A Case Study on "ENERGY AUDIT OF AN HOUSEHOLD APPLIANCES"

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ABSTRACT: Power, the word itself says to what extent the world is dependent on it. It may be fortunate or unfortunate, we are totally dependent on the power which is making the usage higher and higher which left us with energy crises and increasing costs of the energy usage. Now its time for Energy saving. These days, number of people in favour of the Energy saving has been increasing not to lessen the cost of usage but to let our future generations livewithlight and luxury. In this paper we have analyseddifferent methods of energy auditing and we have analysed Energy conservation measures for Homes and Buildings that will save the energy to a little higher extent by using Energy Efficient Devices.

KEYWORDS: Audit, Energy Conservation, Efficiency, Auditing types, Energy Conservation opportunities, ECMS.

CONTENT

I. INTRODUCTION

Energy crisis is one of the major problems in the existing world. An energy crisis is any great bottleneck in the supply of energy resources to an economy.There has been an enormous increase in the global demand for energy in recent years as a result of industrial development and population growth.Since the early 2000s the demand for energy,especially from liquid fuels, and limits on the rate of fuel production has created such a bottleneck leading to the current energy crisis.This problem will solved through Energy conservation and use of energy efficient equipment.With the use of energy efficient measures in different sectors of consumption like Lighting, Refrigeration and HVAC helps energy conservation. An energy efficient lighting design with controls reduces the power consumption and will be a major energy saving component along with commercial and residential sectors.A proper light Design will be able to percept the surroundings and can reduce energy consumption. Similarly HVAC,Heating,ventilation and Air conditioning (HVAC) is a significant operating expense in commercial buildings, accounting for 51% of energy use,An HVAC economizer is a dampered vent designed to save energy and give the cooling system a break. Sensors within the economizer compare the outdoor temperature and humidity with that inside the building.If the outside air is cool enough,the damper is opened to bring outside air in, thereby reducing the need for mechanically cooled air. If the outside air is not cool enough, which is indicated by the Economizers sensors, the damper are closed.

II.ENERGY AUDIT

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

NEED OF ENERGY AUDIT:

Energy audits reveal your usage patterns, identify waste, over-expenditure and, generally, make you fully cognizant of where your energy dollars are going. This knowledge will enable you to be more efficient with your energy use and be able to track and accelerate savings. Energy savings of the order of 5 to 20% are possible by optimizing use of Energy with better housekeeping, low cost retrofitting measures and use of Energy efficient equipment at the time of replacement, renovation or up gradation. Such an audit programme will help to keep focus on variations which occur in the energy costs, availability and reliability of supply of energy, decide on appropriate energy mix, identify energy conservation technologies, retrofit for energy conservation equipment etc. In general, Energy Audit is the translation of conservation ideas into realities, by lending technically feasible solutions with economic and other organizational considerations within a specified time frame. The primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs. Energy Audit provides a bench- mark (Reference point) for managing energy in the organization and also provides the basis for planning a more effective use of energy throughout the organization.

III. TYPES OF ENERGY AUDITS

The term energy audit is commonly used to describe a broad spectrum of energy studies ranging from a quick walk-through of a facility to identify major problem areas to a comprehensive analysis of the implications of alternative energy efficiency measures sufficient to satisfy the financial criteria of sophisticated investors.

Energy Audit is a schematic approach for decision making in the area of energy management. It is defined as the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving Energy Efficient with cost benefit analysis and an action plan to reduce energy consumption. There are two types of Audits:

A)PRELIMINARY AUDIT:

The preliminary audit alternatively called a simple audit, screening audit or walk-through audit, is the simplest and quickest type of audit. It involves minimal interviews with site operating personnel, a brief review of facility utility bills and other operating data, and a walk-through ofthe facility to become familiar with the building operation and identify glaring areas of energy waste or inefficiency. Typically, only major problem areas will be uncovered during this type of audit. Corrective measures are briefly described, and quick estimates of implementation cost, potential operating cost savings, and simple payback periods are provided. This level of detail, while not sufficient for reaching a final decision on implementing a proposed measures, is adequate to prioritize energy efficiency projects and determine the need for a more detailed audit.

B) DETAILED ENERGY AUDIT:

It is a comprehensive Audit provides a detailed energy project implementation since it evaluates all major energy using systems. It is an accurate method for Energy saving and Audit. In this audit mainly two phases are involved

Phase-I: Pre Audit Phase.

Phase-II: Audit Phase.

Phase-III: Post Audit Phase.

