INTERNSHIP REPORT

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Class: B.Tech Mechanical Engineering (RBT24ME107) 1st Year

College: JSPM's Rajarshi Shahu College of Engineering, Tathawade, Pune

Internship Period: [3 June] – [End Date], 2025

Organization: Harihar Industries, MIDC, Ahmednagar

INTRODUCTION

This internship was my first real step into the world of practical mechanical engineering. With a curiosity-driven mindset, I joined Harihar Industries for a one-month summer internship to gain hands-on exposure in CNC (Computer Numerical Control) and VMC (Vertical Machining Center) operations.

As a first-year student, this experience was not just a training opportunity but a professional awakening — offering insights into the factory floor, real machines, live workpieces, and the silent precision of industrial machining.

OBJECTIVES

- • Understand the basic and advanced operations of CNC and VMC machines.
- • Learn about tool paths, tool insertion, tool changes, and manual programming.
- • Study various shaft designs, dimensions, and machining operations.
- • Observe production scheduling and explore possibilities like auto-feed scheduling.
- • Interact with working professionals and develop industrial discipline and ethics.

INDUSTRIAL EXPOSURE

During my internship, I:
- Observed and studied the core components of CNC/VMC machines: controller, spindle, chuck, tool turret, axis drives.
- Learnt basic G-code syntax and structure for tool movements.
- Engaged in manual tool setting and understood how tool changes affect accuracy and productivity.

- Explored different shaft types, including stepped shafts, and learned the terminology (like step length, shoulder length, taper sections).
- Tried to design shafts using CAD tools based on physical measurements and visual references.
- Understood how time optimization is key in production, especially with suggestions like integrating auto-feed scheduling or simulation tools like EDUVMC.
- Experienced how a small change in diameter, feed rate, or tool path can impact the entire operation.

TECHNICAL SKILLS GAINED

- • CNC & VMC Basics: Structure, operation, setup, and process flow.
- • Shaft Design Understanding: Real-world observation and interpretation.
- • Tooling Knowledge: Cutting tools, tool changes, wear, and regrinding.
- • Production Efficiency Thinking: Exposure to productivity solutions like auto-feed and automation.
- • Soft CAD Skills: Rough shaft modeling using AutoCAD (based on visual approximation).
- • Problem Solving: Thinking how to optimize machine time and reduce manual intervention.

KEY TAKEAWAYS

- • Theory is just the beginning: No textbook can replicate the experience of standing beside a real VMC, hearing it cut through metal.
- • Observation is power: I trained my eye to detect differences in shaft profiles, tool placement, and machine behavior.
- • Discipline matters: The punctuality, safety, and system-oriented thinking in the workshop were as important as technical skills.
- • Clarity on Career Direction: While I'm exploring all fields, this internship helped me understand what a career in manufacturing and CNC-based engineering would feel like — practical, intense, and precision-driven.

PERSONAL REFLECTION

This internship turned machines into mentors. It gave life to my mechanical concepts, strengthened my technical foundation, and added industrial clarity to my academic journey. I now understand the value of hands-on experience, the complexity of machine operations, and the satisfaction of seeing a design come to life through metal.

While I may or may not pursue CNC/VMC as my final field, this internship sharpened my engineering instincts and taught me the value of being on the ground.

CATIA Shaft Modeling Report

- **Objective**:

  To create an accurate 3D model of a mechanical shaft using CATIA V5, suitable for structural analysis in ANSYS Workbench.

- **Software Used:**
  - **CATIA V5** – For 3D CAD modeling
  - **Workbench Compatibility:** Geometry exported in STEP format

