# Fabrication and Analysis of Freon Wheel

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*Abstract: Energy consumption has increased a lot during the past two decades. It has increased the cost of energy a lot, and it has constantly led to the inventions of alternative ways of harnessing energy. Freon Wheels are one such way of harnessing low-grade energy with Minimum pollution. It could be used in areas where there is waste heat or in tropical regions where solar energy is wasted. This method is also eco-friendly and at the same time may even reduce the cost of producing crude oil. In this context, a new device (Freon wheels) that is a gravity engine driven by thermal gradient for converting Waste/solar heat into useful work is proposed and its efficiency is studied. The fabrication of Freon wheel is done by using four cylinders as per the design. The cylinders are welded together with $90^0$ each other to the shaft, the bearing is mounted on the both ends of the shaft. The experiment is conducted on the equipment by providing some means of the heat source and the speed is obtained by the Freon wheel is 10rpm.*

*Keywords: Freon Wheel, Fabrication, Cylinders, Heat Source, Pollution.*

## 1. INTRODUCTION

Based on the thermodynamic concepts, an energy source can be called as high-grade or low-grade, depending on the ease with which it can be converted into other forms. Thus electrical energy is called a high-grade energy, as it is very easy to convert almost all of it into other energy forms such as thermal energy (say by using an electrical heater). Whereas, it is not possible to convert thermal energy completely into Electrical energy (typical efficiencies of thermal power plants are around 30 percent). Hence thermal energy is called a low-grade energy. Naturally, high-grade energy sources are more expensive compared to low-grade energy sources. The Mechanical work can be fully converted into heat energy, but only a part of heat energy can be converted into mechanical work. This means that the heat energy and mechanical work are not fully mutually convertible. In other words, there is a limitation on the conversion of one form of energy into another form. Only a part of Heat energy could be converted into work. This is due to disorder existing in this universe and the other name for this disorder is Entropy. The greater the disorder the lesser is the amount of heat that could be converted into work. The way in which heat is converted into work is dependent on the temperature at which it is present. More work can be extracted from a given amount of Heat energy present at a higher temperature, than that present at a lower temperature. Depending on the amount of heat that could be converted into work the energy is graded. Heat energy is of more quality if it has more capability to convert itself into work. The quality of energy is a measure of its capability for conversion of heat energy into work.
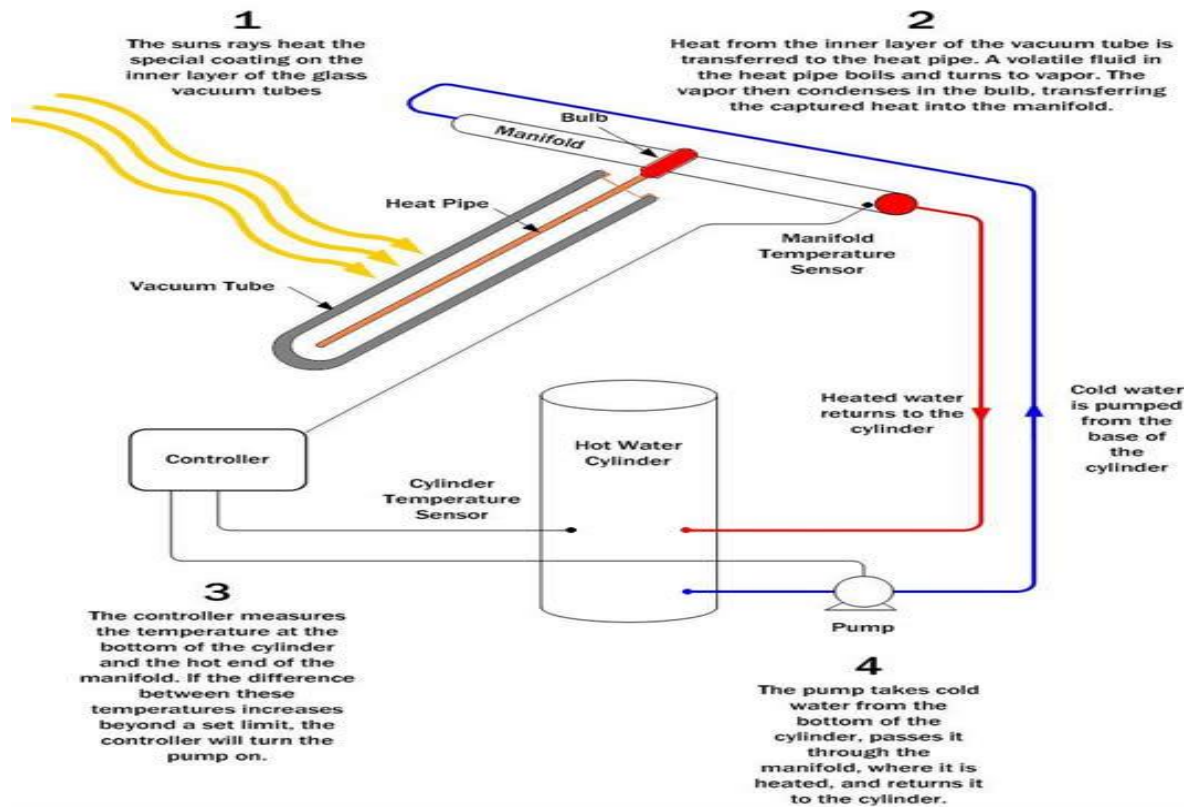
**1**
The suns rays heat the special coating on the inner layer of the glass vacuum tubes

**2**
Heat from the inner layer of the vacuum tube is transferred to the heat pipe. A volatile fluid in the heat pipe boils and turns to vapor. The vapor then condenses in the bulb, transferring the captured heat into the manifold.

**3**
The controller measures the temperature at the bottom of the cylinder and the hot end of the manifold. If the difference between these temperatures increases beyond a set limit, the controller will turn the pump on.

**4**
The pump takes cold water from the bottom of the cylinder, passes it through the manifold, where it is heated, and returns it to the cylinder.

**Fig 1 Detailed description of the way in which solar energy is trapped**

## 2. LITERATURE SURVEY

There is a need for deriving new methods for conversion from low-grade energy to high-grade energy with simple equipment. Literature is reviewed for this purpose. All the literature straight away addresses the problem, giving scope for designing new equipment that works on thermal gradient Such engines in past have been successfully built and used, but some of them were thought to be perpetual motion machines of the first kind. It is the conversion of low-grade energy to high grade, heat exchangers, turbines, and condensers are needed. In all these stages there is a loss of energy (due to flow work) associated as mass crosses the boundary of the system. The boilers, turbines, and condensers are to maintain properly. Due to this the efficiency of the system falls down far below Carnot efficiency. Gravity engines work well if there are some means of moving the mass upwards. Further all liquids when heated up try to rise upwards and come in contact with cool top layers. And condense there. So the concept of heating the fluid is adapted to make it rise to a height and cool there. When the fluid rises it reduces the weight on the bottom side and increases on the top side. This imbalance cannot be stable and it facilitates the movement of the weighted part to down by gravity. Thus the processes can be repeated.

**E.E Bessler et al.** Stated that "The internal structure of the machine is of a nature according to the laws of mechanical perpetual motion, so arranged that certain disposed weights once in rotation, gain force from their own swinging, and must continue this movement as long as their structure does not lose its position and arrangement. "At that time he worked with leverage system and some other unknown arrangement. It was thought that it is a PMM (perpetual motion machine). There are so many devices that seem to be PMM working without human or animal assistance the problem is not only solvable but has already been solved in a variety of ways, for example, Cox Clock-A clock that runs forever on barometric pressure. Tidal power generator-harnessing the innate gravitational power of celestial bodies, geothermal power generator-tapping the energy released when gravity condenses material. Cox Clock was invented in 1760 and it was thought to be a PMM but later it was proving that it stunningly delicate and sophisticated heat engine. It works on jeweled bearings, with the capacity of barometric pressures.

## 3. EXPERIMENTAL APPROACH

**3.1 Properties of Freon 12**: In order to develop the mathematical model we should know the properties of fluids that are to be used in the cylinders. We should also know how much of heat is required for vaporizing the fluid and transfer to a higher level so that the proposed Gravity engine could work. Dichlorodifluoromethane (R-12), usually sold under the brand name Freon-12, is a chlorofluorocarbon halomethane (CFC), used as a refrigerant and aerosol spray propellant. It is soluble in many organic solvents

**Table 3.1 Physical Properties of Freon 12**

| Property | Value |
|---|---|
| Density ($\rho$) at -29.8 °C (gas) | 6.25 kg.m-3 |
| Density ($\rho$) at 15 °C (gas) | 5.11 kg.m-3 |
| Triple point temperature ($T_t$) | -157 °C (116 K) |
| Triple point pressure ($p_t$) | 10 Pa (0.00010 bar) |
| Critical temperature ($T_c$) | 112 °C (385 K) |
| Critical pressure (PC) | 4.170 MPa (41.15 bar) |
| Critical density ($\rho_c$) | 4.789 mol.l-1 |
| Latent heat of vaporization (lv) | 166.95 kJ.kg-1 |
| Specific heat capacity at constant pressure ($C_p$) at 30 °C | 74 J.mol-1.K-1 |
| Specific heat capacity at constant volume (Cv) at 30 °C | 65 J.mol-1.K-1 |
| Heat capacity ratio ($\kappa$) at 30 °C | 1.138889 |
| Vapor pressure ($\eta$) at -20 °C | 151 kPa |
| Property | Value |
| Vapor pressure ($\eta$) at 40 °C | 960 kPa |
| Compressibility Factor (Z) at 21 °C | 0.995 |
| Viscosity ($\rho$) at 0 °C | 11.68 µPa.s (0.01168 cP) |
| Thermal conductivity (k) at 0 °C | 9.46 mW.m-1.K-1 |

