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Energy Handbook for Dubai Hotels

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Introduction

There is significant potential for savings in the hotel industry, and a lot of energy and money can be saved by taking appropriate measures. On average, about 6-8% of turnover is spent on energy and water, and roughly the same percentage goes on maintenance. These figures are significantly higher than the corresponding figures in the trade sector.
This documentation is intended to enable the Chief Engineer to familiarise himself quickly with the problems of saving energy. It shows how to compare energy consumption values and how to identify potential ways of saving energy. **Reducing electricity consumption is a matter of priority here.**

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Defining the Energy Reference Number and the Energy Reference Area

The purpose of the Energy Reference Number is to enable a rapid and simple assessment of a building as an energy consumer. It is defined as follows: It is the total energy used by a building over a period of one year, divided by the energy referenced area (the heated and air conditioned floor area.) We identify this as KWh/m2.

The Energy Reference Area is defined as follows:
It is the sum of all floor areas, above and below grade, that require heating or cooling for the proper operation of the building. These are **gross** floor areas - e.g. including interior and exterior (peripheral) walls. Should only the net areas be available, then the addition of 10 to 15 percent area, should suffice to indicate a reasonable EBF.

Because rooms with high ceilings use more energy, spaces that are over 3 meters in height receive a correction factor of f = h / 3. What is important here is that the floor to floor dimension is utilised, that is floor surface to floor surface. The correction factor for a height of 6 meters would then entail: f = 6 / 3 or **2.0**.

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Benchmarks of Dubai Five Star Hotels

Benchmarks	Unit	Good	Fair	Poor	Very Poor
Water	Liter / Guest	< 650	650 – 1250	1250 – 1750	> 1750
Power	kWh / m2 a	< 275	275 – 325	325 – 375	> 375
Heat	kWh / m2 a	< 50	50 – 75	75 – 110	> 110
Total Energy	kWh / m2 a	< 325	325 - 400	400 - 485	> 485
Watercosts	AED / m2 a	Big differences depending on the infrastructure. Call Farnek Services to get the prices for your hotel / infrastructure.			
Energycosts	AED / m2 a				
Energy- and Watercosts	AED / m2 a				
Watercosts per SU	AED / SU				
Energycosts per SU	AED / SU				

1 SU = 1 Service Unit = 1 Guest night or 4 covers or 10 conference guest

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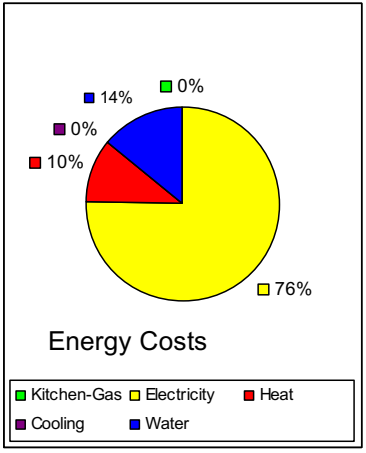
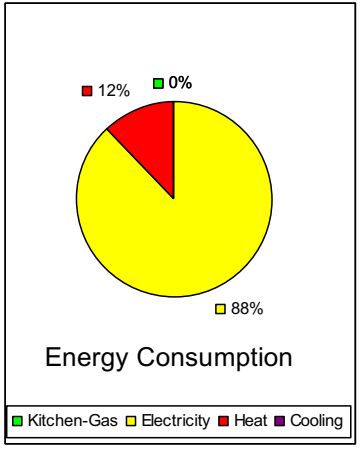
Energy Costs v/s Energy Consumption

The two diagrams that follow indicate the high cost of electricity in comparison to consumption and illustrate the importance of reducing the amount of electricity used. Almost 80% of the energy cost is spent for electricity. In spite of this, the additional savings that can be realised in the consumption of fossil fuels and water cannot be ignored. Clean water is becoming more and more scarce world-wide, and therefore valuable, at the same time, the costs of its purification is on the rise.





