IET-UK YMS CHENNAI NETWORK

Technical Event Report 2009

TECHNICAL REPORT ON AIR-CONDITION

Name: **BIBIN PRASAD**
IET Membership Number: **90965630**
University/College: **ST.XAVIER'S CATHOLIC COLLEGE OF ENGINEERING**
Email:**bibinprasad.mech@gmail.com**
Phone Number: **9940773067**

SUMMARY OF WORK

Tasks

- Obtain and maintain required certifications.
- Comply with all applicable standards, policies, and procedures, including safety procedures and the maintenance of a clean work area.
- Repair or replace defective equipment, components, or wiring.
- Test electrical circuits and components for continuity, using electrical test equipment.
- Reassemble and test equipment following repairs.
- Inspect and test system to verify system compliance with plans and specifications and to detect and locate malfunctions.
- Discuss heating-cooling system malfunctions with users to isolate problems or to verify that malfunctions have been corrected.
- Record and report all faults, deficiencies, and other unusual occurrences, as well as the time and materials expended on work orders.
- Test pipe or tubing joints and connections for leaks, using pressure gauge or soap-and-water solution.
- Adjust system controls to setting recommended by manufacturer to balance system, using hand tools.

Tools & Technology

- Tools used in this occupation:

Flow sensors — Turbine flow meters; Venturi meters; Water flow meters; Water pressure gauges

Hammers — Soft face hammers; Tinners hammers

Pressure indicators — Bourdon tubes; Pneumatic air gauges; Pressure gauges; Refrigerant pressure meters

Thermocouples — Bead type thermocouples; Pipe clamp thermocouples

Voltage or current meters — Alternating current AC line splitters; Current meters; Non-contact voltage detectors; Voltmeters

- Technology used in this occupation:

Computer aided design CAD software — HVAC tools software

Customer relationship management CRM software — Contact management systems

Data base user interface and query software — Data logging software; Database software

Industrial control software — Building automation software

Word processing software — Atlas Construction Business Forms; Microsoft Word

Knowledge

Mechanical — Knowledge of machines and tools, including their designs, uses, repair, and maintenance.

Customer and Personal Service — Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.

Engineering and Technology — Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.

Design — Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.

English Language — Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.

Building and Construction — Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures such as highways and roads.

Mathematics — Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.

Sales and Marketing — Knowledge of principles and methods for showing, promoting, and selling products or services. This includes marketing strategy and tactics, product demonstration, sales techniques, and sales control systems.

Computers and Electronics — Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.

Education and Training — Knowledge of principles and methods for curriculum and training design, teaching and instruction for individuals and groups, and the measurement of training effects.

Skills

Troubleshooting — Determining causes of operating errors and deciding what to do about it.

Repairing — Repairing machines or systems using the needed tools.

Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.

Equipment Maintenance — Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.

Critical Thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.

Installation — Installing equipment, machines, wiring, or programs to meet specifications.

Social Perceptiveness — Being aware of others' reactions and understanding why they react as they do.

Active Learning — Understanding the implications of new information for both current and future problem-solving and decision-making.

Coordination — Adjusting actions in relation to others' actions.

Reading Comprehension — Understanding written sentences and paragraphs in work related documents.

Abilities

Extent Flexibility — The ability to bend, stretch, twist, or reach with your body, arms, and/or legs.

Finger Dexterity — The ability to make precisely coordinated movements of the fingers of one or both hands to grasp, manipulate, or assemble very small objects.

Manual Dexterity — The ability to quickly move your hand, your hand together with your arm, or your two hands to grasp, manipulate, or assemble objects.

Problem Sensitivity — The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.

Arm-Hand Steadiness — The ability to keep your hand and arm steady while moving your arm or while holding your arm and hand in one position.

Inductive Reasoning — The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).

Trunk Strength — The ability to use your abdominal and lower back muscles to support part of the body repeatedly or continuously over time without 'giving out' or fatiguing.

Control Precision — The ability to quickly and repeatedly adjust the controls of a machine or a vehicle to exact positions.

Deductive Reasoning — The ability to apply general rules to specific problems to produce answers that make sense.

Information Ordering — The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules (e.g., patterns of numbers, letters, words, pictures, mathematical operations).

Work Activities

Performing General Physical Activities — Performing physical activities that require considerable use of your arms and legs and moving your whole body, such as climbing, lifting, balancing, walking, stooping, and handling of materials.

