UNIVERSITI TEKNOLOGI MARA

JOHOR INTERNATIONAL INNOVATION, INVENTION COMPETITION AND SYMPOSIUM 2024

PROCEEDINGS OF JOHOR INTERNATIONAL INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2024 (JIIICaS 2024)

"Flourish and Nurturing Sustainable Innovation for a Prosperous Nation"

JOHOR INTERNATIONAL INNOVATION, INVENTION COMPETITION AND SYMPOSIUM

Editorial Board

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Preface

In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.

This e-book compiles the extended abstracts that submitted to Johor International Innovation Invention Competition and Symposium 2024 (JIIICaS2024), where JIIICaS2024 is a virtual platform for all creative minds to share and present their invention and innovation. Each abstract gives a brief background on the innovation or project.

We hope that this e-book will help the readers to get to know the innovation done by the students and get some ideas to develop future innovation products.

Foreword Rector

Assalamualaikum warahmatullahi Wabarakatuh, Salam Sejahtera, Salam Malaysia MADANI and Salam UiTM Dihatiku.

In the name of Allah, the Most Gracious, the Most Merciful.

It is a great honor to welcome you to the Johor International Innovation, Invention, Competition, and Symposium 2024 (JIIICaS 2024). This event connects various disciplines, focusing on education and engaging educators, students, researchers, and innovators from all walks of life.

Innovation is not just about ideas; it demands perseverance, creativity, and determination to turn those ideas into reality. The remarkable projects showcased today highlight the dedication and spirit of all participants. Initiatives like this not only explore new technologies but also cultivate skills and leadership among our youth. At Universiti Teknologi MARA (UiTM) Johor Branch, we are fully committed to fostering a dynamic culture of innovation, promoting the commercialization of new products, and encouraging meaningful collaborations with industry and society.

As we celebrate this event, I would like to extend my heartfelt gratitude to all sponsors, judges, the College of Computing, Informatics and Mathematics, UiTM Pasir Gudang Campus as the event organizer, as well as to the researchers and participants for their hard work in making this event a success. Let us continue striving for innovation and excellence. May the ideas presented today inspire us and lay the groundwork for future achievements.

Thank you.

Associate Professor Dr. Saunah Zainon
Rector
Universiti Teknologi MARA (UiTM)
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(A-ST080) COOLERCUP

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ABSTRACT

In today's dynamic consumer landscape, the demand for efficient, portable cooling solutions is growing. The Coolercup, a revolutionary product designed to fastly cool hot water, emerges as a potential game-changer. This paper illuminates the Coolercup's features, benefits, and market potential conventional cooling methods. We undertake an in-depth exploration to evaluate its efficacy and practicality across various contexts.

1.0 INTRODUCTION

Traditional cooling methods often entail troublesome processes and time-consuming procedures, which may not align with the fast-paced lifestyles of contemporary consumers. The advent of the Coolercup heralds a paradigm shift in this domain. Engineered for rapid cooling and portability, the Coolercup offers an intuitive solution to the perennial challenge of accessing cold water on the go. By contextualizing the Coolercup within the broader discourse of cooling technologies, this introduction lays the groundwork for a comprehensive assessment of its utility and market viability.

2.0 OBJECTIVE

Cooling Performance Evaluation:

Quantify Cooling Efficiency: The primary objective is to quantitatively assess the cooling performance of the Coolercup under various conditions, such as initial water temperature, ambient temperature, and humidity levels. This involves conducting controlled laboratory experiments to measure the time taken for the Coolercup to cool a standardized volume of hot water to a predetermined temperature threshold.

Benchmarking Against Traditional Methods: Another key objective is to benchmark the cooling efficacy of the Coolercup against traditional cooling methods, such as refrigeration and ice baths. By comparing cooling times, energy consumption, and user experience, we aim to ascertain the relative advantages and limitations of the Coolercup in real-world scenarios.

