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Eco Cooler for Cooler House without Electricity for Educational Purposes

Alvito Antonio, Maulidah Hasanah, Novita Damayanti, Oryza Aprilia Devina, Fitri Khoerunnisa,Nanang Winarno[4]*

Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No.229, Bandung, Indonesia

*Correspondence: E-mail: novitadama@upi.edu

ABSTRACTS

The earth's temperature from 1981 to February 2021 has relatively increased. The increase in temperature on earth has made many people choose to use air conditioning so that the temperature in their homes is not too cold. The energy demand from air conditioning worldwide will be three times as much by 2050. Bangladesh has created a system called the Eco-Cooler as an alternative to lowering room temperature without using large electrical energy so as to save energy and costs. The eco-cooler can reduce temperatures from 1-3˚C in a room with a size of 4.2 × 4.2 × 3.3 m^3 using an Eco-cooler with a bottle diameter of 6 cm and a board area of 48 × 48 cm^2. This can be a good educational point for being applied in Indonesia. The advantage of using the Eco-Cooler is that it is easy to maintain, easy to use, the air is more humid, and it saves energy.

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1. INTRODUCTION

Based on BMKG, the earth's temperature from 1981 to February 2021 has relatively increased (Ongoma et al, 2021). The increase in temperature on earth has made many people choose to use air conditioning so that the temperature in their homes is not too cold. This is in accordance with the IEA's article in The Future of Cooling report which states that energy demand from air conditioning worldwide will be three times as much in 2050 (Isaac et al, 2009).

2. METHODS

The research method that we used in this study was a critical literature review. There us some articles from some journals, some YouTube videos, and also some news article.

3. RESULTS AND DISCUSSION

3.1. Brief History

Bangladesh has implemented a system called the Eco-Cooler. The Eco-Cooler is an innovation to solve the problem of high temperatures in Bangladesh, which is aimed at people who cannot afford to buy air conditioning equipment. The use of this Eco-cooler aims to reduce indoor air temperature without using electrical energy (Mendi et al, 2020)

3.2. Work Principle

The working principle of this eco cooler can be explained by two scientific theories (See **Figure 1**). The first is continuity theory. Continuity theory explains that the surface area affects the fluid (air) that flows even though the volume of fluid (air) entering is the same as the air that is leaving. The air that comes out at the mouth of the bottle will go fast (Ch & Mummina, 2018). This air velocity will cause the air pressure to be low and the air molecules will move more slowly so that no collisions between air molecules occur. As a result, less heat is created, the temperature will feel cooler. This decrease in air pressure at the mouth of the bottle is in line with the second theory, namely Bernoulli's theory which states that "where the velocity of the fluid flow is high, the fluid pressure will be low“ (Ch & Mummina, 2018).

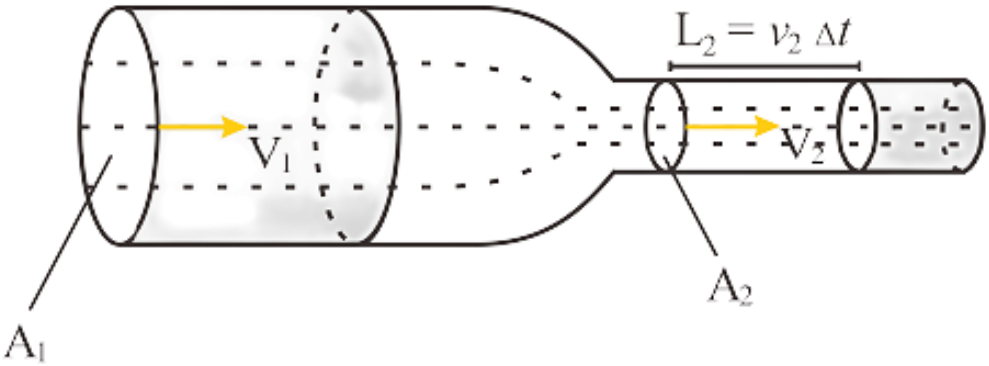

Figure 1. Continuity principle.

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3.3. Desain Eco-Cooler

Nozzle is a part designed to control direction and modify fluid flow (**Figure 2**). The nozzle is usually a tube pipe. The size of this nozzle can affect the air produced by the eco-cooler. To get optimal results we can choose a bottle that has a small nozzle (bottle cap) size (Ch & Mummina, 2018).