Repairing and Maintaining Mechanical Equipment — Servicing, repairing, adjusting, and testing machines, devices, moving parts, and equipment that operate primarily on the basis of mechanical (not electronic) principles.

Handling and Moving Objects — Using hands and arms in handling, installing, positioning, and moving materials, and manipulating things.

Getting Information — Observing, receiving, and otherwise obtaining information from all relevant sources.

Operating Vehicles, Mechanized Devices, or Equipment — Running, maneuvering, navigating, or driving vehicles or mechanized equipment, such as forklifts, passenger vehicles, aircraft, or water craft.

Making Decisions and Solving Problems — Analyzing information and evaluating results to choose the best solution and solve problems.

Performing for or Working Directly with the Public — Performing for people or dealing directly with the public. This includes serving customers in restaurants and stores, and receiving clients or guests.

Communicating with Persons Outside Organization — Communicating with people outside the organization, representing the organization to customers, the public, government, and other external sources. This information can be exchanged in person, in writing, or by telephone or e-mail.

Inspecting Equipment, Structures, or Material — Inspecting equipment, structures, or materials to identify the cause of errors or other problems or defects.

Communicating with Supervisors, Peers, or Subordinates — Providing information to

supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.

Work Context

Face-to-Face Discussions — How often do you have to have face-to-face discussions with individuals or teams in this job?

Telephone — How often do you have telephone conversations in this job?

Freedom to Make Decisions — How much decision making freedom, without supervision, does the job offer?

Contact With Others — How much does this job require the worker to be in contact with others (face-to-face, by telephone, or otherwise) in order to perform it?

Exposed to Contaminants — How often does this job require working exposed to contaminants (such as pollutants, gases, dust or odors)?

Exposed to Hazardous Conditions — How often does this job require exposure to hazardous conditions?

Structured versus Unstructured Work — To what extent is this job structured for the worker, rather than allowing the worker to determine tasks, priorities, and goals?

In an Enclosed Vehicle or Equipment — How often does this job require working in a closed vehicle or equipment (e.g., car)?

Exposed to Minor Burns, Cuts, Bites, or Stings — How often does this job require exposure to minor burns, cuts, bites, or stings?

Outdoors, Exposed to Weather — How often does this job require working outdoors, exposed to all weather conditions?

Job Zone

Title	Job Zone Three: Medium Preparation Needed
Overall Experience	Previous work-related skill, knowledge, or experience is required for these occupations. For example, an electrician must have completed three or four years of apprenticeship or several years of vocational training, and often must have passed a licensing exam, in order to perform the job.
Job Training	Employees in these occupations usually need one or two years of training involving both on-the-job experience and informal training with experienced workers.

Job Zone Examples	These occupations usually involve using communication and organizational skills to coordinate, supervise, manage, or train others to accomplish goals. Examples include funeral directors, electricians, forest and conservation technicians, legal secretaries, interviewers, and insurance sales agents.
SVP Range	(6.0 to < 7.0)
Education	Most occupations in this zone require training in vocational schools, related on-the-job experience, or an associate's degree. Some may require a bachelor's degree.

There are 5 recognized apprenticeable specialties associated with this occupation: Heating-and-Air-Conditioning Installer-Servicer; Furnace Installer-and-Repairer, Hot Air; Furnace Installer; Oil-Burner-Servicer-and-Installer; Air and Hydronic Balancing Technician.

Interests

Interest code: RCI

Realistic — Realistic occupations frequently involve work activities that include practical, hands-on problems and solutions. They often deal with plants, animals, and real-world materials like wood, tools, and machinery. Many of the occupations require working outside, and do not involve a lot of paperwork or working closely with others.

Conventional — Conventional occupations frequently involve following set procedures and routines. These occupations can include working with data and details more than with ideas. Usually there is a clear line of authority to follow.

Investigative — Investigative occupations frequently involve working with ideas, and require an extensive amount of thinking. These occupations can involve searching for facts and figuring out problems mentally.

Work Styles

Dependability — Job requires being reliable, responsible, and dependable, and fulfilling obligations.

Integrity — Job requires being honest and ethical.

Cooperation — Job requires being pleasant with others on the job and displaying a good-natured, cooperative attitude.

Attention to Detail — Job requires being careful about detail and thorough in completing work tasks.

Initiative — Job requires a willingness to take on responsibilities and challenges.

