

Energy Conservation

Exponential consumption owing to rising demands has brought fossil fuels- the drivers of industrial revolution- on the brink of exhaustion.

Grim scenario of depleting these energy resources, human beings have turned to several non-conventional sources such as sun, water, wind, tides and biomass to produce electricity.

Still fossil fuels remain the main sources of power generation. This has also led to an increase in the prices of power as a result of the huge demand supply gap. Obviously the consumers are forced to change consumption patterns if power has to be used at all. World over the call for decreasing consumption pattern of power, and switching over to non-polluting natural resources is gaining ground.

Energy needs of a hotel property- the benchmark for optimum energy consumption- how an energy audit is conducted prior to the formulation of a detailed energy conservation programme – tips for power saving- cost of energy conservation and the benefits of saving energy.

Major resources of energy

The main primary sources of energy used in the hotel industry are fossil fuels such as coal, petroleum, wood etc.. Apart from these, water or steam energy is also used for producing energy.

Fuel is defined as a substance, which can be combined chemically with oxygen to produce heat and light, and is used for burning or production of heat energy for general, domestic and industry needs.

Fuels such as wood, which were once thought of as renewable sources of energy, as they could be replenished, are now considered as non-renewable as their rate of consumption has far exceeded their rate of replenishment. Fossil fuels which were formed million of years ago from fossils or the remains of vegetation and living organisms in the belly of earth, are also considered non-renewable due to their massive consumption rate that is far too much than the time taken for their formation.

Fossil fuels are available in three forms:-

Solid: Coal, peat, lignite etc.
Liquid : Petroleum products
Gas : Methane, Natural gas etc. and higher gases.

These fuels are taken out of earth through mines and serve as major energy generating materials in the world.

The hotel industry mainly uses natural gas, coal and biogas as fuel sources for heat energy. However, over the years fossil fuels have been replaced by electrical energy for the purpose of lighting as well as heating and operating sophisticated equipment in kitchens. This power is either obtained from the grid (municipal supply) or captive power plants comprising huge generators powered by diesel.

Know your fuels (amount of heat energy produced by-)

- 01 litre of LPG produces 11,850 Kcal
- 01 Kwh of electricity produces 850 Kcal
- 01 litre of light diesel oil (LDO) produces 5,946 Kcal

Electrical energy is also referred to as 'artificial' or 'manufactured' fuel in hotel industry. Electrical energy is produced from other energy sources such as thermal energy (burning of fossil fuels), hydro power (kinetic energy) etc.

Conventional generation of electrical energy utilizes coal, gas, oil, or nuclear reactors to heat water, producing high temperature pressure steam. The steam flows through an electrical turbine generator, which converts steam power into electric power that is supplied through the grid for domestic and industrial consumption. As the steam leaves the turbine generator, it contains energy adequate to heat or cool buildings. This steam is also called *City Steam* or *Street Steam*. The development of city steam systems could be very important to the hospitality industry.

What is energy conservation?

Let us go through the following situation. You are the manager of a 100-room three-star hotel property located in Agra, which is operating at cent percent occupancy. Every room is carrying a total connected load of 5.0 Kwh including all types of fixtures, fittings, building system etc. The power tariff paid to the municipal authorities is @ Rs. 5.00 per Kwh. How would you compute the annual energy cost (bill) incurred by you for the rooms?

Solution:- Total annual cost or amount of bill= No. of rooms x Connected load x
Operating hours a day x Tariff rate x 365 days of a year
= $100 \times 5 \times 24 \times 5 \times 365$
= Rs. 2,19,00,000 = 219 lakhs or 2.19 crore

This is a massive cost. Now you initiate an energy conservation programme and ask your staff to switch off all the lights of the guest rooms, when the guests are not in the room. Assuming that a guest generally spends 2/3 of the time (16 hrs) in the room and 1/3 of the time outside the room, and the staff follows your instructions then

The total amount of bill = $100 \times 5 \times 16 \times 5 \times 365$
 = Rs. 1,46, 00, 000
 = Rs. 146 lakhs or 1.46 crore.