- **Modeling Process Summary:**

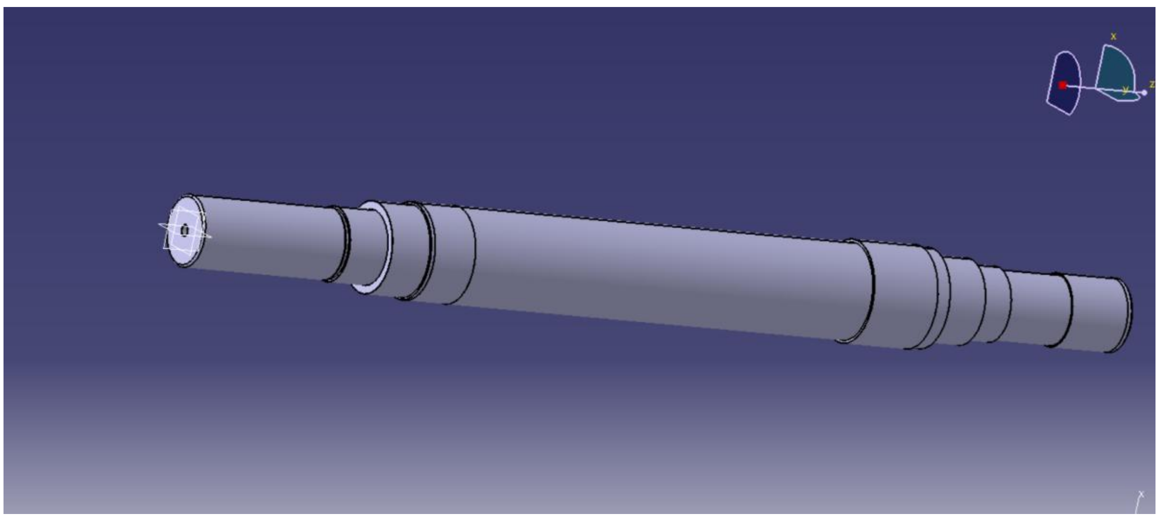
- The shaft was modeled in the **Part Design** workbench of CATIA V5. A 2D sketch representing the longitudinal profile of the shaft was created, incorporating various diameters and step transitions.
- Using the **Shaft (revolve)** feature, the profile was revolved around its central axis to generate the 3D model. Standard features such as **fillets and chamfers** were applied to reduce potential stress concentrations and ensure smoother geometry transitions.

- ### Export for Analysis:

  The final geometry was saved as a .CATPart file and exported to .STEP format to maintain unit consistency (millimeters) and compatibility with ANSYS Workbench for simulation purposes.

- ### Conclusion:

  The CATIA model provided a clean and mechanically appropriate representation of the shaft, enabling reliable finite element analysis (FEA) in ANSYS. The modeling process followed standard design practices and ensured simulation readiness.



Simulation Results Summary

Simulation Setup:

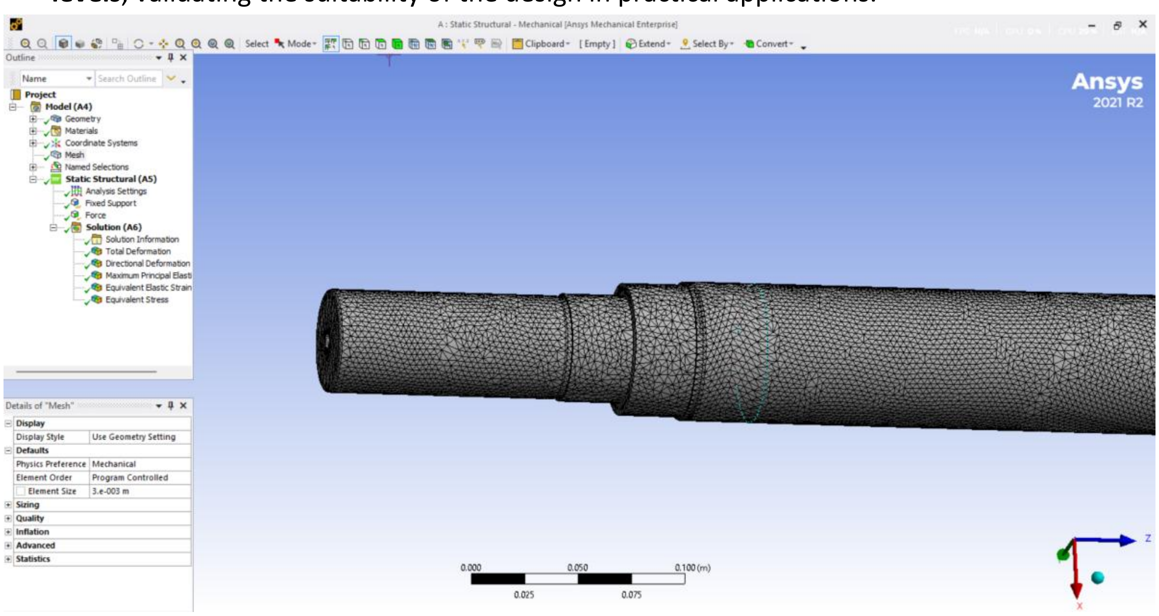
- **Component Analyzed:** Shaft
- **Applied Load:** 60,000 N (axial)
- **Boundary Condition:** One end of the shaft is fixed
- **Material:** Structural Steel *(assumed yield strength ≈ 250 MPa)*
- **Meshing:**
  - **Global Element Size:** 3 mm (3e-3 m)
  - **Mesh Type:** Tetrahedral (default in ANSYS)
- **Unit System:** mm, kg, N, s