C) STEPS INVOLVES IN ENERGY AUDITING:

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C) STEPS INVOLVES IN ENERGY AUDITING:

1) Interview with key facility person: In this, Meeting is scheduled with auditor and all key auditing personals the meeting is focussed on Audit objectives, scope of work, facility rules and regulations, Roles and Responsibilities of members. In addition to these administrative issues, the discussion during this meeting seeks to establish: operating characteristics of the facility, energy system specifications, operating and maintenance procedures, preliminary areas ofinvestigation, unusual operating constraints, anticipated future plant expansions or changes in product mix, and other concerns related to facility operations.

2) Facility Tour:

After the initial meeting, a tour of the facility is arranged to observe the various operations first hand, focusing on the major energy consuming systems identified during the interview, including the architectural, lighting and power, mechanical, and process energy systems.

3) Document Review:

During the initial visit and subsequent kick-off meeting, available facility documentation are reviewed with facility representatives. This documentation should include all available architectural and engineering plans, facility operation and maintenance procedures and logs, and utility billsfor the previous three years. It should be noted that the available plans should represent "as-built" rather than "design" conditions. Otherwise, there may be some minor discrepancies between the systems evaluated as part of the audit and those actually installed at the facility.

4) Facility Inspection:

After a thorough review of the construction and operating documentation, the major energy consuming Processes in the facility are further investigated. Where appropriate, field measurements are collected to substantiate operating parameters.

5)Staff Interviews:

Subsequent to the facility inspection, the audit team meetsagain with the facility staff to review preliminary findings and the recommendations being considered. Given that the objective of the audit is to identify projects that have high value to the customer, management input at this junction helps establish the priorities that form the foundation of the energy audit. In addition, interviews were scheduled with key representatives designatedby the facility as having information relevant to the energy audit. These representatives may include majorenergy consuming system service and maintenance contractors and utility representatives.

6) Utility Analysis:

The utility analysis is a detailed review of energy bills from the previous 12 to 36 months. This should include all purchased energy, including electricity, natural gas, and fuel oil, liquefied petroleum gas (LPG) and purchased steam, as well as any energy generated on site.

IV. ENERGY EFFICIENCY& CONSERVATION

Energy Conservation:

Energy conservation refers to reducing energy through using less of an energy service. Energy conservation differs from efficient energy use, which refers to using less energy for a constant service. For example, driving less is an example of energy conservation. Driving the same amount with a higher mileage vehicle is an example of energy efficiency. Energy conservation and efficiency are both energy reduction techniques.Energy efficiency, sometimes called efficient energy use, is using less energy to provide the same level of performance, comfort, and convenience.

For example,

:: Insulating a home allows a building to use less heating and cooling energy to achieve and maintain a comfortable temperature.

:: Installing a fluorescent bulbs or natural skylights reduces the amount of energy required to attain the same level of illumination compared with using traditional incandescent light bulbs.

:: Compact fluorescent lights use one-third the energy of incandescent lights and may last 6 to 10 times longer.

There are many motivations to improve energy efficiency. Reducing energy use reduces energy costs and may result in a financial cost saving to consumers if the energy savings offset any additional costs of implementing an energy efficient technology. Reducing energy use is also seen as a solution to the problem of reducing carbon dioxide emissions .Energy efficiency and renewable energy are said to be the twin pillars of sustainable energy policy and are high priorities in the sustainable hierarchy Modern appliances, such as, freezers, ovens, stoves, dishwashers, and clothes washers and dryers, use significantly less energy than older appliances. Current energy efficient refrigerators, for example, use 40 per cent less energy than conventional models.

V. RECOMMENDATIONS FOR LOW POWER CONSUMPTION IN HOMES AND BUILDINGS

A) LIGHTING: Take advantage of sunlight and leave lights off during the day.Use compact fluorescent light bulbs in place of conventional incandescent light bulbs. CFL uses approximately one- fourth the wattage of an incandescent bulb producing a similar level of illumination, and they last 8,000 to 10,000 hours. Install motion-detection switches or timers for outdoor lighting rather than leaving lights on all night. Replace incandescent night lights with LED or electro luminescent lights. Change conventional ballast with electronic ballast. Many automatic devices can help in saving energy used in lighting. Consider employing infrared sensors, motion sensors, automatic timers, dimmers and solar cells wherever applicable, to switch On/off lighting circuits.

B)FANS: As in case of lights, switch offthe fans when not in use. If you are buying a new fan, buy energy efficient fans. Wherever your fan usage is more than 12 hours, replace them by energy efficient fans, you will get your money back in 2 years and after that it will be all bonus for you.

C)TV: Most of the time, we keep the TV and associated electronic items (Set-up box, Speakers, etc.) on even when not in use. You may think that this does not consume a lot of electricity, but it does. Make it a habit to switch off the TV when you are not watching it.