Stress Tolerance — Job requires accepting criticism and dealing calmly and effectively with high stress situations.

Independence — Job requires developing one's own ways of doing things, guiding oneself with little or no supervision, and depending on oneself to get things done.

Persistence — Job requires persistence in the face of obstacles.

Self Control — Job requires maintaining composure, keeping emotions in check, controlling anger, and avoiding aggressive behavior, even in very difficult situations.

Leadership — Job requires a willingness to lead, takes charge, and offer opinions and direction.

Work Values

Support — Occupations that satisfy this work value offer supportive management that stands behind employees. Corresponding needs are Company Policies, Supervision: Human Relations and Supervision: Technical.

Independence — Occupations that satisfy this work value allow employs to work on their own and make decisions. Corresponding needs are Creativity, Responsibility and Autonomy.

Working Conditions — Occupations that satisfy this work value offer job security and good working conditions. Corresponding needs are Activity, Compensation, Independence, Security, Variety and Working Conditions.

HISTORY AND DEVELOPMENT OF AIR CONDITIONER TILL DATE

HISTORY OF AIR CONDITIONER

Air conditioning is a 20th century phenomenon. The idea of air conditioning started before a machine was created to produce the cooling effect desired. The first attempt at building an air conditioner was made by Dr. John Gorrie (1803-1855), an American physician, in Apalachicola, Florida. During his practice there in the 1830s, Dr. Gorrie creating an ice-making machine that essentially blew air over a bucket of ice for cooling hospital rooms of patients suffering from malaria and yellow fever.

In 1881, when President James Garfield was dying, naval engineers constructed a box-like structure containing cloths saturated with melted ice water, where a fan blew hot air

overhead. This contraption was able to lower a room by 20 degrees Fahrenheit but consumed half a million pounds of ice in two months' time.

A close ancestor to the modern air conditioner units was first made in 1902 by an American engineer by the name of Willis Carrier. The machine at that time was called "Apparatus for Treating Air" and was built for the Sackett-Wilhelms Lithographing and Publishing Co. in Brooklyn, New York. Chilled coils were used in the machine to cool air and lower humidity to 55%, although the apparatus was made with enough precision that the humidity level desired was adjustable.

After the invention by Carrier, air conditioners began to bloom. They first hit the industrial buildings such as printing plants, textile mills, pharmaceutical manufacturers, and a few hospitals. The first air-conditioned home was that of Charles Gates, son of gambler John "Bet a Million" Gates, in Minneapolis in 1914. However, during the first wave of their installation, Carrier's air conditioner units were large, expensive, and dangerous due to the toxic ammonia that was used as coolant.

In 1922, Carrier had two breakthroughs - he replaced the ammonia with the benign coolant dielene and added a central compressor to reduce the size of the unit. The next advance was when Carrier sold his invention to movie-theater operators, with a notable debut in 1925 at the Rivoli on Broadway in New York City. In a short amount of time, air conditioners were installed in office buildings, department stores and railroad cars. The United States House of Representatives had air conditioners installed in 1928, with the Senate, White House and Supreme Court following suit in the years after. After World War II, window unit's air conditioners appeared, with sales escalating from 74,000 in 1948 to 1,045,000 in 1953.

Today, air conditioners have been said to be a partial cause for the changes in the South, and for most of us who have experienced its cooling benefits in times of searing heat waves, it is an invention that is hard to live without.

DEVELOPMENT OF AIR CONDITIONER TILL DATE.

Development of air-conditioning control algorithm for building energy saving

In office buildings, the requirement is that the room air-conditioning control system has to provide comfortable thermal feeling for the working people. While energy saving may sometimes conflict with comfort, it is possible to eliminate the wasteful use of energy associated with its overuse without prejudicing the comfort. The basic concept is that the target set values for the room temperature should be changed dynamically so as to suit the constantly changing room environment. The paper shows that the well-

known comfort index PMV is useful for air-conditioning control systems aimed at both energy-saving and comfort.

The Development of Air-conditioner which Generates Oxygen Enriched Air

Recently, the demands to energy saving and indoor air quality in air-conditioner have been increasing. Under such a background, we developed the air-conditioner which generates oxygen enriched air. This system consists of the oxygen enriched membrane and vacuum pump and two way bulb etc., so can keep indoor air at the balance of nature by supplying the air of about 30 % oxygen concentration. The degree of comfort was estimated by brain wave (.ALPHA. rhythm) of right and left frontal head. As the result, the case of an oxygen enriched air tented to rise compared with non oxygen enriched. (Author abst.)

