Answer on Question #44805 – Math – Geometry

Question

How much grain will the silo hold if the height of the ladder is 40 feet and the radius is 6 feet?

Given

R = 6 feet – radius of the silo

H = 40 feet – height of the ladder

Solution

The silo on a farm is a composite figure made up of cylindrical and hemispherical parts. So, the total volume of the silo is equal to the sum of volumes of its cylindrical part and its hemispherical part:

$$V_{silo} = V_c + V_{hs}$$

Volume of the cylindrical part of the silo:

$$V_c = \pi R^2 H = 3.14 \cdot (6\ feet)^2 \cdot 40\ feet = 4522\ cubic\ feet$$

Volume of the hemispherical part of the silo:

$$V_{hs} = \frac{2}{3} \pi R^3 = \frac{2}{3} 3.14 \cdot (6\ feet)^3 = 452\ cubic\ feet$$

Total volume of the silo:

$$V_{silo} = 4522 + 452 = 4974\ cubic\ feet$$

Packed density of the grain on average is d = 62.4 pounds/cubic foot (it is reference datum)

If the silo is full of the grain, the mass of the grain hold in the silo:

$$m = V_{silo} \cdot d = 4974\ cubic\ feet \cdot 62.4 \frac{pounds}{cubic\ foot} = 310526.8\ pounds$$

Answer: 310526.8 pounds