SFM	surface feet per minute (ft./min.)	HP	horsepower
RPM	revolutions per minute (rev./min.)	CF	cutting force (lb./in.^{2})
D	diameter of the part (in.)	T	cutting time (min.)
MRR	metal removal rate (in.^{3}/min.)	L	machined length (in.)
DOC	depth of cut (in.)	TSF	theoretical surface finish (µ)
IPR	inches per revolution (in./rev.)	NR	nose radius of insert (in.)

Cutting Speed (SFM)
(surface feet per minute)

$$SFM = \frac{D \times RPM}{3.82}$$

Example: Determine the cutting speed (SFM) required for turning a 3-1/2" diameter part with a spindle speed of 500 RPM.

$$SFM = \frac{3.5 \times 500}{3.82} = 458.12 \text{ ft./min.}$$

Spindle Speed (RPM)
(revolutions per minute)

$$RPM = \frac{SFM \times 3.82}{D}$$

Example: Determine the spindle speed (RPM) required for turning a 3-1/2" diameter part with a cutting speed of 400 SFM.

$$RPM = \frac{400 \times 3.82}{3.5} = 436.57 \text{ rev./min.}$$

Metal Removal Rate (MRR)
(in^3/min.)

$$MRR = SFM \times DOC \times IPR \times 12$$

Example: Determine the metal removal rate (MRR) required for cutting with a depth of .030" with a cutting speed of 500 SFM and feed rate of .012 IPR.

$$MRR = 500 \times .030 \times .012 \times 12 = 2.16 \text{ in}^3\text{/min.}$$

Power Requirement (HP)
(horsepower)

$$HP = \frac{SFM \times DOC \times IPR \times CF}{33{,}000}$$

Example: Determine the power requirement (HP) for turning a material with a cutting force of 190,000, a depth of .070", a cutting speed of 400 SFM, and feed rate of .014 IPR.

$$HP = \frac{400 \times .070 \times .014 \times 190{,}000}{33{,}000} = 2.26 \text{ HP}$$

Cutting Time (T)
(min.)

$$T = \frac{L}{IPR \times RPM}$$

Example: Determine the amount of time (T) required to machine an 8" long part with a spindle speed of 500 RPM and a feed rate of .012 IPR.

$$T = \frac{8}{.012 \times 500} = 1.33 \text{ min.}$$

Theoretical Surface Finish (TSF)
(microns/micro-inches)

$$TSF = \frac{IPR^2 \times 1000}{8 \times NR}$$

Example: Determine the theoretical surface finish (TSF) using an insert with a 1/64" nose radius (NR) and a feed rate of .012 IPR.

$$TSF = \frac{(.012)^2 \times 1000}{8 \times .016} = 1.125 \text{ microns (45 micro-inches)}$$

NOTE: If micro-inches are desired, multiply TSF by 40.