Technical Assistance Request:

This project will construct a Dual Stirling Air Conditioning Heat Pump for use in concentrated direct sunlight. The objective is to increase the power density and efficiency of a Stirling cycle heat pump by removing the dead volume that dilutes the usable compression, and deliver more active working fluid (either nitrogen or helium) to the thermal surfaces that are best able to use it to do actual work.

This design replaces the usual pistons with regenerator disks that nest within each other to both store thermal energy, and act as the displacer of the pump. In this way, the working fluid is forced closer to either end of the pump at the correct time, and all working fluid is purged from the interstitial spaces, so that it will be working rather than diluting the pressure that is achievable at that time.

It is hoped that the improvement will be useful in supplementing air conditioning equipment with the capacity to use concentrated solar thermal to drive a heat pump directly, without leaving the thermal cycle or going through any conversion to or from electric power. In this way, the heat of the mid-day sun could be used directly to cool the structures that need it at the time of peak power requirements, thereby reducing the peak load of the system and thereby the grid.

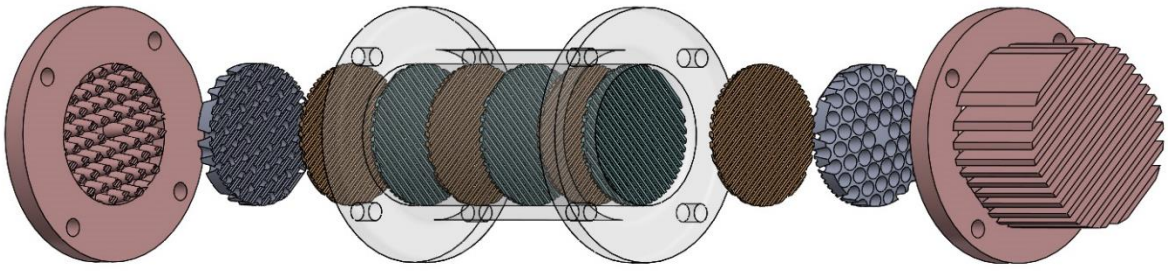
Parts to be built:

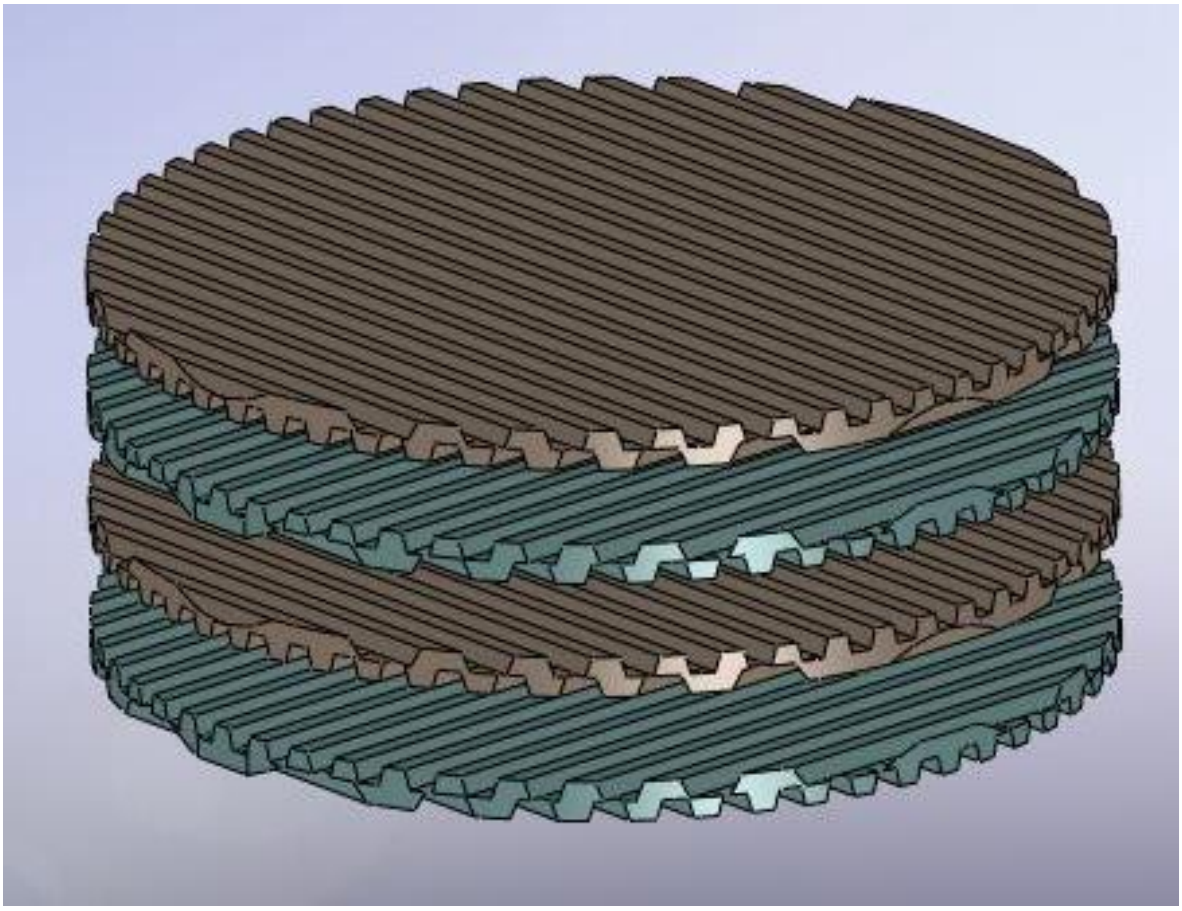
The pressure case will likely be made of a fiber reinforced thermoset plastic with a friction sleeve. The heads will be made of a heat conductive metal such as copper or aluminum. The inner parts that will pose a challenge will be the actual regenerator disks that probably need to be machined from a heat conductive metal and/or PTFE.

