

AYUSH MAHAPATRA

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EDUCATION

B.Tech Mechanical Engineering

July 2023 – Present

Vellore Institute of Technology, Vellore | CGPA: 8.71

12th AISSCE

July 2021 – May 2023

Sri Chaitanya Techno School, Chennai, Tamil Nadu | Percentage: 84

10th AISSE

July 2014 – April 2020

Delhi Public School E-City, Bangalore, Karnataka | Percentage: 91

SKILLS / SOFTWARE

- CAD & Mechanical Design: Proficient in 3D modelling and simulation using SolidWorks and Fusion 360.
- Simulation: Structural and thermal simulation using Ansys and Abaqus; MATLAB and Simulink for system modelling, control, and 1D flow/thermodynamic analysis.
- Tools: Google Sheets, Slides, MS Excel, PowerPoint, Canva, Figma, DaVinci Resolve.
- Engineering Subjects: Design of Machine Elements, Material Science, Thermodynamics, Heat Transfer, Mechanics of Solids, Kinematics of Machines, Gas Dynamics.

WORK EXPERIENCE

Larsen & Toubro (L&T), Pithampur

May 2026 – June 2026

Intern, Production Department

- Interned in the Production Department at L&T's hot-dip galvanizing plant in Pithampur.
- Audited a 105-tonne LPG-fired zinc kettle furnace, establishing a baseline thermal efficiency of 31% and specific energy consumption of 12.3 kg LPG/tonne against an industry benchmark of 8–12 kg/tonne.
- Identified two root causes of excess fuel consumption: ~30% idle burn (furnace firing at full rate with no steel being processed) and high flue gas losses (~18% of total heat input) from uncontrolled excess air
- Designed a shell-and-tube flue recuperator to preheat combustion air to 250°C, recovering 56,602 kcal/hr and reducing fuel consumption by 4.8 kg LPG/hr.
- Developed a MATLAB script that takes live plant data as inputs — LPG consumption, zinc bath temperature, steel throughput, stack temperature — and outputs a full energy balance showing how heat is distributed across useful work, flue gas losses, wall losses, and idle burn. The model also runs a parametric study showing how efficiency changes with excess air and stack temperature, and compares five improvement scenarios with projected fuel savings and payback periods.

Society of Automotive Engineers (SAE)

Events Committee Core Member

- Planned and organized technical workshops, events, and team meetings to enhance engagement and knowledge sharing.
- Acted as a speaker for select knowledge-sharing events.
- Promoted events through social media, digital marketing, and direct communication, increasing team visibility and audience engagement.

PROJECTS

Tool Design Optimization for Friction Stir Welding of AA2219 (Aerospace-Grade Al Alloy)

Ongoing

- Studying the weldability of AA2219 aluminum alloy (3–5 mm thickness) — a cryogenic-tank-grade alloy used in launch vehicle propellant tanks — via Friction Stir Welding (FSW), evaluating 3 tool pin geometries.
- Designed a novel tool variant with heat-sink fins, hypothesizing improved conductive heat dissipation to reduce the heat-affected zone (HAZ) relative to standard pin designs.
- Built thermal simulations in ABAQUS to predict temperature distribution across tool designs: baseline tool recorded a peak interface temperature of 498°C and HAZ width of 5 mm, versus 442°C and 3.55 mm for the finned design — a ~30% reduction in HAZ width.
- Ran a 9-combination parametric sweep across 3 FSW process parameters (constant depth of cut) and used MATLAB to relate simulation outputs and identify the optimum parameter combination for the studied configuration.
- Currently validating simulation results against experimental/literature data as part of ongoing work.

Autonomous Dustbin with Guided Waste Disposal System*September 2025 – December 2025*

- Designed and developed an autonomous dustbin with self-navigation and obstacle-avoidance capabilities through sensor-based control logic.
- Implemented automated detection to enable hands-free, hygienic operation.
- Combined embedded hardware and software to deliver reliable real-time performance in indoor environments.

Ultrasonic Welding of Additively Manufactured Composites*February 2025 – April 2025*

- Designed honeycomb sandwich panels in SolidWorks and 3D-printed PLA and CF-PLA components using a FlashForge Adventurer 3.
- Optimized ultrasonic welding parameters to 1450 W, 5 bar pressure, and a 1.5 s weld time to maximize lap-shear joint strength without adhesives.
- Evaluated mechanical properties through Instron testing and FEA, and analyzed weld microstructures via SEM.
- Determined that a 1.5–2.0 mm laminate thickness gave the optimal compressive strength-to-mass ratio of 0.25 MPa/g and reached a peak compressive stress of 15 MPa.
- Validated through flexural testing that thicker 2.5 mm laminates could withstand reaction forces exceeding 400 kN.

CERTIFICATIONS

- Autodesk Design Academy: Fusion 360, Autodesk | 2025
- MATLAB Onramp, MathWorks | 2025