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Towards Sustainable Tomorrow: Exploring Energy Efficiency of Malls in Delhi

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Abstract

The rapid growth of population and economic development has put severe stress on the natural resources, infrastructure and environment of the country. Malls are the new generation window to the country's commercial activity. They are in the luxury mode by spending extravagantly on facilities and services. The study was an effort to explore the energy resources used for facilities and services in selected malls and also assess the experience of comfort level of employees working in the malls as well as customers visiting the malls.

The results of the study highlighted that maximum power was consumed by HVAC (Heating, Ventilation and Air Conditioning) systems and motors used for pumping water followed by escalators and elevators as compared to energy used by lighting system and security services. Carbon emissions were alarming from each mall as the minimum emissions per day were 8032.12kg to a maximum of 44097.46 kg per day. As regards energy efficiency rating on the parameters of GRIHA developed by TERI, none of the selected malls could obtain minimum score of 50 to be qualified as green structure even though couple of them adopted water recharge pits to ensure zero discharge of waste and rainwater into municipal drainage. In some of the malls the HVAC and the lighting systems were switched off manually when not in use. However, the effort was insignificant. A substantial percentage of respondents i.e., the mall employees and the customers reported discomfort due to heaviness in eyes and high illumination levels. There is a need to design and build such structures on sound concepts of energy efficiency and apply suitable retrofit

options to existing buildings to minimize energy consumption and environmental pollution.

Keywords: Sustainability, Energy Efficiency, Energy Security, Energy Conservation, Green Buildings.

1. Introduction

Malls are in the spent thrift or luxury mode for extravagantly spending on facilities and services. There has to be an intelligent use of various facilities and services so that unnecessary expenditure of energy could be avoided. While designing the buildings as Green, there have been many challenges and alongside these challenges there are enormous opportunities for various stakeholders – architects, builders, developers, manufacturers and others. The market for green building materials and products is estimated to reach Rs.15000 Cr by 2010 and hence, service providers from India will have opportunities to offer green building services to other countries as well. In spite of best efforts, there exists a wide gap between supply and demand affecting the development process of our economy adversely.

The study was conducted with the following specific objectives:

1. To explore various facilities and services in selected malls.
2. To audit energy resources used for facilities and services in selected malls.
3. To investigate the experience of comfort level of employees working in the malls as well as customers visiting the malls.
4. To find out extent of carbon emissions by selected malls.
5. To suggest energy efficient methods for various facilities and services.

The study entitled "Energy Audit of malls in Delhi" was carried out in 5 malls located in in West zone of Delhi and was conducted in 4 phases- interview with Key Facility Personnel; facility Tour for Energy Consumption; identification of feasible energy efficient methods; experience of comfort level of employees working in the malls as well as customers visiting the malls. Information was gathered from the key facility personnel managing the malls by case profile method. 50 customers visiting the malls and 50 employees working in the malls were selected by random sampling technique to find out their level of comfort and perception on energy use.

2. Salient Findings of the Study

2.1 Case Profile of the Malls

- All the malls were located in Delhi spread over 65 acres. The area of the malls ranged from 65000 square feet to 550000 square feet. Sanctioned load which ranged from 1250 KV-3870 KV. The monthly electricity tariff varied from Rs.12,00,000/- to Rs.47,00,000/-. Malls were operational for 12-14 hours every day. Number of employees managing the maintenance of malls ranged from 97 to 150 persons per mall.