The savings made by small efforts is equal to
 = Rs. 2,19,00,000 - Rs. 1, 46,00,000
 = Rs. 73,00,000 = Rs. 73 lakhs

Thus, we see that savings or conservation made is an effort to conserve or extend the availability of our energy resources for a longer period of time for future generations. At the same time no compromises have been made in maintaining the standard of services provided by the hotel, plus you are getting monetary benefits by cutting down the energy expenses and prudently using your energy resources. The saving made also help soar your profit percent directly without putting stress on the marketing and sales team, or the food and beverage service brigade.

Overview of energy cost

There are various forms of energy that are consumed in various sections of a hotel property; for example, electricity, water, kitchen gas, district heating, boiler gas, and other fuels. Energy costs of a hotel vary according to its type, size, location etc. However, the total energy cost generally ranges from 9 to 13 percent of the total operating cost of a hotel, or 2 to 3 percent of the total turnover of the hotel business.

Indian hotels consume approximately 70% of electricity, 12% water, 4% kitchen gas (LPG), 4% district heating, 4% boiler gas and 6% other fuels.

Major energy usage department of hotels

Some of the major energy consuming areas/ departments of a hotel are the following:-

- Guest rooms
- Food production
- Laundry
- Food and beverage service
- Elevators/ escalators
- Swimming pool
- Hotel Engineering especially in HVAC system which is the biggest user of energy.

How to conserve energy in key discipline areas of a hotel

Energy conservation is a team job, and the contribution of every single staff makes a difference. Therefore, it is important that all employees be appropriately counseled and

appraised of small habits that go a long way in conserving energy. Some useful tips on power saving for some energy consuming majors in the industry are enlisted as under:

F & B department

- Switch on only that equipment which is required.
- Prepare a schedule clearly indicating additional equipment requirement during peak season.
- Check the capacity of heavy equipment, like ovens, deep fat fryers, dough kneaders etc. and plan for optimum capacity utilizations.
- Time required for preheating the oven should be known and notified to all staff concerned.
- Oven doors not to be opened for longer than necessary for loading and unloading. Opening doors frequently reduces efficiency and results in energy loss.
- Switch off ovens, and gas ranges that are not necessary / not in use.
- Limit the general use of hot water to 106⁰ F.
- Cook on the largest volume possible.
- Turn down heat as soon as food begins to boil.
- Keep all cooking surfaces clean.
- Bring the frosted meat/vegetables/fruit items to room temperature before you start cooking.
- Soaking of lentils and rice helps in energy conservation.
- Place foil under range and griddle burners.
- Do not turn on the gas burners until you are ready to cook.
- Timers should be installed on the kitchen equipment.
- Burners should always be at minimum before placing the pot or kettle on them.
- Use flat-bottom pans and pots to maximize heat transfer.
- Regularly check all gas units for uneven or yellow flames.
- Replace the outdated equipment with more energy efficient ones.
- Follow scheduled maintenance of equipment.
- Check proper insulation and earthing of equipment on a routine basis.
- Proper cleaning and maintenance of equipment reduce fuel consumption.
- Install chandeliers and other decorative light fixtures in restaurants, coffee shops, banquets, nightclubs, discotheques etc.
- Banquet is a major section of energy consumption. So, control the functioning of a/c according to the time of function; e.g. if function starts at 15-00 hrs, then switch on the AC system at 14-30 hrs and if it schedules closing at 21-00 hrs, then switch off the AC system at 20-30 hrs.
- Timely defrosting in case of refrigerated equipment helps in energy conservation.
- Replace incandescent bulbs with CFL lamps.

Room Division

- Make use of natural light when designing the rooms. A saving of half an hour per day results in energy conservation of almost 180 hrs per room per year.
- Use light finishes for walls and ceilings for better reflection.
- Reduce wattage of lamps with the help of light savers.
- Switch off light in corridors bearing in mind safety and security.
- Switch off TV or music in an unused room.
- Keep draperies closed in guest rooms.
- Ensure that leakage in water taps is promptly attended.
- Laundry is a major section of energy consumption in the housekeeping dept., so develop a regular preventive maintenance and cleaning programme of the heavy-duty equipment.
- Control neon fixtures, other floodlights and spot fixtures used for illuminating building exterior on present automatic time switches.
- Place alternate lights in passages, corridors, staircases, backyards and compounds on separate circuits.
- Practice preventive maintenance.
- Turn off all the lights of all the public areas when not required.
- Turn off the corridor lights during the day when natural light is adequate.
- Install master switch controls in all lights of the guest rooms and which can be synchronized with looking arrangements from outside the entrance door to turn off and turn on supply of electricity.
- Follow manufacturer's instructions for maximum output of an equipment.

