ENERGY CONSERVATION

Necessity of energy conservation in hotels:

- **It Reduces the Hotel's Operating Cost:** Energy consumption contributes significantly to a hotel's operating cost. In general, energy cost account for 4%-8% of total operating costs. This results in expensive hotel rates that can lower a hotel's competitive edge in the tourism market.

- Energy efficiency can reduce a hotel's energy cost by 10%-40% depending on the measures taken. This in turn lowers the hotel's operating cost, resulting in a higher profit margin and increased competitive ability of the business.

- **It Reduces Climate Change Risks** Energy generation is the largest source of human-induced GHG (Green House Gas) emissions. GHG emissions cause global climate change, which in turn affects human habitation and livelihood in many ways.

- **It Promotes Green Tourism** According to the World Tourism Organization, ecotourism is the fastest growing market in the tourism industry – potentially increasing between 25% and 30% a year. There is now increasing awareness among tourists about climate change and concern for the environment.

- There are currently several certification schemes available for green hotels around the world. These include regional certification schemes like Green Seal, Certification for Sustainable Tourism (CST), etc., as well as globally recognized certification schemes such

as Green Globe, Green Key, Sustainable Tourism Eco-certification Program (STEP), and others.

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.

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.

Fossil fuels are available in three forms:-

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

.

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 However, over the years fossil fuels have been replaced by electrical energy for the purpose of lighting as well as heating and operating sophisticated equipment in kitchens.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.

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 x 5 x 24 x 5 x 365

= Rs. 2,19,00,000 = 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 x 5 x 16 x 5 x 365

= Rs. 1,46, 00, 000

= Rs. 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 apprised 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 106^0 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.
- 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 turned off 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.
- Timely defrosting in case of refrigerated equipment helps in energy conservation.
- Replace incandescent bulbs with LEDs.

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 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 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 should be adequately insulated to minimize heat loses.

Food production:

Food preparation in hotel restaurants is a factor in the energy budget, with cooking using about 6% and refrigeration (not including guest icemakers) using about 2% of the total energy consumed in the hotel. In seeking energy savings, consider these opportunities:

Cooking:

- Turn individual pieces of cooking equipment off or down to an idling temperature during slack production times or when not needed Operate at the proper temperature, (e.g., fryers at 325˚F to 350˚F.) Excessive temperature wastes energy and often results in improperly cooked food. Don't increase temperature during rush hours to increase production. Excessive temperature could destroy the quality of the product and energy consumption will increase.
- Do not load the units beyond the manufacturer's recommended capacity. Overloading results in poor food quality.
- Keep all units clean and properly maintained.
- Establish and implement a regular schedule of preventive maintenance tasks.

Specific measures for energy intensive equipment in Food production include –

A. **Fryers**. Drain and strain the oil and check fat levels frequently. This saves oil and preserves food quality.

B. **Griddles**. Pre-heat only until the griddle surface has achieved the correct cooking temperature required to cook the food, and heat only the sections necessary. Clean the griddle frequently and always re-season. Scrape the cooking surface between production intervals. Cleaning some

types of griddle surfaces requires special tools - use them. Inspect each griddle section periodically for hot or cold spots.

C. **Broilers**. Preheating a broiler for an extended period of time or at an excessively high temperature wastes energy and could alter the food quality and taste. Load the broiler to maximum capacity to gain maximum efficiency. Clean grates frequently - carbonized grease hinders heat transfer, lowers cooking efficiency, and mars food quality. Adjust broiler section power. Consider infrared broilers whenever possible as they may be turned off when not in use and then quickly reheated when needed.

D. **Ovens**. Energy efficiency of ovens depends upon how well they are constructed and used. Insulation levels and quality are two of the most significant factors in oven design. Some inexpensive ovens have little-to no insulation in the oven door. In addition, ovens consume considerable amounts of energy when they are left on, even when no food is being cooked. If your kitchen production requirement does not call for a full-sized oven, consider a half-size oven; it will operate at much better economies.

E. **Steamers**. Steamer ovens are well insulated to reduce heat loss to the kitchen. They are quick to preheat because of the high heat transfer characteristics of steam. Therefore, they require less energy to stay up to temperature during slow times. Keep the unit fully loaded when possible as a steamer operates at peak efficiency and productivity at full capacity.

F. **Kitchen Refrigeration**: Refrigeration is a vital tool for almost every food service operator but refrigeration systems have two strikes against them – they are “On” all the time and they consume electricity. The hotel has a number of deep freezers and cold storage rooms. This means that even small amounts of energy wasted by poorly maintained refrigeration will

add up to substantial costs over time. Here are some practical recommendations to keep refrigeration systems running efficiently:

- Use strip curtains or plastic swing doors on cold stores. These "infiltration barriers" block warm moist air from getting into the boxes while the door is open. Strip curtains used in busy kitchens can reduce compressor runtime significantly and that saves lot of energy. Remember, strip curtains have to cover the entire door opening.

