

REVIEWER'S REPORT

Manuscript No.: IJAR-51950

Date: 28.05.2025

Title: "Experimental Study of Energy Storage and Recovery with Fluid Change: Application in a Cylindrical Enclosure Filled with a Porous Terracotta Medium at Thiki in the Thiès Region"

Recommendation:

Accept after major revision

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality			✓	
Clarity				✓
Significance			✓	

Reviewer Name: Dr.K.ARUMUGANAINAR

Date: 28.05.2025

Reviewer's Comment for Publication.

(To be published with the manuscript in the journal)

The reviewer is requested to provide a brief comment (3-4 lines) highlighting the significance, strengths, or key insights of the manuscript. This comment will be Displayed in the journal publication alongside with the reviewers name.

- **Language Editing:** Revise the paper for English grammar, clarity, and scientific expression.
- **Equation and Figure Formatting:** Ensure all mathematical expressions are complete and clearly numbered; enhance figure clarity and labeling.
- **Uncertainty and Error Analysis:** Include a section on experimental errors, sensor calibration, and repeatability.
- **Comparative Analysis:** Add a comparison of results with existing materials/systems to highlight the advantage of Thiki clay.
- **Expand Conclusion:** Include implications, limitations, and potential for future research in the conclusion section.

Detailed Reviewer's Report

"Experimental Study of Energy Storage and Recovery with Fluid Change: Application in a Cylindrical Enclosure Filled with a Porous Terracotta Medium at Thiki in the Thiès Region"

1. Summary of the Paper

The paper presents an experimental investigation of thermal energy storage and recovery using a porous terracotta medium (from Thiki, Thiès region) within a cylindrical enclosure. The study aims to improve energy efficiency by testing the heat storage behavior of a porous medium under various thermal loads using a resistor heater and fluid exchange. Key findings include detailed thermal data (temperature, energy, power profiles) over time that highlight the storage and dissipation characteristics of the system.

2. Strengths

- **Relevance:** The research addresses a timely and significant topic — sustainable and efficient energy storage.
 - **Experimental Design:** Clear description of the test rig and measurement systems (use of thermocouples, controlled heating, data acquisition).
 - **Use of Local Material:** Exploration of Thiki terracotta offers an affordable and environmentally friendly alternative to conventional metallic media.
 - **Thermal Performance Metrics:** Temperature evolution, energy accumulation, and power variation are thoroughly documented.
 - **Visual Aids:** Adequate figures and graphs support the findings (temperature, energy, and power over time).
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3. Weaknesses

- **Language and Grammar:** The manuscript has multiple grammatical errors, awkward phrasing, and inconsistent terminology. It requires careful proofreading.

- **Incomplete Mathematical Formulations:** Some equations are not clearly written or lack explanations. For example, equation (2) for thermal power is incomplete.
 - **Limited Analysis:** The discussion section could benefit from a deeper physical interpretation of the results and comparison with existing studies.
 - **Data Presentation:** Graphs are referenced but not always labeled clearly. Axis units and legends are missing or vague in places.
 - **Bibliographic Quality:** References lack consistent formatting; some contain typos or incomplete details.
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4. Comments on Methodology

- The methodology is generally sound. The use of a vertical cylinder, resistor heating, and water-saturated porous media aligns with standards in thermal storage studies.
 - The process for determining porosity and saturation is well-explained.
 - However, the calibration process for thermocouples is not mentioned.
 - There is no mention of uncertainty analysis, which is essential in experimental research.
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5. Results and Discussion Analysis

- **Temperature Behavior:** The heating and cooling cycles are clearly observed. Convective behavior within the porous medium is explained qualitatively.
 - **Energy Accumulation:** Figures 4 and 5 illustrate sensible heat storage well but lack numerical clarity.
 - **Power Decay:** The exponential decay in power (Figures 7 and 8) supports heat dissipation analysis but would benefit from curve fitting or modeling.
 - There is no quantitative comparison with similar systems in the literature, which weakens the significance of the findings.
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6. References Evaluation

- The reference list is relevant and reflects knowledge of prior work in the field.
 - Formatting is inconsistent, and some DOIs are not clickable or are redundantly listed.
 - Several references are cited properly in context, but others appear in the bibliography without adequate discussion in the body text.
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7. Suggestions for Improvement

- **Language Editing:** Revise the paper for English grammar, clarity, and scientific expression.
 - **Equation and Figure Formatting:** Ensure all mathematical expressions are complete and clearly numbered; enhance figure clarity and labeling.
 - **Uncertainty and Error Analysis:** Include a section on experimental errors, sensor calibration, and repeatability.
 - **Comparative Analysis:** Add a comparison of results with existing materials/systems to highlight the advantage of Thiki clay.
 - **Expand Conclusion:** Include implications, limitations, and potential for future research in the conclusion section.
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8. Recommendation

Major Revision

While the concept and experimental base are strong, the manuscript needs **significant improvements in language, data clarity, result interpretation, and formatting** to meet academic publishing standards.