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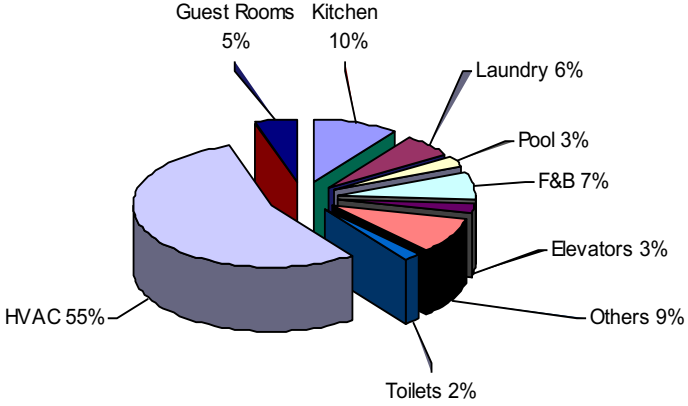
How energy cost are subdivided

The following diagram identifies the division of energy costs as a percentage of total and by department for a 300 bed 5 star hotel. (Source: Environmental Management for Hotels).
It is evident that the single greatest consumer of energy is that associated with Ventilating and Air Conditioning (HVAC).



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Immediate Organisational Measures

These measures can be put into effect without much effort. They can generate significant immediate financial success. Special attention should be given to the long-term effects of the measures taken.

Tips

- Switch off anything that can be switched off. In general, this measure should generate a sizeable potential for savings.
- Keep the running times for systems and equipment to a minimum (circulation pumps, ventilation systems).
- Do not leave machines on standby (such as grills and oven plates, coffee makers, warming equipment, computers, printers and photocopiers).
- Avoid using large consumers simultaneously, which will serve to reduce the peak load (if you are charged a peak-consumption rate).
- Ascertain what you actually require and only cool and ventilate as much as you really need.
- Familiarise yourself better with your equipment; if you have queries, ask the suppliers, service personnel or electricity utility. Optimise your facilities and maintain a complete set of operating manuals.
- Energy consumption records: Keep records diligently and respond instantly to discrepancies.
- Create operating schedules for large consumers, e.g. for large kitchen appliances, such as washing machines, tumble dryers, ventilation systems, etc.

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- Maintain complete sets of operating manuals for installation and appliances and keep them next to the relevant machine.
- Increase the temperature in rooms which are not in use.
- Install central (off) switches beside the doors of guest rooms. They disable all consumers in the room.
- Give personnel instructions, encourage them to be energy-conscious and give them a share of the money saved. Send chiefs on a course on how to save on energy.
- Carry out energy saving weeks regularly.

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Hot water

Tips

- Set the boiler temperature to 58-60°C. According to the WHO, there is no risk of Legionnaires disease.
- Switch the hot water circulation pump to operate at intervals (with a timer, pulse relay or thermostat on the circulation backflow pipe) and switch it off at night.
- Insulate hot water pipes effectively, all the way along, including valve fittings.
- Only use auxiliary pipe heaters in exceptional cases.
- Preheat water, e.g. with the heat which is drawn off refrigerating systems or with solar collectors.
- Use water-saving devices in the wash-hand basin taps and shower nozzles. This will enable consumption to be reduced by 50%.

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Ventilation

Tips

- Always give careful thought to whether or not mechanical ventilation is necessary, and if so, in which areas.
- Only operate this system as required; switch it off in rooms which are empty. The switching on and off of escaping air systems in wet cells can be delayed via the light switch.
- Don’t forget! Fresh air cools the rooms free of charge during the winter months!
- Avoid subjecting the air to humidity, heat and harmful substances unnecessarily, such as excessive steam during cooking, washing, etc.
- Only humidify air in exceptional circumstances (evaporation energy, dirt and sources of bacteria in ducts, structural damage).
- Contaminated air should be tested at source, if possible.
- Avoid air infiltration which adds load on the Air-conditioning System.
- Use Variable Frequency Drives (VFD) for AHUs & Pump motors.
- Keep operating times to minimum using timers.
- Perform maintenance work, such as cleaning filters, heat exchangers, ventilation grids and ducts regularly.

- Use two-step (or variable speed) fans and only switch these up to top speed by pressing the "comfort switch" if the air is particularly smoky or steamy (in the kitchen at 11 o'clock for example). This button is reset automatically to the lower setting after 30 minutes.
- Non-smoking areas do not need to be ventilated as much as smoking areas. The two areas should ideally be separated structurally.
- Efficient ventilation can be automated using ambient air hygiene sensors. They measure the quality of the air and control the requirement-dependent ventilation system. Energy savings of 70% are possible.
- So-called blown air systems in exhaust air hoods enable heavily contaminated air to be extracted efficiently with much lower volumes of air than with conventional extraction devices.
- Incoming air should be cooled by means of thermal energy recovered from the escaping air system.

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Kitchen

Tips

- Cook with minimal quantities of water. Warning up and, more especially, steaming are very energy-intensive processes.
- **Cook with pre-boiled water** instead of heating up cold water electrically on the hob.
- Repair or replace pots with uneven bases.
- Use chromium steel pans instead of cast iron pans (less heat radiated off).
- Make the most of the residual heat in the appliances, for example switch off the oven 10 minutes before the dish is ready.
- Be very careful in terms of when you use large appliances, such as the tilting steam boiler, tilting frying pan and grill plate. Try to use more efficient appliances more often or change over to them altogether. Large appliances require a lot of energy just to heat them up.
- Use a quick response gas or induction oven for à la carte menus. However, you will require other ovenware for this; induction ovens require dishes with ferritic bases.
- Use a grill plate with an anti-radiation cover and clean this regularly during use in order to reduce heat radiation. If the cover is oily or dirty, the effect of the anti-radiation coating will be cancelled out. The grill plate must be switched off if it is not in use.
- Heating cabinets and plate warmers should have an insulating layer of at least 4 cm.

- Inspection windows on ovens, chicken grills, heating cabinets, etc. should be fitted with a heat-reflective coating or be double-glazed.
- Keep stand-by operation of the cooker, grill plate, water bath, warming cabinet and drinks coolers, etc. to a minimum.
- Check the washing temperatures: pre-wash: 40-45°C (possibly cold), wash: 55°C, rinse: 80°C, try out the lowest possible temperature.
- Use a dishwasher with an insulated cover, a well-insulated water tank and hot water connection heat energy recovery system.
- Don’t fill up the rinsing tanks for the dishwasher with warm water on the evening before, wait until just before work starts (otherwise the water will cool down).
- Use more gas appliances. Gas is cheaper than electricity. Electricity consumption peaks can be avoided by using gas-operated "key appliances". Also consider using (cylinders of) liquefied petroleum gas.

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Refrigeration

Tips

- Keep refrigerators (and walk-in refrigerators) well stocked.
- Concentrate use to a few refrigerators.
- Do not put warm food into the refrigerator.
- Defrost frozen products in the walk-in refrigerator (plan!).
- Plan when to take out goods in order to have walk-in refrigerators open less often.
- Switch off decentralised drinks coolers at night (pay careful attention to hygiene).
- Don’t leave walk-in refrigerator doors lying open.
- Cover or wrap up food.
- Equip the walk-in refrigerator light with an easily visible switch and pilot light.
- Check the temperatures of the walk-in refrigerator and set the thermostats.
- De-ice the evaporator as required, without leaving it to defrost for too long. If there are defrost heaters, use them at off-peak times.
- Never evaporate defrost water electrically, drain it into the pipes.

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- Clock the freezer door frame heater, i.e. halve the operating time using a timer, e.g. only operate for 15 minutes an hour.
- Check the door frame seals and if they are brittle, replace them.
- Empty and switch off cooler cabinets if they are not in service or place a transparent drape, a night blind or a cover over them.
- Fit low-energy lighting in the cabinets, if possible.
- Connect the refrigerators, coolers and walk-in refrigerators to the central refrigerating system with the shortest possible refrigerant pipes.
- Use waste heat recovered from the chiller to pre-heat the hot water.
- Reduce head on chiller - use lowest possible condenser and highest possible evaporator pressure to just satisfy load. Automate by installing microprocessor controls.
- Use energy saving devices for saving energy consumption.
- 1 percent saving for each degree centigrade higher chilled water or lower condenser water temperature.

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Lighting

Tips

- Make optimum use of daylight.
- Use light colours in the design of interior rooms.
- Fluorescent lamps (or tubes) with electronic ballast use five times less electricity than filament lamps, and they last ten times longer. The electronic ballast prevents flickering and make the starters redundant. If rooms are empty for at least 10 minutes, it is cost-efficient to switch off the light.
- Low-energy lamps use about four times less energy than filament lamps and last 5 to 10 times longer.
- Halogen spotlights are electricity-intensive, despite being low-voltage types. This is true, in particular, because, as is so often the case, they are used in large quantities.
- Reduce use of halogen lights as it generates more heat and adds load on the air-conditioning system.
- Consider LED lighting which also reduces maintenance costs while saving energy.
- Install movement sensors or timer switches for lights in rooms which are not used much.
- Use timers for switching the lights from night to day mode.
- Use separate switches for zones with or without daylight.

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- User dimmers to control the lighting intensity.
- Indirect lighting is particularly energy-inefficient; therefore, it is better to use spotlights than illuminate entire rooms.

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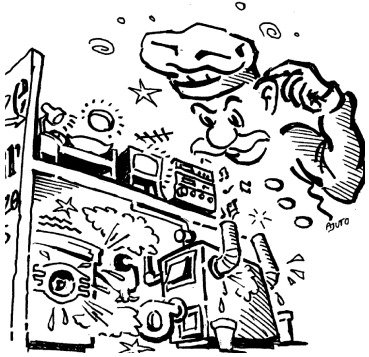
Laundry

Tips

- Use a hot-fill washing machine with the lowest possible water consumption and the highest possible spinning speed.
- Only use a dehumidifier in rooms with closed windows.
- Utilise the waste heat from the mangle and the tumble dryer by recovering the heat from the ambient air.
- Pre-heat the water entering the machine using waste heat from the boiler or other equipments.



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Swimming pools

Tips

- If the pool is not in use, a lot of energy can be saved by placing a cover over it.
- Multi-setting ventilation fans can be used to suit specific requirements (for Indoor pools)
- Install and use the economy circuit for water preparation. Filter pumps require a great deal of energy, therefore reduce operating times (by testing) or use pumps with a lower output.
- Water should be able to be drained out from the floor of the pool (reducing evaporation), e.g. by means of transverse slopes or wiping.
- It would be wise to have separate energy meters for the indoor swimming pool, both for electricity and for fuel. A water meter should also be installed.
- The relative humidity should be raised as high as is permissible for the building structure (approx. 50 to 60%) (for indoor pools)
- All hot / cold water feeder pipes should be well insulated.
- Consider using solar power for pool heating.

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Miscellaneous

Tips

- It is easy to check current consumption in operation and in standby mode in 230 V appliances.
- About three quarters of the current consumed by office equipment is attributable to standby losses. Therefore, switch off photocopiers, fax machines, PCs and printers when they are not in use. Switch off PCs if they will not be used for at least 15 minutes.
- When you purchase office equipment such as PCs, printers, photocopiers and fax machines, ensure that they come with a power management feature and a low-energy label (Energy 2000 action programme). Use ‘energy star’ rated equipment.
- Use inkjet printers instead of laser printers, which use more electricity.
- Fit elevators with controlled drives (frequency converter); they need about 25% less energy. The lifting motors on older elevators can also be fitted with these energy-saving mechanisms. Hydraulic elevators use much more energy than conventional elevators with a wire cable and counterweight.
- Indoor car parks normally do not have to be cooled. The temperature can be moderated with escaping air from appropriate rooms.
- Maintain the Power Factor close to Unity. This will reduce electricity consumption of equipments and increase life of equipments.

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Low Occupancy Adjustments

Tips

- Establish an energy management plan for low occupancy period, which should focus on continuous monitoring of systems to track energy consumption of major energy intensive equipment.
- Segregate the equipment based on controls required. Systems which need manual controls should be adjusted one by one at the site. In addition, Controls should be adjusted based on the changing environment conditions.
- Strategic room deployment based on equipment serving pattern: Guest rooms should be deployed with ideas of best possible sequence for FAHU & Exhaust fans operation, to reduce operating floors to cut down energy consumption in corridors etc.
- Low occupancy set points: Consider providing a higher set point in guest rooms for longer unoccupied period with a close check on room RH levels.
- Increase common area set points: Higher temperatures (28-30^{o}C) can be maintained in sections were electronic circuits and human interventions are not present.
- Reduce Fresh air supply to rooms: Reduce the fresh air supply to unoccupied rooms as per the standard. Adjust the fresh air supply temperature based on ambient dew point temperature.
- Utilise VSDs installed: Operate VSDs at the lowest possible frequencies to optimize the energy consumption as per the reduction in building load.
- Reduce number of elevators in operation:

- Reduce pool circulation rates to minimum
- Switch off kitchen systems and Spa equipment if required.

Each hotel is unique and the applicability of proposed tips varies based on facilities. The best way to optimise the hotel energy consumption is to work with trained experts in building management. If you face uncertainty about doing this work Farnek Services can help, whether with an onsite audit or remote audit.

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