Development of air conditioning technologies to reduce CO2 emissions in the commercial sector

Architectural methods that take into account global environmental conservation generally concentrate on mitigating the heat load of buildings. Here, we evaluate the reduction of carbon dioxide (CO_2) emissions that can be achieved by improving heating, ventilating, and air conditioning (HVAC) technologies.
Results
The Climate Change Research Hall (CCRH) of the National Institute for Environmental Studies (NIES) is used as a case study. CCRH was built in line with the "Green Government Buildings" program of the Government Buildings Department at the Ministry of Land, Infrastructure and Transport in Japan. We have assessed the technology used in this building, and found that there is a possibility to reduce energy consumption in the HVAC system by 30%.
Conclusion
Saving energy reduces CO_2 emissions in the commercial sector, although emission factors depend on the country or region. Consequently, energy savings potential may serve as a criterion in selecting HVAC technologies with respect to emission reduction targets.

Technology development in the solar absorption air-conditioning systems

An environmental control system utilizing solar energy would generally be more cost-effective if it were used to provide both heating and cooling requirements in the

building it serves. Various solar powered heating systems have been tested extensively, but solar powered air-conditioners have received little more than short-term demonstration attention. This paper reviews past efforts in the field of solar powered air-conditioning systems with the absorption pair of lithium bromide and water. A number of attempts have been made by researchers to improve the performance of the solar applied air-conditioning (chiller) subsystems. It is seen that the generator inlet temperature of the chiller is the most important parameter in the design and fabrication of a solar powered air-conditioning system. While collector choice, system design and arrangement are other impacting factors for the system operation.

Development of a micro channel evaporator model for a CO2 air-condition

The development and verification of a heat exchanger model for evaluating the thermal performance of an evaporator for a CO_2 mobile air-conditioning system. The model has been developed, on the basis of the finite volume method, with emphasis placed on the air-side heat and mass transfer processes. The governing equations are derived from mass and energy balances using the newly developed air-side heat transfer and friction loss correlations for micro channel heat exchangers under both dry and wet conditions. The calculated air-side heat transfer and pressure drop data are in good agreement with measured data. However, the refrigerant-side pressure drop estimation for micro channel tubes usually underestimates the measured value.

Development of control method and dynamic model for multi-evaporator air conditioners (MEAC)

Interference between operation parameters among the different evaporators makes the desirable control of MEAC hard to realize. A novel control strategy is herein proposed. The suction pressure was taken as the controlled variable to modulate the speed of its compressor, and at the same time, the room air temperatures were taken to regulate the openings of individual electronic expansion valves (EEV). A self tuning fuzzy control algorithm with a modifying factor was incorporated in the controller. A controllability test was conducted with a dynamic thermodynamic model developed with a special modeling methodology. The controllability test has shown that the control strategy and algorithm are feasible and can achieve desirable control results.

Development of a thermally enhanced frame wall with phase-change materials for on-peak air conditioning demand reduction and energy savings in residential buildings

The development of a thermally enhanced frame wall that reduces peak air conditioning demand in residential buildings. A frame wall that integrates a highly crystalline paraffin phase-change material (PCM), via macro-encapsulation, was developed, constructed, and evaluated. This prototype wall is referred to as phase-change frame wall (PCFW). Results from field testing show that the PCFW reduced wall peak heat fluxes by as much as 38%. For a period of several days that included walls facing different directions, the average wall peak heat flux reduction was approximately 15% when PCFWs with a 10% concentration of PCM (based on indoor sheathing weight) were used and approximately 9% when a 20% PCM concentration was used. The average space-cooling load was reduced by approximately 8.6% when 10% PCM was applied and 10.8% when 20% PCM was used. The level of insulation in the PCFWs that were tested was 1.94m^2K/W (R-11).

Addressing climate crisis, US calls for Development of National Air Conditioner

In a nationally televised address reminiscent of President Kennedy's historic 1961 speech pledging to put a man on the moon, President Bush responded to the global warming crisis by calling for the construction of a giant national air conditioner by the year 2015.

"Climate change is real and it demands a real solution," Bush said. "Therefore, I am committed to dedicating all of the technology, all of the brainpower, and all of the resources we need in order to keep America cool and comfortable well into the 21st century."