- Make sure that the doors of the cold stores are shut all the time. Repair or replace broken auto-closers on the doors, lubricate door hinges, and realign sagging doors. Also, don't allow employees to prop open walk-in doors.

- Check all the door gaskets every fortnightly on all refrigerators and replace any gaskets that are torn, cracked, worn out, or just plain missing. (Always use the manufacturer's specified replacement). A refrigerator door must seal completely to be effective. Remember, that the proper sealing of doors is not for keeping the cold air in – it is to keep hot and humid kitchen air out.
- Airflow is an important part of refrigeration. When the coils are clogged and dirty, the compressor works harder and will fail sooner. Thus it is recommended to clean the evaporator coil (the cold one inside the refrigerator) and condenser coil (the hot one outside the refrigerator or on the roof) at least quarterly. If the aluminum fins are frozen or bent/damaged then call a qualified service person for the cleaning. Remember – never use a caustic cleaner on these coils.
- Find the time clocks that control the freezer defrost and set them properly. Time clocks might be located on top of or

underneath the freezers, on the wall, or on the roof. There is a clock for each freezer. With the help of these clocks, the number of daily defrost cycles can be reduced from four to three and sometimes even two. Each cycle should be about 15 minutes long. Also, make sure that the evaporator drain line is heated and insulated so that the defrost condensate has some place to go. Improper defrosting can waste a lot of electricity and compromise safe freezer temperatures.

- Use only Compact fluorescent lamps (CFL) in cold storages. A regular CFL will work fine in the cold storage but for freezer a low temperature rated CFL or LED light is required. LED's would be the ideal solutions for both applications.

G. Energy Conservation in Kitchen Ventilation An unbalanced or poorly designed kitchen exhaust system can spell trouble both for restaurant's air quality and for utility bills.

• Catch all that is possible – Cut down on spillage by adding inexpensive side panels to hoods that are failing to capture, and push each appliance as far back against the wall as possible to maximize hood overhang and close the air gap between the appliance and the wall.

• Rebalance the act – If an air balance has not been performed recently, it's time to do so. Time, maintenance, broken belts, and poor commissioning all lead to kitchen exhaust systems that are out of balance, potentially moving too much or too little air, spilling and costing money. This also applies to dining room heating, ventilation, and air conditioning (HVAC) system; outside doors that are hard to open because of suction or that blow open by themselves are a sure sign that it's time to order an air balance.

• Use variable-speed exhaust – Typically, kitchen exhaust hoods have two settings: "off" and "on". Naturally, "off" is ideal for when the kitchen is empty, and "on" may be great for the frenzied lunch and dinner rush—but

neither is quite right for the afternoon lull, the post-dinner wind down, or any other situation when the kitchen isn't operating at full capacity. Variable-speed, demand-based exhaust controls get around this problem by using sensors to monitor the cooking and varying the exhaust fan speed to match the ventilation needs. Demand ventilation controls typically reduce the cost to operate an exhaust system by anywhere from 30 to 50 % and can be installed on either new installations or retrofitted to existing hoods.

• Maximize hood size – A 4-foot deep hood is somewhat typical for restaurant exhaust, but more smoke and heat can be captured if a 5 or 6 foot deep hood is used.

Hotel Laundry:

One of the large consumers of water and heat in the hotel, laundry is an outlet that can significantly reduce energy consumption with no effect on guest comfort or satisfaction. Some of the important points to achieve desired results are listed below:

• Shift the lights – different switches operating for different corners of the laundry. This will help in switching off the lights when not required.

• Clean lamps and lights fixtures every month to maintain the lighting levels.

• Clean and wash walls, floors and ceiling to allow better reflection of lights.

• Check and record the water consumption. Compare water consumption daily to find wastages, if any.

• Consider using cold water detergents. It will greatly_reduce energy consumption.

• Reduce hot water temperature to 48˚C. .

• All steam line values should be checked for leaks. That is, you should be able to shut off steam to any machine not in use keeping steam supply main open.

• If possible use final rinse water for 1st wash while washing uniforms and hotel cloths.

• Reduce time between loads to prevent tumblers from cooling down.

• Air line should be checked for leaks.

• Periodically clean exhaust duct and blower of lint and dust.

• Keep steampressure at lowest possible level.

• Shut off steam valve whenever machine is not being utilized.

• Keep radiator coils and fins free from dirt all the times.

• Ensure all steam traps in perfect working order.

• Keep an eye on the preventive maintenance schedule of all laundry equipments by Engineering Department to ensure timely compliance.

