Fuzzified Artificial Intelligent air conditioner for cost effective electricity consumption

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Abstract: **Electricity consumption and billing is one of the major issues in urban areas. Although due to global warming, unsustainable raise in the climatic temperature became a big problem. Air conditioner for a normal life style is mandatory nowadays. Whereas its electric consumption and maintenance is a challenge for a middle class family and it need a permanent solution. In this paper we have proposed a microcontroller based intelligent electronic device which is able to control the A.C (air conditioner) smartly. In this experiment we have used a C.T. (current transformer) for sensing the input A.C. pulses (considered as 220v; 50hz), whereas solid state relay is for switching the output A.C. pulses that may vary from 25-50hz or 30-60hz (as per input of 110v 60hz). All the components are controlled by the microcontroller AT-mega 8. The microcontroller read the signal for cycle duty and current. A normal air conditioners compressor has ability only to being on or off state, it cannot be in between or control its speed just like an inverter A.C. Wherein ON condition it consumes more energy as much it can. The logic is to discontinue the cycle of A.C pulses in between to control the speed of the compressor according to the need of the climate which saves electricity. In this experiment 1.5ton A.C. is turned on for 10 hours where a normal A.C. has consumed 13.5 unit of energy, when this device is connected with a normal A.C., it consumed 10 unit of energy (including the consumption of device).**

Keywords: **Fuzzy logic, Artificial Intelligence, Air Conditioner, Current transformer**

I. INTRODUCTION: Because of Shortage of power the cost of power is expanding. Keeping in mind the end goal to address the absence of sufficient power supply to every one of the general population in the nation by March 2019, the Government of India propelled a plan called "Power for all. This plan will guarantee persistent and continuous power supply to all family units, businesses and business foundations by making and enhancing important framework. It's a joint coordinated effort of the Government of India with states to share financing and make general monetary development.

A. Gap between Generation and demand

India has a large gap between the demand and supply. Especially at the time of peak load in summer season of northern region. Actually the overdrawn of power by this region leads to blackout in 2012.

B. High losses in power systems

These losses include Technical Losses i.e. T&D (transmission and distribution) losses, and Commercial losses due to theft and improper meter reading in mostly rural areas. Transmission and distribution losses in system have been around 20 % as reported by various electricity boards. However Utilities like Tata power in Delhi having transmission losses approx 1 % are doing very well.

C. Lack of latest Technology.

Most of the houses in rural areas are still having Electro-mechanical meters. Automated meter readings Infrastructure (AMR/AMI) are not used at very large scale. Smart sensors and Smart micogrids are bounded to books and journals only. FACTS devices are also not implemented at full scale.

D. Very less focus on Energy mixes with Renewable (RES)

When most of the electricity demands of countries like Denmark, Norway comes from Renewable energy resources for a very long time, Indian government allows the offshore wing plants recently. With this example you can realize how far we have to go to match the developed nations.

E. Lack of Demand Side Management (DSM) Strategies

We hardly know about well known organizations offering DSM and Energy Management Systems (EMS) to improve efficiency of system.

II. METHODOLOGY

A. Refrigeration

The reasonable unit of refrigeration is communicated in the terms of 'Ton of refrigeration'. A huge amount of refrigeration is characterized as the measure of refrigeration impact delivered by the uniform liquefying of one tone (1000kg) of ice from and at 0°C of every 24 hours. The inactive warmth of ice is 335kj/kg, along these lines one ton of refrigerationhours. The inactive

warmth of ice is 335kj/kg, along these lines one ton of refrigeration,

1TR   = 1000* 335 KJ 24 hours

= 1000 *335/24*60

= 232.6kj/min

In genuine practice, one ton of refrigeration is taken as an identical to 210kj/min or 3.5 Kw.

A. Coefficient of Performance

The coefficient of execution is the proportion of warmth separated in the fridge to the work done on the refrigerant. It is otherwise called the hypothetical coefficient of execution. Scientifically, Theoretical C.O.P = Q/W Q = Amount of warmth removed in the icebox or the limit of cooler W= Amount of work done.

