

Hong Kong Student Science Project Competition 2022

Template of Extended Abstract (Invention)

(Word Limit: 1,000 words, Pages: 2 pages only)

Team Number: SAPE217

Project Title: ENVIRONMENTALLY & AUTOMATICALLY HEAT & NEWTON LAW BOTTLE (EANB)

Project Type: INVENTION

To our best knowledge and after thorough literature research, as at _24/6/22, there are similar works. If there are, the reference links are as below:

https://www.amazon.com/-/zh_TW/dp/B09WJ46C15/ref=sr_1_50?crid=MQSUD0COXMB0&keywords

The enhancement our project has made for the existing related products or research is summarized as below:

LOWER COST& MORE ENVIRONMENTALLY FRIENDLY

*Please delete if not applicable. HKSSPC values the originality of works. Students must conduct literature research thoroughly to ensure that their works are unique, and to list relevant reference materials to complement the research or invention.

I. Background

- We found that many people want to drink hot water in the special circumstances, for example: the girl on their periods, the orienteering participates. They need a bottle to keep their drinking water above 30 degree.
- Unfortunately, around 65% to70% thermos bottle on the market are insufficient to prevent the energy lost. Although those thermos use electricity, they still don't keep hot water temperature well
- Our invention attempts to generate electricity by using solar panels instead of batteries, which can not only provide electricity to keep warm, but the use of materials can also protect our environment and reduce pollution to the environment.

II. Objectives

Our goal is basically to lead the trend of environmental protection. This idea led us to create this environmentally friendly bottle. To deal with this idea, we tried to create this invention that would make people who use this bottle more inclined to use it and reduce the need for other non-reusable bottles.

Moreover, portable thermos bottles on the market tend to have less capacity. In order to meet the needs of people who drink a lot of water, we have created thermos with larger capacity.

III. Methodology

➤ **Armamentarium:**

- 1x bottle
- 4x rubber band
- 1x solar panel

- 1aluminium foil
- heater
- Heat capacity of water experiment:
- $E=mc\Delta T$
- $F=mg$
- $P=Et$
-
-
-

IV. Design of Invention

- Describe the **design** and the **principle** of invention (e.g. The ideation of the projects, the prototypes or creative solution as far as applicable)
- Provide sketches / drawings / photos of the invention

After the experiment, we found that he can stay warm for 10 hours without the heating plate, and now with the heating plate, he will keep heating, we can't measure such a long time, because the disadvantage is that it will be empty at night. There is no electricity, so we estimate that according to the experiment, it can stay warm when there is more sun, and after sunset, it will become normal temperature in about 10 hours. Therefore, in the next stage, we can normally use solar energy when there is more sun. Stored in the battery to keep you warm throughout the day.

V. Application / Market Need

Application: Keep water at the temperature of the designated area for an extended period of time

Theory: Wrap the water bottle with a material that can insulate heat and store the heat energy of the water in the bottle, and use the electricity collected by the solar panel to convert it into heat for heating when the water temperature drops to ensure that the water in the water bottle can be preserved. in a hot or warm state

Market needs: There are a large number of thermos bottles on the market for the public to buy, but our invention can heat the bottle, and the supply on the market is less.

We advocate the concept of environmental protection. Compared with thermos bottles on the market, it has a certain degree of harm to the environment.

The target customer group is mainly women and the frailer people to invent, because their needs are more than the general public

In terms of benefits, it may be relatively low. Since the products on the market have already established a certain reputation and commodity guarantee, the benefits for niche products are not large.

Regarding limitations:

- Due to the complexity of materials (such as small solar panels), this need to customize specific dimensions and goods will lead to an increase in the finished product of inventions.
- Since the power of the invention comes from solar energy, in the case of cloudy or rainy days, the bottle will lose its power source, and another remedy is required.

VI. Conclusion

First, we made an ultra-low-cost thermos bottle

stay warm for 10 hours without a heating plate

Then, we decided to use tin foil to increase his thermal insulation

We then extended his insulation with solar panels and heaters

no power at night

Right now, we're trying to keep costs down and store solar energy in batteries with

Store solar energy in batteries when there is sun to keep you warm throughout the day

Our project is developed based on our school's previous project and the enhancement is as below: