



Choosing the right equipment

Airconditioning equipment comes in many different types and capacities – from a 0.5 ton window-mounted or split room airconditioner to a floor-standing 15 ton packaged or ceiling suspended ducted split airconditioner and the still larger central plant consisting of a 200 ton packaged reciprocating chiller and the still larger 600 ton screw or centrifugal chiller package with connected air handling and fan coil units. Multiples of such chillers adding upto 1800 tons and more can cater to the largest hospitals conceived.

Several factors

The choice of proper equipment will depend on several factors such as the hospital location (big city, medium city or small town), hospital size (number of beds), budget constraints (funds available) and the paying capacity of the patients that will be served.

In large cities, privately owned hospitals which cater to the affluent and middle class patients tend to be fully airconditioned but some which also cater to a small percentage of poor patients free of charge tend to keep general wards and some patient rooms non-airconditioned. Large central plants are used to condition such hospitals. Government, municipal or private charitable trust hospitals in large cities are generally not fully airconditioned and only critical areas such as operating theatres, intensive care units and some patient rooms are airconditioned with small central plants and window ACs.



Using window ACs or splits

In the poorer areas of large cities, large cities in poor states, and the smaller towns, private hospitals are airconditioned using the very minimum and smallest type of airconditioner such as the 1 or 1 ½ ton window AC even in the most

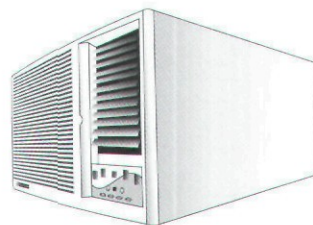


Fig 7. A Window AC

critical area, the operating theatre with no attention paid to the recommendations of fresh air quantity, air filtration, humidity levels and maintaining positive air pressure, all of which have been discussed earlier in this booklet. If, as a result, infections do occur, patients are left to fend for themselves with the help of strong antibiotics. The strong may survive but the weak succumb to infection and longer recovery periods.

With adequate interest and proper guidance from specialist HVAC consultants and enlightened contractors, not to mention the introduction of basic guidelines for health-care facilities by city and state authorities, the owners of such small hospitals working on shoe-string budgets can be educated and helped to purchase lower cost AC equipment which will serve the purpose of providing comfort and speedier recovery to poor patients without compromising their general health and taxing their immune systems.

As an example, **window or small split ACs**, if they must be used in a hospital, are best for patient's rooms or a doctor's examination room but certainly not for an operating room unless only the very minor type of surgery is performed there.

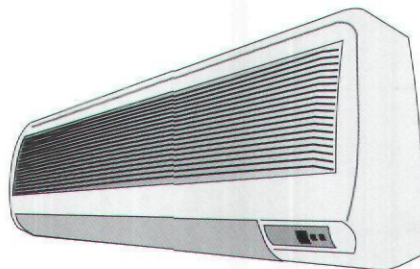


Fig 8. Hi-Wall Mounted Split AC



Packaged or split ducted ACs are not recommended for the danger of cross-infection through the common ducts feeding such rooms. **An economical and yet acceptable airconditioning system for an operating theatre where even major surgeries can be performed, can be designed and installed using a direct expansion system of 10 to 40 ton capacity with an air handler using recommended air filters and fresh air quantity.**

Central Plant AC equipment

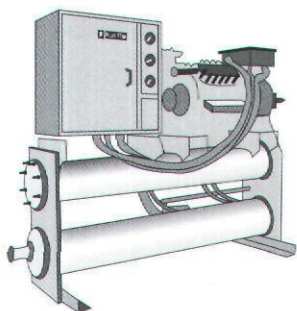
Airconditioning and ventilation systems constitute the largest consumers of electric energy (or LDO / natural gas / any other fossil fuel consumed by an absorption chiller) in a general hospital that is fully airconditioned or a major part of which is airconditioned. An American energy audit expert has worked out the energy consumption profile for hospitals in the USA (Table 5).

As can be seen, airconditioning and ventilation systems consume close to 60% of the total energy consumed and centrally air conditioned hospitals in India are no exception.

The Blue Star Guide to Power Savings in Airconditioning will help the reader to understand the type of central plant equipment available, the relative cost and power consumption per ton. It also provides valuable tips on how to conserve energy while operating an AC plant.

**Table 5.** Energy Consumption Profile for Hospitals

	Range (%)	Norms (%)
Airconditioning & ventilation	40-65	55
Lighting	10-20	15
Laundry	8-15	12
Food service, Kitchen Operations, Medical Equipment, Sterilisation, Incinerator, Elevators, Security Lighting	5-15	18
Total		100

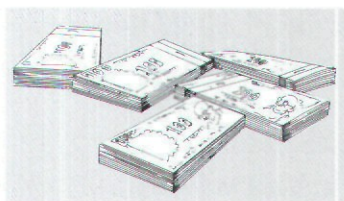
**Fig 9.** A typical Packaged Chiller

System selection criteria

A brief review of the important criteria that will help in the selection of the right central plant AC equipment and system follows:

First cost

This is the first criterion that comes to mind and it certainly is important. For some owners, it might even seem to be the only criterion. But there are other criteria and some of them will have a bigger effect on total cost over the life of the building than first cost.



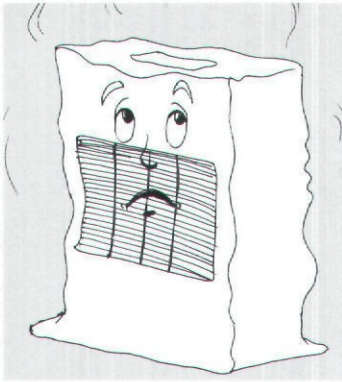
Operating cost

Operating cost is made up of many components. Energy, water, maintenance, repair, equipment replacement and system modifications are the most common. Many of them will be determined by which system is selected.



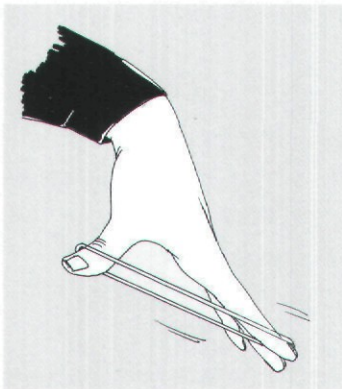


Reliability



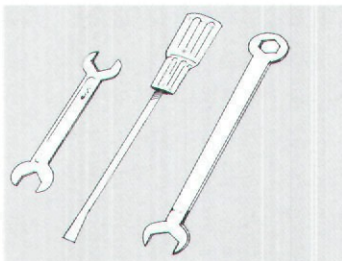
Reliability should consider how quickly and easily service can be restored in the event of a failure as well as how frequently failures are likely to occur. The system type affects both.

Flexibility



With rapidly evolving technology, nothing stays the same for long. New diagnostic equipment will replace older models that may need special conditioning and if so how can the HVAC system be adapted to meet that new need.

Maintainability



What will it take to keep the system in good operating condition and running smoothly and efficiently? Will periodic maintenance require mechanics working in the occupied space or in a mechanic equipment room? Will someone be climbing on a desktop every month to clean filters? What level of skill will be required to operate and maintain the system.



As a simple example let's take an 'air handling unit' and compare two types, Single skin and Double skin, on the basis of the above criteria (Table 6).

Table 6. Selection Criteria for an Air Handling Unit

	First Cost	Operating Cost	Reliability	Maintainability
Single skin with galvanised steel casing and drain pan, mild steel blowers, no insulation and no access door	Low	High (Panels, blowers, & drain pan require frequent replacement)	Poor	Poor
Double skin with aluminium panels, PU foam insulation, aluminium frame and drain pan, galvanised steel blowers and with access door	High (approx. 20%)	Low	Good	Good

Similar comparisons should be made for packaged chillers with semi-hermetic reciprocating compressors, open screw compressors and open / semi-hermetic centrifugal compressors and absorption chillers, cooling towers, air filters, exhaust blowers, ducting (hand made or machine formed), insulation etc.

Packaged chillers for producing chilled water for central air conditioning systems come in two types, air-cooled or water-cooled, except very large capacity screw, centrifugal and all sizes of absorption chillers, which are available in only water-cooled types. Careful consideration must be given to the pros and cons of both types before taking a final decision. Air-cooled types do not have to depend on a reliable source of soft water that will be continuously available for the life of the plant. However air-cooled units consume more energy than water-cooled, must be installed in the open and are generally noisier.