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Continuing Education Course #267  
Biomass Process Flow Calculations

1. The following represent some of the differences between a Block Flow Diagram (BFD) and a Process Flow Diagram (PFD).
  - a. The PFD contains more detail than the BFD.
  - b. The BFD is normally completed earlier in a project than a PFD.
  - c. The BFD groups equipment and represents groupings as blocks, where the PFD includes a separate representation of each major piece of equipment.
  - d. All of the above.
2. The Block Flow Diagram is done
  - a. After the project design is complete.
  - b. After the Process Flow Diagram is complete.
  - c. Concurrent to detail design
  - d. After a Design Criteria document has been completed and approved, and before any other drawings are started.
3. The Process Flow Diagram is done:
  - a. Concurrent to General Arrangement Drawings
  - b. Before the Block Flow Diagram.
  - c. After detailed design is complete.
4. Material balance calculations are based on:
  - a. Hourly wet-basis flow.
  - b. Annual dry-basis flow.
  - c. Annual we-basis flow.
  - d. Hourly dry-basis flow.
5. The client usually defines storage requirements in terms of:
  - a. Weight of material required.
  - b. Volume of material required.
  - c. Hours or days of storage required.
  - d. Area required for storage.
6. For the purposes of estimating fuel flow to dryers, the most important rating specification is:
  - a. Length of dryer.
  - b. Diameter of dryer
  - c. Electric power consumption of dryer
  - d. Heat required (Btu) per pound of water evaporated.
7. The heating value of fuel to use in estimating fuel flow to the dryer is:
  - a. Higher heating value of the fuel
  - b. Lower heating value of fuel.

- c. Average of higher and lower heating value of fuel
- d. Lower heating value of fuel, oven-dry basis, reduced to account for heat evaporate water in the fuel and to raise the temperature of water to stack temperature.

8. A sample of green wood weighs 0.543 pounds. It is placed in a drying oven at 104C and weighed periodically until two successive weighments result in no detectible change. Final weight is 0.373 pounds. What is the initial moisture content of the sample, dry basis?

- a. 45.6%
- b. 31.3%
- c. 56.2%
- d. 17.3%

9. For the above sample, what is the moisture content, wet basis?

- a. 45.6%
- b. 31.3%
- c. 56.2%
- d. 17.3%

10. The dry-basis moisture content of a sample is 100%. What is the wet-basis moisture content?

- a. 30%
- b. 40%
- c. 50%
- d. 60%

11. Some considerations in selecting equipment design factors include:

- a. Lack of certainty regarding input data and lack of certainty that the vendor design will match his promises.
- b. Normal process variations
- c. Upstream equipment capacities may exceed material balance flow calculations.
- d. All of the above

12. For the following questions, the student is referred to the calculation example in Section 4.3. At a particular flow point in Block Flow Diagram, we have the following input data:

-Annual Uptime Hours: 6,800

-Bulk Density, Dry Basis: 10 pounds/cubic foot

-Moisture Content: 7%

-Annual Flow, Dry Basis is determined by mass balance to be 600,000 MT (metric tons) per year.

-What is the Annual Flow, Wet Basis?

- a. 558,000 MT
- b. 560,748 MT
- c. 645,161 MT
- d. 642,000 MT

13. For the flow point described in Question 12, what is the hourly flow, wet basis?

- a. 94.9 MT/hr.
- b. 88.2 MT/hr.
- c. 645,161 MT/hr.
- d. 600,000 MT/hr.

14. For the flow point described in Question 12, what is the hourly flow, dry basis?

- a. 94.9 MT/hr.
- b. 88.2 MT/hr.

- c. 645,161 MT/hr.
- d. 600,000 MT/hr.

15. For the flow point described in Question 12, what is the hourly volumetric flow?

- a. 9.49 CF/hr.
- b. 8.82 CF/hr.
- c. 19,018 CF/hr.
- d. 19,439 CF/hr

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