D)REFRIGERATORS: Keep the refrigerator away from the wall by about half feet. Refrigerators throw out heat and this heat needs to escape. If we do not let the heat go away, its efficiency reduces. Also, do not keep your fridge stuffed with lot of food items. In winters, you can keep the fridge in min cool mode. If some container has very less food, try to finish it, as the fridge will waste more energy in keeping the container itself cool.

E)ACs: If you have one or more ACs at home, this is the item you should focus on the most to save electricity. Ensure that your doors and windows are properly closed when you use the ACs. Replace the old Air Conditioner with Energy Efficient Equipment .Switching on the fan while using the ACs helps you in keeping the AC at a higher temperature Old ACs use lot of electricity so better to replace it with new equipment.

F) REDUCE ELECTRICITY USUAGE:

1.Turn off all electric appliances (lights, computers, televisions) when they are not in use. Computer printers and photocopiers are typically.

2.Watch TV with the light off

3. Change out a CRT TV with an LCD model of equivalent size.

4. Reduce miscellaneous electric use from power adapters and electronics in standby mode by plugging them into a power strip that can be switched off.

5. Set your computer to automatically shut off the monitor and switch to standby mode (if available) after a certain number of minutes of disuse. Choose a flat panel display instead of a conventional CRT. Adjust your display's brightness to the surrounding light conditions (less brightness is needed in dark rooms).

6. Purchase a laptop and use it as a replacement for your desktop computer. Most laptops are optimized for energy efficiency and don't need an uninterruptible power supply, since the battery can be used during thunderstorms.

7. Use products with the Energy Star logo (or similar). In particular, recycling and replacing old refrigerators with an Energy Star-approved one can save a few hundred kilowatt-hours a year. Replacing old refrigeration and air conditioning units (even if they are still functional) with more efficient ones is often an economically and ecologically sound decision.

8. Consider installing and using a clothes line for drying clothes. Each load not dried in an electric dryer saves 3 to 5 kilowatt hours.

9. Unplug appliances that will not be used for an extended period of time; many devices, especially consumer electronics, use a small amount of electricity even when they are switched off, due to indicator lights or listening for remote-control signals. Direct current converters, which are typically used to connect small consumer electronics devices to household power, lose a significant amount of energy as heat, even when the device is not plugged into the converter.

10. Refrigerator is probably among the biggest energy users in the home. Take special care to operate it efficiently:

11. Clean the condenser coils on your refrigerator to keep them operating efficiently.

12. Reduce the number of trips you make to the refrigerator/freezer and do not leave the door open unnecessarily.

13. Small refrigerators are often less efficient than larger models because they usually have less insulation or a less efficient compressor.

VI. ANALYSIS OF THE POWER CONSUMPTION IN HOME

As in Homes & Buildings the main power consuming areas are:-

1. Lighting.

2. Cooling.

3. Heating.

4. Entertainment.

5. Other Appliances.

Lighting includes of Bulbs,Tubes,Fixtures,Indoor, and Outdoor Applications.

Cooling includes of Ceiling Fans,Air Conditioners, and Refrigerators etc...

Heating comprises of Electric Iron,Geysers,Ovens,and Stoves etc...

Entertainment comprises of Radio, Television, and Desktops, Laptops etc...

Other appliances include Mixers,Washing Machine

Calculation for total wattage consumption for existing devices:

To Calculate Power Consumption In Home:

1.Device Wattage (watts) x Hours Used Per Day = Watt-hours (Wh) per Day.

2.Device Usage (Wh) / 1000 (Wh/kWh) = Device Usage in kWh.

3.Daily Usage (kWh) x 30 (Days) = Approximate Monthly Usage (kWh/Month)

{1Unit =1 kWh=1000 W-h}

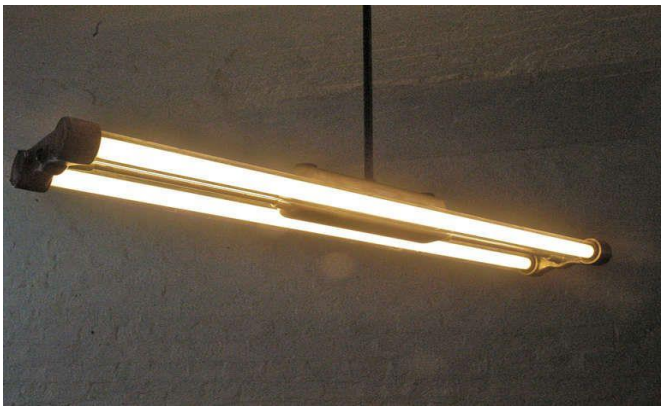
1) For Tube Light:-

Total Tube Lights:-12 (55w)

Time Duration:- 4hrs daily

Total Consumption:- 512 watts per day

:- 0.512 kwh per day



2) For Ceilling Fan

Total Ceilling Fan:- 4 (55w)

Time Duration:- 12 hrs daily

Total Consumption:- 3300 watts per day

:- 3.30 kwh per day

3) For Refrigerator (Single Door)

Total Refrigerator:- 1 (750w) {198Liters}

Time Duration:- 24 hrs daily

Total Consumption:- 18000 watts per day

:- 18.0kwh per day

4) For Air Conditioner

Total AC:- 1 (1 Ton)

Time Duration:- 5hrs daily

Total Consumption:- 2400 watts per day

:- 12 kwh per day

5) For Electric Iron

Total Electric Iron:- 1 (1100w)

Time Duration:- 1hr daily

Total Consumption:- 1100 watts per day

:- 1.1 kwh per day

6) For Television

Total Television:- 1 (18w)

Time Duration:- 14 hrs daily

Total Consumption:- 2632 watts per day

:- 2.632 kwh per day

7) For Desktop Computer

Total Desktop Computer:- 1 (250w)

Time Duration:- 5 hrs daily

Total Consumption:- 1250 watts per day

:- 1.25 kwh per day

8)For Kitchen Appliances {Mixer, Grinder & Juicer}

Total Mixer, Grinder & Juicer:- 1 Unit Each (200 w)

Time Duration:- 2 hrs daily {Not daily}

Total Consumption:- 400 watts per day

:- 0.4 kwh per day

9) For Washing Machine

Total Washing Machine:- 1 (1500w)