The National Air Conditioner Initiative is expected to be the largest public works project in the nation's history. Because technology capable of creating an air conditioner that can fulfill the cooling needs of a continental land mass does not presently exist, the president estimated that research and development alone will require at least $100 trillion in both federal and private sector funds.

Development of the PCM Floor Supply Air-Conditioning System

Floor supply air-conditioning system using PCM can enhance the building mass storage. In this diurnal cooling load is aimed to be covered by stored cold energy in PCM and building during night. A new floor supply air-conditioning system was proposed using phase change material to augment building mass thermal storage. In this system, latent heat is stored in PCM that is embedded just under OA floor boards in the form of granules with several millimeters in diameter. The feature of the system is that heat exchange occurs through direct contact between the packed bed of the granular PCM and air flowing as the heat medium. This allows outstanding heat exchange efficiency and little space needed for storing PCM then increase of the TES capacity in the entire

system .The whole diurnal cooling load aimed to be covered by stored cold energy in an embedded packed bed of the granular and the building frame during night. In addition, the use of the granular PCM can lead to improvement of the indoor thermal environment in comparison with that in conventional systems due to thermal radiation from the floor
Surface area, which can be maintained around the phase change temperature.

Development of Energy-Saving Air-Conditioning System for New COLT

Mitsubishi Motors has developed a new energy-saving air-conditioning system for compact cars. This innovative system incorporates a high-efficiency scroll compressor, which is controlled automatically according to ambient temperature, the driver's selection of fresh-air/recirculation mode, and solar radiation, and is highly effective in reducing power consumption. It saves energy and fuel by improving the refrigeration-cycle efficiency (through the use of high-efficiency component parts) and by preventing excessive cooling. Bench tests showed a 10 % reduction in annual fuel consumption with the newly developed air-conditioning system activated.
Demand for greater occupant comfort in recent years has made air-conditioning indispensable in all automobiles. Meanwhile, issues pertaining to environmental protection (notably prevention of global warming) have raised high on the global agenda, leading to stricter regulations on emissions of greenhouse gases such as carbon dioxide (CO2) and on emissions of toxic pollutants such as nitrogen oxides (NOx) and hydrocarbons (HC). Higher fuel efficiency in an automobile is vital for lower exhaust emissions. Minimizing the air-conditioning
System's energy consumption is an important means of achieving higher fuel efficiency. Compact cars are increasingly popular in Japan, so demand for further-improved fuel efficiency in compact cars is also growing rapidly. The new energy-saving air-conditioning system presented in this paper is a response to this demand. Achieved by means of improved component efficiency and optimized system control, it simultaneously meets the need for cabin comfort and the need for superior fuel efficiency. The new air-conditioning system is used in the new Mitsubishi COLT.

WORKING PRINCIPLE OF AIR-CONDITIONER

Air conditioning is the process whereby the condition of air, as defined by its temperature and moisture content, is changed. Note that in practice other factors must also be taken into account especially cleanliness; odour; velocity & distribution pattern.
An air conditioner is a device which uses a special type of substance which readily changes from its normal gas state to a liquid one. The gas is contained in a closed circuit of pipes connected to a pump. The pump compresses the gas so hard that the pressure is great enough for it to turn into a liquid. In doing this the gas/liquid has got hot (If you

try to compress a gas, it will almost always get hot - think of a bike pump when you pump up a tyre (tire), the greater the pressure in the tyre, the hotter the pump gets).

Now the hot liquid travels round a set of pipes which allow the heat to escape. Next the liquid under pressure passes through a valve into a pipe where the pressure is much lower, and the liquid evaporate back into its gas state. In doing this it needs to take in heat from its surroundings, thus making the pipes colder. The gas now gets back to the pump and the whole cycle starts again.

The pipes are usually arranged so that there are fans to blow air over both the hot part of the pipes and the cold part. The hot part is frequently put outside the house, and the cold part inside. This is called either a 'split pack', or a 'twin pack' depending on which country you are in There are also portable versions which have both parts in the same box, with the cold air blowing out of the front, and the hot air blowing out of a flexible hose which you put outside the room to allow the hot air to dissipate.

Imagine stepping inside your front door after a long day of working outside in the humid summer air and feeling the cool rush of air from your air conditioner envelope you in refreshing comfort. A great thought, no?