**3.2 DESIGN OF FREON WHEELS:** In this system, four Freon-12 bottles or cylinders (generally made up of wrought iron) are hose-clamped to the ends of two pieces of M.S material, each about three feet long. The pipes crossed at 90° at the center and were mounted on a central hub like a skinny four-blade windmill with bottles to swing in the breeze. Each bottle or cylinder was connected to its mate on the opposite end of the pipe with steel brake line tubing. Under the rig's support was a tank of the type used to locate leaks in an inner tube. No fuel would be needed in many cases. The temperature difference required between the liquid on the bottom and the top occurs naturally in many situations: water and air, light and shade, etc. as shown in the figure below.
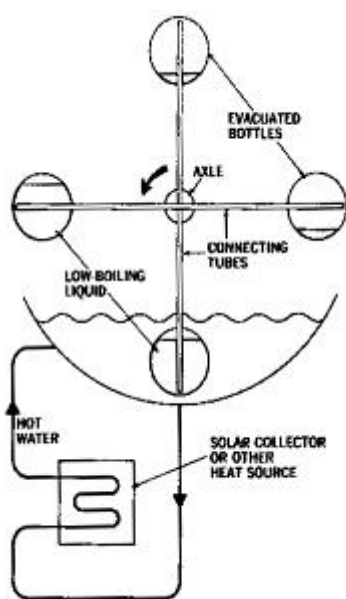


**Fig 2 Schematic representation of Freon wheel and actual**

Low-boiling liquid, such as Freon or propane, fills one bottle of each pair with a pressure of 90 psi that is $23.5^0$c saturated liquid and gas form. The opposite bottle is empty. The liquid collects in the lower bottle, which is immersed in warm (solar-heated) water. Heat from the water (or a solar reflector, or any other source slightly warmer than the surrounding air) vaporizes the liquid and forces part of it up through the connecting tube and into the empty bottle on top. Gravity does the rest: The heavy bottle starts down and the lighter bottle floats up. As each pair shuttles its liquid mass back and forth, the whole thing turns and repeats the process endlessly.

## CONCLUSIONS

The Freon wheel is fabricated as per the design specifications. The Freon wheel consists of four cylinders attached by four arms to the shaft. Fabrication is done by different methods like arc welding, gas welding, machining, flaring processes etc. The equipment is tested under the conditions at a temperature of $60^0$c and the shaft rotates slightly and going on increases in the temperature, at $70^0$c the complete rotation takes place. The low speeds are generated because of low capacity and less number of cylinders. The increase in the capacity and number of cylinders will vary the speeds. The increase in the height of the model increases the torque produced. Materials of the cylinders should be select in such way that light weight and it can withstand high pressures in the cylinder. The rotational speed of system is less because the time taken for condensation process is more, in order to improve the rotational speed of the system

**Graph1: - No Of Cylinders vs. Efficiency**
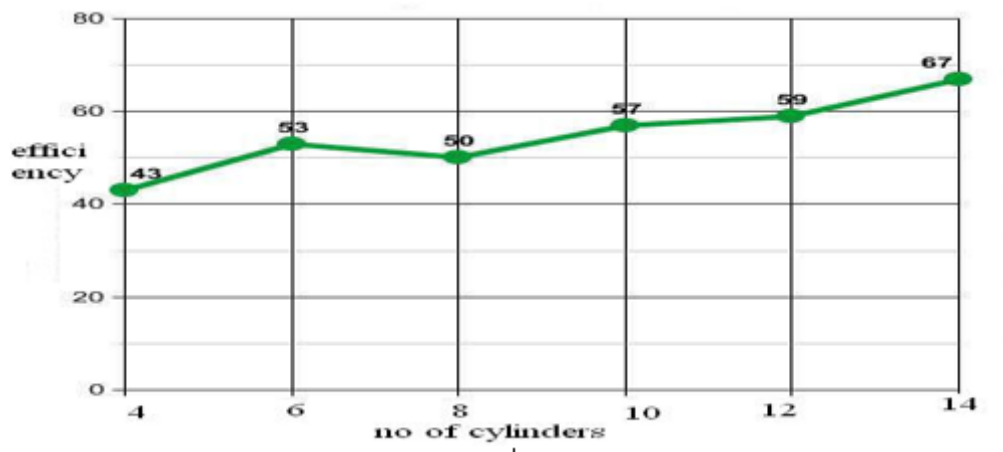


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