Study and development of electric Curie engine

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1. Introduction

Humanity has always sought to create new ways of getting energy. We need powerful and economically efficient engines to make our society exist. Such mechanisms do not only give us light and life, they often destroy what the nature gives us for life. The main task of modern man is the invention of an engine that will reduce the harm for the environment. Our goal was to create a Curie engine, which operates due to the characteristics of ferromagnetic materials. This engine is explored not enough, and it gives us an opportunity to vary its design.

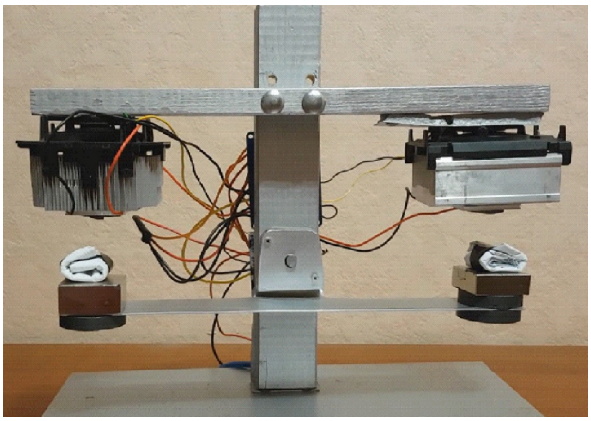
2. Experimental Setup

To manufacture this engine, we needed: a nickel plate, aluminum spokes, a bearing, an axis of rotation, a magnet and a gas burner. When the part of the nickel wheel close to the magnet is heated reaching to the Curie point (the phase transition point, it is associated with a change in the magnetic symmetry of the ferromagnetic), the magnetic domains (they constitute magnetic symmetry) are destroyed, which under normal conditions increase the magnetic field several times. In the place of heating, the destruction of the magnetic domains has already occurred (the magnetic properties in this part have changed to paramagnetic), the magnet begins to attract an unheated part with a force greater than the heated part, the wheel is rotated and the cycle repeats. Using the formulas of the moment of inertia for the wheel ($I = mR^2$) and the solid disk ($I = 1/2\ (mR^2)$), we were able to measure the mass and determine the total moment of inertia of the system.

Next, we determined the moment of force with which the magnet acts on our nickel wheel. For this, we had to turn half of the part with which the magnet interacted off. We also determined the decay time of rotation when the magnet doesn't influence the wheel taking simultaneously into account friction about air and viscous friction of the bearing. In the end, we determined the angular velocity of our wheel under ideal conditions.

3. Results

We decided to use a swing instead of a wheel and ferromagnetic called gadolinium, that has the Curie temperature is 17 degrees Celsius. We want to attach Peltier elements to basic frame and put pieces of gadolinium to these elements. A swing will be fixed under and the magnets will be located at each end. When gadolinium is cooled to 17 degrees, it will sharply begin to exhibit its ferromagnetic properties and be pulled upward toward the magnet. The gadolinium on the other side will continue to be a paramagnetic, and magnet going down under the gravity. After we change the direction of the current in the Peltier element, and the opposite happens. By programming the control of Peltier elements with Arduino, we can easily change their polarity. Swing will begin to perform mechanical work.



1 image – working installation of the Curie motor

4. Conclusion

We consider this variant of the engine to be much more efficient and eco-friendly than classical one. The efficiency has increased from approximately 1.5 percents to 6 percents, that means that we have increased it 4-fold.