Measures for Improvement in Thermal Environment in Air Conditioned Space

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Abstract*: This paper introduces the indoor thermal environment in an air conditioned room or areas for improvement in comfort. Indoor thermal environment in an air conditioned spaces is most important factor while considering thermal comfort level. Room temperature and indoor air quality have a strong impact on the overall satisfaction with the thermal environment. Indoor environment is improved by measuring temperatures .Various temperatures sensors can be used to determine comfort. In this paper we study the temperature variations in an air conditioned room at different points with different levels under conditions.*

Keywords*: Indoor air quality (IAQ), Thermal comfort, Air conditioned, Temperature sensor, Thermal environment, Thermal environment.*

I. INTRODUCTION

Indoor thermal environment in an air conditioned spaces is most important factor white people living in offices, homes, schools, colleges, factories, hospitals etc. Indoor thermal environment consists of combination of three major words: Indoor, Thermal, Environment. The terms indoor, thermal, environment can b defined in following ways. First Indoor by definition relating to the interior of a building or in other words living, located, or carried on within a building. Second one is Thermal by heating being or involving a state of matter dependent upon temperatures , thermal conductivity, thermal conductivity, thermal agitation of molecular structure. Third one is Environment by definition , the complex of physical, chemical and biotic factors (such as climate, soil, and living things that act upon an organism or an ecological community and ultimately determine its form survival .Heat transfer and air flow characteristics in large space buildings were analyzed the boundary conditions are considered in indoor environment. Thermal environment is affected by the air temperature and surrounding surface temperatures. Good air temperature air is characterized by the right room temperature. Thermal comfort describes the human satisfactory perception of the thermal environment, it refers to a number of conditions in which the majority of people feel comfortable. The human body can be viewed as a heating engine where food is the input energy. The heat transfer is proportional to the temperature difference. In cold environment the body loses more heat to the environment and in hot environment, the body does not exert enough heat. Thermal indoor environment is affected by both internal and external sources. Common heat sources are electrical equipment (such as lighting and computers), sun radiation, human presence, . Common sources of cold are window surfaces, poorly insulated walls, thermal bridges in the construction. All the sources will influence the human perception of the environment and therefore the comfort level. Thermal comfort depends on the clothing resistance and activity level.

II. METHOD

a. Test room and measuring instruments

Room air distribution characterizing how air is introduced to flows through and is removed from spaces is called room air distribution Air distribution achieves the acceptable levels of temperature , humidity, cleanliness and air motion in the occupied zone of conditioned area. Air flow and transport phenomena play an important role in air quality , thermal comfort and energy consumption in buildings. Air movement is one of main variables determining human thermal comfort. Air flow patterns depends on the location of the air conditioner. Thermocouples is used for measuring temperature. Thermocouple is a temperature measuring device, it uses for measuring the temperature at one particular point. In other words, it is a type of sensor used for measuring the temperature in the form of an electric current or the emf. The thermocouple consists two wires of different metals which are welded together at the ends. The welded portion was creating the junction where the temperature is used to be measured. The main purpose of thermocouple used for measuring temperature because it is cheaper than the other temperature measuring devices ,thermocouple has the fast response time, it has a wide temperature range. The experimental measurements were carried out in an air conditioned room with the dimensions of 8.0 L× 4.0 B × 4.0 H in m. The cooling load consisted of an 8 m2 shaded window, simulated by means of a radiant heating wall to simulate solar heat gains in summer conditions, together with the internal heat gains created by two desk lamps, two heated metal boxes simulating office equipment (computer, monitor, etc.), and two simulated occupants, represented by an electrically heated dummy and a thermal

manikin of the multi-gas monitor was 1% of the measured value.

b. Thermal comfort model

Thermal comfort model is the base of thermal comfort evaluation methods and thermal environment standards. The purpose of this section is to describe the selection of thermal comfort model used in the study. According to the simplified method of human thermal system, there are mainly three types of thermal comfort models including single-node model, two-node model, and multi-node mode l

Figure 1 : Experimental Model ,Thermocouples connected in series with ammeter for measuring temperature

