**ABSTRACT:**

The electricity generating plants generally use waste materials as to generate electricity. This plants have tremendous pollution of materials like plastic, rubber, wrappers etc.

**PROBLEM STATEMENT:**

According to a research and study, the maximum energy consumption is done for particularly refrigeration equipments. The electrical consumption in refrigeration system can reach 40-50 % of the total electricity consumption in buildings. Due to increase in electricity consumption and depletion of available conventional energy sources there is need to make an energy saving efforts on refrigeration equipment’s. In existing system the heat transfer rate is less as well as the coefficient of performance of refrigeration system is low due to this the total power consumption in refrigeration is more. so there is need to enhance the performance of existing vapour compression system by increase the heat transfer rate  to reduce the consumption of energy.

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**SOLUTION:**

1. Reduction on the size of heat transfer equipment.
2. The dielectric fluid like transformer oil, water etc can be used to enhance the heat transfer with application of electric field in it.
3. Simplified implementation, as it needs only a small transformer and electrode.
4. The electro hydrodynamic effect causes more temperature drop at the outlet of the evaporator which results in decreased compressor work requirement and increases COP of the system.
5. Energy consumption is less than conventional refrigeration systems.
6. Environment point

**NEED OF THE PROJECT:**

A day by day there is growing need of improving the performance of refrigeration system in commercial and domestic sector. Heat transfer enhancement technology has been widely applied to heat exchanger applications in power plants, refrigeration, automobile, process industries etc. The use of EHD effect in refrigeration system turns out to produce energy savings, increased cooling capacity and increased COP significantly. Beneficiaries of our project are domestic and commercial users. The successful completion of this project will yield appropriate refrigeration application with more temperature drop by electro hydrodynamic effect. This improved technology will help the HVAC & RAC industry through various industrial and domestic applications. In this manner the **ISHRAE** had recognized by sponsoring this project.

**PROTOTYPE IMAGES:**

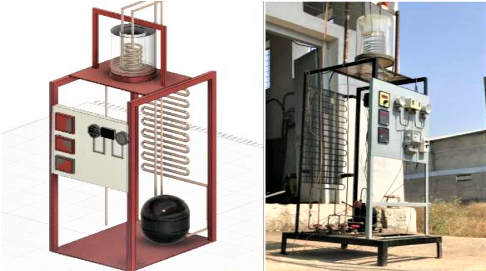
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Fig.1: Experimental setup

**METHODOLOGY:**

The methodology is followed for this Experimental setup is as mentioned below –

* Connect the water supply to the evaporator and secondary heat exchanger. Adjust the water flow rates. Start the pump it will supply transformer oil to the condenser section adjust the flow rate of it. Switch ON the main supply. Switch ON the compressor. Within about half an hour confirm the steadiness of the temperatures.
* If temperatures have reached steady state note down all the readings and complete the observation table. Initially experiment is carried out without the electro hydrodynamic effect and readings are taken. Reading for temperature, pressure, mass flow rate is noted on the basis of it calculations are done.
* Now supply electric current (DC) to wire electrodes (which are not shown in the figure) and adjust voltage with the help of dimmer stat and repeat step. This will give the coefficient of performance of the system with application of electro hydrodynamic effect. Different readings are taken by varying voltage with the help of dimmer stat and calculate the coefficient of performance of the system.
* Every test must be run under constant mass flow rate, and at steady state condition, with or without the electric field. Take the readings and we will check the effect of different input voltage on the performance of heat exchanger.

**WORKING:**

1. Experimental set-up has been designed and fabricated for the investigation of effect of electro hydrodynamic effect on performance of refrigeration system with R-134a. The cycle consists of main four components compressor, condenser, expansion valve, evaporator in this system hermetically sealed compressor (1/3 tonne). This coil is inserted in a tank containing water. Condenser is tube and plate type with air cooled. Distilled water or Transformer oil is used as a dielectric fluid.
2. Electro hydrodynamic effect is applied to Evaporator section in vapour compression refrigeration cycle through producing current in dielectric media. The Evaporator coils are dipped in water and it is separated by container which includes dielectric fluid. Two and more electrodes are immersed in the dielectric fluid and these electrodes are connected to dimmer stat to vary the intensity of electric field in dielectric fluid medium.
3. Electrodes are made from the Nichrome Wire and intensity of current is adjusted by Dimmer stat. For the measurement of pressure of high side and low side two pressure gauges and LP-HP cut off are used. For temperature measurement chromel-alumel thermocouple with digital temperature indicator is used. In the control panel energy meter, ammeter, dimmer stat, temperature indicator, on and off switches is used.

**DELIVERABLES OF THE PROJECT:**

1. Electro hydrodynamic technique is the interaction of electric fields and flow fields in a dielectric fluid medium. This interaction can result in enhancement of heat transfer.
2. The condensation process of refrigerant can be increased by use of EHD technique in refrigeration setup itself with some modifications in condenser section.
3. The results obtained from the experimental work in the current study show that the EHD technique can be utilized for effective separation of liquid droplets from gas flows and can push the technology beyond the limitation of conventional separators.

**POTENTIAL USERS AND SUGGESTED PLAN OF ACTION:**

1. This improved technology will help the HVAC & RAC industry through various industrial and domestic applications.
2. Domestic refrigerators are among the foremost wide used household appliances and excellent portion of energy is employed by this system.
3. Hence, reduction of temperature fluctuation and improvements of system performances is that the main reason of using PCM in refrigeration system.
4. Suitable for application to special environments, such as zero gravity environments.

**REFERENCES:**

1. Miss. R. R. Kadam, Prof. P. R. Kulkarni “Experimental Investigation of Effect of Electrohydrodynamic Effect on Performance of Refrigeration System with R-134A” IJIRST, Volume 3, July 2016,ISSN (online): 2349-6010.
2. Omidvarborna, M. Dasht-e-Bayz, A. Mehrabani-Zeinabad, M. Nasr Esfahany “Effect of Applied EHD on In-Tube Condensation of R-134a within an Assembled experimental Rig Including a Laboratory Heat Exchanger” international journal of experimental heat transfer, thermodynamics and fluid mechanics , ETF 8243, 7 June 2014.
3. Hamid Omidvarborna, Arjomand Mehrabani-Zeinabad , Mohsen Nasr Esfahany “Effect of electrohydrodynamic (EHD) on condensation of R-134a in presence of non-condensable gas” International Communications in Heat and Mass Transfer 36 (2009) 286–291
4. Taveewat Suparos, “Heat Transfer Enhancement of Refrigeration System Under Electric Field” Proceeding of HT2005 ASME Summer Heat Transfer Conference July 17-22,2005 , Francis Hotel, San Francisco,CA,USA
5. Sadek, A.J. Robinson, J.S. Cotton, C.Y. Ching , M. Shoukri, “Electrohydrodynamic enhancement of in-tube convective condensation heat transfer”, International Journal of Heat and Mass Transfer 49 (2006) 1647–1657
6. Suriyan Laohalertdecha, Somchai Wongwises, “Effects of EHD on heat transfer enhancement and pressure drop during two-phase condensation of pure R-134a at high mass flux in a horizontal micro-fin tube”, Experimental Thermal and Fluid Science 30 (2006) 675– 686