Category: Energy and Transportation.

Topic: Renewable Energy.

a)Introduction

b)Materials and methods

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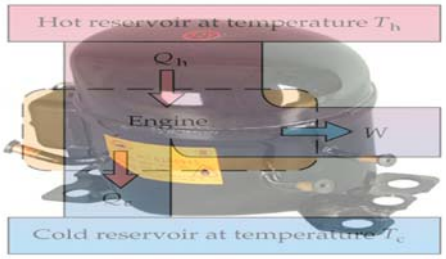
Introduction:

Energy is the source of life. We use it in every moment in every field of our life. Nowadays fossil fuels energy is commonly used, but by using these kinds of fuels, poisoning substances that pollute our environment are released. For now we are dependent on it but we must find innovative energy sources. In fact, we must find sources from which energy can be converted in useful one.
Our project explains how we can transfer the infinite kinetic energy of the molecules to cool or heat our houses. In our project we translate the energy instead of producing it. Even we don't realize there is a huge amount of energy around us as heat. If we can concentrate this heat energy in a certain place, we can use it without producing a new one. We are going to heat our houses by transferring it from outside to inside. In order to understand the amount of energy that is possible to transfer from outside, we can compare atmosphere with the buildings that we live. Atmosphere has how much energy ever we want. We are going to use just a little amount of this energy to heat our buildings.

Materials:

Pipes(thin and thicker ones) to construct our system,
We have used Copper or aluminum pipes which are good thermo conductors. They are with different diameters.

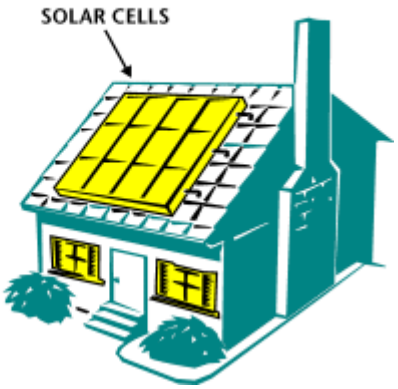
Compressor(powerful one) so as to establish high pressure.
We must use a powerful compressor to get high efficiency. Here is a simple one:



The substance inside the pipes(cyclohexane, chlorofluorocarbon or other volatile substances).
Key facts about cyclohexane:
Molecular weight: 84.18 g mol-1
Boiling point 80.7 degrees C (353.85 degrees Kelvin)
Specific gravity: 0.78 at 20 degrees C (293.15 degrees Kelvin)
Vapor density: 2.90
Melting point: 6.47 degrees C (280.62 degrees Kelvin)
Vapor pressure at 20 degrees C (293.15 degrees Kelvin): 95 mm Hg
Solubility: Insoluble in water; soluble in alcohol, ether, acetone, benzene, and ligroin

Sun panel(used to produce sufficent energy for the compressor).

- Design and build PV panels
- Customize panel output
- Make tab and bus ribbon
- Solder cell connections
- Wire a photovoltaic panel
- Purchase solar cells
- Test and rate PV cells
- Repair damaged solar cells
- Work with broken cells
- Encapsulate solar cells



The sun has produced energy for billions of years. Solar energy is the sun's rays (solar radiation) that reach the earth. Solar energy can be converted into other forms of energy, such as heat and electricity.

