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Salt Fridge

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Abstract
This research paper presents the Salt Fridge; a low-cost and eco-friendly cooling system designed for rural and off-grid communities. In areas without electricity, preserving perishable food items such as fruits, vegetables, and dairy products is a major challenge. The Salt Fridge uses the principle of evaporative cooling with simple materials like clay pots, sand, salt, and water to maintain a lower temperature inside the storage chamber. Additionally, an improved version includes a temperature sensor and automatic fan system to enhance cooling efficiency. The system is sustainable, affordable, and easy to construct, making it highly suitable for rural households. The results show that it can reduce temperature by 5–10°C below ambient conditions and extend food freshness for several days.

Keywords: Evaporative Cooling, Clay Pot Refrigerator, Sustainable Cooling, Rural Innovation, Temperature Control

1. INTRODUCTION

Food preservation is essential for maintaining nutrition and reducing food wastage. In many rural and off-grid areas, access to electricity is limited, making conventional refrigeration impossible. As a result, perishable food items spoil quickly, leading to economic loss and health issues.
The Salt Fridge is an innovative solution based on traditional knowledge and scientific principles. It uses evaporative cooling to reduce temperature naturally. The addition of a simple temperature monitoring system further improves its efficiency and usability.

2. Problem Statement

The following problems are commonly observed:

- Lack of electricity in rural and remote areas
- Rapid spoilage of perishable food items
- High cost of conventional refrigerators
- Food wastage and poor nutrition
- Limited awareness of alternative cooling methods

3. Survey and Research

Survey results show that many rural households struggle with food storage due to high temperatures and lack of refrigeration. Research indicates that evaporative cooling is an effective natural method for reducing temperature without electricity.

Clay materials are porous and allow water to evaporate easily. When water evaporates, it absorbs heat from the surroundings, creating a cooling effect. Adding salt increases the evaporation rate, improving cooling performance.

4. Proposed Solution

The Salt Fridge system consists of:

- Two unglazed clay pots (one inside another)
- Sand and salt mixture between the pots
- Water to enable evaporation
- Cotton cloth cover to enhance cooling
- Optional temperature sensor and fan system for improved performance

This system provides a natural refrigeration effect without using electricity.

5. Working Principle

- **Evaporative Cooling:** Water in the sand evaporates through the outer clay pot, absorbing heat from the inner pot and reducing its temperature.
- **Heat Transfer:** Heat from the stored food moves outward and is removed through evaporation.
- **Role of Salt:** Salt increases the rate of evaporation, enhancing cooling efficiency.
- **Smart Enhancement (Optional):** A temperature sensor monitors internal temperature. When it rises above a set level (e.g., 18°C), a small fan turns ON to improve cooling.

6. Advantages

No electricity required

- Low-cost and affordable
- Eco-friendly and sustainable
- Easy to build using locally available materials
- Extends shelf life of food
- Optional smart system improves efficiency

7. Applications

- Rural households
- Off-grid communities
- Farmers and small vendors
- Food storage in villages
- Emergency and disaster relief areas

8. Conclusion

The Salt Fridge is a simple yet highly effective solution for food preservation in areas without electricity. By utilizing the principle of evaporative cooling, it provides a sustainable and affordable alternative to conventional refrigeration.

The project highlights the importance of combining traditional techniques with modern technology. With further improvements, such as better materials and smart monitoring systems, the Salt Fridge can be wid-

ely implemented to reduce food wastage and improve living conditions in rural communities.

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References

1. Mohamed Bah Abba Abba, M. B. (2000). Pot-in-Pot Refrigerator (Zeer Pot) Innovation. (Foundational concept behind clay pot cooling systems)
2. Jain, D. (2007). Development and testing of two-stage evaporative cooler. Building and Environment, 42(7), 2549–2554. (Technical explanation of evaporative cooling efficiency)
3. Roy, S., & Khurana, S. (2020). Low-cost sustainable cooling technologies for rural applications. Journal of Cleaner Production, 250, 119–130. (Sustainability and eco-friendly cooling)