

Space Engine Design : Heat to translation

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Abstract

The design documented in this paper is author attempt to design a stirling engine in Catia V5 powered by Sun in space.

Keywords

Stirling engine, Sun, Space, Catia.

Introduction

Stirling engine was invented by Robert Stirling in 1816. [1] This design is a creative attempt to redesign in Catia V5 combined with heat transfer analysis in COMSOL Multiphysics. The design has been uploaded at <https://grabcad.com/library/space-engine-1> and is presented below.

Design

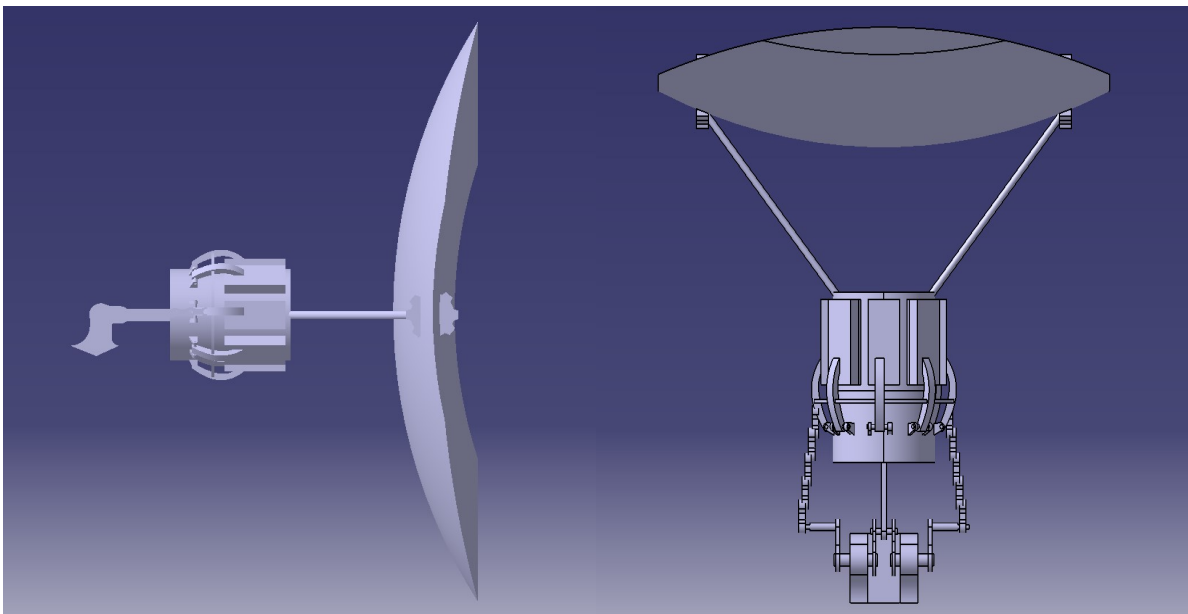


Figure 1 & 2

Figure 1 and 2 depict the finished design with retractable fins attached to heat sink components mounted and buried inside the gas chamber.

