The Stirling Cycle

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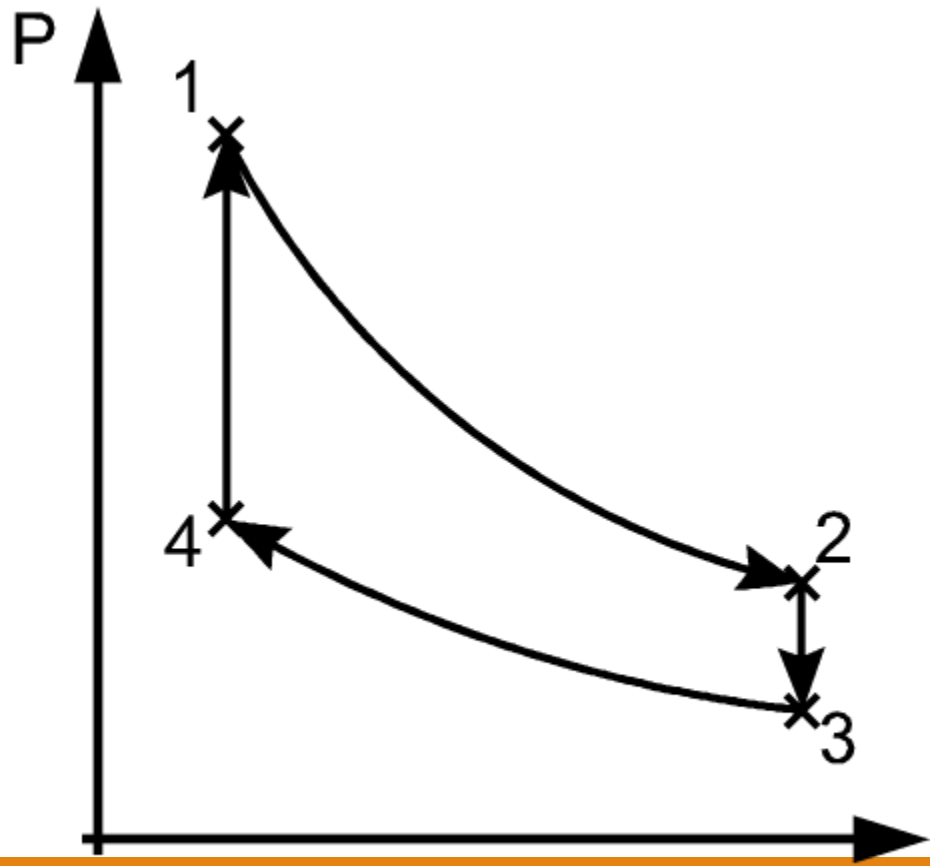
The Stirling Cycle

Process 1-2: Isothermal expansion

2-3: Constant-volume cooling

3-4: Isothermal compression

4-1: Constant-volume heating



http://en.wikipedia.org/wiki/Stirling_engine#The_Stirling_cycle

The Stirling Cycle

Closed Cycle – the working fluid never leaves the system

Reversible

External heat source – any heat source is valid, as long as it produces enough heat to expand the fluid

Uses a “regenerator” to conserve internal energy and increase thermal efficiency.

http://en.wikipedia.org/wiki/Stirling_engine#The_Stirling_cycle

The Stirling Engine

First developed in 1816 by Reverend Dr. Robert Stirling

After development, had little use until the mid 1900's, when it became more common

Used today in many applications, primarily green energy, since the heat source can be anything (geothermal, solar, etc.)

The Stirling Engine

Main application of the Stirling cycle

Uses pistons and cylinders to rotate a crankshaft

Two types/configurations – Alpha and Beta

Alpha Stirling engines use two cylinders and two pistons

Beta Stirling engines use one cylinder, one piston and a “displacer”

Pros

Mechanically very simple in comparison to internal combustion engines

Lightweight, compact

Not limited by fuel or heat source

Aside from a longer warm-up time, reliable in cold weather (unlike some engines)