III. RESULT

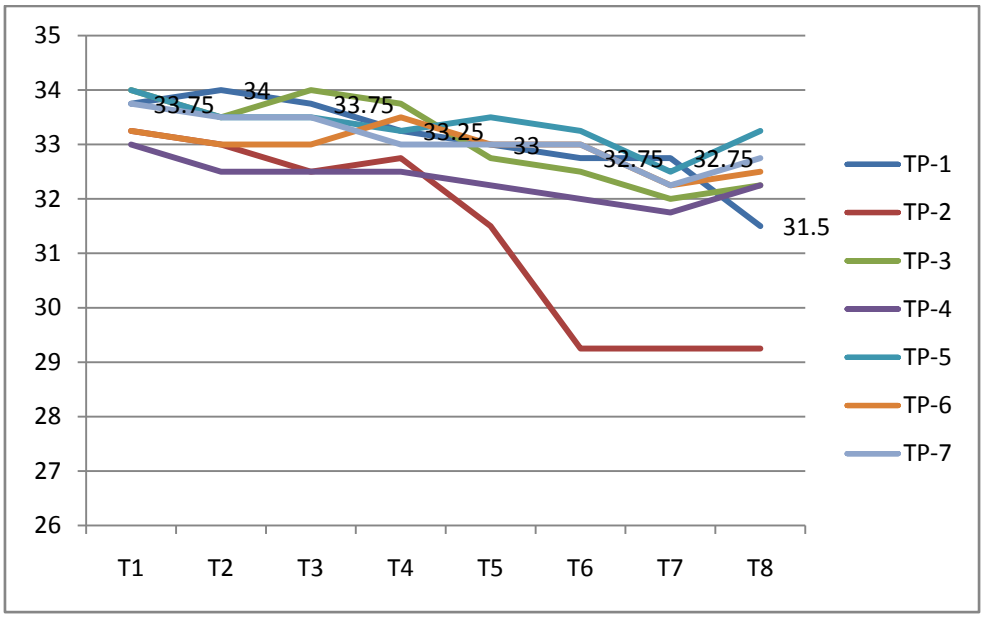
In the present work, a experimental study was performed in a typical room of LNCT, Bhopal. The room is a lab having CNC machine and three faculty members sitting there. The room is fitted with a window type of air conditioned room and three sides of the room were having concrete walls while on was a glass partition.

In study all studies at different temperature and time is taken with AC/Fan off and on all the conditions. Two conditions can be taken in this study one is AC on and fan off, other is AC off and fan off. This work is performed in summer season. In this study temperature readings is taking at one week work is carried out at different conditions and at different time for day to day.

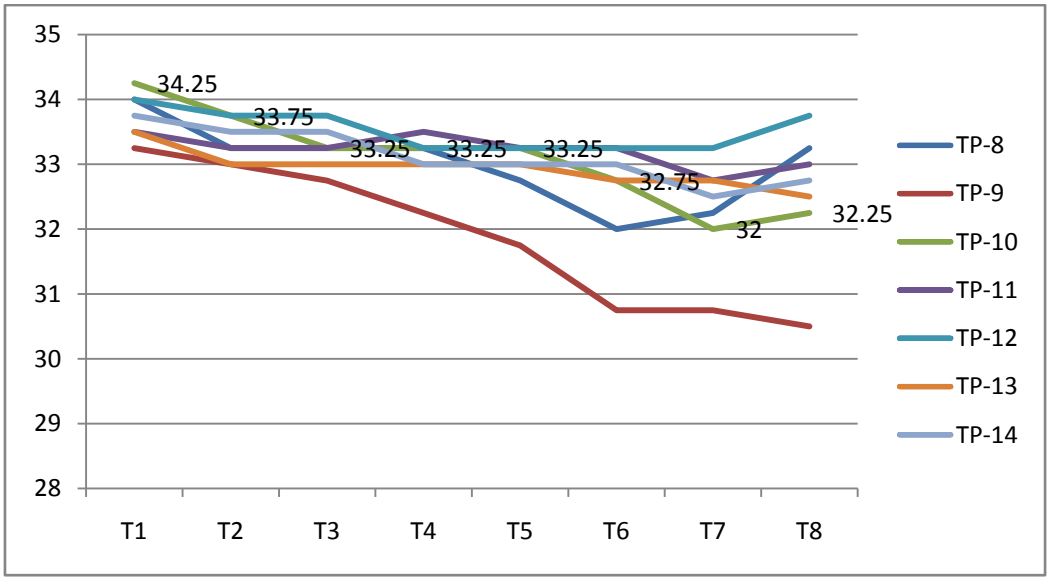
TP-testing points, T-temperature, total testing points-21. In the case study two conditions at different day is taken in which temperature is read out at two conditions one is AC on and Fan off and another one is AC off & Fan Off.

