Measurement Of Convective Heat Transfer Coefficient Over a Flat Surface

Bill Of Materials

	Price	Source
Heater	1547	https://www.ubuy.co.in/product/6MTUI722-filfeel-1pc-constant-temperature-ptc-heating-element-thermostat-heater-plate-220v-130w110v-140w?srsltid=AR5OiO2PMcXU_SUXWmGGlakM14lg719iBi0UusaE1BDloqGbHwG2_oVxdbg
Insulator	700	https://m.indiamart.com/proddetail/electrical-insulated-mat-11211457891.html
Copper Plate	1000	Offline Dealer

Theoretical Approach

Theoretically, we can find the average heat transfer coefficient for a given flow rate using the relation between Nusselt Number, Reynold's Number, and Prandtl Number.

Where,

$$Nu = \frac{h_l L}{k},$$
$$Re = \frac{\rho V L}{\mu}\text{, and}$$
$$Pr = \frac{\mu C_p}{k}$$

For Laminar Flow

$$Nu = 0.664(Re)^{0.5}(Pr)^{0.33}$$

For Turbulent Flow

$$Nu = 0.037(Re)^{0.8}(Pr)^{0.33}$$

Practical Approach

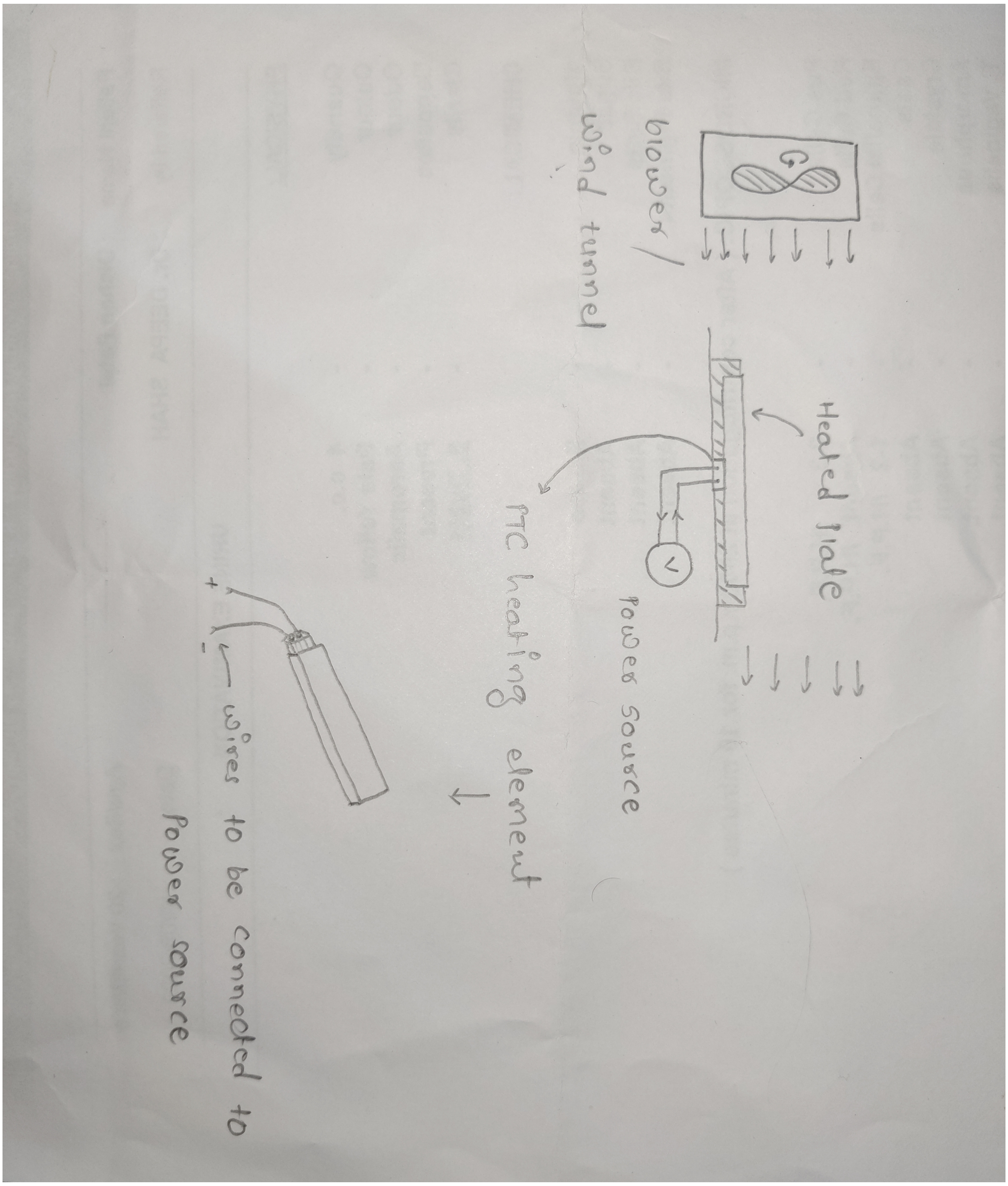
From experimental readings, we can find average heat transfer coefficient using,

$$\dot{q} = hA(T_s - T_\infty) = V * I$$

where,

- T_s → Temperature of surface
- T_∞ → Temperature of Air inside wind tunnel

Schematic


blower/
wind tunnel
Heated plate
Power source
PTC heating element
+
-
wires to be connected to
Power source