Stephen Harris & Joel Brauer

Physics 353

Project Summary

Our project was to design and build a Stirling Engine that would utilize the Sun's energy to run. Our initial goals were to design some type of solar thermal generator that would be capable of use on a small, domestic, scale. What we want to accomplish in our design is such that it can be used on a residential scale to alleviate power usage from the main grid by providing things like hot water, heating, air conditioning, or even power to a few electrical appliances. We chose the stirling cycle for our engine design because of its inherent efficiency, its wide range of design types, and because it can be designed to be small and cheap. All these aspects are what we felt would be needed in order to design something that could be used on a residential scale.

What we came up with is a parabolic reflector dish that concentrated the Sun's radiation to a point (the focal point of the parabola) that would be used as our heat source for the engine. We chose the reflector dish instead of, say, a lens because in small scale use we knew we would want something that would be light weight and could easily track the sun in the sky over the course of a day; a lens would be heavy and more expensive. This meant the engine would have to be suspended above the reflector and thus we designed it to be in the shape of a cylinder in order not to block as much of the sun as possible. Aside from these details the rest of the design was in the modest spirit of simply trying to get something that would work, i.e. as far as the rest of the design goes we didn't necessarily have residential use in mind.

We made the engine from completely raw materials save for a hoola-hoop used for the frame of the reflector dish. The design itself stayed the same throughout, but we went through several attempts at various parts of the engine. There was quite a bit of trial and error but our final product worked quite smooth, as far as the components went. However, the engine never fulfilled a full cycle by its own momentum and thus was a failure. To save some face, the design itself worked, but we weren't able to fully seal all the compartments and thus it was never fully pressurized. This is the primary reason Joel and I felt the engine could not function. On the video of our field work you can even hear air escaping through the power piston in the form of gurgling of the lubrication (WD40).

All in all we are extremely happy with what we were able to accomplish given our limited time, tools, and materials. We even feel that with a bit more time we could have gotten a working model even with the materials and tools we had; a bit more ingenuity and trial and error and we may well have had a great working engine! This experience has enlightened both our minds to the complexities of designing and building a heat engine. We definitely plan on working on it further to hopefully getting a working product. We would also like to thank you, professor, for the opportunity to think outside the box and apply our knowledge to areas we are both interested in. We both hope you enjoy the videos!

Joel Brauer
Stephen Harris
PHYS 353

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