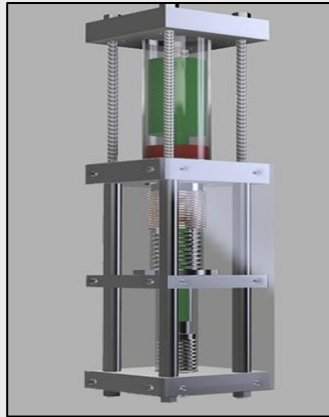


Stirling Engine - Renewable Electricity from Waste Heat

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Figures: Our CAD model of the free piston Stirling engine (left). Parabolic solar cooker used for generating renewable heat to power the Stirling engine (right).

OUR PROJECT

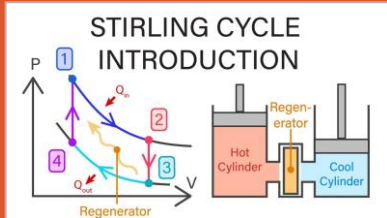
- Our goal is to convert industrial wasted heat into clean energy. With clean energy becoming increasingly important, waste heat is a resource that can no longer go unused.
- Stirling engines can be used in hotel heating and ventilation, as well as traditional renewable energy generation systems to increase the energy efficiency of the hotel industry.
- The Stirling engine will be heated by the solar cooker to help produce clean energy, which makes it a very sustainable design.

According to Energy Star, the average hotel in America is spending \$2,196 per year on the energy required for each room

What is a Stirling Engine?

Stirling engines are closed system engines used to create power by repeatedly expanding and compressing a working fluid contained within.

The expansion and compression of the working fluid is created from the temperature differential between the hot and cold ends of the engine

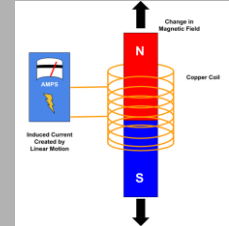


WHY STIRLING ENGINES?

- No combustion is necessary which allows renewable heat input
- Requires little to no maintenance
- Can utilize sustainable materials in its construction
- Low noise output
- Low vibration

Function

- The engine is heated by an electrical heating element to resemble the heat that could come from solar or waste heat
- When the helium is heated, it will expand and move the power piston, causing the magnets to pass through the coils
- The motion of the magnets manipulates the local magnetic field, inducing current in the coils



- The bottom of the cylinder is water cooled creating a cold sink. This cold section causes the helium to contract, and the springs overcome the gas pressure, restarting the cycle.

Free Piston Design

- Single piston Stirling engines
- Uses internal pressure instead of mechanical linkages.
- Uses springs to cycle the recycle the movement
- Fewer seals required to contain the gas
- Made from primarily aluminum because it is light and thermally conductive

Future Work

- Increase the efficiency, and power output of the existing engine
- Add new sources of renewable heat that the engine can function on