CHEMISTRY PBL

PROBLEM STATEMENT

Optimize the performance and cost-effectiveness of energy-efficient building technologies, including insulation, lighting, and HVAC systems, to reduce overall energy consumption in residential and commercial buildings.

INTRODUCTION

The main goal of this project is to improve the efficiency and cost effectiveness of energy saving technologies used in buildings, such, as insulation, lighting and HVAC systems (Heating, Ventilation and Air Conditioning) in order to reduce energy usage in both homes and businesses. Zero energy buildings (ZEBs) represent an approach in the construction industry. They are known for their insulation sealing against air leaks and use of renewable energy sources. These structures are designed to generate energy as they consume throughout the year resulting in a balance of zero net energy consumption and a carbon neutral impact on the environment, for those who occupy them.

PROBLEM ANALYSIS

- The overall energy usage is increasing day by day but the supply is constant.
- To overcome this we need to apply some methods to reduce energy wastage and consumption.
- We can use some methods to reduce energy consumption in various domains such as Apartments, Bungalows and buildings.

METHODOLOGY

The study has been implemented in ways

- Research and case study about energy consumption and zero energy home.
- Taking a survey to understand the usage of energy in an household.
- Proposing a virtual solution by taking a particular area in mind.

SURVEY

The key points we got from a survey are

- 80% of people try to save electricity by using various methods such as turning of the lights when not required
- Using sunlight as light source in daytime and not using fan when there is proper ventilation in house.
- Doing time to time service of appliances.
- Using appliances that use more electricity on more need basis only.

MINI-PROJECT

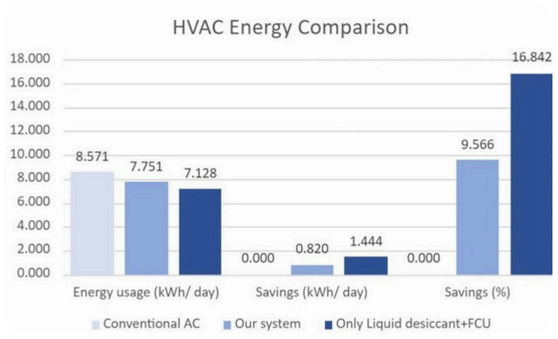
Solar Tracker

- Created a solar tracker using Arduino uno, servo motor, ldr sensor module.
- In this project we rotated the solar panel according to the sunlight with the help of LDR sensor module

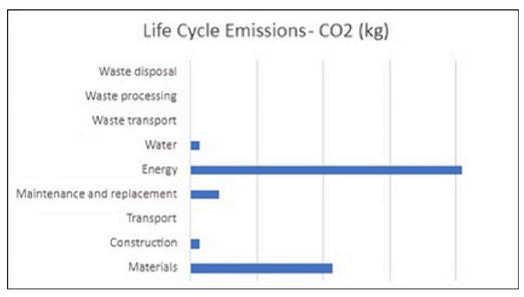
RESULT

- We can save electricity using modern as well as old methods
- The common and feasible method to save electricity will be using Home automation.
- Solar panel is widely use to make a zero energy home worldwide
- Old methods such as using Jali in home can improve airflow and reduce energy consumption.
- Various other methods such as using solar reflectance solution and using a mist spraying machine can also cool down the house

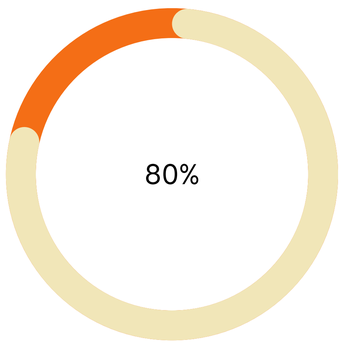
OBSERVATION



Energy Eficiency Ratio Comparison



The life cycle CO2 emissions of a conventional house distributed among different categories



Percentage of people trying to save electricity by using various means

FUTURE SCOPES

- Materials such as aerogels, vacuum insulation panels, phase-change materials, and advanced foams offer promising opportunities for improving insulation performance.
- Research into organic light-emitting diodes (OLEDs) and other emerging lighting technologies holds promise for even greater energy savings and visual comfort.
- Variable refrigerant flow (VRF), heat pumps, radiant heating and cooling, and district energy systems offer opportunities for optimizing HVAC performance while minimizing environmental impact.
- Designing and constructing buildings that generate as much energy as they consume (zero-energy buildings) or produce a surplus of energy (net-zero energy buildings)

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- References and source: -
- https://www.mahindralifespaces.com/real-estate-properties/mumbai-properties/mahindra-vista-kandivali-east/
- INDIAN INSTITUTE OF TECHNOLOGY BOMBAY Team SHUNYA's Project Vivaan
- https://www.anker.com/blogs/home-power-backup/electricity-usage-how-much-energy-does-an-average-house-use
- https://www.energy.gov/eere/geothermal/geothermal-heat-pumps
- https://www.intechopen.com/chapters/53557

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