Group A2

Stirling Engine

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Aim of the Project

The aim of the project is to design and manufacture a functional Stirling engine

Background

Stirling engine is a heat engine that works by converting thermal energy into mechanical work by using a closed cycle system invented by Robert Stirling in 1816.

Stirling engines are a safer alternative to steam engines.

It consist of components i.e Displacer, heat source, piston, fly-wheel, and a space for compression and expansion.

Types of sterling engine

- The Stirling Engine (Alpha Configuration)
- The Stirling Engines (Beta Configuration)
- The Stirling Engines (Gamma Configuration)

Final Design

Our design was finalized on Solidworks and showed interferences that might any occur us during assembly.





A Finite Element Analysis was performed on the link arm to the flywheel, we felt this would be a point of high stresses as the parts are small and thin. Results show deformation will start when 400 N of force are applied. This is well over our calculated force.

Manufacture

- Our workshop skills to manufacture our parts.
- manufacture.
- crafting our Sterling parts.
- We used our workshop skills to:
- Lathe (Turning, facing, boring and reaming)
- Manual bench (Tapping, Filing, cutting and polishing)

The mill was used to profile our main body down to size and accurately drill holes and tap them.

Materials

In this Sterling Engine project, we decided to machine our base from aluminum because it is commonly used in industry and was easy to access.. Our support legs in the sterling engine are made from steel as they are strong and stable to hold our main body up. Our heat gasket is made from nylon at the minute but originally, we had planned to machine it from PEEK, but nylon was more accessible. Our link arms were machined from brass and so was our cold cylinder as it increases the thermal efficiency and aesthetics.









Finite Element Analysis

• The workload was divided, and we took different parts of the engine to

• We created working drawings and acquired the necessary stock and began

• Milling machine (Face milling, profiling, tapping, and drilling)



Conclusion

- Understanding the fundamental principles and the function of a sterling engine is a necessity in designing and manufacturing one.
- The group project presented many difficulties such as, communicating, designing, manufacturing, creating a cad assembly, file management, time management after hours and many other factors.
- Adapting to challenges and obstacles was of major importance the designing and such as manufacturing of the sterling engine.
- · Overall, the project has helped us to increase our skills and to better understand everything that the into the design qoes and manufacturing of a product.
- The team had to change designs and add new parts to allow for better optimization of the sterling engine along with ease of manufacture due to having to create parts manually

References

- Moodle Notes. •
- Brownie (YouTube channel)
- Google Scholar
- Mechanical Advantage (YouTube channel)

Acknowledgements

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