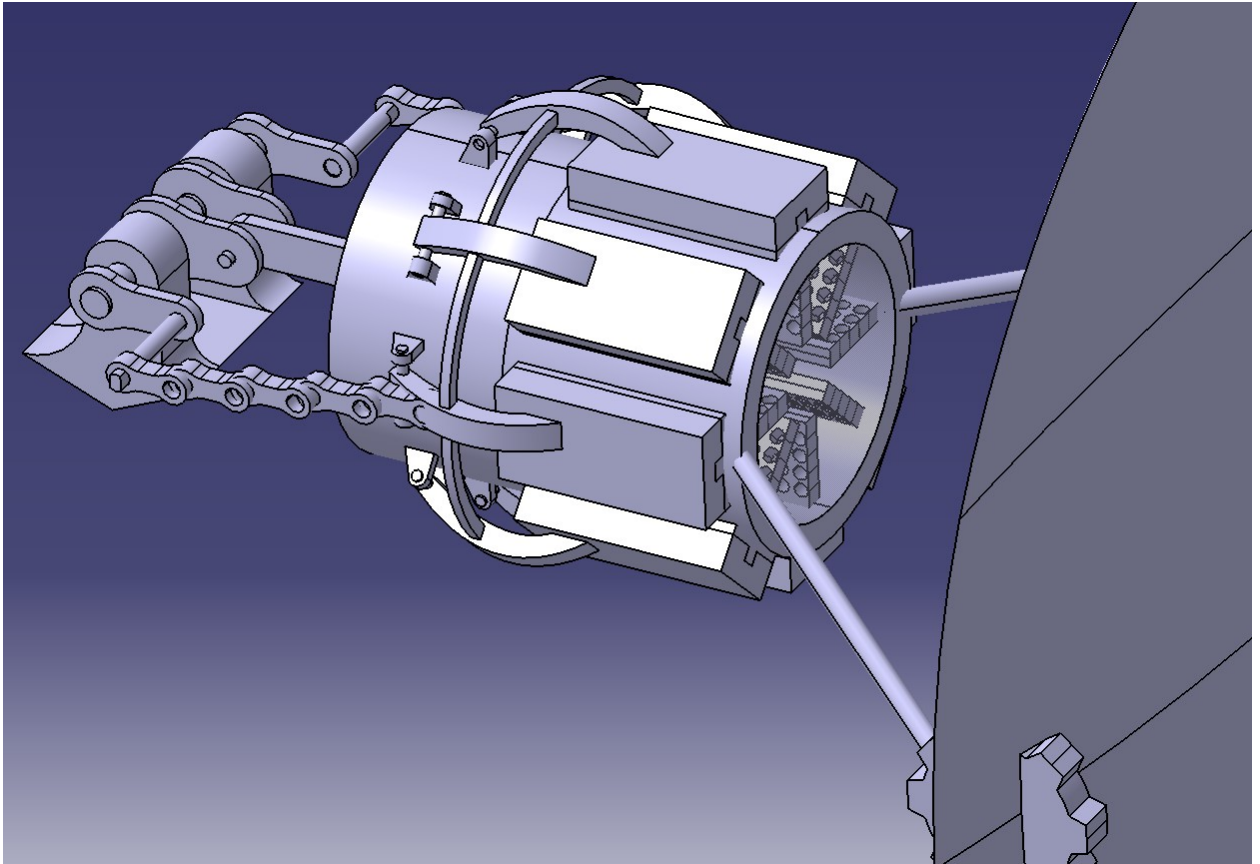


Figure 3

Figure 3 depicts same design with transparent air chamber to make the grid inside visible. The engine works on expanding and contracting gas (preferably a mixture of Hydrogen/Helium for compressibility and a greenhouse gas), and when the piston (depicted in figure 4) goes to the end position the retractable attachments close to allow the heat to be moved via external heat sink.

