Milling Equations

Rotational Speed (RPM's)

$$N = \frac{v}{\pi D}$$

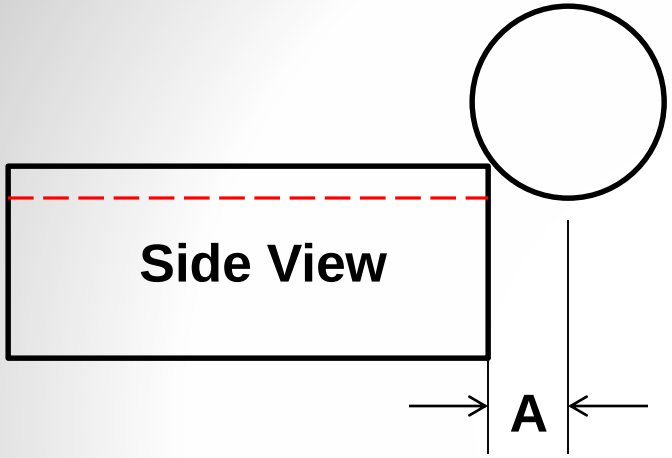
N = Rotational Speed (RPM's)
v = Cutting Speed (SFPM)
D = Cutter Diameter

Feed Rate: f_r ($^{Dist}/_{Min}$)

$$f_r = N\, n_t\, f$$

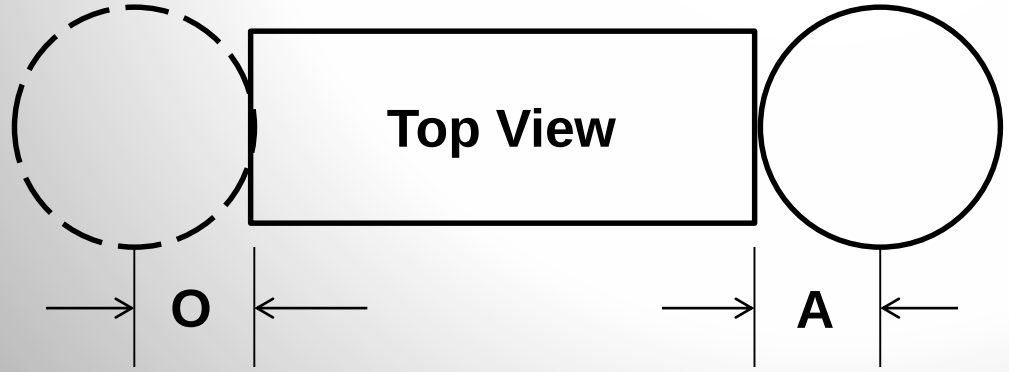
f_r = Feed Rate ($^{Dist}/_{Min}$)
N = Rotational Speed
n_t = Number of Teeth on the Cutter
f = Feed ($^{In.}/_{Tooth}$)

Approach Distances



Peripheral Milling

A = Approach Distance
O = Cutter Run Out (Face Milling)



Face Milling

Milling Equations

Approach Distance : Peripheral Milling

$$A = \sqrt{d\,(D-d)}$$

A = Approach Distance
D = Cutter Diameter
d = Depth of Cut

Approach Distance : Face Milling

$$A = O = \frac{D}{2}$$

A = Approach Distance
O = Cutter Run Out Distance
D = Cutter Diameter

Milling Equations

Machining Time : Peripheral Milling

$$T_m = \frac{L + A}{f_r}$$

T_m = Machining Time (Min.)
L = Length of Cut
A = Approach Distance
f_r = Feed Rate ($^{Dist.}/_{Min.}$)

Machining Time : Face Milling

$$T_m = \frac{L + A + O}{f_r}$$

T_m = Machining Time (Min.)
L = Length of Cut
A = Approach Distance
O = Cutter Run Out Distance
f_r = Feed Rate ($^{Dist.}/_{Min.}$)