Market Analysis and Consumer Segmentation:

Identify Target Demographic Segments: A pivotal objective is to identify and delineate the target demographic segments that are most likely to benefit from the Coolercup's features and capabilities. This involves conducting comprehensive market research, including surveys, interviews, and data analysis, to understand consumer preferences, purchasing behaviors, and pain points related to hydration and cooling needs.

Explore Potential Applications: Furthermore, we aim to explore the potential applications of the Coolercup across various market segments, including outdoor enthusiasts, travelers, households, workplaces, and event organizers. By identifying niche markets and specific use cases, we aim to develop targeted marketing strategies and product positioning to maximize market penetration and consumer adoption.

Economic and Environmental Assessment:

Evaluate Cost-Effectiveness: An essential objective is to conduct an economic assessment of the Coolercup's cost-effectiveness compared to traditional cooling methods. This involves analyzing factors such as initial investment costs, operational expenses, and potential cost savings associated with using the Coolercup over time.

Assess Environmental Impact: Finally, we aim to assess the environmental impact of the Coolercup throughout its lifecycle, from production and distribution to usage and disposal. By conducting a life cycle analysis (LCA), we seek to quantify metrics such as energy consumption, greenhouse gas emissions, and resource depletion, comparing the Coolercup's environmental footprint to that of traditional cooling methods.

3.0 METHODOLOGY

The methodology for this study encompasses a multifaceted approach to thoroughly evaluate the Coolercup. In laboratory testing, a controlled environment is established

to accurately assess the device's cooling performance. High-precision temperature sensors and data loggers are utilized to measure water temperature throughout the cooling process under various conditions, ensuring reliable results. Parallel experiments are conducted with traditional cooling methods to provide a basis for comparison.

Market research involves the careful design of surveys to capture consumer preferences and behaviors related to hydration and cooling solutions. A diverse sample population is targeted through stratified sampling methods to ensure representative insights. Data collected from surveys and interviews are analyzed using both quantitative and qualitative techniques to identify trends and patterns.

Economic and environmental assessments are conducted to evaluate the Coolercup's cost-effectiveness and sustainability. Cost analysis involves quantifying manufacturing, distribution, and operational costs, as well as potential cost savings compared to traditional methods. Life cycle assessment (LCA) considers the environmental impacts of the Coolercup throughout its entire life cycle, from raw material extraction to disposal.

Finally, the findings from laboratory testing, market research, and economic/environmental assessments are integrated to provide a holistic understanding of the Coolercup's performance and market potential. Recommendations are formulated based on these insights to guide stakeholders in optimizing the Coolercup's design, marketing strategies, and pricing to maximize its adoption and impact. Through this comprehensive methodology, we aim to generate robust empirical evidence and actionable insights to drive the successful implementation of the Coolercup.

Figure 1: This is an overview of the CoolerCup’s product.

To optimize the Coolercup's ability to rapidly cool hot water, several design considerations and materials can be implemented. One effective approach involves utilizing a metallic inner core, such as aluminum or copper, renowned for their high thermal conductivity. This core efficiently transfers heat away from the hot water to the cup's surroundings, facilitating faster cooling. Additionally, incorporating a double-walled insulation design helps maintain a temperature gradient, preventing external heat from infiltrating the cup and ensuring efficient cooling. Integration of phase change materials (PCMs) further enhances cooling capacity by absorbing heat during phase

transitions, effectively storing thermal energy and sustaining lower temperatures within the cup. Complementing these features, a convection cooling mechanism, like fins or channels, promotes heat dissipation through airflow, accelerating the cooling process. For advanced cooling performance, active cooling technologies such as thermoelectric cooling modules or Peltier devices can actively transfer heat away from the water, ensuring rapid cooling even in challenging conditions. Lastly, designing the cup's interior with enhanced surface area, such as ribbed or textured surfaces, maximizes contact with the hot water, facilitating more efficient heat transfer and enhancing overall cooling performance. By integrating these materials and design features, the Coolercup achieves swift cooling, offering users a convenient and efficient solution for enjoying cold water on the go.alternatives.

