

Continuing Education Course #249
Bulk Silos for Biomass Facilities

1. A silo must be provided to hold 10 hours of production capacity. Density is 12 pounds/cubic foot. Production rate is 30 tons/hour. What is the working volume of the silo?

- a. 25 CF
- b. 25,000 CF
- c. 50,000 CF
- d. 100,000 CF

2. Moisture will tend to condense along the inside wall of a silo because:

- a. The walls of the silo are warmer than the chips, causing them to suck moisture from the air.
- b. The walls are made of steel.
- c. The walls are made of concrete.
- d. The chips control the temperature and relative humidity of the air inside the silo. With a high temperature and dew point, moisture will condense on the relatively cool inside wall of the silo.

3. Welded silos are usually limited to 14 feet diameter because:

- a. Welding costs of larger silos are too high.
- b. Road transportation limits.
- c. Larger welded silos are prone to rust.
- d. Larger welded silos are not visually appealing.

4. A bin vent filter should be supplied with a maximum particulate discharge of:

- a. .01 grain per cubic foot.
- b. .01 grams per cubic foot.
- c. .01 ounce per cubic foot.
- d. .01 milligrams per cubic foot.

5. To properly size the explosion panels on a silo, the Supplier should be supplied with values for:

- a. $P_{min}$ and $K_{st}$
- b. $P_{max}$
- c. $K_{st}$
- d. $P_{max}$ and $K_{st}$

6. The silo should be designed to promote mass flow, avoiding:

- a. Rat-holing.
- b. Funnel flow.
- c. Bridging
- d. All of the above.

7. Aspect ratio of a silo refers to:

○ a. The ratio of the diameter of the silo divided by the height of the cylindrical portion of the included pile.
○ b. The ratio of the height of the cylindrical portion of the pile divided by the radius of the silo.
○ c. The ratio of height of the cylindrical portion of the pile divided by the diameter of the silo.
○ d. The ratio of the radius of the silo divided by the height of the cylindrical portion of the pile.

8. Some features of a screw reclaim system include:
○ a. The screw rotates.
○ b. The screw revolves.
○ c. The distance between flights increases toward the center of the silo.
○ d. All of the above.

9. A passive reclaim system:
○ a. Uses a reclaim screw at the bottom of the silo.
○ b. Relies solely on gravity to maintain flow from the silo.
○ c. Usually has a flat bottom.
○ d. Is preferred for material with poor flow characteristics.

10. The preferred method of metering material from the opening of a passive-reclaim silo is:
○ a. A variable opening gate.
○ b. A variable-speed feed conveyor, in which a chute from the hopper discharge terminates a few inches above the conveyor surface.
○ c. A rotary feeder.
○ d. A manually operated shovel.

11. A silo will be designed to hold 60 hours of production of wood pellets to allow shipment to stop during week-ends. Plant production rate is 25 tons per hour, 24 hours per day. Assume no downtime. Bulk density of the pellets is 42 pounds/cubic foot. Expected aspect ratio is 2.0. Angle of repose is 30 degrees. A hopper angle of 55 degrees is proposed. The silo discharge will be 10 feet above grade. Calculate the working volume.
○ a. 71,428 CF
○ b. 35.7 CF
○ c. 119 CF
○ d. 714,280 CF

12. Estimate the diameter of the above silo.
○ a. 25.2 feet
○ b. 31.4 feet
○ c. 33.8 feet
○ d. 37.4 feet

13. Estimate the height of the cone of the top material formed by the angle of repose:
○ a. 4.1 feet
○ b. 7.2 feet
○ c. 12.7 feet
○ d. 9.8 feet

14. Estimate the height of the cylindrical portion of the pile.
○ a. 67.6 feet
○ b. 135.2 feet
○ c. 33.8 feet
○ d. 50.7 feet

15. Estimate the height of the bottom hopper.

- a. 12.0 feet
- b. 48.2 feet
- c. 6.0 feet
- d. 24.1 feet

16. Estimate the overall height of the silo

- a. 101.5 feet
- b. 111.5 feet
- c. 91.7 feet
- d. 77.4 feet