Time Duration:- 2hrs daily

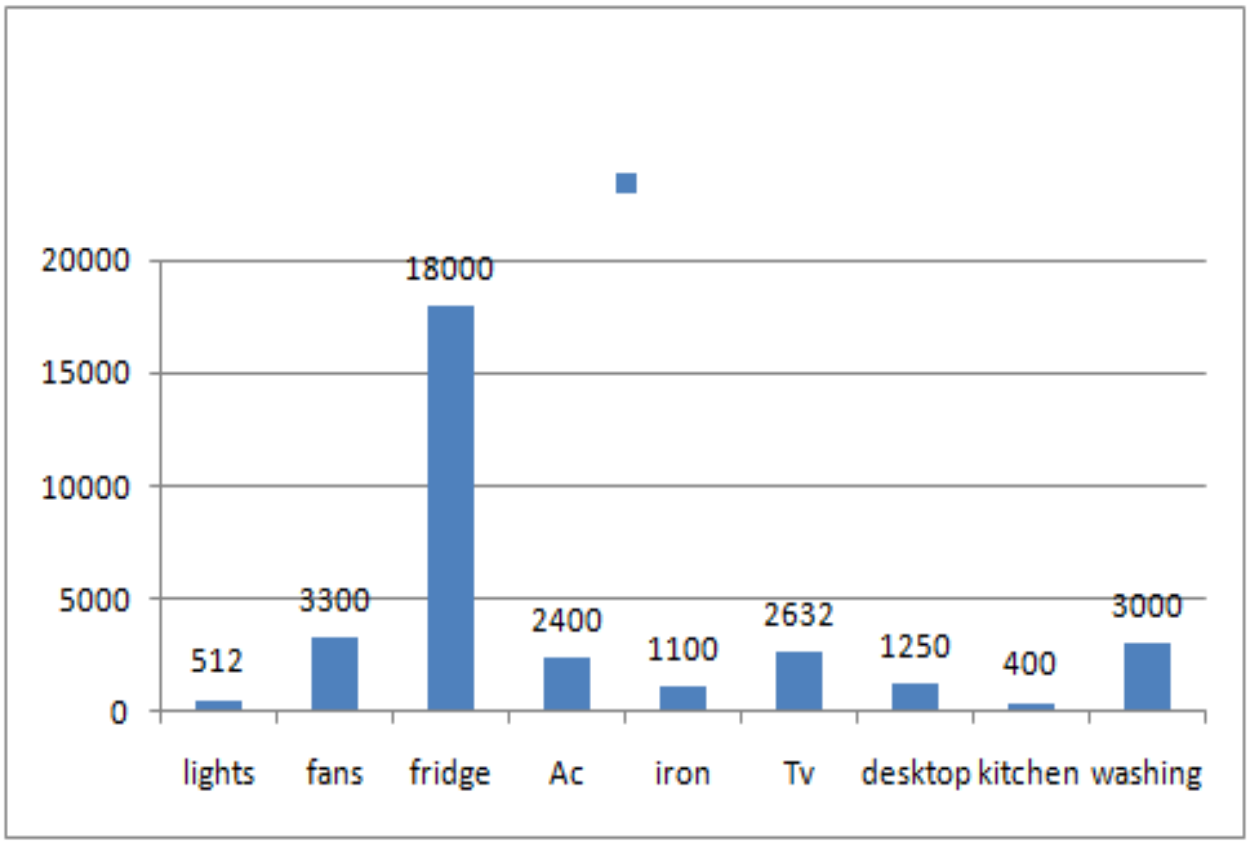
Time Consumption:- 3000 watts per day

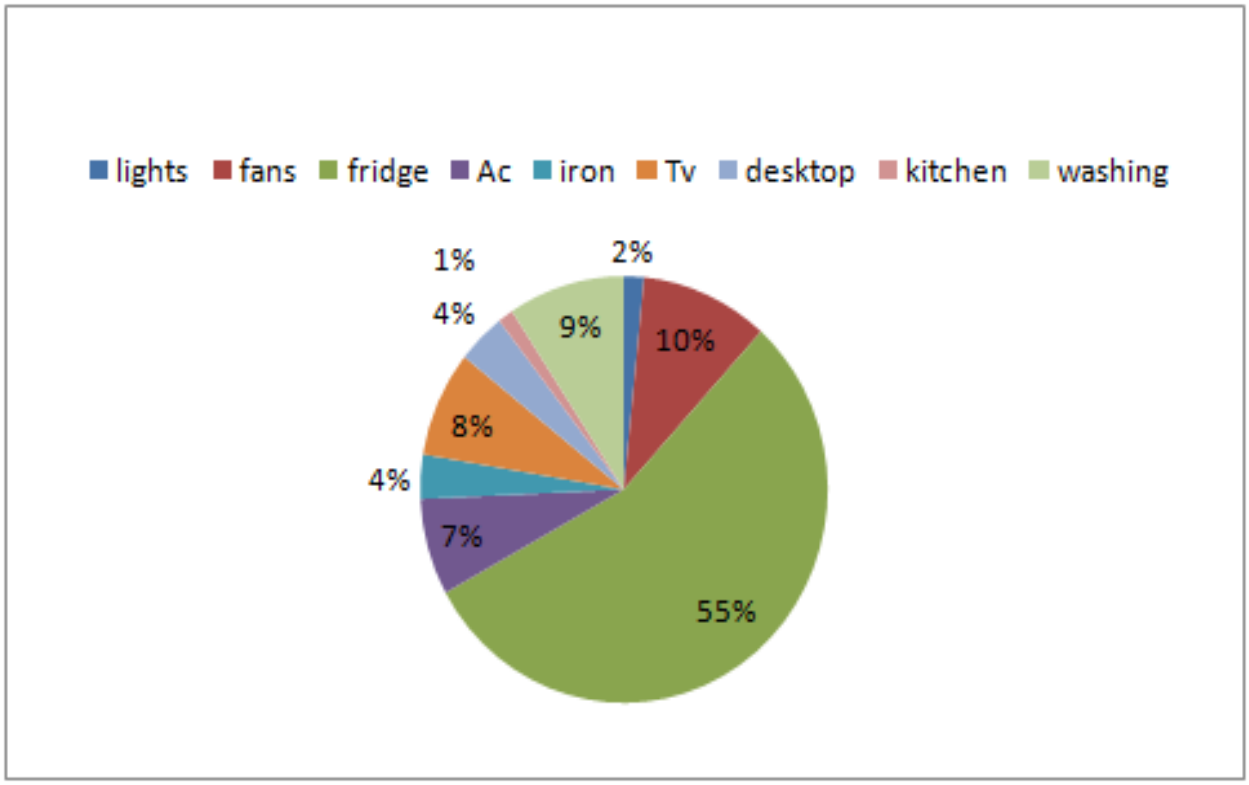
:- 3.0 kwh per day

Total power consumed by all these regular Appliances is :-

=} 32594 watts per day.

=} 42.194 watts per day.





VII. CONCLUSION

Energy Audit deals with verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving Energy Efficient with cost benefit analysis and an action plan to reduce energy consumption. Energy Saving is a Social Responsibility for every individual. In this paper we have analysed the amount of wattage consumed by different devices and suggested necessary replacements and showed the net savings.

By this analysis, if we implement Energy Efficient Equipment we can conserve a lot of power being wastage with current devices without disturbing the output and we can use it for some other devices. By using Energy Efficient Devices we can save and reduce shortage of Power and can reduce power inflation.

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