# Basic Lubrication Formulas

## Calculating Bearing Requirements for Oil Lubricants:

V = A x T
V = volume in terms of lube-oil replacement rate in cubic inches per hour ($in^3$/hr)
A = bearing surface area in square inches ($in^2$) (sized differently based on bearing type)
T = film thickness….generally .001 inch….but it may vary based on oil type and application

## Calculating Bearing Requirements for Grease Lubricants:

V = A x T
V = volume in terms of lube-grease replacement as cubic inches per four hour ($in^3$/4 hrs)
A = bearing surface area in square inches ($in^2$) (sized differently based on bearing type)
T = film thickness….generally .002 inch….but it may vary based on grease type and application

## Metric Conversion Note:

Quite often requirements are expressed in metric terms. To convert to metric, calculate volume requirements as noted above and simply multiply by 16.39 to convert to cubic centimeters per hour ($cc^3$/hr) for oil or cubic centimeters per four hours ($cc^3$/4 hrs) for grease.

## Common Bearing Types: (Necessary to know for calculating areas)

- Plain bearings: Area ($in^2$) = 3.14 x shaft diameter (ins) x length of bearing (ins)
- Slides, gibs and ways: Area ($in^2$) = area of the largest contact surface
- Anti-friction bearings: Area ($in^2$) = shaft diameter squared x number of rows

## Gears: Area ($in^2$) = 3.14 x pitch diameter of gears (ins) x width of gear (ins)

**Sizing Example:** Plain bearing with 6-inch shaft and 6-inch-long bearing surface using oil

Area ($in^2$) = 3.14 x 6 (ins) x 6 (ins) = 113.04 $in^2$

Volume ($in^3/hr$) = 113.04 ($in^2$) x .001 (in) = .113 ($in^3/hr$)

Should this need to be converted to metric, the requirement for this single bearing application would be 1.85 cubic centimeters per hour. .113 ($in^3/hr$) x 16.39 = 1.85 ($cc^3/hr$)

## Total Machine Lube Requirement:

Each and every bearing or lube point on a machine would be calculated in this fashion and when done, the replacement rates for all points would be added together to determine the total system lubrication requirement.

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