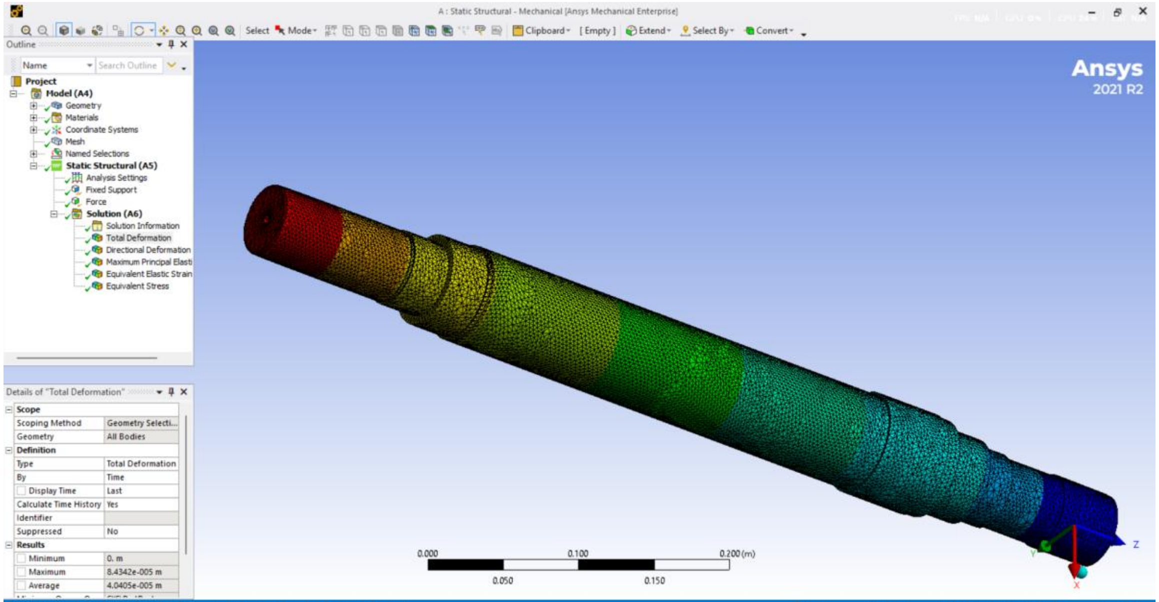
Final Simulation Output:

Parameter	Result	Unit
Total Deformation	8.432×10^{-5}	mm
Directional Deformation	1.5529×10^{-6}	mm
Maximum Principal Elastic Strain	0.00059419	— (unitless)
Equivalent Elastic Strain	0.0013325	— (unitless)
Equivalent (von Mises) Stress	207.85	MPa

Conclusion & Engineering Interpretation:

- The shaft experienced a **maximum total deformation of only 0.000084 mm**, which is exceptionally small and confirms the component's **high stiffness** under the applied load.
  The **von Mises stress** reached **207.85 MPa**, which is well within the **elastic range** of structural steel (yield strength ~250 MPa).
  The **strain levels** are also within the elastic range, confirming that **no plastic deformation** occurred.
- ✅ **Conclusion:** The shaft design is **mechanically safe** and **structurally sound** for the applied 60,000 N axial load. The simulation results confirm **minimal deformation** and **safe stress levels**, validating the suitability of the design in practical applications.




A : Static Structural - Mechanical [Ansys Mechanical Enterprise]
Ansys
2021 R2
Outline
Project
Model (A4)
Geometry
Materials
Coordinate Systems
Mesh
Named Selections
Static Structural (A5)
Analysis Settings
Fixed Support
Force
Solution (A6)
Solution Information
Total Deformation
Directional Deformation
Maximum Principal Elasti
Equivalent Elastic Strain
Equivalent Stress
Details of "Total Deformation"
Scope
Scoping Method
Geometry Selecti...
Geometry
All Bodies
Definition
Type
Total Deformation
By
Time
Display Time
Last
Calculate Time History
Yes
Identifier
Suppressed
No
Results
Minimum
0. m
Maximum
8.4342e-005 m
Average
4.0405e-005 m
0.000
0.100
0.200 (m)
0.050
0.150