Although air conditioners are indispensable to us in the summer time - and year-round for those of us who live in warmer climates - many people do not understand how an air conditioner works...
Air conditioners use the evaporation of coolants, such as Freon, a nonflammable fluorocarbon, to create cool air. The evaporation cycle in an air conditioner begins when the compression unit compresses cool Freon gas. The Freon is mixed with a small amount of oil, which helps to lubricate the compressor. The compression of the Freon causes it to become a hot, high-pressured gas.
The gas is then propelled through a series of coils where it dissipates its heat and condenses into a liquid. Next, the Freon moves through an expansion valve where it becomes a cold, low-pressured gas. Then, the gas runs through another set of coils that allows the gas to absorb heat and cool down the air inside your home. Fans placed near these coils help to propel hot air outside and move cool air inside.

COMPARATATIVE REPORT ON AIR-CONDITIONER

L.G

MODEL	*FEATURES*	*PRICE*
LG-ArtCoolLS-P1260HD	• 1Ton • 1250Watts • 8.8(EER)	Rs 9,999

LG-LWA09C1RAE1	• 0.75Ton • 1000Watts • 9(EER)	Rs 10,800 to 14,500
LG-LWA12G2ND1	• 1Ton • 1260Watts • 9.52(EER)	Rs 12,000 to 17,900
LG-LWA12G2RDE1	• 1Ton • 1260Watts • 9.52(EER)	Rs 13,500 to 17,500
LG-LWA18G2ND1	• 1.5Ton • 1850Watts • 9.73(EER)	Rs 14,500 to 20,990
LG-LWA18G2RDE1	• 1.5Ton • 1850Watts • 9.73(EER)	Rs 15,499 to 17,999
LG-LS-K2467PC	• 2Ton • 2300Watts • 10.43(EER)	Rs 18,978 to 28,000
LG-LW-N2466QC	• 2Ton • 2650Watts • 9.1(EER)	Rs 19,000 to 28,000
LG-LS-K1861PC	• 1.5Ton • 1750Watts • 10.29(EER)	Rs 19,600 to 22,550
LG-LS-K1866QC	• 1.5Ton • 1900Watts • 9.5(EER)	Rs 21,000 to 27,500

WHIRLPOOL

MODEL	*FEATURES*	*PRICE*
Whirlpool_WASR12RKO	• 6th Sense Quick Cool • 6th Sense MPFI Cooling • 12000 Btu/hr Cooling	Rs 17,500
WHIRLPOOL-Magicool150Si	• 1.5Ton • 1980Watts	Rs 20,000 to 22,500
WHIRLPOOL-Magicool150Mi	• 1.5Ton • 1790Watts • 10.05(EER)	Rs 12,990
WHIRLPOOL-Magicool100Mi	• 1Ton • 1475Watts • 8.13(EER)	Rs 13,500

WHIRLPOOL-Magicool100Ei	• 1Ton • 1475Watts • 8.13(EER)	Rs 13,800

SAMSUNG

MODEL	*FEATURES*	*PRICE*
Samsung_AW-24WKA	• 2 Ton • 2700 Watts	Rs 21,000 to 30,000
Samsung_AWT-18QKA	• 1.5 Ton • 1900 Watts	Rs 16,800 to 17,990
Samsung_AWT-12FKA	• 1.5 Ton • 1800 Watts • 10(EER)	Rs 21,900 to 25,000
Samsung_AS-12WA	• 1Ton • 1200 Watts • 10(EER)	Rs 14,200 to 22,000
Samsung_AS-24WA	• 2 Ton • 2500 Watts • 9.6(EER)	Rs 28,200 to 30,090
Samsung AST12PJWD(Deluxe)	• 1TTon • 1200Watts • 1200(EER)	Rs 22,500 to 22,990
Samsung AWT18XSHDE(Premium)	• 1.5TTon • 1950Watts • 1950(EER)	Rs 19,000 to 20,000
Samsung AWT18W1HDF(Deluxe)	• 1.5TTon • 1950Watts • 1950(EER)	Rs 17,000
Samsung AWT18Q1HDF(Classic)	• 1.5TTon • 1950Watts • 1950(EER)	Rs 15,600 to 17,900

ONIDA

MODEL	*FEATURES*	*PRICE*
ONIDA-WG18	• 1.5Ton • 1905Watts • 8.76(EER)	Rs 15,800 to 17,490
ONIDA-S024GR	• 2Ton • 2400Watts • 10(EER)	Rs 27,500 to 27,750

