Intermediate Food Dehydration and Drying

Assignment 2: (Worth a total of ___ marks)

Based on “Chapter 3: Calculating the Heat to Dry a Product” in the Intermediate Course in Food Dehydration and Drying manual. In addition, you will need to use information presented in the previous chapters.

This assignment contains questions that may not appear to be directly linked to drying. They are designed to familiarize you with calculations and concepts that will be used in many drying calculations. Assignment 2 has been made rather short since Assignment 3 will also involve some of the concepts from Chapter 3 in the manual.

Please note: The latent heat of vaporization of water and other important pieces of information can be found in Section 2.2.7 (see Chapter 2) of the course manual.

1. When doing drying calculations, we often use the latent heat of vaporization of water. Why do we not use the latent heat of vaporization of the solid materials in our calculations? (___ marks)

2. A food scientist in South Africa decides to calculate the specific heat capacity of a sample of onions from her garden. The Cp value is found to be 3.785 kJ/kg C°. Another food scientist living in Nigeria tests a sample of locally grown onions and finds they have a specific heat capacity of 3.833 kJ/kg C°. Meanwhile, the literature value given for a typical representative sample of onions is 3.818 kJ/kg C°. Since the three samples are all onions, you might expect that the Cp values should all be the same. Why do you think the three values are slightly different? (___ marks)

3. It takes 2,257.1 kJ of heat energy to vaporize one kilogram of water. This is the latent heat of vaporization of water.
   a. How much heat would be required to vaporize 75 kg of water? (___ marks)
   b. If the process to evaporate the 75 kg of water actually used 199,000 kJ, what is the heat use efficiency of the process? Express your answer as a percent to one decimal place. (___ marks)

4. A processor purchases 450 kg of fresh peaches which are to be frozen. The peaches are washed and their skins and stones (pits) removed. After slicing, there are 375 kg of peach slices left (89% moisture content). Their temperature is 23°C. How much heat must be removed from these peach slices to get them to a final temperature of -18°C? Be sure to draw a diagram similar to that in Figure 2-1. (___ marks)