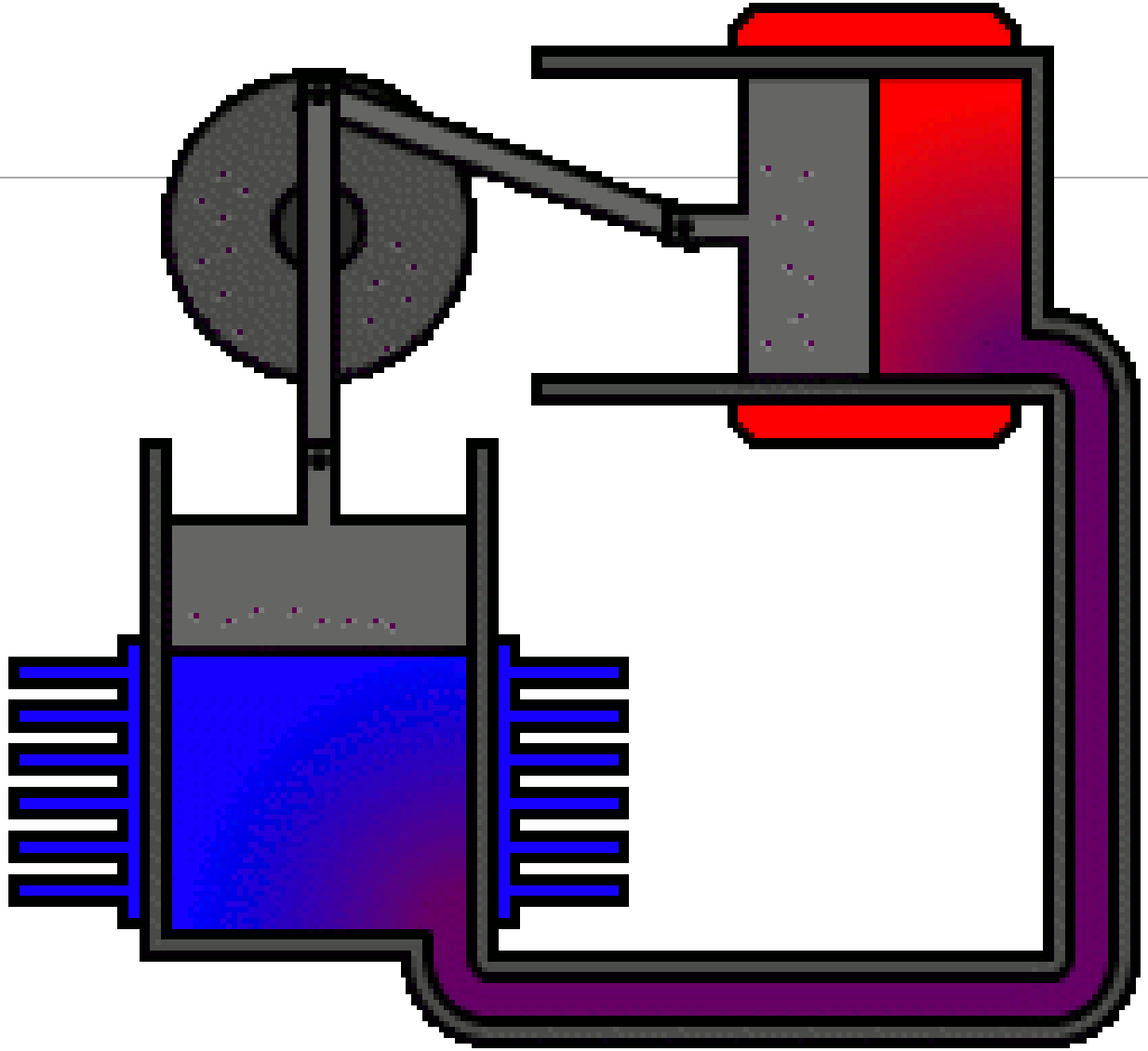
Cons

Low torque

In order to be more efficient, it requires metals with very high thermal conductivity, which can be expensive

Rotation is not always smooth – the fluid sometimes heats up faster than it cools off

Alpha Stirling Engine



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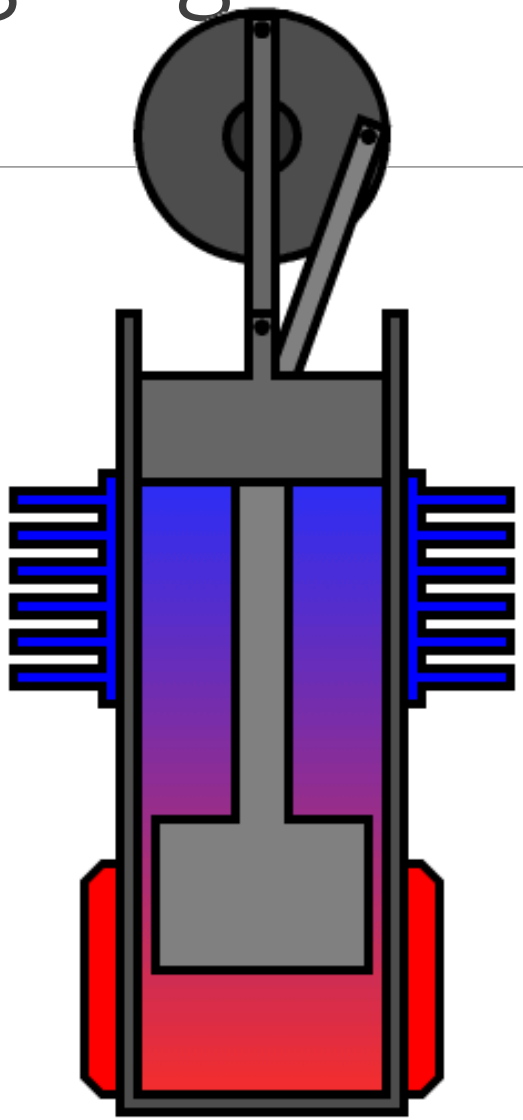
Beta Stirling Engine



