ORDRE DES INGÉNIEURS DU QUÉBEC

MAY 2009 SESSION

Open-book examination
Calculators : only authorized models
Duration : 3 hours

04-AGRIC-B9 FOOD PROCESS ENGINEERING (PART 2)

All questions are of equal value (20 points each)

1) A rice mill located on the humid golf coast of Texas, where the temperature is 27°C and 60% relative humidity, wants to establish a market of its rice in dry Arizona climate, where the temperature is 32°C and 35% relative humidity. Rice filled in packages at the Texas mill would have 12.65% moisture (wet basis). How much of the packages must be overfilled in order to maintain a 500g weight in Arizona? The equilibrium moisture content of rice in Arizona is 9.1% (wet basis).

2) The osmotic pressure is a function of the solution concentration and it can be predicted using the van't Hoff relation. Determine the osmotic pressure of a 1% by mass sodium chloride solution (molecular weight of NaCl = 58.5 grams/mole) at a temperature of 20°C. The solution density is 1.007 kg/m^3.

3) What are the important functions of the packaging technology used for the following products: i) UHT-processed sterilized chocolate milk packaged in a laminated carton; ii) ice-cream dessert-on-a-stick packed in a paper overwrap; iii) potato chips packaged in an aluminum foil laminated bag; iv) wine in a bag-in-box packaging arrangement; and v) tea biscuits packaged in a decorative metal box?

4) A filter press produces 500 liters of water from an aqueous food suspension after 10 minutes and 1000 liters after 35 minutes. How long will it take to filter 2000 liters and what will the filtration rate be at that stage? Consider that this filtration system is operating under constant pressure, i.e. $k_1V^2 + k_2V^2 = t$, where t is the time in seconds, k_1 and k_2 are constants while V is the filtrate volume.

5) What are the functions of a well planned cleaning process of raw materials in terms of the requirements/tasks it must accomplish?