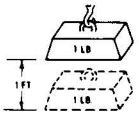
Torque and Horsepower Equivalents

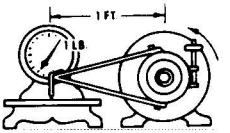


A foot-pound is the amount of energy expended in lifting a one-pound mass a distance of one foot against the pull of gravity

FOOT-POUNDS INDICATE ENERGY

TORQUE

It is: a turning moment or twisting effort. Is it expressed in foot-pounds? or pound-feet?



A pound-foot is the moment created a force of one pound applied to the end of a lever arm one

POUND-FEET INDICATE TORQUE

Torque (in Pound-Inches) = $\frac{63{,}025 \times HP}{RPM}$ = Force X Lever Arm (In Inches)

Torque (In Pound-Feet) = $\frac{5{,}252 \times HP}{RPM}$ = Force X Lever Arm (In Feet)

Force = Working Load in Pounds.
FPM = Feet Per Minute.
RPM = Revolutions Per Minute.
Lever Arm = Distance from the Force to the center of rotation in Inches or Feet.

Example:-

25 HP at 150 RPM = 10504 Pound-Inches Torque
2.5 HP at 150 RPM = 1050.4 Pound-Inches Torque

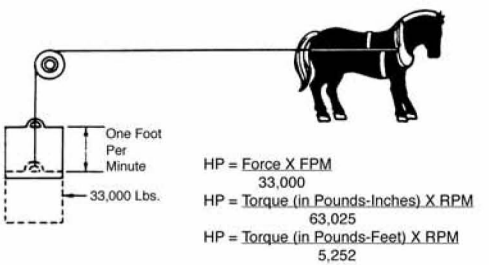
For other values of RPM move decimal point in RPM values to the left or right as desired, and in Torque values move to the right or left (opposite way) the same number of places.

Example:-

25 HP at 150 RPM = 10504 Pound-Inches Torque
25 HP at 1.50 RPM = 1050400 Pound-Inches Torque
2.5 HP at 1.50 RPM = 105040 Pound-Inches Torque

HORSEPOWER

Common Unit of Mechanical power - (HP)
One HP is the rate of work required to raise 33,000 pounds one foot in one minute



Overhung Loads

An overhung load is a bending force imposed on a shaft due to the torque transmitted by V-drives, chain drives and other power transmission devices, other than flexible couplings.

Most motor and reducer manufacturers list the maximum values allowable for overhung loads. It is desirable that these figures be compared with the load actually imposed by the connected drive.

Overhung loads may be calculated as follows:

O.H.L. = $\frac{63{,}000 \times HP \times F}{N \times R}$

Where HP = Transmitted hp X service factor
N = RPM of shaft
R = Radius of sprocket, pulley. etc.
F = Factor

Weights of the drive components are usually negligible. The formula is based on the assumption that the load is applied at a point equal to one shaft diameter from the bearing face. Factor F depends on the type of drive used:

F =
- 1.00 for single chain drives.
- 1.3 for TIMING Belt Drives and HTD belt Drives.
- 1.25 for spur or helical gear or double chain drives.
- 1.50 for V-belt drives. 2.50 for flat belt drives.
- 2.50 for flat belt drives.

Example: Find the overhung load imposed on a reducer by a double chain drive transmitting 7 hp @ 30 RPM. The pitch diameter of the sprocket is 10"; service factor is 1.3.

Solution:

O.H.L. = $\frac{(63{,}000)\ (7 \times 1.3)\ (1.25)}{(30)\ (5)}$ = 4,780 lbs.

Mathematical Equations

To find circumference of a circle. multiply diameter by 3.1416.
To find diameter of a circle. multiply circumference by.31831.
To find area of a circle, multiply square of diameter by.7854.
To find area of a rectangle, multiply length by breadth.
To find area of a triangle, multiply base by 1/2 perpendicular height.
To find area of ellipse, multiply product of both diameters by.7854.
To find area of parallelogram, multiply base by altitude.
To find side of an inscribed square, multiply diameter by 0.7071 or multiply circumference by 0.2251 or divide circumference by 4.4428.
To find side of inscribed cube, multiply radius of sphere by 1.1547.
To find side of an equal square, multiply diameter by.8862.
To find the surface of a sphere, square the diameter and multiply by 3.1416.
To find the volume of a sphere, cube the diameter and multiply by.5236.
A side of a square multiplied by 1.4142 equals diameter of its circumscribing circle.
A side of a square multiplied by 4.443 equals circumference of its circumscribing circle.
A side of a square multiplied by 1.128 equals diameter of an equal circle.
A side of a square multiplied by 3.547 equals circumference of an equal circle.
To find gallon capacity of tanks (given dimensions of a cylinder in inches): square the diameter of the cylinder, multiply by the length and by.0034.