

## **WEEKLY REPORT 3: 8/5/2024-8/11/2024**

### What I've done for the week:

#### **1. Tolerance Stackup Analysis:**

Following a thorough review of the tolerance stackup template provided by my mentor, I began developing a detailed tolerance stackup analysis for the vertical Stirling engine assembly, concentrating on the transfer cylinder and base components. The objective was to ensure that the assembly would function seamlessly with the correct fit and clearance between these critical parts.

I started by analyzing the assembly's design, focusing on how the transfer cylinder interfaces with the base. This included calculating the cumulative tolerances to determine the potential variations in fit due to manufacturing deviations. The analysis aimed to ensure that the final assembly would meet the required functional and performance criteria without excessive play or interference.

Once the initial analysis was complete, I submitted my findings to my mentor for feedback. Based on the insights provided, I made targeted adjustments to the stackup analysis, refining the dimensional tolerances to achieve a more precise clearance fit. This iterative process led to a more robust design, minimizing the risk of assembly issues and enhancing overall product quality.

#### **2. Heat Treatment and Surface Treatment Processes:**

In parallel with the tolerance analysis, I focused on optimizing the heat treatment and surface treatment processes for the components. Recognizing the importance of these processes in improving the material properties and durability of the parts, I conducted extensive research on industry standards and best practices.

I reviewed how heat treatment and surface treatment processes are typically represented in engineering drawings, taking into account the material composition of the transfer cylinder and base, as well as their functional roles within the assembly. The research involved studying the impact of various treatments on hardness, wear resistance, and corrosion protection, ensuring that the chosen treatments would enhance the performance and longevity of the components.

Based on this research, I updated the engineering drawings to accurately specify the required heat and surface treatments.

#### **3. GD&T Enhancements and Drawing Refinements:**

To further improve the precision and clarity of the engineering drawings, I identified additional GD&T (Geometric Dimensioning and Tolerancing) features that were critical to the assembly's performance. Specifically, I incorporated controls for flatness, straightness, and cylindricity, which are essential for ensuring the parts meet the necessary geometric specifications. In addition to the GD&T updates, I also made several refinements to the overall layout of the drawings. This included standardizing font sizes, improving the positioning of dimensions, and ensuring that all annotations were legible and unambiguous.

### Challenges & Lessons learned:

1. I learnt the importance of determining the critical surfaces for applying GD&T features without over-complicating the manufacturing process.

2. Balancing precision with manufacturability and ensuring clear communication in engineering documentation is key to successful product development.

What will I be doing the next week:

1. Continue improving on the treatment processes on the remaining drawings & review the final modified drawings with the mentor for feedback
2. Align on next steps with the mentor during the biweekly meeting.