Milling Equations

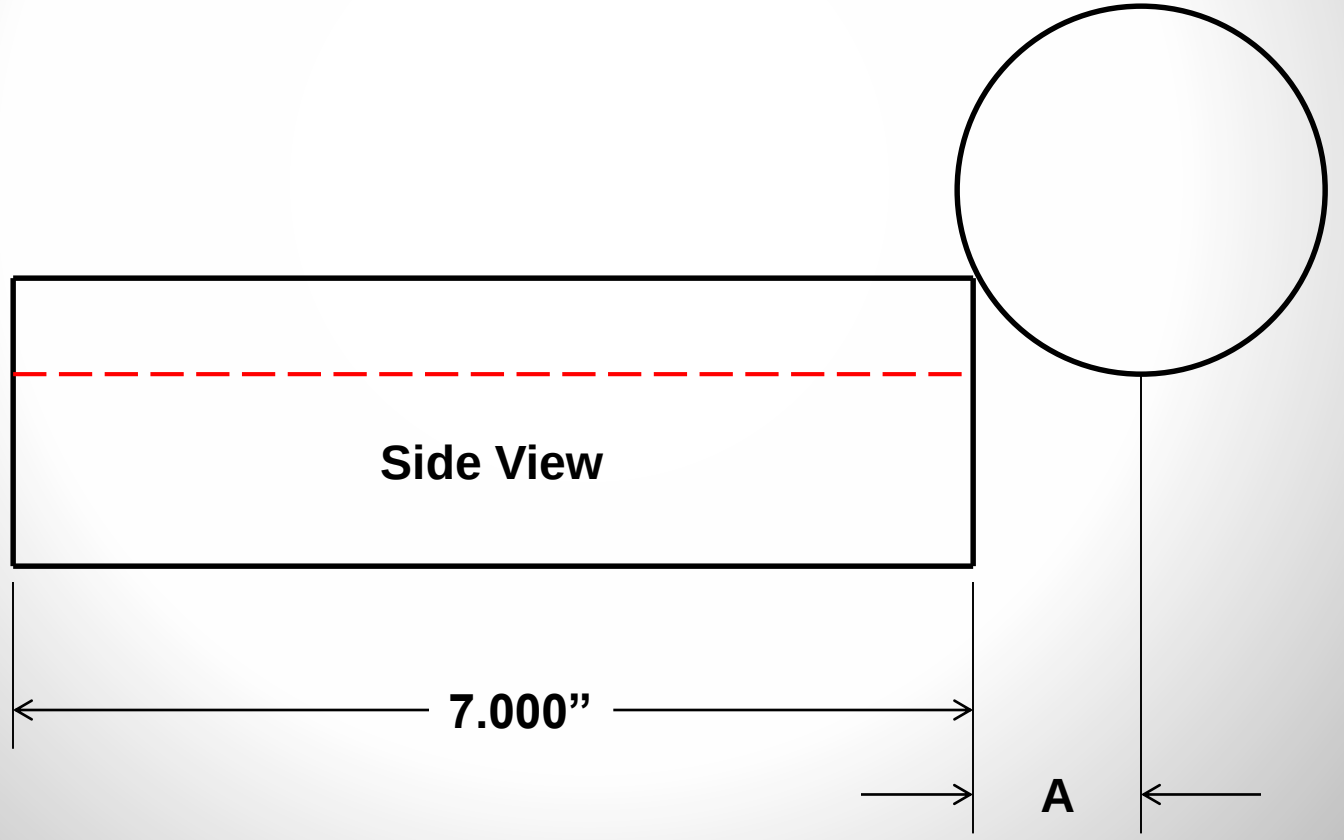
Material Removal Rate ($^{in.cu.}/_{Min.}$)

$MRR = w\ d\ f_r$

MRR = Material Removal Rate ($^{cu.in.}/_{Min}$)
w = Width of Cut
d = Depth of Cut
f_r = Feed Rate ($^{Dist.}/_{Min}$)

Peripheral Milling Example

Data: D = 4.500”; d = 0.250”; w = 1.750”;
f = 0.0005 $^{in}/_{tooth}$; v = 128.5 SFPM; n_t = 20 teeth



Peripheral Milling Example

Approach Distance

$$A = \sqrt{d(D-d)}$$

$$A = \sqrt{0.250(4.500-0.250)}$$

A = 1.0308”

