Fig. 1 Psychometric chart

On the Psychometric chart (Figure 1) follow down the wet-bulb line for a temperature of 20°C until it meets the dry-bulb temperature line for 25°C. Examining the location of this point of intersection with reference to the lines of constant relative humidity, it lies between 60% and 70% RH and about 4/10 of the way between them but nearer to the 60% line.
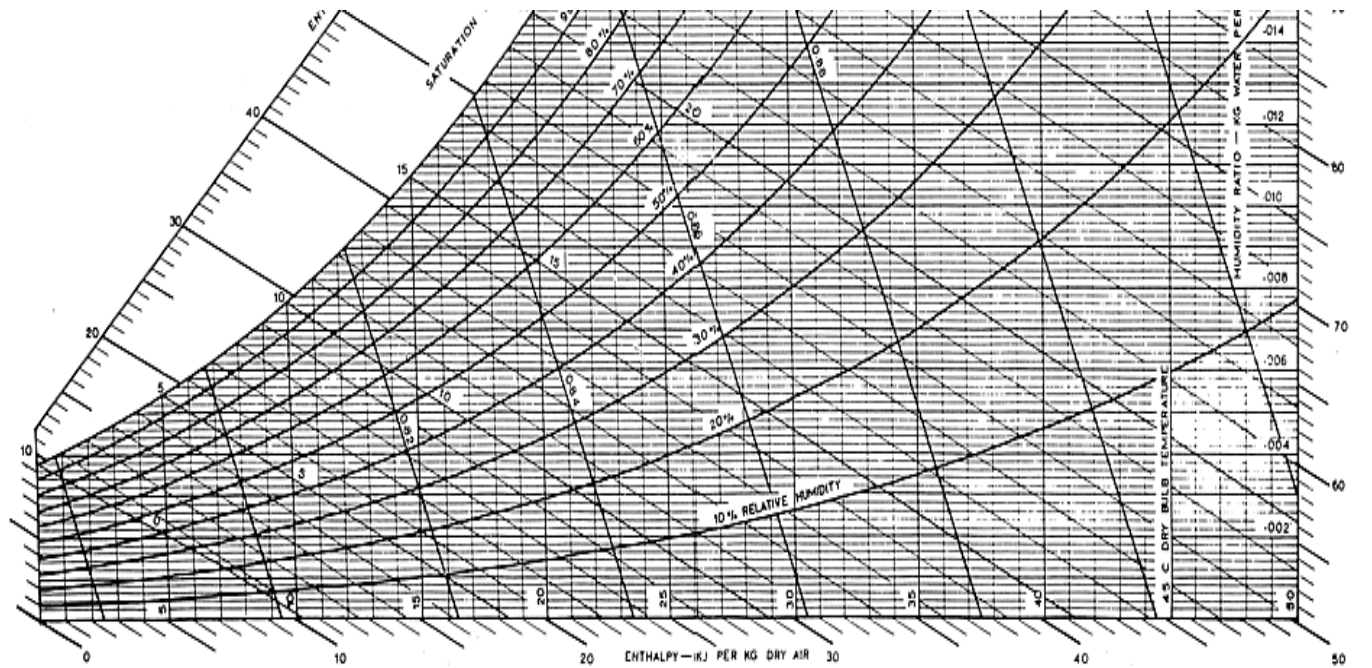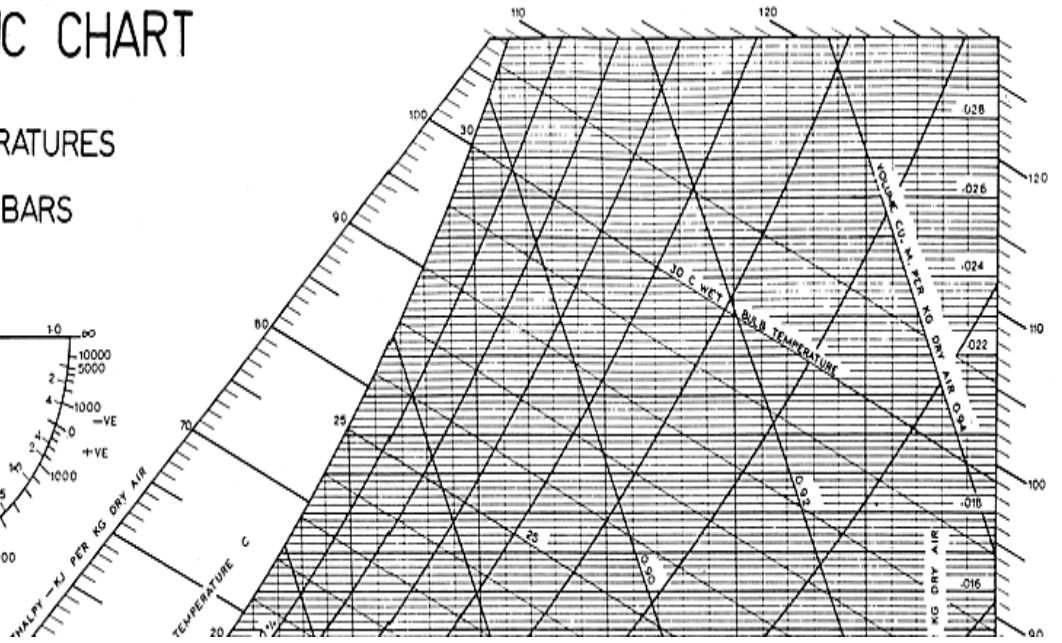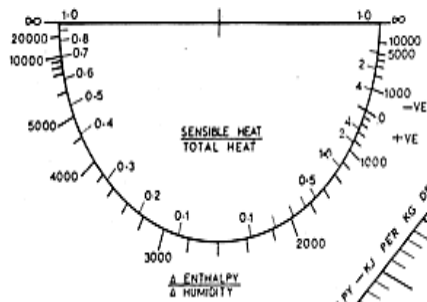
Therefore the RH is estimated to be 64%.
Similar examination of the enthalpy lines gives an estimated enthalpy of 57 kJ kg^{-1}, and from the volume lines a specific volume of 0.862 m^3 kg^{-1}.

PSYCHROMETRIC CHART

NORMAL TEMPERATURES

1013.25 MILLIBARS

LABORATORY 1.

TITLE: Physical Properties of Agricultural Products 1 - Size and shape
OBJECTIVES: At the end of this laboratory you will be able to do the following:

1. Measure the principal dimensions of some fruits and vegetables
2. Determine the roundness and sphericity of the products
3. Determine surface area of the products
4. Determine the overall shape of the products

NOTES: Physical characteristics of agricultural products are very important in handling the products and in the design of machinery for drying, handling, processing and storage.

Procedure

A. Roundness
    You are supplied with
    a. Garden egg
    b. Tomato
    c. Orange
    d. Any other product

1. Draw the projection of each of the product in the natural rest position.
2. Draw the smallest circumscribing circle on the projection drawn in I
3. Calculate Roundness using the relationship A_p/A_c
4. Repeat procedure A 1 draw an inscribed circle and calculate roundness using the relationship E_t / NR as given in class
5. Repeat procedure A1, and calculate roundness using the relationship r/R as given in class.
6. Compare the three results for all the products.

B. Sphericity
    1. Measure the three major diameter, a b and c (as given in class) of all the products given $(abc)^{1/3}/a$
    2. Determine sphericity using the relationship
    3. Draw the projections of the products in their natural rest position.
    4. Draw the largest inscribed circle and the smallest circumscribed circle.
    5. Determine sphericity with the relationship d_1/d_2 (as in class)
    6. Compare your results in 2 and 5
    7. Why do you think roundness and sphericity are important in handling and processing?

8.   Which is easier to handle – a large sized product or a small product? Why?
9.   Describe the shape of each product.

LABORATORY 2:

TITLE: Physical Properties of Agric Products II – Volume, Density and Surface area

OBJECTIVES: At the end of this laboratory, you will be able to do the following:

1.   Determine the volume and density of product that is heavier than water
2.   Determine the volume and density of product that is lighter than water
3.   Determine the surface areas of some products.

REQUIREMENTS: Fruits, vegetables, graph paper, scale, container sinker and water.

NOTES: Volume, density and surface area are important parameters in the design of soils and storage bins, separation of products from undesirable materials, mechanical compression of material, grading and sorting.

PROCEDURE

A.   Volume and Density of heavy product.

You are supplied with 4 agricultural products that will readily sink in water, for all four products

1. Determine the weight of product in air – W_a
2. Determine wt of container + water – W_w
3. Determine weight of container + water – product – W_r
4. Find volume of product. Also find density and specific gravity of product.

B.   Volume and density of light product

You are supplied with 3 products that are lighter than water
1. Determine weight of product in air – W_{pa}
2. Determine weight of product in water W_{pw}
3. Determine weight of sinker + product inair – W_{aa}
4. Determine weight of sinker + product in water – W_{aw}
5. Find the wt. of water supplied, volume of solid and density of solid
C.   Surface area
You are supplied with 3 kinds of leaves
1. Project the surface area on paper
2. Find the area of the leaves using graph paper
D.   Questions
1. In what area do you think surface area of objects is particularly useful?
2. How do you suppose you can find the volume of products that will dissolve in water?