Condition -Ac on FAN off

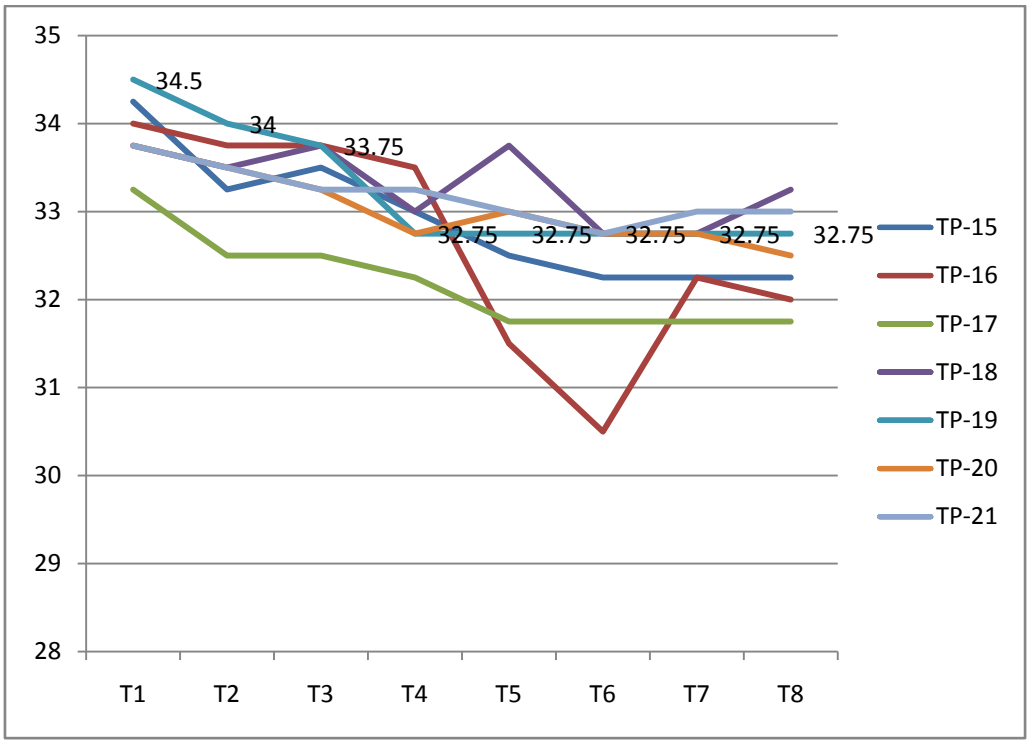
	T1	T2	T3	T4	T5	T6	T7	T8
TP-1	33.75	34	33.75	33.25	33	32.75	32.75	31.5
TP-2	33.25	33	32.5	32.75	31.5	29.25	29.25	29.25
TP-3	34	33.5	34	33.75	32.75	32.5	32	32.25
TP-4	33	32.5	32.5	32.5	32.25	32	31.75	32.25
TP-5	34	33.5	33.5	33.25	33.5	33.25	32.5	33.25
TP-6	33.25	33	33	33.5	33	33	32.25	32.5
TP-7	33.75	33.5	33.5	33	33	33	32.25	32.75



	T1	T2	T3	T4	T5	T6	T7	T8
TP-8	34	33.25	33.25	33.25	32.75	32	32.25	33.25
TP-9	33.25	33	32.75	32.25	31.75	30.75	30.75	30.5
TP-10	34.25	33.75	33.25	33.25	33.25	32.75	32	32.25
TP-11	33.5	33.25	33.25	33.5	33.25	33.25	32.75	33
TP-12	34	33.75	33.75	33.25	33.25	33.25	33.25	33.75
TP-13	33.5	33	33	33	33	32.75	32.75	32.5
TP-14	33.75	33.5	33.5	33	33	33	32.5	32.75



	T1	T2	T3	T4	T5	T6	T7	T8
TP-15	34.25	33.25	33.5	33	32.5	32.25	32.25	32.25
TP-16	34	33.75	33.75	33.5	31.5	30.5	32.25	32
TP-17	33.25	32.5	32.5	32.25	31.75	31.75	31.75	31.75
TP-18	33.75	33.5	33.75	33	33.75	32.75	32.75	33.25
TP-19	34.5	34	33.75	32.75	32.75	32.75	32.75	32.75
TP-20	33.75	33.5	33.25	32.75	33	32.75	32.75	32.5
TP-21	33.75	33.5	33.25	33.25	33	32.75	33	33