The recommended bottle body size is ± 6 cm in diameter because it is easy to find. The more bottles used, the greater the decrease in air temperature produced by the eco-cooler. The eco-cooler design that has been successfully implemented is a bottle that has a diameter of approximately 6 cm which is placed on a board measuring 48 x 48 cm. This design has been proven to be effective in reducing the temperature by 1-3℃ in a room measuring 4.2 × 3.1 × 3.3 m^3 (Kasantikul, 2020).

3.4. The Advantages

There are several advantages:

1. Easy maintenance, only need to change the water in the box
2. Easy to move
3. The air becomes damp
4. Save electricity

If the home of the AC user has a maximum power of 1300 VA at a rate of Rp1,444.7/kWh and uses AC with 600 watts of power which is turned on for 12 hours every day within a year.

600 × 12 hours = 7200 watts = 7.2 kWh
Cost for 1 day = 7.2 kWh × Rp. 1,444.7 = Rp.10,401.00
Cost for 1 year = Rp. 3,744,360
So if we calculated, we can save electricity costs of up to Rp. 3,744,360 in one year.

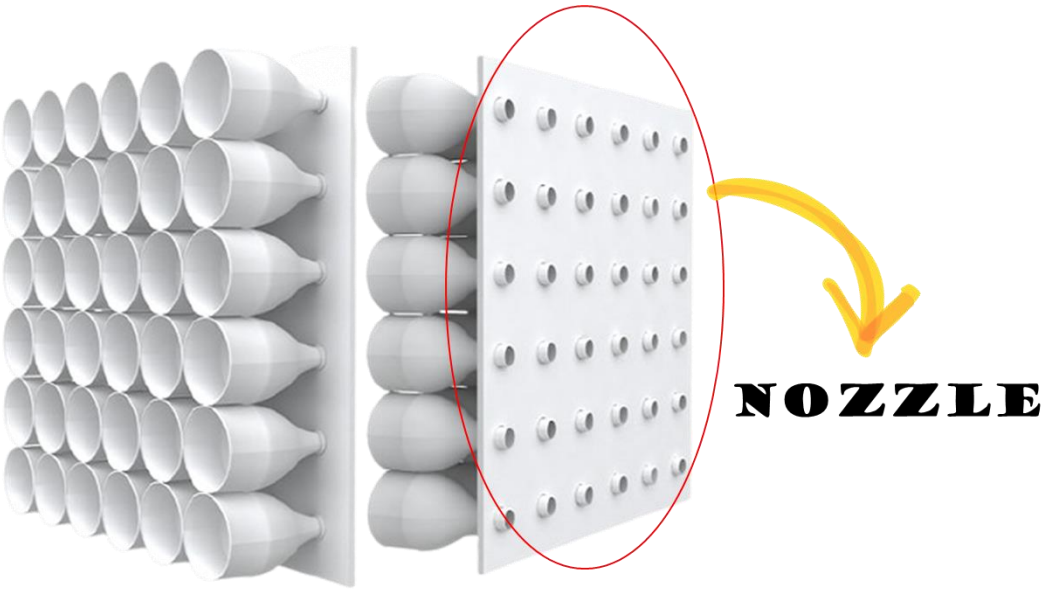

Figure 2. Daniel Eco-Cooler

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4. CONCLUSION

Eco cooler can be used as an alternative to cool the room without requiring electrical energy and additional costs. The eco cooler design with a bottle diameter of 6 cm measuring 48 × 48m² can reduce the temperature by 3°C. Besides being cost-effective, the use of an eco-cooler can also be a way to save energy for the availability of electrical energy for the future.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

6. REFERENCES

Ongoma, V., Rahman, M. A., Ayugi, B., Nisha, F., Galvin, S., Shilenje, Z. W., and Ogwang, B. A. (2021). Variability of diurnal temperature range over Pacific Island countries, a case study of Fiji. *Meteorology and Atmospheric Physics*, *133*(1), 85-95.

Ch, B., and Mummina, V. (2018). Performance evaluation of an eco-cooler analysed by varying the physical and flow parameters. *IOP Conference Series: Materials Science and Engineering*, *377*(1), 012024.

Isaac, M., and Van Vuuren, D. P. (2009). Modeling global residential sector energy demand for heating and air conditioning in the context of climate change. *Energy Policy*, *37*(2), 507-521.

Kasantikul, B. (2020). Eco-cooler analysis for room temperature reduction. *Mahasarakham International Journal of Engineering Technology*, *6*(2), 69-74

Mendi, V., Kumar, A., Yadav, B. S., Verma, D., and Ankit, R. J. (2020). Use of eco-coolers in indoor cooling. *IOP Conference Series: Materials Science and Engineering*, 1006(1), 012005.

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