

CHME 401 CHEMICAL ENGINEERING LABORATORY II
EXPERIMENT 401-2
TRAY DRIER

OBJECTIVE

The objective of the experiment is to make material balance over tray drier apparatus by the help of psychrometric chart and to determine performance of tray drier by means of moisture content and drying rate curves at different operating conditions.

PRELIMINARY WORK

1. Study the basic principles of psychrometry and solid drying.
2. Decide your experimental parameters
3. Visit the lab. in advance to experiment and familiarize yourself with the experimental set-up with the consent of the teaching assistant and consult your teaching assistant for conduction of first two steps in the experimental section. These steps will be done a day before the laboratory lecture.

DESCRIPTION OF THE EXPERIMENTAL SET-UP

The Tray Drying unit mainly composed of an air duct which hot air is blown by the help of an axial flow fan impeller, The velocity of air can adjusted as high as 1.5 m/s. Air is heated by an electrically heater element .The temperature of the air can be increased up to 80 °C. Weight of the sample is monitored in-situ and air flow rate is measured with a vane anemometer. Equipment setup is also given in Figure 1.

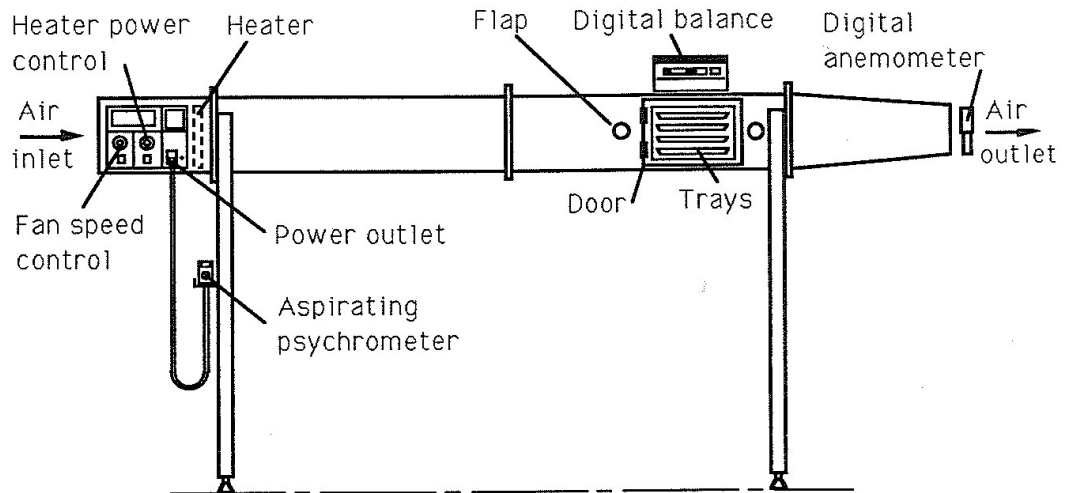


Figure 1. Experimental Setup

EXPERIMENTATION

During the experiments, dry and wet bulb temperatures before and after the tray should be recorded as well as the weight of the sample being dried (a digital balance attached to the system).

Procedure

- 1) Weight dry sand samples to be used. Dry sand to be used should be in an amount that can fill four trays to a depth of 10 mm.
- 2) Saturate your samples with water by putting them in a container filled by water.
- 3) Weight trays before putting the wet sample on them then put wet sand samples on trays and weight again (weighting can be done by using the balance attached to the setup)
- 4) Fill the water reservoir in the psychrometer for wet bulb temperature measurements
- 5) Operate the dryer by turning the main switch on then adjust air flow rate and air temperature by using the controls on the main board.
- 6) Record weight of the sample and dry and wet bulb temperatures of air before and after the trays.
- 7) Repeat these steps for different conditions which should be decided before the experiment.

Analysis

- 1) Plot drying rate vs. moisture content and moisture content vs. time figures.
- 2) Comment on the effect of parameters by the help of these figures.
- 3) Compare drying rates obtained by weight recording and psychrometric readings