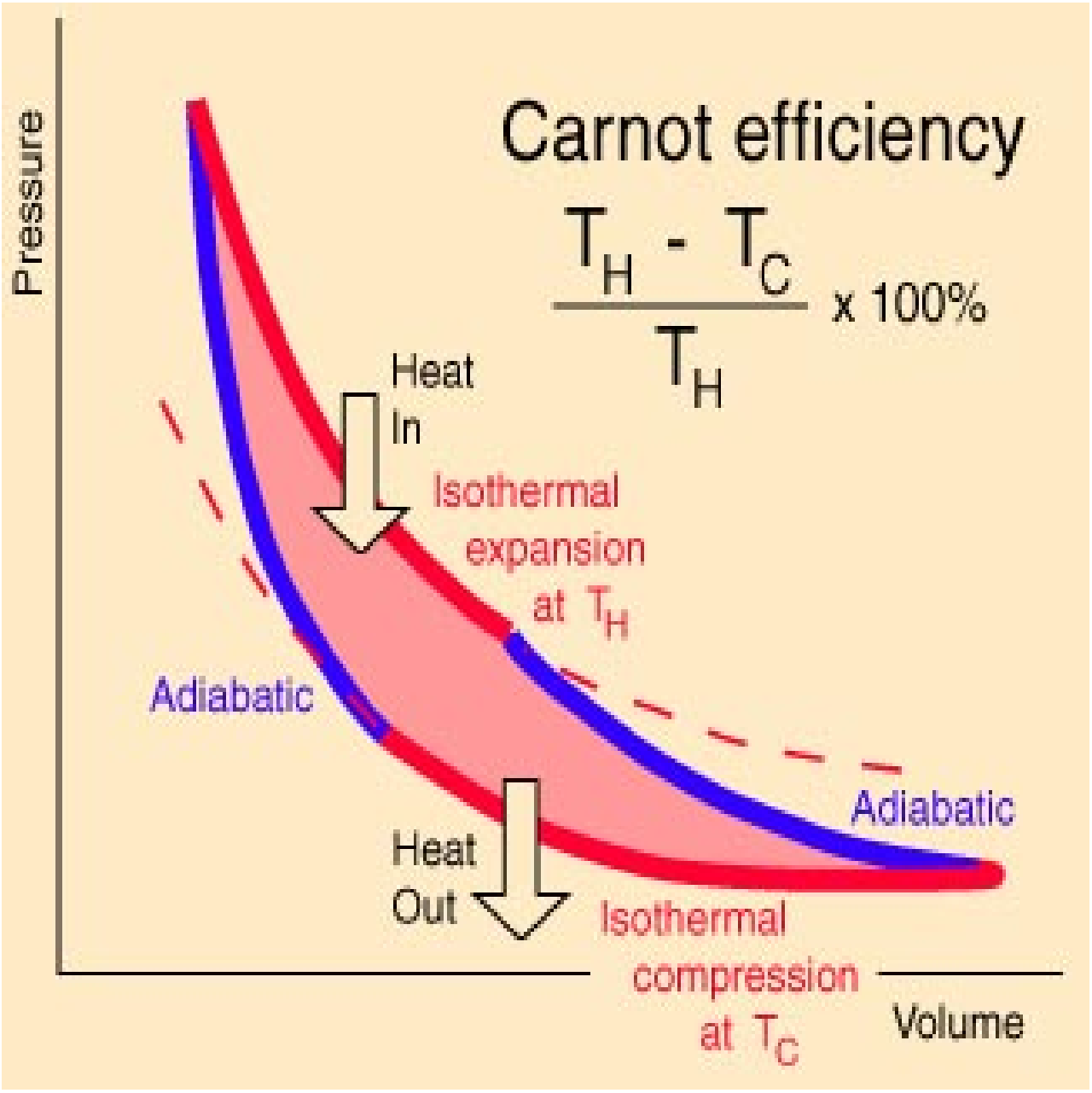
Battery(used to store the energy needed during night).

