

ELECTRICITY FROM HEAT

Thermo Electric Generator



In this description you can read how to make a "Thermoelectric Generator". The heat generated with a tea light can be used to generate electricity. For this we use a "Peltier element".

A Peltier element is an electronic component that can cool with the help of electricity, for example they are used in electric coolers. You can see a Peltier element in the photo below.



Peltier element (source: wikipedia.org)

A Peltier element has a cold and warm side. When current runs through it, one side will become warm and the other side cold. By reversing the "+" and "-" of the voltage on the Peltier element, the cold and warm sides switch places.

A Peltier element can also be used to convert a temperature difference into electrical energy. When we provide a warm side and a cold side, with sufficient temperature difference, an electrical voltage will be generated. We can use this electrical voltage to provide an electrical device, such as the Squeezer, with energy.

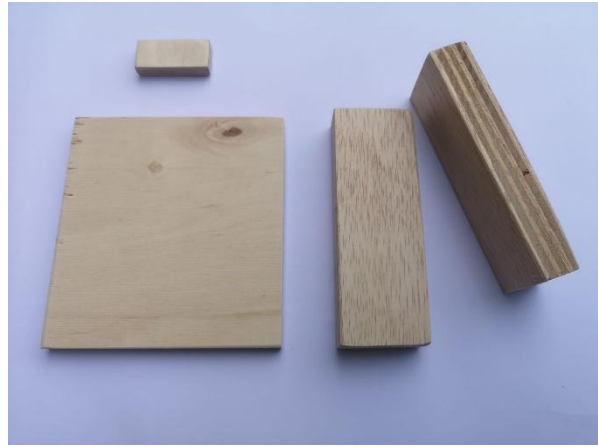
We can make a nice experiment out of this, most materials are fairly simple, and maybe can be found somewhere in or around the (club) house. What you won't easily find is the Peltier element. These can be ordered online.

The Peltier element used here is of the type "TEC1-12704" and is about 30mm wide, 30mm long and approx. 4mm thick. This can be obtained for a few euros at various webshops. By the way, types that are fairly similar to this can (probably) also be used.

To create the temperature difference, we will use the warmth of a tea light and the coolness of a bowl of (cold) water.

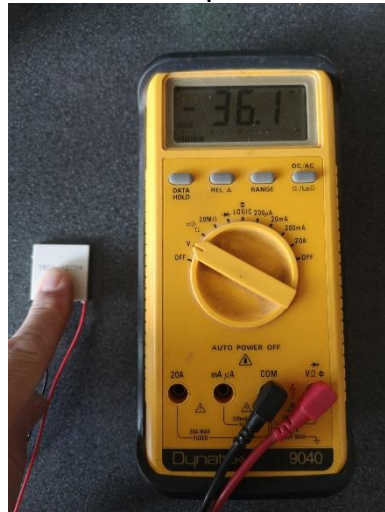
What do we need?

- Peltier element (TEC1-12704 or similar)- Metal pan with flat bottom- Screws, if possible made of brass
- M3 nut and bolt- Pieces of wood (plate of 11x12cm, two blocks of 12x4cm (approx. 2cm thick), small block)
- Tea light- Soldering iron, wire cutters, solder, pencil
- Epoxy adhesive / two-component adhesive - Multimeter to measure DC voltage



Most of the materials needed

Step 1: In electrical systems, the red wire is used for the "+" and the black wire for the "-". Because to do so here, we first need to determine which side is the warm side and is the cold side of the Peltier element for the correct polarity. For this we will need the multimeter. Connect the red wire of the Peltier element to the red wire of the multimeter, do the same for the black wires. Place the Peltier element on a flat (relatively cool) surface, for example a table. (This should just be at room temperature!). Wait until the voltage on the multimeter is (almost) 0 Volts, do not touch the Peltier element for this. If the meter reads about 0 Volts, place a finger on the other side of the Peltier element. The voltage will now change and become positive or negative.



Measurement of the tension of the Peltier element. Left: voltage about 0 Volts, middle: voltage negative, right: voltage positive.

On the picture on the far right we have found, that in this specimen(!), the voltage on the polarity is positive when the side with the text is on the cold surface, and the side without text is heated (let's call this the warm side). The side on the table is the "cold side". Keep this in mind!

Step 2: Make a small amount of two-component glue. Treat the "cold side" of the Peltier element completely (!) with a thin layer of glue. Glue the Peltier element, in the middle, to the bottom of the pan. (Too much glue will cause heat loss, resulting in less electrical energy generated.)

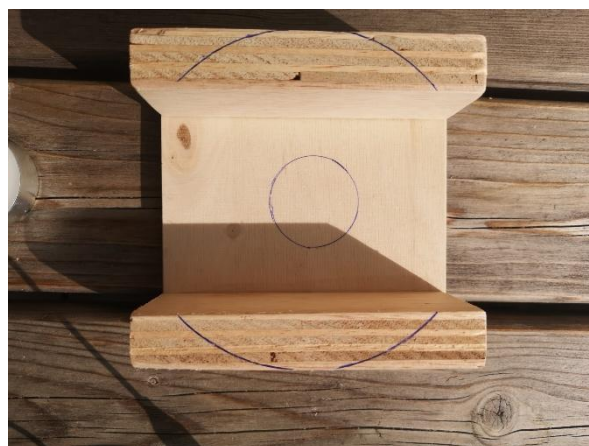
Fix the Peltier element, temporarily with a piece of tape, until the glue is dry.



Step 3: We twist the threads of the Peltier element together (twist). On the handle of the pan, we attach a small block of wood (with M3 bolt and nut). In the block we screw two copper or brass screws. To these screws we attach (solder) the red and black wire.

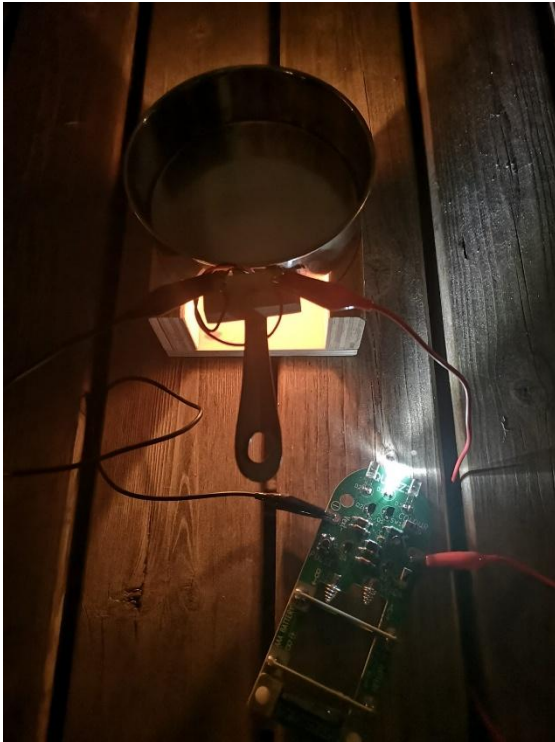


Step 4: From the larger blocks of wood and the board, we make a kind of container. See the photo below.



On the tray, you draw the shape of the pan and the place where the tea light should go. The flame of the tea light must be placed in the middle of the Peltier element.

Step 5: Fill the pan with a layer of water. Place the tea light in the marked spot and light it. When you now put the pan above the tea light, a voltage will be generated.



Step 6: Connect the Squeezer (Vext+ and Vext-) with a few wires (for example a wire with an alligator clip on both sides) to the connections on the wooden block. Vext+ to the red wire, to Vext- the black wire. If all went well, your Squeezer will now glow!

Good luck and have fun generating your own energy!