Condition-AC off FAN off

	T1	T2	T3	T4	T5	T6	T7	T8
TP-1	33	33	33	32.5	32	27	31.5	32.5
TP-2	34.5	34.5	34	34	33.5	33.5	32	32.5
TP-3	36	36	37	37	35	35.5	34.5	35
TP-4	37.5	37	37	37	36	36	36	36
TP-5	38	37.5	37.5	37.5	37.5	37.5	36.5	36.5
TP-6	36.5	36.5	36.5	37	36.5	36.5	35.5	35.5
TP-7	36.5	36.5	36.5	37	36.5	36.5	36	36

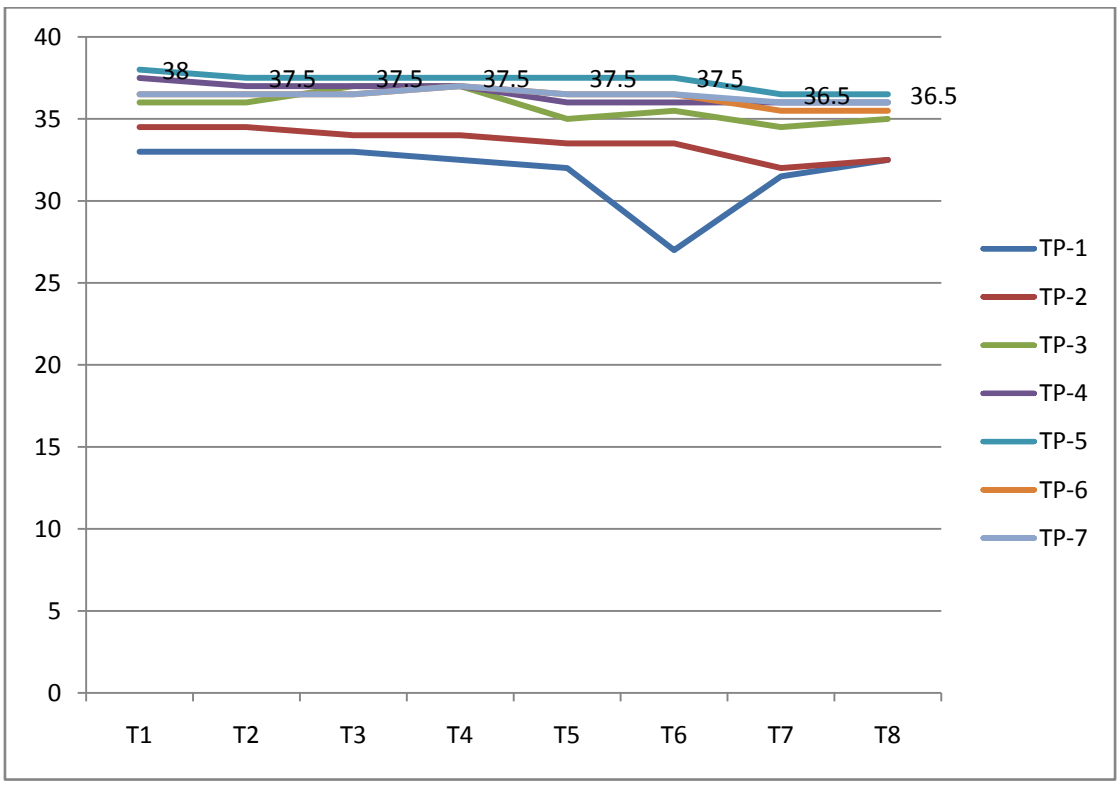
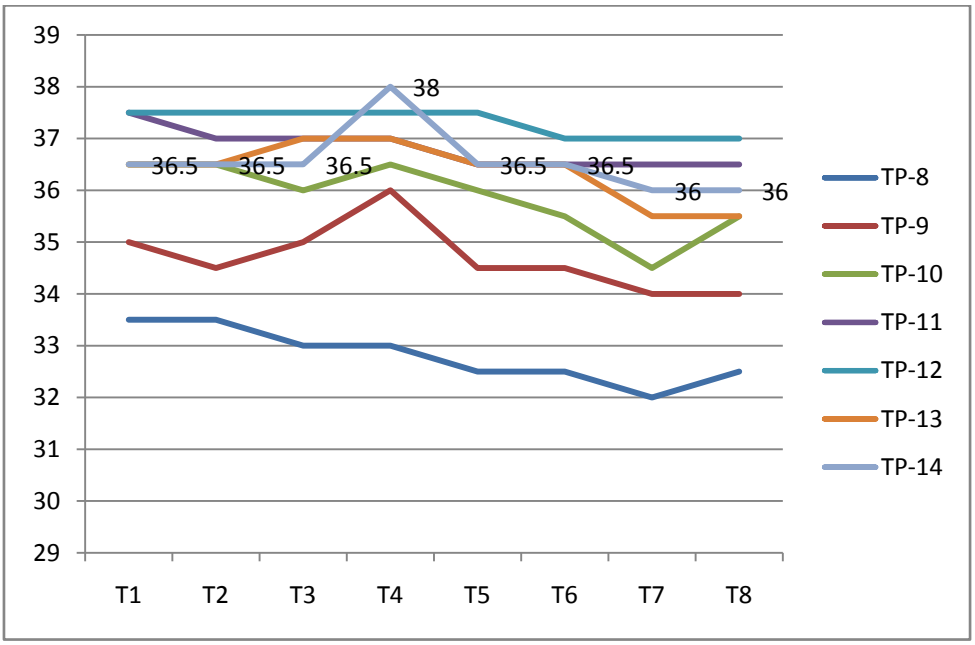
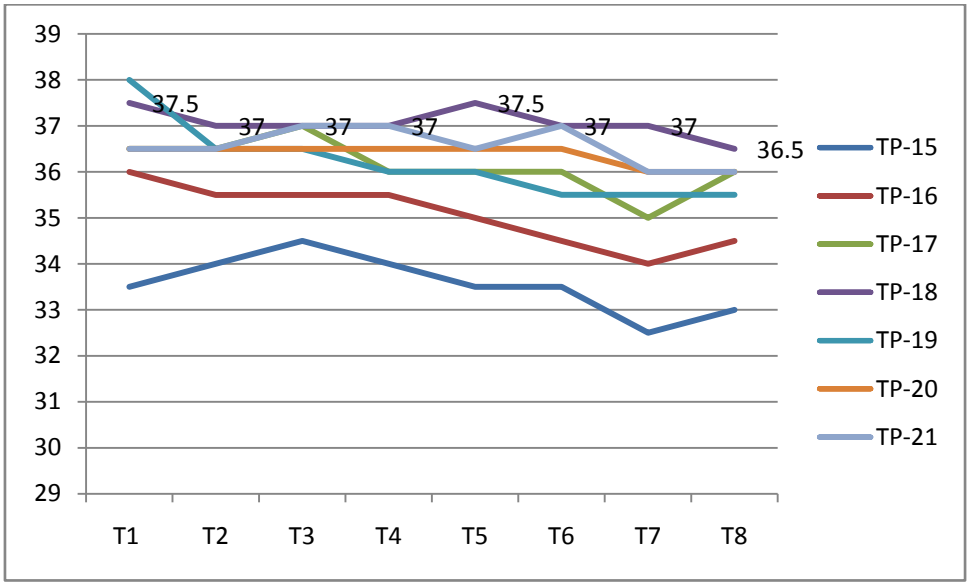