ENERGY AUDIT

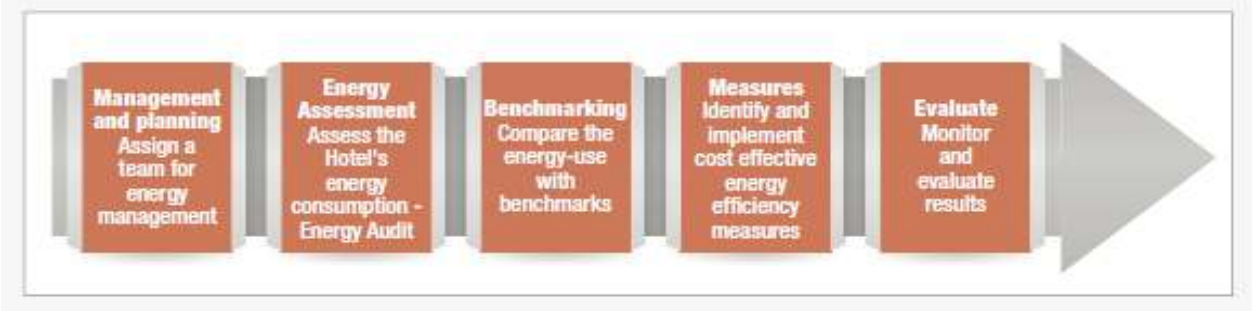
An energy audit is an essential step of energy management. Its objective is to analyze and evaluate collected data to determine the energy performance of an entire property and its major consumers. Simply, energy audit means comparison of the actual performance with the standard benchmark of a particular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

STEPS OF ENERGY MANAGEMENT



Step 1 – Management and planning The first step is to identify a team to oversee energy management in a hotel. The team should comprise management-level staff (owners, managers), technical staff, financial staff, and housekeeping. Large hotels usually have an engineering department and full-time technicians for regular maintenance of hotel facilities.

Step 2 – Energy Assessment Knowing the hotel's energy consumption is critical to developing an energy management plan. A detailed energy audit is the best way to identify where energy is being consumed, and how to improve energy efficiency. A detail audit needs to be carried out to

measure power consumption for a certain period of time. It requires an allocation of resources and time to conduct a useful and detailed energy audit.

Step 3 – Benchmarking is an analysis based on the performance or energy consumption of a given hotel, followed by subsequent comparison to the performance of other hotels in similar environments. Levels of energy consumption tend to vary by hotel classification and climate conditions. As a result, hotels are generally classified by size, (number of rooms) and star rating (facilities and comfort levels).

Step 4 – Measures to improve energy efficiency can be implemented by changing behavior and simple maintenance activities that require little or no investment. These measures can effectively reduce energy consumption, often to a significant degree. Hotel owners may also choose to replace old appliances with more efficient ones. This requires capital investment, but can drastically reduce a hotel's energy cost within a potential payback period of 2-5 years.

Step 5 – Evaluate After implementing energy efficiency measures, it is important that energy managers monitor the level of energy consumption by keeping records of energy and water consumption, and subsequently evaluating the results of implemented measures. This information is important for the hotel management for the purposes of calculating operating cost and profit margins, and for maintaining the energy consumption at a low level.

Energy Conservation Program

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 includes 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, installation of equipment would be instrumental in conservation.

Flow Chart for Developing an Energy Conservation Program

Phase One

Step 1 Collect data on consumption of energy and convert it into the amount.

Step 2 Compare the data with the benchmark by performing an energy audit.

Step 3 Analyze the findings and identify a department where differences are highest.

Step 4 Call a meeting and invite the head of the department and his/her team for discussion on the results.

Step 5 Seek their suggestions and ask about the problems faced by them regarding the poor performance in the energy audit.

Step 6 Appoint an energy conservation committee headed by the departmental head and give them a target to reduce energy consumption within a set time frame.

Phase Two

Step 7 Review the results of phase one. If the results are positive after the target time, commend the efforts of the task force and seek their suggestions to invest the savings in the second phase. Allow them to make certain changes in the existing standard operating practices / minimum investment in replacing the light equipment / accessories. Give them a target to reduce energy consumption within a set target time in the second phase.

If the results are not encouraging, then repeat the first phase till the desired results are obtained.

Phase Three

Step 8 Review the results of phase two after the target time. If the results are positive, then praise the efforts of the task force and solicit their advice. Invite the senior management / owners for a discussion on the success story of the task force. Ask for the owner's investment in making changes in the infrastructures, building systems, and inducting the latest technology, etc. to further improve energy conservation.

If the results are not encouraging, then the second phase is repeated till the time the desired results are obtained.