ONIDA-S018GR	• 1.5Ton • 1750Watts • 10.3(EER)	Rs 20,000 to 23,000
ONIDA-S012GR	• 1Ton • 1220Watts • 9.8(EER)	Rs 15,800 to 19,490

GODREJ

MODEL	*FEATURES*	*PRICE*
GODREJ-GSH12G3	• 1Ton • 1313Watts • 9.10(EER)	Rs 19,990 to 22,999
GODREJ-GSC24F2	• 2Ton • 2250Watts • 10.70(EER)	Rs 25,999
GODREJ-GSC19G1	• 1.5Ton • 2050Watts • 9.30(EER)	Rs 20,900 to 25,000
GODREJ-GSC19F2	• 1.5Ton • 2000Watts • 9.50(EER)	Rs 19,000 to 25,490
GODREJ-GSC12G1	• 1Ton • 1250Watts • 9.60(EER)	Rs 17,900 to 20,500
GODREJ-GSC12F2	• 1Ton • 1250Watts • 9.60(EER)	Rs 18,500 to 20,490
GODREJ-2.0T(Corded Remote)	• 2Ton • 2650Watts • 9.06(EER)	Rs 23,500
GODREJ-1.6TWindowACLCDRemot	• 1.6Ton • 2015Watts • 9.7(EER	Rs 13,500 to 17,500
GODREJ-1.5TWithLCDRemoteCo..	• 1.5Ton • 1950Watts • 9.23(EER)	Rs 14,500 to 18,190
GODREJ-1.5T	• 1.5Ton • 2100Watts • 8.57(EER)	Rs 14,500 to 22,500

BLUE STAR

MODEL	*FEATURES*	*PRICE*

BLUESTAR-DeluxeWAM121Y	• 1Ton • 1350Watts • 8.9(EER)	Rs 19,000

KEN STAR

MODEL	*FEATURES*	*PRICE*
KENSTAR-KT18HE	• 1.5Ton • 1850Watts • 10.5(EER)	Rs 18,000
KENSTAR-KT18H	• 1.5Ton • 1850Watts • 10.5(EER)	Rs 14,800 to 15,400
KENSTAR-KT12H	• 1Ton • 1300Watts • 9.7(EER)	Rs 12,000 to 13,500
KENSTAR-KT10HE	• 0.8Ton • 930Watts • 10.6(EER)	Rs 10,000
KENSTAR-KT10H	• 0.8Ton • 930Watts • 10.6(EER	Rs 11,000
KENSTAR-KT-24GS	• 2Ton • 2350Watts • 10.7(EER)	Rs 33,990
KENSTAR-KT-18GS	• 1.5Ton • 1850Watts • 10.4(EER)	Rs 22,000
KENSTAR-KT-12GS	• 1Ton • 1300Watts • 9.7(EER)	Rs 14,000 to 22,400

VIDEOCON

MODEL	*FEATURES*	*PRICE*
Videocon-SC 3600 SPT	• 3Ton • 36000 BTU/hr / 9000 Kcal/hr	Rs 56,000
Videocon-VA 2400 SPGT	• 2.1Ton • 25200 BTU/hr / 6300 Kcal/hr	Rs 34,000 to 55,000
Videocon-SC 3600 SPCA	• 3 Ton • 36000 BTU/hr / 9000 Kcal/hr	Rs 60,000 to 70,000
Videocon-VA 2400 SPCA	• 2.1Ton • 25200 BTU/hr / 6300	Rs 49,000 to 69,000

Videocon-VAS G243	• 2.1Ton • 25200 BTU/hr / 6300 Kcal/hr	Rs 26,500
Videocon-VAS G182 G183	• 1.6Ton • 18700 BTU/hr / 4725 Kcal/hr	Rs 19,300 to 23,500
Videocon-VAS G123	• 1Ton • 12000 BTU/hr / 3000 Kcal/hr	Rs 15,200 to 19,500
Videocon-VAS G102	• 0.8Ton • 9000 BTU/hr / 2250 Kcal/hr	Rs 13,990 to 18,000
Videocon-VAW 2434	• 2.1 Ton • 25200 BTU/hr / 6300 Kcal/hr	Rs 17,100 to 19,700
Videocon-VAW 1833 i	• 1.6 Ton • 18700 BTU/hr / 4675 Kcal/hr	Rs 18,750