Figure 2 : Temperature reading showing

	T1	T2	T3	T4	T5	T6	T7	T8
TP-8	33.5	33.5	33	33	32.5	32.5	32	32.5
TP-9	35	34.5	35	36	34.5	34.5	34	34
TP-10	36.5	36.5	36	36.5	36	35.5	34.5	35.5
TP-11	37.5	37	37	37	36.5	36.5	36.5	36.5
TP-12	37.5	37.5	37.5	37.5	37.5	37	37	37
TP-13	36.5	36.5	37	37	36.5	36.5	35.5	35.5
TP-14	36.5	36.5	36.5	38	36.5	36.5	36	36



	T1	T2	T3	T4	T5	T6	T7	T8
TP-15	33.5	34	34.5	34	33.5	33.5	32.5	33
TP-16	36	35.5	35.5	35.5	35	34.5	34	34.5
TP-17	36.5	36.5	37	36	36	36	35	36
TP-18	37.5	37	37	37	37.5	37	37	36.5
TP-19	38	36.5	36.5	36	36	35.5	35.5	35.5
TP-20	36.5	36.5	36.5	36.5	36.5	36.5	36	36
TP-21	36.5	36.5	37	37	36.5	37	36	36



IV. CONCLUSION

The purpose of this paper is to improving the indoor thermal environment for human comfort .In this paper we are research on the air conditioned room for determining temperature variations using thermocouples for right thermal comfort level on living spaces.

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