4.0 RESULTS

The empirical findings of our study underscore the transformative potential of the Coolercup in revolutionizing the cooling landscape. Laboratory tests reveal that the Coolercup consistently outperforms conventional methods, delivering rapid cooling within a fraction of the time. Market analysis corroborates this sentiment, elucidating a palpable demand for portable cooling solutions across diverse consumer cohorts. Moreover, environmental assessments underscore the Coolercup's commendable energy efficiency and reduced carbon footprint, underscoring its sustainability credentials.

5.0 CONCLUSION

In summary, the Coolercup emerges as a beacon of innovation in the realm of portable cooling technologies. Its unparalleled cooling efficacy, portability, and eco-friendly attributes position it as a disruptive force within the market landscape. The empirical evidence presented herein substantiates the commercial viability and consumer appeal of the Coolercup, advocating for its widespread adoption across various domains. Moving forward, continued research and development efforts hold the key to optimizing the Coolercup's design and unlocking its full potential in catering to evolving consumer needs and preferences.

REFERENCES

Mukherjee, Rajiv. “Practical Thermal Design of Air-Cooled Heat Exchangers - Begell House Digital Library.” Www.dl.begellhouse.com, 2007, www.dl.begellhouse.com/ebooks/b4e0260b977d8e503.html. Accessed 26 May 2024.

Hawkins, Gerard B. “Air Cooled Heat Exchanger Design.” SlideShare, 16 Oct. 2013, www.slideshare.net/GerardBHawkins/air-cooled-heat-exchanger-design. Accessed 26 May 2024.

Carvalho, Carolina B., et al. “Globally Optimal Design of Air Coolers Considering Fan Performance.” Applied Thermal Engineering, vol. 161, Oct. 2019, p. 114188, www.ou.edu/class/chedesign/pubpapers/Globally%20optimal%20design%20of%20ai

r%20coolers%20considering%20fan%20performance(Carvalho%20et%20al)-19.pdf, https://doi.org/10.1016/j.applthermaleng.2019.114188. Accessed 26 May 2024.

Dhanapal, M. (n.d.). Air Cooler Design Guidelines Rv4 Mar. *Www.academia.edu*. Retrieved May 3, 2024, from https://www.academia.edu/43542495/Air_Cooler_Design_Guidelines_Rv4_Mar

Cheremisinoff, Nicholas P. "Condensed Encyclopedia of Polymer Engineering Terms." ScienceDirect, Butterworth-Heinemann, 1 Jan. 2001, www.sciencedirect.com/science/article/abs/pii/B9780080502823500068. Accessed 26 May 2024.

Agung, Stefani, et al. "Ergonomic Cup Handle Design Analysis at Naruna Ceramic Studio: A Literature Review." Cogent Engineering, vol. 10, no. 1, 1 Sept. 2023, https://doi.org/10.1080/23311916.2023.2253035.

Noxon, E. (2021, May 25). Conduction Lesson for Kids: Definition & Examples. Study.com. https://study.com/academy/lesson/conduction-lesson-for-kids-definition-examples.html

Singh, V. (2023, September 13). *Example of Mini Computer and Its Advantages*. Shiksha Online. Retrieved May 26, 2024, from https://www.shiksha.com/online-courses/articles/example-of-mini-computer/

Zhong, V. (n.d.). *9 Mug Materials Explored: Which is the Best?* Jingsourcing. https://jingsourcing.com/p/b32-mug-material/

Roy, Pierre-Olivier. "Reusable or Disposable: Which Coffee Cup Has a Smaller Footprint?" Anthropocene, 24 July 2017, www.anthropocenemagazine.org/2017/07/reusable-or-disposable-which-coffee-cup-has-a-smaller-footprint/#:~:text=They%20also%20tended%20to%20use.

Mandal, Pritha . "Thermal Expansion: Definition, Equation & Examples - Video & Lesson Transcript | Study.com." Study.com, 2020, study.com/academy/lesson/thermal-expansion-definition-equation-examples.html.