HITACHI

MODEL	*FEATURES*	*PRICE*
HITACHI-Quadricool2RAV024E	• 2Ton • 2280Watts • 10.5(EER)	Rs 27,000 to 28,000
HITACHI-Quadricool2RAV024E	• 2Ton • 2280Watts • 10.5(EER)	Rs 26,000 to 27,500
HITACHI-Quadricool1.5RAV01..	• 1.5Ton • 1800Watts • 10.6(EER)	Rs 23,200 to 24,000
HITACHI-Quadricool1.5RAV01..	• 1.5Ton • 1800Watts • 10.6(EER)	Rs 21,000 to 25,000
HITACHI-Quadricool1.0RAV01..	• 1Ton • 1300Watts • 10.6(EER)	Rs 22,000 to 22,990
HITACHI-Quadricool1.0RAV01..	• 1Ton • 1300Watts • 10.6(EER)	Rs 19,790 to 21,800
HITACHI-Logicooli1.5TR	• 1.5Ton • 1950Watts • 9.23(EER)	Rs 33,000

HITACHI-BigFlo1TR	• 1Ton • 1190Watts • 10.08(EER)	Rs 21,500
HITACHI-BigFlo1.5TR	• 1.5Ton • 1840Watts • 9.78(EER)	Rs 16,300

VOLTAS

MODEL	*FEATURES*	*PRICE*
VOLTAS-Vertis3T	• 3Ton • 4300Watts • 8.37(EER)	Rs 26,000
VOLTAS-Vertis2Ton	• 2Ton • 2600Watts • 9.23(EER	Rs 21,000
VOLTAS-Vertis2.0Ton	• 2Ton • 2650Watts • 9.06(EER)	Rs 21,000 to 29,500
VOLTAS-Vertis1Ton (split)	• 1Ton • 1410Watts • 8.5(EER)	Rs 18,000 to 21,000
VOLTAS-Vertis1.5Ton	• 1.5Ton • 1970Watts • 9.14(EER)	Rs 21,000 to 23,200
VOLTAS-Vertis1.0Ton	• 1Ton • 1290Watts • 9.3(EER)	Rs 13,000 to 18,000
VOLTAS-Vertis0.8TonPremium	• 0.8Ton • 940Watts • 9.6(EER)	Rs 10,990 to 13,850
VOLTAS-Vertis0.8Ton	• 0.8Ton • 940Watts • 9.6(EER)	Rs 11,000 to 12,400
VOLTAS-Vertis0.6Ton	• 0.6Ton • 690Watts • 10.1(EER)	Rs 9,500 to 9,800
VOLTAS-Verdant1.5Ton	• 1.5Ton • 1970Watts • 9.14(EER)	Rs 26,900

HAIER

MODEL	*FEATURES*	*PRICE*
	• 1.5Ton	

HAIER-HW-18FR	• 1950Watts • 9.23(EER)	Rs 17,450
HAIER-HW-12CD03	• 1Ton • 1400Watts • 8.6(EER)	Rs 11,900

CARRIER

MODEL	*FEATURES*	*PRICE*
CARRIER-42DN01851MSC036D	• 3Ton • 4160Watts • 8.65(EER)	Rs 26,000
CARRIER-42DN01251MSB012	• 1Ton • 1630Watts • 7.36(EER)	Rs 24,000
CARRIER-2TOptima	• 2Ton • 2700Watts • 8.3(EER)	Rs 19,000
CARRIER-2TCelesta	• 2Ton • 2700Watts • 8.3(EER)	Rs 19,000 to 23,000
CARRIER-1.5TOptimaPlus	• 1.5Ton • 1840Watts • 9.8(EER)	Rs 20,000
CARRIER-1.5TOptimaManual	• 1.5Ton • 1840Watts • 9.8(EER)	Rs 22,000 to 24,500
CARRIER-1.5TonCelesta	• 1.5Ton • 1840Watts • 9.8(EER)	Rs 17,000 to 18,400
CARRIER-1.0UltimaManual	• 1Ton • 1318Watts • 9.1(EER)	Rs 17,000
CARRIER-1.0UltimaLCDRemote	• 1Ton • 1318Watts • 9.1(EER)	Rs 15,800 to 20,000
CARRIER-0.75UltimaManual	• 0.75Ton • 947Watts • 9.5(EER)	Rs 15,000 to 16,000