

Mechanical Engineering Final Year Project Proposal

Project Title:

Design and Fabrication of an Energy-Efficient Solar Water Heater

Student Name:

[Your Name]

Supervisor:

[Supervisor's Name]

Date:

[Submission Date]

1. Introduction

With the rising demand for sustainable and renewable energy sources, solar energy has become a key focus in reducing energy consumption and environmental impact. Water heating is a significant part of domestic energy use, with traditional electric and gas heaters consuming a substantial amount of non-renewable energy. This project proposes the design and fabrication of an efficient solar water heating system aimed at reducing energy consumption, costs, and carbon footprint. The proposed design will harness solar energy to heat water for household use in an eco-friendly and economical manner.

2. Objectives

- To design an efficient solar water heater that maximizes heat absorption and retention
- To fabricate a durable, low-cost prototype suitable for domestic use
- To test and evaluate the performance of the solar water heater under different weather conditions
- To compare the efficiency and cost-effectiveness of the solar water heater with traditional water heating methods

3. Problem Statement

Conventional water heating systems, powered by electricity or gas, are energy-intensive and contribute to rising energy costs and environmental degradation. The reliance on fossil fuels for energy increases carbon emissions. The need for an affordable, efficient, and eco-friendly alternative to these conventional methods leads to the exploration of solar energy. This project seeks to address these issues by developing a solar-powered water heater that provides an efficient and sustainable solution.

4. Methodology

- **Material Research and Selection:** Identify materials with high thermal conductivity and durability (e.g., copper, aluminum) for the absorber plate and storage tank
- **Design:** Use CAD software (SolidWorks) to create a detailed design for the solar collector, water tank, and piping system

- **Fabrication:** Build the prototype using the selected materials, focusing on maximizing heat absorption and minimizing losses
- **Performance Testing:** Conduct field tests under various weather conditions to evaluate the heater's efficiency and heat retention capacity
- **Analysis:** Collect and analyze data to assess energy savings and compare performance with traditional water heaters

5. Expected Outcomes

- A functional prototype of a solar water heater with enhanced energy efficiency
- Performance data showing significant energy savings over traditional electric or gas heaters
- Feasibility report for large-scale manufacturing and deployment
- Contribution to reducing reliance on non-renewable energy and promoting environmental sustainability

6. Tools and Equipment

- CAD software (SolidWorks) for design
- Solar collector materials (copper, aluminum)
- Temperature and pressure sensors for testing
- Water storage tank and piping
- Heat exchangers for efficient heat transfer

7. Conclusion

This project aims to deliver an energy-efficient, sustainable, and cost-effective solar water heating system that will reduce energy consumption and operational costs for

households. The successful implementation of the project can serve as a model for expanding the use of renewable energy in domestic applications and contribute to environmental sustainability.