Engineering

- Do not deploy reheating for comfort applications; under perfect conditions reheating units are not desirable.
- Check the quality of water and provide necessary water treatment solution to prevent scaling and fouling of heat exchangers.
- Switch off HVAC equipment in unoccupied areas paying attention to the humidity condition.
- Ensure that the heat exchangers, cooling towers, cooling coils are thoroughly cleaned and maintained periodically.
- Check air-handling unit for air quantities.
- Check ventilation and exhaust systems and limit the number of air changes to the minimum that is acceptable.
- Implement regular cleaning programmes for HVAC system filters.
- All electrical distribution system should be checked and all the phases are to be balanced.
- Implement an effective preventive maintenance programme for the boiler house.
- Hot water supply and return pipes should be adequately insulated to minimize heat losses.

Beneficiaries of Energy Conservation

The benefits of energy conservation are several. The manner in which various stakeholders stand to benefit from saving energy is discussed as under:-

Owners- The foremost benefits of energy conservation are the monetary owners that accrue as a result of reduced cost of operations and consequent increase in the net profits of the property. The benefits of energy conservation generally go to the owners and senior management of the hotels. For instance, if a hotel earned Rs. 5,00,000 by reducing the energy cost per annum, then to save the same amount, they would have to increase the sales of their property by Rs. 25,00,000 per year to achieve same net profit, if the profit percentage is 20.

Guests- They may not be getting direct benefits in terms of money, but tremendous energy conservation is directly related to environment friendly practices and judicious use of natural resources. This intangible benefit in terms of enhanced well-being results in guest satisfaction that translates into repeat business to the hotel.

Staff- The employees stand to gain in terms of higher level of morale as also a sense of pride and achievement that comes from an increase in the level of effectiveness and efficiency. Maintenance of high level of service standards, better output, and productivity are other benefits derived from energy conservation.

Environment- The biggest gainer of the energy conservation exercise happens to be the environment. As 'energy saved is energy generated', this means that the rate of depletion of energy resources is slowed down, and they could be available for the consumption of future generations. An idea of the scale of saving natural resources can be drawn from the following statement:-

One ton of lost steam each day is equivalent to 80 litres of high fuel oil commonly termed as light diesel oil (LDO) or approximately 30,000 litres per year.

Energy Audit

An energy audit is an essential step of energy management. Its objective is to analyze and evaluate collected data to determine the energy performance of an entire property and its major consumers. Simply, energy audit means comparison of the actual performance with the standard benchmark of a particular equipment to find out the variance in terms of the actual and desirable performance.

Some useful tips while conducting the energy audit are as follows:-

- Carry out a departmental energy audit to get a fair idea of major energy consumers.
- Compare the result to determine potential savings from a section or department.
- Energy audit should be done on a regular basis.
- Convert energy units to Kwh.
- Establish a monitoring and targeting system.
- Install sub meters for each utility.
- Calculate on monthly basis energy consumption per kg for laundry.
- Compare the result with benchmarks and calculate the difference in percentage and money to see how much could be saved.

Benchmarks

These are yardsticks against which assessment or evaluation is done. The International Hotel Environment Initiative, launched by some leading corporate players in the industry, made the first significant move towards sustainable tourism by conserving environment and energy in the early 1990s. The move, backed by the Prince of Wales, evolved into the International Tourist Partnership, in 2004. This forum is credited with several ground-breaking firsts on environmental management in the tourism industry. It is also reported to have outlined guidelines for the hotel and catering industry to conserve energy and save the earth. Some tables provide information regarding benchmarks for some commonly used equipment in various sections of the hospitality sector.