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Cool Stuff

This one runs off of body heat

Probably no real application, just cool

http://en.wikipedia.org/wiki/Stirling_engine

Cool Stuff

Solar Stirling engine

Uses reflected sun rays as heat source

Green energy

Could power a house

http://www.researchdata.us/Images/Stirlingdish2.jpg

Cool Stuff

Very large solar Stirling engine

Could probably power a sma city

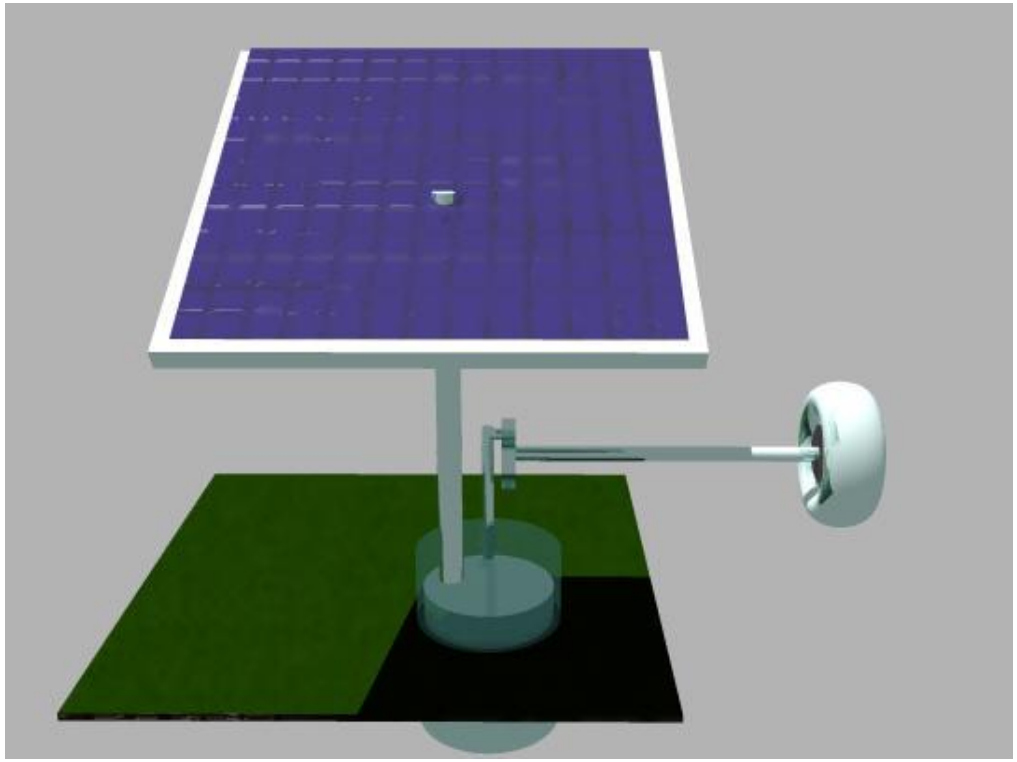
http://www.tommccarty.com/blog/wp-content/uploads/2008/08/brightsource-solar-mojave2.jpg

Cool Stuff

Theoretical solar Stirling engine

Uses residual heat produced from a solar panel sitting in the sun as heat source

Converts the unused heat into electrical energy that can be used



http://www.peacekeeper.com/freeideas/ow.asp?p=PersonalStirlingEngine&a=print

Works Cited

http://en.wikipedia.org/wiki/Stirling_engine#The_Stirling_cycle

http://www.tommccarty.com/blog/wp-content/uploads/2008/08/brightsource-solar-mojave2.jpg

http://www.peacekeeper.com/freeideas/ow.asp?p=PersonalStirlingEngine&a=print

http://www.researchdata.us/Images/Stirlingdish2.jpg