Using the difference between the external and internal temperatures of buildings to generate electrical current (Seebeck effect)

Research problem

Not taking advantage of the difference between wasted thermal energy from the sun and cooling inside buildings to generate electricity via the Seebeck principle (thermoelectric energy).

Objectives

- Taking advantage of the amount of wasted solar thermal energy and continuous cooling inside buildings during the solar day to generate electricity.
- Reducing the use of non-renewable resources to generate electricity.
- Inventing a device based on this principle.

Scientific background

The Seebeck effect (thermoelectric energy) is the production of electrical energy when exposed to a difference between temperatures, and the difference between temperatures has a direct relationship with the production of electricity. The reason for this is that when temperatures increase, it leads to an increase in the movement of the molecules of the substance that make up the substance. One of the factors that increases the difference between temperatures is thermal accumulation, and thermal accumulation is a group of thermal units or degrees that accumulate on the surface exposed to heating. Also, the materials used are important factors in the production of electricity. Semiconductors (semiconductors) are considered insulators at low temperatures, but when temperatures increase, they become good at electrical conductivity, and they are also less expensive than conductors (metals). The direction of the sun is an important factor In electricity production, semiconductors (semiconductors) are considered insulators at low temperatures, but when temperatures increase, they become good electrical conductors, and they are also less expensive than conductors (metals). The direction of the sun is an important factor in generating electricity for this innovation.

Hypotheses

1. There is a relationship between temperature differences (external and internal) of buildings and electricity generation.
2. Seebeck's principle can be applied to environmental conditions (temperatures) for generating electricity.

Variables

- Independent variable: the temperature on the building during one day.
- Dependent variable: the amount of electrical current generated.

procedures

Default experience (in the previous table):

1. Imposing temperature values during the solar day inside and outside the building.
2. Find the temperature difference and convert it to (KELVIN).
3. Use the average Seebeck coefficient extracted from practical experience and substitution in the law ($V=-S^{\cdot}\Delta T$) to find the value of the potential difference (electric force).
4. Graphically representing the relationship between temperature differences and the amount of electric current.
5. Draw the relationship between temperature and the amount of electricity generated.

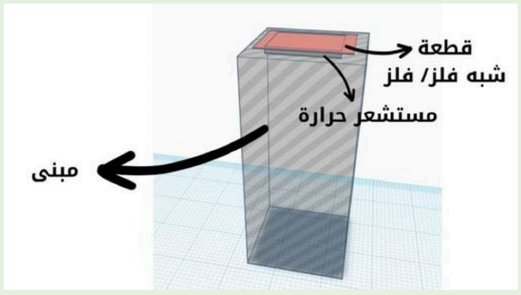
Practical experience (carried out in the Mawhiba Summer Program):

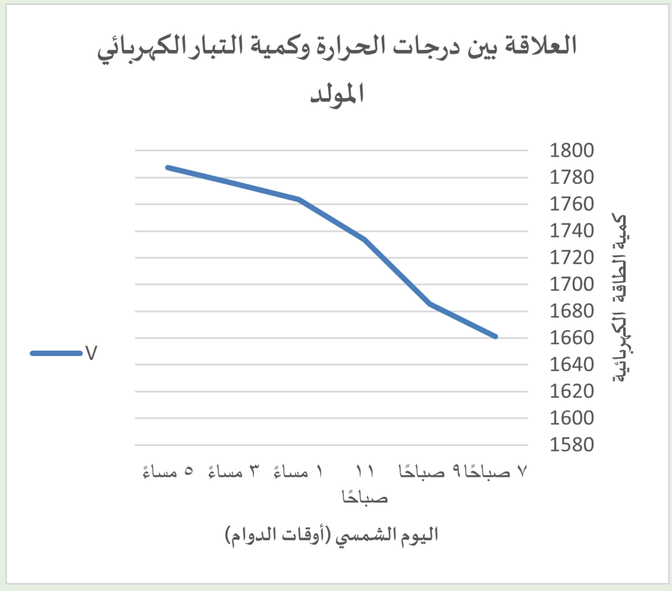
1. Heating a piece of copper metal with a wax flame.
2. Place the temperature sensor over the piece of metal.
3. Place a piece of ice over the temperature sensor.
4. Set the difference between temperatures and convert it to (KELVIN).
5. Measure the potential difference (electrical force) with a (MULTIMETER) device.
6. Substitution in the Seebeck coefficient equation ($S=V/\Delta T$).

Data

V	-S	ΔT(KELVIN) T(EX) – T(EN) + 273	T(EXITERIOR)	T(ENERIOR)	الزمن
1661.1511	-6.0186634	276K	23C	20C	7 صباحًا
1685.226		280K	27C	20C	9 صباحًا
1733.3751		288K	35C	20C	11 صباحًا
1763.468		293K	40C	20C	1 مساءً
1775.5057		295K	42C	20C	3 مساءً
1787.5435		297K	44C	20C	5 مساءً

Charts





Data analysis

The relationship from the previous graph is a simple relationship between temperatures during the solar day and the amount of energy.
It indicates that during the solar day, temperatures outside increase due to the direction of the sun and heat accumulation, causing an increase in the amount of electrical energy generated.

Results

V
1661.1511
1685.226
1733.3751
1763.468
1775.5057
1787.5435

Conclusion

It is possible to generate electricity from buildings as a result of their continuous exposure to the sun, as well as continuous internal cooling during the solar day (official working hours).

Applications

This innovation will be applied to buildings and transform them into smart buildings that benefit from the sunlight falling on them to generate electricity and use it to operate devices and charge emergency batteries, and to dispense with generating electricity from non-renewable sources.

Future business

1. Developing it to become more efficient to operate an entire building.
2. Create an engineering design for the device and sell it on a global level.

Research sources