determining Residual Stress using Indentation and Surface Displacement Measurement (Slides, Thesis)

Bachelor of Engineering in Mechanical Engineering — May 2019
Savitribai Phule Pune University (SPPU), Pune, India — **GPA:** 9.43 / 10.0
Project: Design of a Remotely Operated Test Rig for Performance Evaluation of Automotive Alternators (Report)

SKILLS

Design and Simulation: SolidWorks, CATIA, Creo Parametric, Inventor, AutoCAD, Abaqus, ANSYS, Hypermesh
Methodologies: GD&T, Design for Manufacturing and Assembly, Rapid Prototyping, Image processing
Project Management: 3D Experience ENOVIA, Atlassian Jira, Microsoft SharePoint
Fabrication: Mill, Lathe, Waterjet, 3D Print, Weld, Hand Tools
Electronics: Soldering, Instrumentation Calibration, Data Acquisition & Processing
Programming: Python, MATLAB, C/C++

INDUSTRY EXPERIENCE

Design Engineer - Assembly Tool Design, Atlas Copco India Ltd. — January 2020 – June 2021

Assembly Station for Air Dryers
- Replaced separate assembly stations with a modular station for 16 different dryer sizes.
  - Dryer diameters range from 200mm to 1500mm (750%) and heights range from 150mm to 600mm (400%).
  - New motorized system reduced human intervention by 50%.
- Reduced production time per dryer by 18% by integrating multiple assembly steps into a single setup installation.

Dual Purpose Lifting Tool
- Replaced two separate tools by a single tool to lift compressor casings ($\sim$ 1500kg) and adapt to existing assembly station.
- Reduced safety hazard of heavy swinging while lifting by ensuring CoG of casings are balanced.
- Integrated two assembly steps into one, reducing production time ($\sim$ 10%) and improving worker safety.

Precision Alignment Tool
- Designed tooling to align compressor rotors in bores within a 5 micron tolerance.
- Incorporated features to flag good/bad fits to the assembly person to make changes on site.

Modular Pallet System
- Replaced rotor size specific pallets with a modular solution for 8 different rotor diameters and lengths.
- New standardized pallet system saved time previously wasted waiting for specific pallets at assembly stations.

Poka-yoke Systems for Assembly
- Designed Poka-yoke plates for multiple products being assembled on the same line.
- New integrated plates ensured parts are used in correct quantity on the correct product.

Impeller Assembly Depth QC Device
- Designed a 3D printed device for GO/ NO-GO checks of assembled impeller depths on shafts.
- Checks became much faster compared to prior method of individual measurements.

Project Management
- Managed project schedules, budgets and stakeholder meetings to ensure requirements are understood and handled with precision.
- Created over 200 3D and 2D drawings with systematic assembly BOMs.

Management Trainee - Handheld Demolition Tools, Atlas Copco India Ltd. — July 2019 – December 2019

Pneumatic Hammer Vibration Reduction
- Revised the valve design of Chicago Pneumatic rock hammers and drills to reduce handle vibrations during operation.
  - Measured vibrations using accelerometer network calibrated with National Instruments data acquisition setup.
- Revised machine passed certification tests as per machine handle vibration standard.

Investigated Acquired Hydraulic Products
- Documented valve and fluid flow cycles in newly acquired hydraulic hammers and drills.
- Produced a calculation spreadsheet for valve seat fits and tolerances for 40 different products.
  - Served as a basis for discussions on local manufacturing capabilities and suitable design adjustments.

Assembly Line Surveying
- Identified various process and safety issues delaying assembly line processes.
- Categorized and recorded them in charts for process engineers to scrutinize and effect appropriate operational changes.

ACADEMIC EXPERIENCE

Graduate Research Assistant - UBC Vancouver, Renewable Resources Lab — September 2021 – December 2023
- Developed a novel method to estimate residual stresses using surface deformations around an indentation.
  - Estimates magnitude, sign and surface orientation of residual stresses, unlike existing indentation-based method.
- Developed a Finite Element (FEA) based calibration system to eliminate the need for experimental calibration.
  - Reduced a 13 variable problem to 3 control variables.
- Validated the method experimentally for an isotropic residual stress distribution case.
  - Designed and self-manufactured a compact setup using cameras, positioning systems & various optical arrangements.
  - Designed and built instrumentation and developed code for image processing, data management and visualization.
- Proposed a specimen preparation method to improve image data quality and increase signal to noise ratio by 20%.
  - Used a custom built system for directional control of surface illumination, creating directional contrast.

Graduate Teaching Assistant, UBC Vancouver
- **Mechanical Engineering Design Project** $\times$ 2 — Winters 2022 & 2023
- **Mechanical Design** $\times$ 2 — Winters 2022 & 2023
- **Intermediate Mechanics** $\times$ 1 — Winter 2022
  - Mentored students through term-long design projects involving industry consultation and proposals.
  - Conducted weekly tutorials to solve numerical problems and assist students with doubts.
  - Designed and graded questions for homework assignments and examinations.

SELECTED PROJECTS

Formula SAE Suspension Dynamics (Report)
- Designed a compact double wishbone setup minimizing roll center traverse, pitch rates and cornering imbalance.
- Maximized utilization of lateral slip from tires for high speed cornering.
- Vehicle testing revealed an $\sim$ 8% improvement in corner negotiation across 3 different drivers.

Formula SAE Wheel Assembly (Report)
- Redesigned uprights and hubs to reduce 1.5kg per corner by combining new materials and design strategies.
- Improved performance to cost ratio by 13% while maintaining required fatigue life of 0.5 million cycles.

Haptic interface for Teleoperation (Report)
- Created a virtual environment for testing feasibility of using teleoperation for medical surgeries using Phantom Omni.
  - Visualized the Omni's movement by creating a graphic interface using ROS and Unity.
- Tested effectiveness of humans in matching the pose and force of the leading device based on visual and haptic feedback.
  - Recorded motion metrics of the Omni's tip using inverse kinematics.

Control Scheme for Robot Arm (Report)
- Modelled an observer-based state-space control system for a two-link arm mimicking a simplified CMM.
- Proved steady-state stability of model against noise mimicking external disturbances to the CMM's positioning system.

Robotic Arm Kinematics Using MATLAB/Simulink (Report)
- Modelled kinematics of a 3 DOF robot arm with practical joint constraints.
- Demonstrated effectiveness of model using an example case of a line welding robot arm maintaining weld continuity.

Vehicle Production Cost Reporting (Report)
- Spearheaded preparation of a comprehensive report of costs involved in Formula SAE racecar production.
- Awarded 2^{nd} out of 126 teams for level of detail and cost effective engineering (expenditure under CN$ 5,600).

SCHOLARSHIPS AND ACHIEVEMENTS

- International Tuition Award to assist my tuition fees for my graduate program (CN$ 7,400).
- Faculty of Applied Science Graduate Award as scholarship top-up for my graduate program (CN$ 5,500).
- St John's College Charles C C & Sophia Wong Memorial Fellowship for Summer Session 2023 (CN$ 11,000).
- St John's College George Shen Fellowship for Summer Session 2022 (CN$ 3,500).
- Ranked 3^{rd} in academics among the entire B.E program of 200 students.
- Captained Formula Student team Vishwaracers - team ranked 5^{th} among 126 teams in Formula SAE India 2018 (Video).

PUBLICATIONS

S. S. Vaidyanathan, G. S. Schajer., "Determining Residual Stress by Indentation and Surface Displacement Measurement," in *Journal of Experimental Mechanics*, (In Progress)