- Various facilities and services used in selected malls included motors, HVAC system, lighting system, plumbing system, escalators, elevators, CCTV, rain-water harvesting, waste water management, parking, security and safety.
- Maximum energy in all the malls was consumed by HVAC systems and motors followed by escalators and elevators while less percentage of energy were used by lighting system and security services. Carbon emissions were alarming from each mall as the minimum emissions per day were 8032.12kgs to a maximum of 44097.46kgs per day. If we go by the predictions that real estate will further boom in the coming years - that means more buildings and malls will come up in the near future. If we continue to build in the same fashion by ignoring the concern for saving the ecology for a sustainable future we could be sure of very severely unfavourable living conditions. Climate change would become more powerful, thus, affecting the quality of life adversely.
- The maximum energy consuming mall was Mall 3 which was the biggest in area. Carbon emissions as well as percentage of power consumed per month were highest by the HVAC system of Mall 2 followed by escalators, elevators, plumbing system, lighting system and security services. Rain-water harvesting was practiced only by Mall 1 and 3.
- Energy consumption for Mall 3 was the lowest in terms of KWH power per square foot – i.e., 2.4KWH showing efficient use of energy as against Mall 2 with 4.6 KWH per square foot.
- None of the selected malls could achieve a minimum score of 50 on the criterion of TERI's GRIHA to be qualified as Green Building. Mall 3 the largest of all scored the maximum. Hence we could say that malls are big energy guzzlers wherein they also emit large amounts of carbon compounds in the atmosphere. They are not making enough efforts towards self-sufficient, energy efficient and sustainable environment and following the norms or benchmarks set by TERI towards green design for environmental harmony. Experts also believe that a green building improves workers' productivity by favourable indoors environmental conditions.
- The reason for poor scoring on TERI's *GRIHA* could be lack of awareness of the mall management right from pre-construction stage wherein there was no consciousness among the concerned persons to make efforts for incorporating energy efficient components in the building structure. Probably all the focus was on its appearance and aesthetics to attract maximum customers. There is a great need to make people aware of the green building concept so that energy consumption in building could be minimized and the hazardous substances emitted by buildings like, VOC (volatile organic compounds), HCFC (hydro chlorofluorocarbon)/ and CFC (chlorofluorocarbon) could be reduced to as far as possible.
- Majority of the employees were middle level professionals including Sales Executive Customer Care Associates, HR Executives, Quality Analyst, Engineers, Estate and Facility Managers. Majority of respondents belonged to

the age-group of 15-25 years including almost equal number of males as well as females.

- The mall customers were varied in terms of their age, sex and occupation. The profile of customers revealed majority of females mainly in the age range of 37-47 years.
- There was no difference in the overall comfort level of customers and employees. Majority of them felt comfortable within the interior premises of the malls. Substantial percentage of respondents reported discomfort (like pain in the eyes, heaviness in the head) due to heaviness in eyes on account high illumination levels.
- Majority of the customers as well as the employees felt that either energy was not wasted or very little was wasted for lighting. Customers could not appreciate high lighting levels being used for display of certain products as probably they were comparing illumination levels practiced in their own environment whereas the employees were used to such optimum levels of illumination. The employees also felt that energy was wasted ranging from somewhat (38%) to highly wasted (18%). The reason for their perception was that majority of them found the temperature very low while at times they felt that the temperature could have been a little higher but since electronic thermostats were not installed only a certain constant temperature could be maintained on a long term sustainable basis. As was also observed air-conditioning used the maximum power which ranged from 203220-1062045 KWH per month.
- As regards the energy consumption it was observed that ventilation was possible through heavy duty motors installed in the malls which were used to operate the equipment. As most of the motors were on alternative power supply and were using 7-13% of the total energy in the malls, about 1/3 was being used for ventilation purpose.
- Majority of the customers felt that security devices do not involve excessive use of energy while a very few felt that energy was being wasted through security devices. Three malls were found to have CCTV and most of the malls were using smoke detectors for ensuring the safety of occupants.
- Observation of power consumption of CCTV revealed that it consumed 1188 KWH-4050 KWH energy per month of the total energy consumed in the malls. However, there seemed to be no better and convenient alternative, therefore, most of the commercial building made use of CCTV in order to keep a track on the security.

Findings of the study suggest that there is a need for energy-efficient and cost-effective alternatives to reduce the energy costs incurred by the malls as well as volatile substance emitted by them such as low power factor on an electrical system within a building, sensors to control temperature of the air conditioners, Variable Speed Drives for plumbing system, energy efficient light sources such T-8 and T-5

tube lights, use renewable energy sources, efficient waste and water management practices.

3. Conclusion

Malls are in the spent thrift or luxury mode for extravagantly spending on facilities and services. There has to be an intelligent use of various facilities and services so that unnecessary expenditure of energy could be avoided.

The findings of the research also highlight the fact that even though malls were spending so much on power yet they were able to satisfy only three-fourths of the occupants or visitors one-fourths were yet uncomfortable. Therefore, a greater consciousness is required by the builders, architects, designers, town planners and beaurocrats to encourage green practices in building construction so that optimal use of power was made. Several researches and experiments by architects and designers have also shown that better aesthetics could be worked out by practicing green design using local materials and technologies. The right orientation is required by the practitioners using natural materials and procedures. There is need to design and develop the new buildings on sound concepts of efficient use of energy and apply suitable retrofit options to existing buildings to substantially improve energy efficiency, reduce wastage and pollution, recycling and reuse of waste and improve quality and productivity.

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