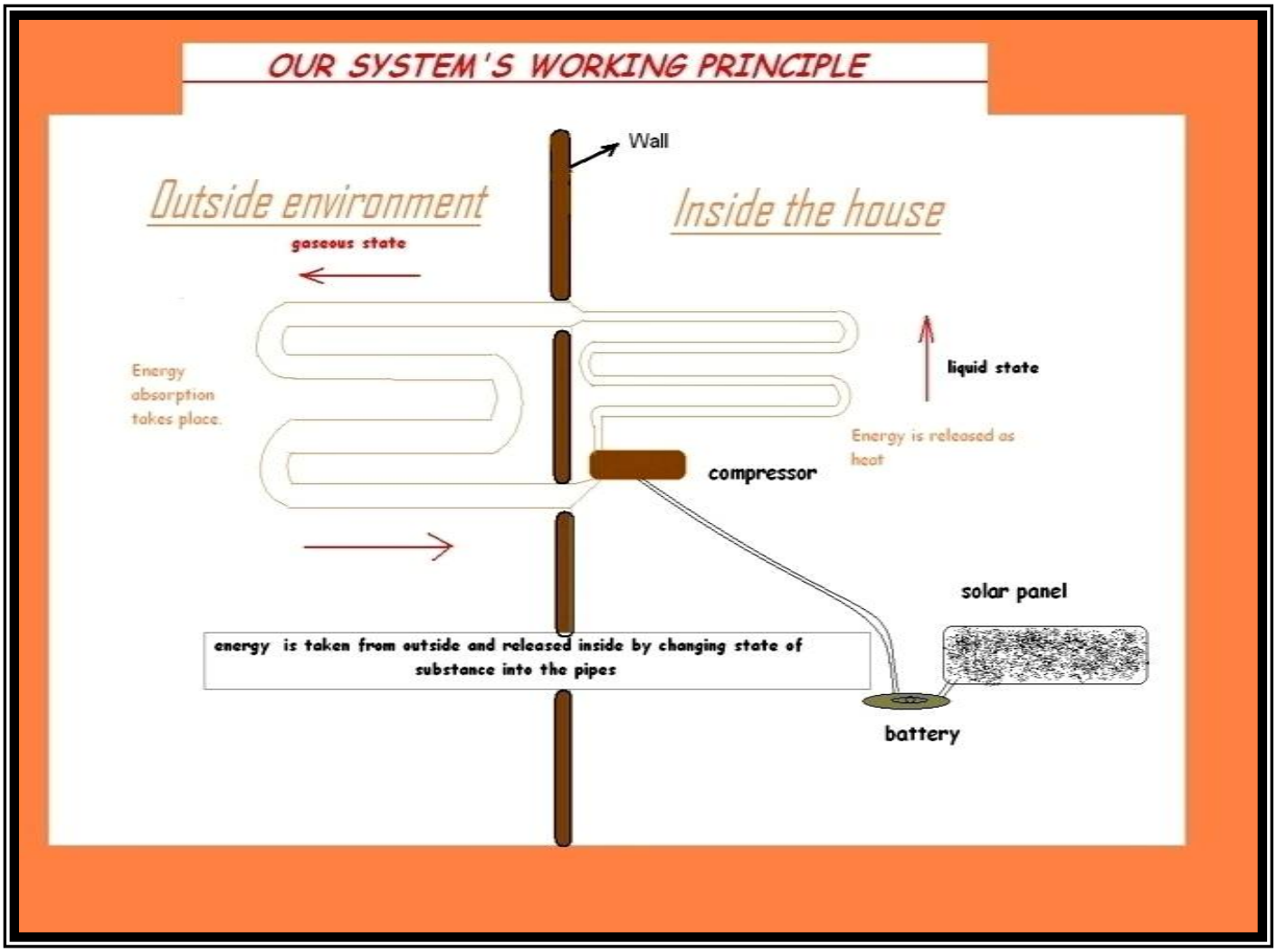
- VEC054C Soft Start Technology (SST)
- Automatic Reset
- Turbo Cooling
- Noise Free Technology
- Direct connection terminal block for higher power loads
- DUAL 15-amp (panel mounted circuit breakers)
- Three grounded AC plugs
- Powerful internal high speed cooling fan
- Features high surge capability
- High and low voltage protection
- Low battery alarm and low battery shutoff
- Short circuit/fault protection

Methodes:

Increasing the volume of a gas at a certain amount, decreases the temperature, decreasing the volume of the gas increases the temperature. By using compressor gas is compressed to small thin pipes; gas is liquefied and releases its heat. This liquefied gas is flowed into a region having bigger volume and lower pressure. Liquefied cyclohexane (C_6H_{12}) becomes gas suddenly. In order to be gas it needs energy and it takes it from the surroundings. Energy enters the

system. This energy is released from the system and the gas is liquefied in thinner pipes. These thinner pipes are going to be inside the building to heat it.





Explanation of the working of our system:

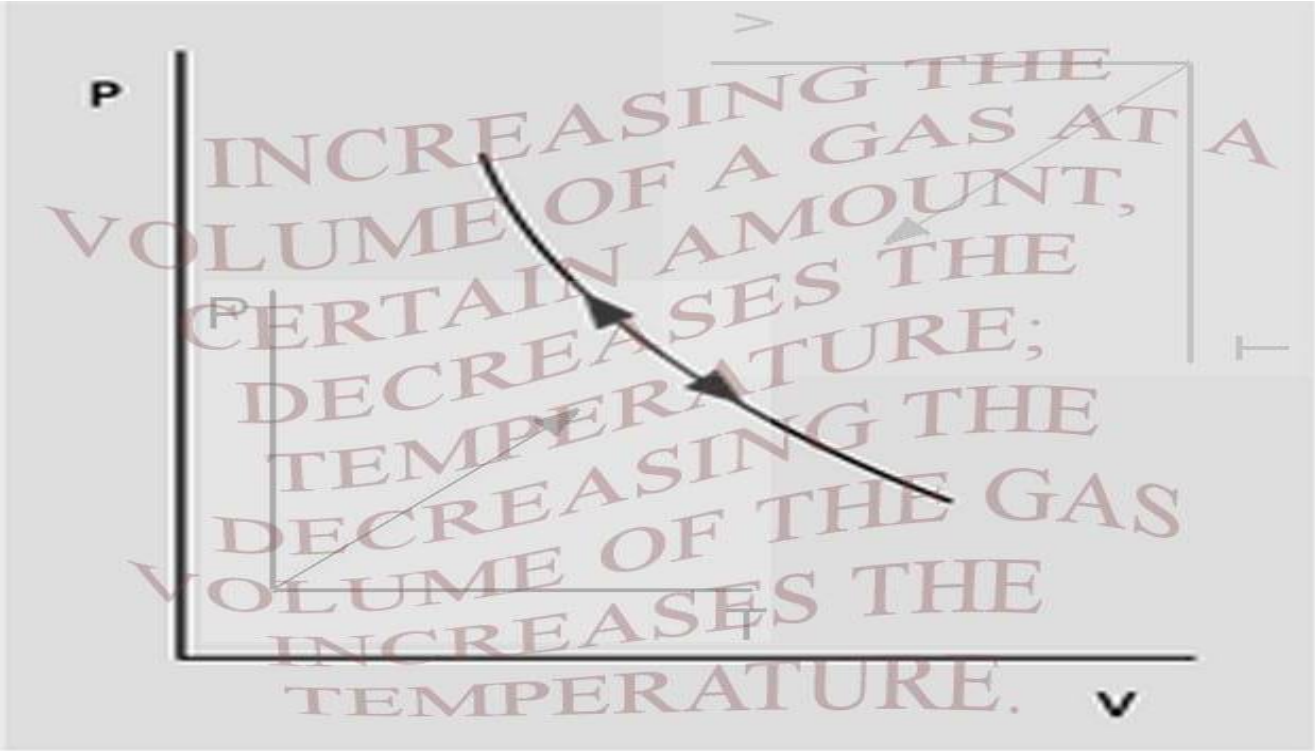
As you can see upward our system consist of a system of pipes the thikness of which varies to the volume of the place we want to heat.The thinner pipes are inside and the thicker pipes are placed outside of the building. The compressor pushes the gas(cyclohexane) form the thicker to the thinner pipes with high pressure. When the cyclohexane is pushed into the thin pipes it is liquefied due to the high pressure of the compressor. When this fluid goes outside of the building an immediate increase in the volume of the pipe makes the pressure fall drastically.

According to the ideal gas law(PV=nRT) the decrease of the pressure will make this volatile gas evaporate. As we know the kinetic energy of the gas molecules is higher than that of liquid molecules, so the cyclohexane molecules must take energy. This energy is provided by the kinetic energy of the air molecules outside, so it takes energy from the air. The air travels in the pipes and then enters into the house. When the gas enters, it is compressed into thinner pipes. This sudden compression makes the pressure increase immediately and the gas liquefies. When the gas is liquefied the energy absorbed outside will be released as heat by warming the air. The cycle continoues always like this by taking energy from outside and transfering it inside the building.We do not produce energy but we just transfer it.

Results:

1 compressor of 100 watt increases the temperature of 10m3 air by 5oc.
1 solar panel of dimensions 1,6X1m has a power of 500 Watt
To increase the temperature of normal room of dimensions 5x4x3m by 5oc we need 1 pannel and 2 compressors to work for 3hours.
To increase the perfomance of the system we can increase the number of pannels or the power of the compressors. For the night use we use a recheargable batteries. Nowadays there are powerful batteries up to 2000 Watt that can work for 37hour.

We are based on the ideal gas law: (PV=nRT).



Discussion:

These are some crucial points that were asked about our project:
1)How are we going to construct the pipe system into the buildings?
Inside the buildings are going to be the system of thinner pipes and the compressor. These pipes are going to be connected with some other thicker pipes situated in the outer part of the buildings.
2)Are they going to be visible and spoil the view of the building?
The pipes can be placed everywhere out of the building, but they must not be isolated from the air in outside environment. We can place these pipes in the back of the buildings or in the roofs, so everywhere we want.
3)Does the air temperature affect the working of the system?
As we know the molecules in each state have kinetic energy, even if the temperature is to low air molecules still have energy to give to the gas inside the pipes. Also the temperature of the environment has a negligible effect in the temperature of the gas inside the pipes, because it is pumped with high pressure by the compressor.
4)Does it have bad affect on the environment?
As we do not use fossil fuels or other poisoning substances it has no bad affect on the environment.

Conclusions:

By constructing a system that is sufficient for a house of a normal family, we need to spend just approximately 1200 $: 1) 2 panels x 400$= 800$
2) 2 compressors x 100$ =200$
3) pipes + battery (2000 Watt) = 200$
So by spending 1200$ we can construct a system used to cool-heat our houses without consuming anything and with no bad effects on the environment. Also some components as batteries and solar panels are guaranteed for at least 5 years.

Acknowledgments:

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Reference:

Websites selected from the Google as:
www.eia.doe.gov
www.wikipedia.org
www.home.howstuffworks.com