

ME5202 Industrial Transfer Processes

Semester 1 2009-2010

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<http://serve.me.nus.edu.sg/arun>

Home assignment I

You are encouraged to search and review pertinent published work in responding to the following questions. Please submit your assignment by e-mail to [mpeasm@nus.edu.sg](mailto:mpeasm@nus.edu.sg). Be sure to write your name and matriculation as well as module number on the first page of your assignment. Please be brief; a maximum of 6 pages will be accepted. Font size maybe 10 pts and use 1.5 spacing.

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1. Define wet bulb and adiabatic saturation processes. Compare the definitions carefully. Why are the wet bulb and AST numerically equal for air-water system? Are the two temperatures the same for nitrogen-alcohol system? Justify your answer.
2. Is the statement: " The constant drying rate process is the same as wet bulb process" always true? Justify your answer. Why is the wet bulb temperature almost independent of the shape of the wet bulb thermometer? Explain briefly.
3. List ten criteria for classification of dryers and for selection of industrial dryers.
4. State conditions under which you would select a flash dryer and a fluidized bed dryer. Refer to the types of moisture in the particles and their role in determining the drying rate curve and hence the type of dryer.
5. What are the advantages and limitations of superheated steam drying relative to hot air drying? Low pressure superheated steam drying is

suggested for drying of heat sensitive materials like fruits, vegetables, marine products etc. How does it compare with vacuum drying and freeze drying in terms of drying kinetics and product quality?

6. Common salt, after crystallization, is dried industrially on a large scale using rotary dryers (old technology), flash dryers or vibrated fluidized bed dryers. What are the advantages and limitations of each type?
7. A solid wet with an organic solvent is to be dried to nearly zero residual solvent content. What type of dryer would you recommend and why?
8. What are the limitations of the liquid diffusion model? In a recent publication, researchers utilized a diffusion model to describe their drying rate data and showed good fit with their data. Comment on the validity of this model based on the physics of the drying process.