Calculations based on consumption

Calculate water consumption in cubic metres per person per year if

- Annual consumption = 69,000 cubic metres
- Number of rooms = 300
- Average occupancy = 80% including 25% double occupancy

Total number of rooms occupied = 240

Total house count = 300 guests

(Note: If 100% rooms are single occupied, then house count from single rooms = 240. If 25% rooms are double occupied, then house count from double rooms = 60).

Water consumption = $69,000 / 300 = 230$ cubic metres per person per year.

Calculations based on energy audit

The following information about the food and beverage department of a five star hotel is given. Conduct an energy audit and find out the results.

Covers sold in the month of August 2009:

- Banquet 12,000 covers
- Coffee shop 10,000 covers
- a la carte restaurant 6,000 covers
- Employee meals 4,000 covers
- Total covers 32,000

Consumption of energy for cooking, dishwashing, and cold storage = 1,20,000 kWh

Consumption of energy for lighting, ventilation, and hot water = 30,000 kWh

Water (cold and hot) = 2,000 cubic metres

Electricity rate @ Rs. 5.00 kWh

Water rate @ Rs. 10.00 per cubic metre

Solution:

We have to use the multiplying factors from the table of benchmark (Table 5) and get-

Banquet	12,000 covers x 0.7 =	8,400
Coffee shop	10,000 covers x 0.8 =	8,000
a la carte restaurant	6,000 covers x 1.6 =	9,600
Employee meals	4,000 covers x 0.5 =	2,000
Total covers	32,000	= 28,000

The total equivalent covers at factor 1.0 are 28,000 covers. Now we will use this figure to calculate consumption per cover with benchmarks.

Energy for cooking, dishwashing, and cold storage = $1,20,000\text{kWh} / 28,000 = 4.285 \text{ kWh}$. per cover. Rating : Fair, excess 40% above 3 kWh (benchmark), monthly wastes in this case is Rs. 1,68,000 ($1.2 \text{ kWh} \times \text{Rs.}5 \times 28,000$)

Energy for lighting, ventilation, and hot water = $30,000 \text{ kWh} / 28,000 = 1.071 \text{ kWh}$. Rating: Fair, excess 7% above 1 kWh (benchmark), monthly waste in this case is Rs. 9,800 ($0.07 \text{ kWh} \times \text{Rs.}5 \times 28,000$)

Water (cold and hot) $2,000 \text{ cubic metres} \times 1000 / 28,000 = 71.4 \text{ liters}$ per cover. Rating : Very poor, excess 36 liters above 35 liters (benchmark), monthly waste in this case is Rs. 10,080 ($36\text{ltr}/1000 \times \text{Rs.}10 \times 28,000$).

Total monthly waste = Rs. 1,68,000 + Rs. 9,800 + Rs. 10,080 = Rs. 1,87,880.

Energy Conservation Programme

Once an energy audit is complete, the next logical step is to draw out and execute the exercise to accomplish energy consumption in sectors of the hotel where there is scope. This exercise constitutes the energy conservation programme. It must, however, be borne in mind that energy conservation is not a one man or one department programme. It requires involvement and commitment of every employee of the hotel from General Manager to the entry-level staff of any section.

Generally, an energy committee is constituted with the head of the committee being appointed from the department concerned. The committee is tasked to plan, implement, and monitor the energy conservation programme. The details of the philosophy of the programme are left to the committee. The committee must be made aware that the energy conservation programme is a three-phase programme. The flow chart mentioned in the next page (page 13) will clear the idea.

The first phase include the things that can be done immediately with minimum inconvenience to the guests as well as to the organization. The point to remember here is that there is no budget for an energy conservation programme, so the payoff of this phase is usually fairly large for the efforts put in.

The second phase involves readjustment of the operational practices. The savings made in these two phases should be fed back into the operations so that the third phase can be implemented.

The third phase involves changes in the physical property, which may require the owners' investment plus the savings made in the first and second phases. For instance, installing an equipment that would be instrumental in conservation.

From table 8 (page 14) a general composition of energy conservation committee in a five star can be seen.

A circular logo with a light blue double-lined border. Inside the circle, the text "IAHM Notes Site" is written in a teal, cursive-style font, centered and arranged in three lines.

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