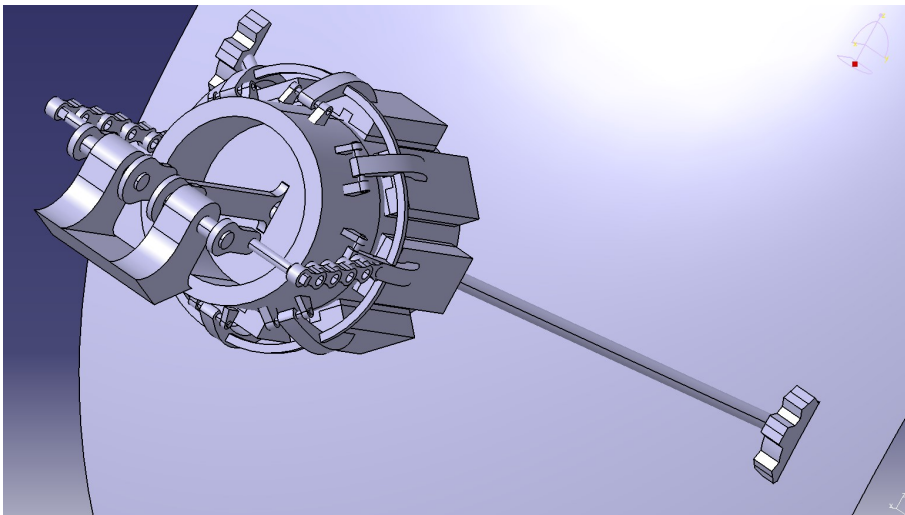


Figure 4

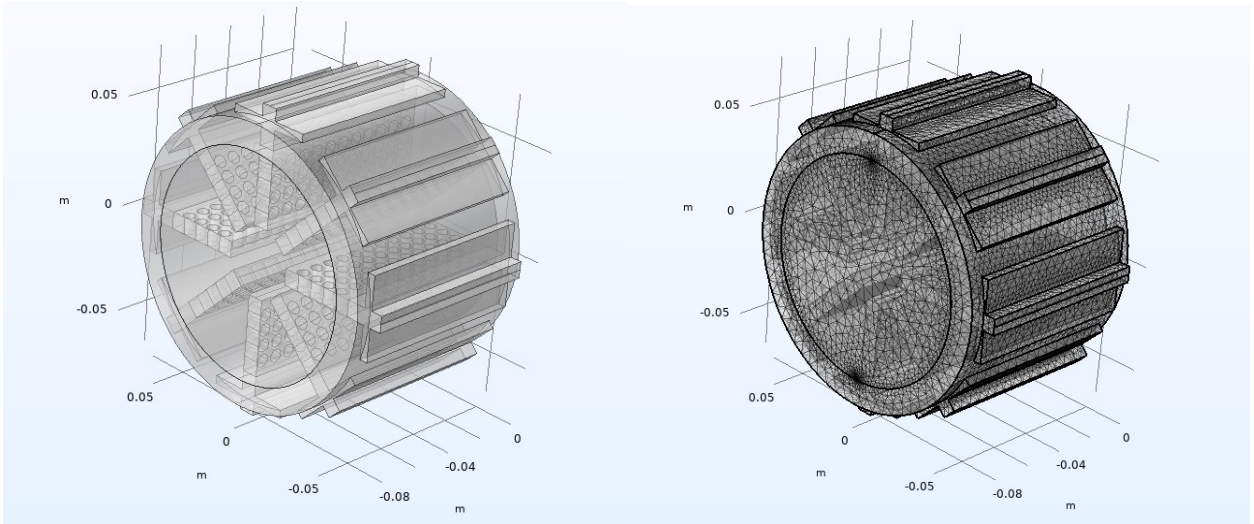


Figure 5 & 6

Figure 5 and 6 illustrates the import and meshing of the gas chamber with grid in COMSOL.

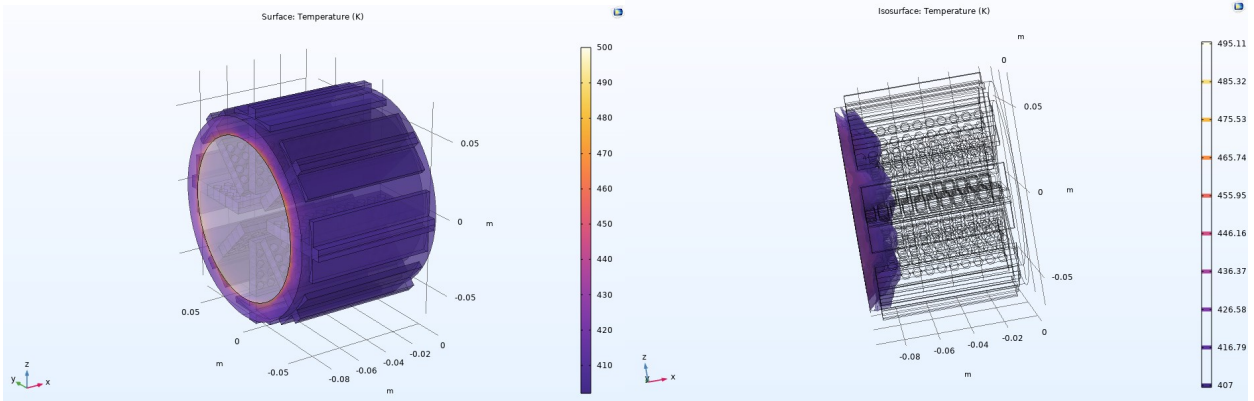


Figure 7 & 8

Figure 7 and 8 are results of initial temperature being 0 degree celsius and the foremost plane of gas chamber being at 500 K, and analysis has been done with convective heat flux going outwards from the grid tops at $1 \text{ W/m}^2\text{K}$. The countour shows the drop of temperature is 93K at <30% length.

Conclusion/Remarks

The stirling engine designs holds key to passive locomotive force generation around sun and must be further innovated upon.

References

[1] Source : The Engineer, Dec. 14, 1917, p. 516 - Part 1 - The Economiser
Date of patent : 1816, Patent #: 4081