C. Refrigeration System

Profound Freezer is the Device which keep up the temperature dependably beneath than the Logic: The main logic which we found during research is to discontinuing the frequency with helps to control the speed of the compressor. By controlling the speed of the compressor we able to save electricity whereas the normal compressor acts as an inverter AC's compressor. In typical AC the compressor is in ON state or either in OFF state. But after putting the fuzzy logic it works like an inverter AC.

The electronic Device which contains the microcontroller with fuzzy logic, and control the compressor with the driver(IGBT) according to the thermal sensor(for temperature sensing) and CT(current transformer to recognize the AC Current pulses pattern).
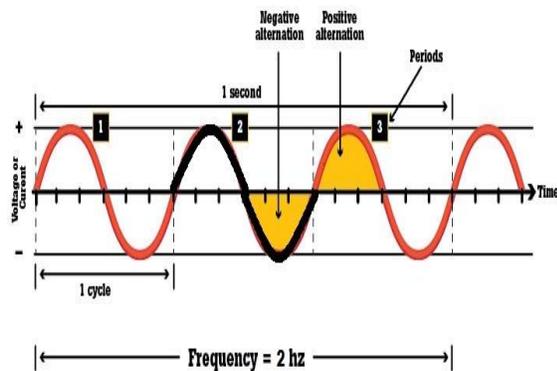

environmental temperature. In other word we can state that it is the shut unit which changes over the water in to ice. It is for the most part utilized for all modern reason from a little cooler to a major ventilating plant. The fundamental segments of Freezer are Compressor Condenser.
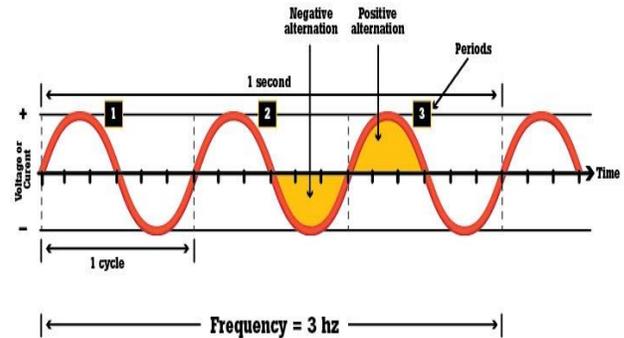
III. RESULT & DISCUSSIONS

A.Compressor: A refrigerant compressor as the name demonstrates is a machine used to pack the vapor refrigerant from the evaporator and to raise the weight with the goal that the relating immersion temperature is higher than that of the cooling medium. It additionally ceaselessly circles the refrigerant through the refrigerating framework. Since the pressure of refrigerant requires some work to be done on it, in this way a compressor are must be driven by some prime mover.
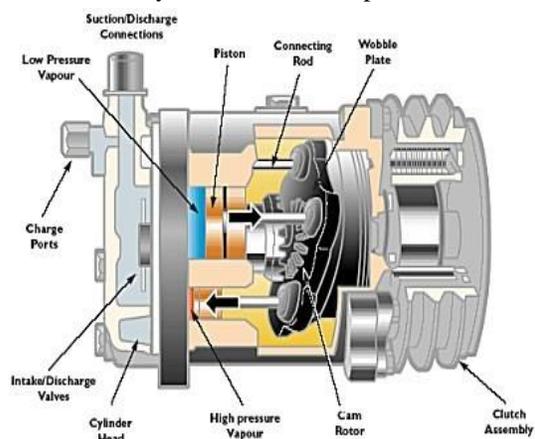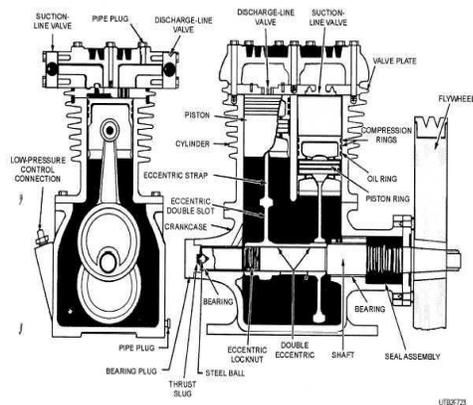
B. Condenser

The condenser is a critical gadget utilized as a part of high weight side of a refrigeration framework. Its capacity is to evacuate warmth of the hot vapor refrigerant release from the compressor. The warmth from the hot vapor refrigerant in a condenser is expelled first by exchanging it to the dividers of the condenser tubes and after that from the tubes to the gathering or cooling medium. The determination of a condenser relies on the limit of refrigeration framework, and the sort of refrigerant utilized and the kind of cooling medium accessible.

