Class :2nd stage
Subject: thermodynamics
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Experiment No.(1): Air speed measurment

Objective:

The objective of the current experimental is to calculate air speed and explained deferent device which used to air flow rate and understanding how it used.

Experiment Theory:

Many devices are used by refrigeration and air conditioning engineer to check of the operating refrigerant pressures and temperatures, along with determining the airflow through the unit and the temperature rise or drop of the air, is usually all that is needed to determine the efficiency of the unit also to understand many problems and phenomena. The proper adjustment of one or more of these operating factors usually determines the Btu output of the unit. The ductwork, insulation, and the condition of the structure will determine, to a great extent, whether or not the system will provide the desired conditions inside the building.

Airflow Measuring Instruments:

In air conditioning and refrigeration work, it is necessary that technicians understand how to determine airflow and what the readings indicate. Air velocity is the distance air travels in a given period of time. It is usually expressed in feet per minute (fpm).

When the air velocity is multiplied by the cross section area of the duct, the volume of air flowing past that point in the duct can be determined. This volume of airflow is usually expressed in cubic feet per minute (cfm). The velocity or air volume

measurements can be used to determine if the airflow system is operating properly, or if some repairs are needed.

Figure (1-1):Air flow Anemometer

Figure(1-2):Hot wire Anemometer

Dry Bulb Thermometer

A dry bulb (db) thermometer is a normal type thermometer used for checking air temperatures. Determining the temperature rise of the air as it passes through the heating unit or cooling unit. The dry bulb temperature is a measure of the heat absorbed from the heat exchanger by the air. The air temperature is measured in two locations: the return air stream and the discharge air stream, Be sure to take the temperature readings after the mixing of any air. The thermometer must be placed where the radiant heat from the elements cannot be measured by the thermometer. Radiant heat can cause a faulty temperature reading and an incorrect test

Procedure:

1. Fix anemometer and the two thermocouple (one for the inlet temperature (T_{in}) and the other for the outlet temperature (T_{out})).
2. Record outlet temperature which is constant in the experiment.

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3. Take the first reading of speed and inlet temperature.

4. After 1-2 minutes, change the speed and record T_{in} and V again and repeat this step until reach the required number of readings.

5. Make a table with results as below

No.	T_{out} (°C)	T_{in} (°C)	V_{air} (m/s)
1			
2			
3			

Requirement:

1. Draw curve between T_{in} and V_{air} at constant T_{out}.

2. Define anemometer.

3. Calculate mach number (M_a) by using equation below:

$$M_a = \frac{V}{661.9 * \sqrt{\frac{T(in)}{T(out)}}}$$

Discussion :

1) Why don't used the Rota meters in duct measuring?

2) How can measured the velocity in the ducting system?

3) Where is thermometer used?

4) Explain how the thermocouples work?

5) Give the thermal properties of steam that measured in laboratory.