Fan Horsepower

Pressure is required to force air through grain. This pressure is normally expressed as static water pressure. The term 'static' comes from the fact that the pressure is measured perpendicular to the direction of air flow and gets none of the dynamic or velocity effect from moving air. The static pressure developed by air flowing through grain or bins can be determined if the air flow in CFM per square foot of drier or bin floor and grain depth is known. Figure N2.1 shows the relationship between air flow and static pressure in inches of water for beans and common grains.
Fans must be sized based upon volume of air delivery and static pressure. Fan motors must be sized on the same criteria as fans. The expression below gives the fan motor horsepower required if it is assumed that most fans are about 50 percent efficient in moving air. The constant 3178 is a conversion factor.

$$Fan \ hp. = \frac{CFM \times static \ pressure - inches \ of \ water}{3178}$$

Example: If the total air flow is 28,070 CFM and the total pressure is 1 inch of water.

$$Fan \ hp. = \frac{28,070 \times 1.0}{3178} = 8.8 (10 \ is \ the \ next \ standard \ motor \ size)$$

Heat Required

- The heat required to raise the temperature of the drying air depends upon the volume of air and the temperature rise as given by the expression:

  B.T.U. per hour = 1.1 X temperature rise X CFM of drying fan

- The temperature rise is the drying air temperature minus the initial design condition which is 60°F (see footnote under Table N2.2).

- In the example, the total heat required to heat the 28,070 CFM of air from 60 to 110°F is given as follows:

  B.T.U. per hour = 1.1 X (110 - 60°F) X 28,070 = 1,543,850