Stirling Engine

Group-C1

Cian O Carroll, Cilian Moughty, Ricardo Rodriguez, Jacob Quirante

Aim of the Project

The Aim of the project is to design, build and test a Stirling Engine

Background

A Stirling engine is a heat engine invented by Robert Stirling in 1816. It operates by cyclically compressing and expanding gas at different temperatures. Heat is applied to the gas on the hot side, causing expansion, while the cold side cools the gas, causing contraction. This pressure difference moves a piston to produce mechanical work. Stirling engines are highly efficient, operating close to the theoretical Carnot cycle. They can run on various heat sources, making them versatile but are limited by heat transfer and material challenges. There can be three different types of sterling engines Alpha, Beta and Gamma.

Materials

For this Sterling Engine project, we used many different materials like aluminum steel and ptfe. We decided to make our base out of aluminum as it is commonly used in the workshop and easy to get. Our two connecting rods are made from steel because of its strength and durability. Our holders for the two pistons were made from aluminum. We made our two pistons from brass to stop them from binding to the aluminum cylinder's.

Manufacturing

We used our workshop skills to manufacture our parts. After putting in our materials order we created working drawings for each piece to help speed us up in the workshop. When we got into workshop, we then split the workload evenly with someone on a lathe, a mill and two people on the bench.

Figure 1: Lathe and Milling Operations.



Finite Element Analysis

An FEA was conducted on Solidworks for one of our holders. So that we could determine the different forces that would act on the holder such as stress and strain. As seen in figure two the use of colour represents the size of the force acting on the holder. From the scale you can see that red is the highest force on the scale and blue is the lowest.



Figure 2: Finite Element Analysis









This is our final design that was created on

Figure 3: Suitable figure caption

Photo of: Suitable figure caption

References

• Sterling Engineering. (2024). About Sterling. [online] Available at: https://www.sterlingengineeringeu.com/ab out-us/ [Accessed 27 Mar. 2025]. Moodle Notes. • Nicola Toy YouTube channel.



Conclusion

The group project presented many challenges for us such as, communication, time management (having to stay on after hours when we all got the chance), the whole design process and then having to assemble it together. Getting over all these challenges was very important in the overall designing and manufacturing off the sterling engine.

Overall, the project has helped us gain great experience in working in a group and communicating with a team. We also increased our skills in the workshop as we were manufacturing everything we designed. This all gave us a great understanding of what goes into the design and manufacturing of a product.

We had to change some parts of the design like the base as the brief changed meaning we had to put the engraving on a curved surface. Which then meant we had to redo the assembling of the sterling engine. We also had to change some designs as we were told the parts would be too difficult to manufacture.

Acknowledgements

The team would like to thank our lectures who helped us with the design/manufacture elements and all the questions we sent their way: Ciaran O Loughlin, John Walsh, Bosco Clarke and Emma Kelly.