Peripheral Milling Example

Spindle Rotation

$$N = \frac{v}{\pi D}$$

$$N = \frac{(128.5)\ (12)}{\pi\ 4.500}$$

N = 109.0742 RPM's

Feed Rate

$$f_r = N\ n_t\ f$$

$$f_r = (109.0742)\ (20)\ (0.0005)$$

$$f_r = 1.0907\ {}^{in}/_{Min}$$

Peripheral Milling Example

Machining Time

$$Tm = \frac{L + A}{f_r}$$

$$Tm = \frac{7.000 + 1.0308}{1.0907}$$

$$Tm = \underline{7.3607}\ \text{Min}$$

Peripheral Milling Example

Material Removal Rate

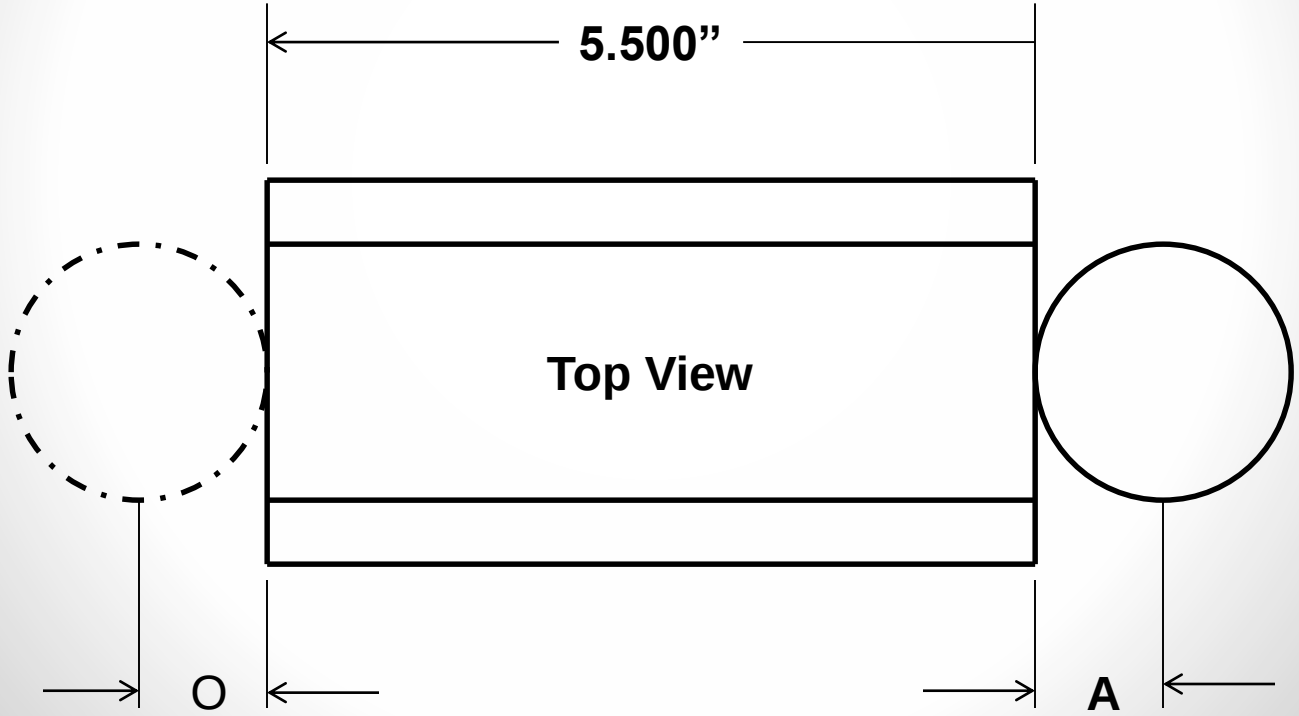
$$MRR = w\ d\ f_r$$

$$MRR = (1.750)\ (0.250)\ (1.0907)$$

$$MRR = \underline{0.4772}\ ^{cu.in.}/_{min}$$

Face Milling Example

Data: D = 0.625”; d = 0.375”; n_t = 6;
f = 0.0015 $^{in}/_{tooth}$; v = 100 SFPM



Face Milling Example

Approach & Over Travel Distance

$$A = O = \frac{D}{2}$$

$$A = O = \frac{0.625}{2}$$

$$A = O = 0.3125”$$

Face Milling Example

Spindle Rotation

$$N = \frac{V}{\pi D}$$

$$N = \frac{(100)\ (12)}{\pi\ 0.625}$$

N = 611.1550 RPM's

Feed Rate

$$f_r = N\ n_t\ f$$

$$f_r = (611.1550)\ (6)\ (0.0015)$$

$$f_r = 5.5004\ {}^{in}/_{Min}$$

Face Milling Example

Machining Time

$$Tm = \frac{L + A + O}{f_r}$$

$$Tm = \frac{5.500 + 0.3125 + 0.3125}{5.5004}$$

Tm = 1.3863 Min

Face Milling Example

Material Removal Rate

$$MRR = w\ d\ f_r$$

$$MRR = (0.625)\ (0.375)\ (5.5004)$$

$$MRR = \underline{1.2892}\ {}^{cu.in.}/_{min}$$