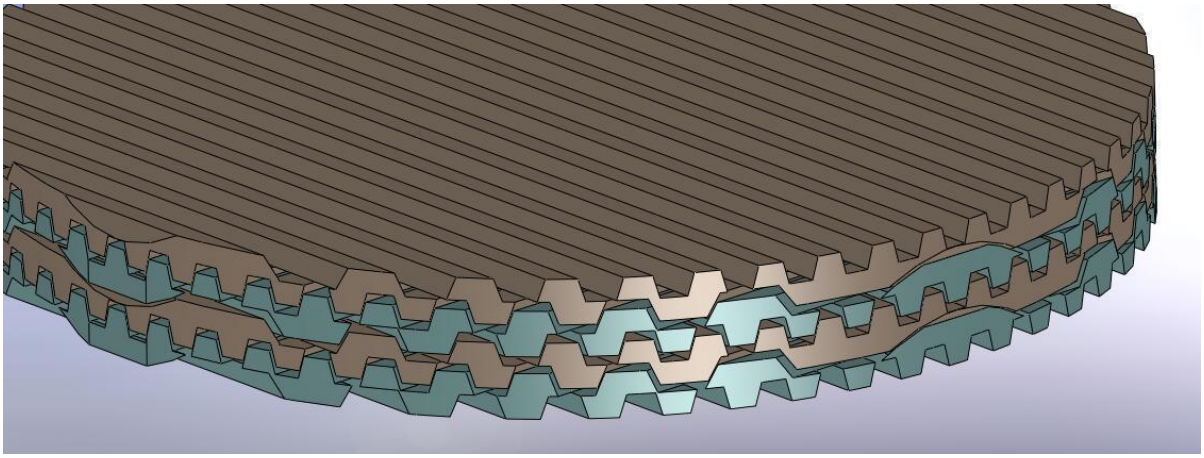
Studies to be done:

A computational fluid dynamics study has been started by a post-doc researcher at Lawrence Livermore National Labs. We don't know how much data will be forthcoming from this, since his time is limited to about two person/weeks spread over several months. We may get a good start on it, or maybe just get better at defining the problem. In any case, it would be great to have a backup plan for modeling this device in several sizes, at several temperatures, and varying several other parameters if possible, to get an idea of the prototype design with the highest likelihood of success.

Several drawings are below to give an idea of what the parts look like while interacting. Further information is available in U.S. Patent 8,991.170 or going to the website http://frigerator.net/







If you have any questions, feel free to contact me, Tom Sherlock, at 650-823-9976 or at tom@tomsherlock.com