C. Evaporator

The evaporator is utilized as a part of the low vapors side of refrigeration framework. The fluid refrigerant from the extension valve enters in to the evaporator where it bubbles and changes in to vapor. The capacity of evaporator is engrossing warmth from the encompassing area of medium which is cooled, by methods for refrigerant. The evaporator ends up chilly and stays cool because of following reason-The temperature of the evaporator loop is low due to the

• Low temperature of the refrigerant inside the curl. The low temperature of the refrigerant remains

• Unchanged in light of the fact that any warmth it ingests is changed over in to inactive warmth as bubbling continues.

D. Expansion device

The extension gadget otherwise called the metering gadget or throttling gadget it is an essential gadget that partitions the high weight side and the low weight side of refrigerating framework. It is associating between the beneficiaries (containing fluid refrigerant at high weight) and the evaporator (containing fluid refrigerant at low weight). The extension gadget performs following capacities It diminish high weight fluid refrigerant to low weight

• Liquid refrigerant before being sustained in to evaporator. It keeps up the coveted weight contrast between the

• High and low weight sides of the framework, with the goal that fluid refrigerant vaporizes at the planned weight in the evaporator. It controls the stream of refrigerant as indicated by the heap

• Refrigerant is a warmth transporting medium which amid their cycle (pressure, buildup, development and vanishing) in the refrigeration framework assimilates warm from a low temperature framework and dispose of the warmth so consumed to a to a higher temperature framework.

E. Functionality

1) Material

So as to have fast warmth move in an evaporator, the material utilized for the development of an evaporator loop ought to be
a decent warmth conductor. The material which isn't influenced by the refrigerant should likewise be chosen. Iron and steel can be utilized with every single basic refrigerant. Metal and copper are utilized with all refrigerants aside from smelling salts.

2) Temperature Difference

The temperature contrast between the refrigerant inside the evaporator and the item to be cooled assumes an essential part in the warmth exchange limit of an evaporator.

3) Velocity of refrigerant

The speed of refrigerant likewise influences the warmth exchange limit of an evaporator. In theevent that the speed refrigerant coursing through the evaporator builds, the general warmth exchange coefficient likewise increments. In any case, this expanded speed will cause more noteworthy weight misfortune in the evaporator.

4) Contact surface area

A fundamental factor affecting as far as possible is the contact surface available between the mass of evaporator circle and the medium being cooled. The measure of contact surface, subsequently, depends on

a very basic level on the physical size and condition of the evaporator circle.

5) Heat Transfer during Boiling
The component of bubbling is complex to the point that it is hard to foresee the warmth exchange coefficient. It is expected the factor, for example, inert warmth impacts, surface strain, immersion temperature and the idea of the strong surface. The bubbling happens in the accompanying two ways. Pool bubbling as it happens I overflowed evaporators Flow bubbling or constrained convection bubbling as it happens in coordinate extension evaporators. At the point when warm is add to a fluid from a submerged

IV. Conclusions

Energy Consumption for 1.5 ton window or split AC's				
Star Rating	Energy Efficiency Ratio (EER)	Cooling Capacity	Input Power	Unit ConsumptionPer day(7hours)
			Watt	KWh
No Star	2.2	5200	2364	9.45
1	2.3	5200	2261	9.04
2	2.5	5200	2080	8.32
3	2.7	5200	1926	7.7
4	2.9	5200	1793	7.17
5	3.1	5200	1677	6.71
AC with fuzzii logic	3.0	5200	1735	6.94

strong surface, the bubbling procedure is called pool bubbling. A vital condition for the event of pool bubbling is that the temperature of the warming surface surpasses the immersion temperature of the fluid. In this procedure, the vapor deliver may frame bubbles, which develop and along these lines segregate themselves from the surface, ascending to the free surface because of lightness impacts. Then again, the stream bubbling or constrained convection bubbling happens in a streaming stream and the bubbling surface may itself are a segment of the stream section. This marvel is by and large connected with two stage courses through bound section.

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