Working Speed and Feeds

		Feed Per Tooth (Inch Per Tooth) Diameter equals	
Material Group	Speed SFM*	up to 1/4"	1/4" to 1/2"
Aluminum/Related Alloys	600-1200	.001-.002	.002-.004
Brass/Bronze	300-550	.001-.002	.002-.003
Copper/Related Alloys	500-900	.001-.002	.002-.003
Cast Iron (soft 195bhn)	200-500	.001-.002	.002-.003
Cast Iron (medium 225bhn)	125-350	.001-.002	.002-.003
Cast Iron (hard 275bhn)	80-300	.0005-.001	.001-.002
Magnesium	800-1400	.001-.003	.003-.005
Monel/Nickel Alloys	65-175	.0005-.001	.001-.002
Plastics	600-1200	.001-.003	.003-.006
Steel-Heat Treated (35-40Rc)	150-350	.0003-.0005	.0005-.001
Steel-Heat Treated (40-45Rc)	125-275	.0002-.0005	.0005-.001
Steel-Heat Treated (45Rc)	50-200	.0002-.0005	.0005-.001
Steel-Medium Carbon	175-350	.0005-.001	.001-.002
Steel, Mold & Die	50-250	.0005-.001	.001-.002
Steel, Tool	150-250	.0005-.001	.001-.002
Stainless-Soft	250-400	.0005-.001	.001-.002
Stainless-Hard	75-250	.0005-.001	.001-.002
Titanium Alloys	90-225	.0003-.0009	.0009-.002

* Surface Feet/Minute
SFM = 0.262 x Dia. x RPM

General Endmill Calculations

In order to find the...

RPM (Revolutions Per Minute)
The speed by which the tool or spindle is rotating

SFM (Surface Per Minute)
The manufacturer's suggested working velocity of the tool based on geometry, substrate, coatings and workpiece material

IPM (Inches Per Minute)
The feedrate by which the workpiece material passes by the endmill during production

IPT (Inches Per Tooth)
the manufacturer's suggested feedrate, measured in .001" increments, as applied to each tooth of the endmill, aka "chip load"

Feed Rate
The distance traveled by the workpiece as the tool revolves one time only

If you know these...	Then the math becomes easy...
Suggested **Surface Feet Per Minute** (SFM) (see above for material suggestions) **Diameter of Tool**	RPM = SFM X 3.82, ÷ Diameter of tool
Revolutions Per Minute (RPM) **Diameter of Tool**	SFM = .262 X RPM X Diameter of tool
RPM Chipload Per Tooth (feed per tooth per revolution) Number of teeth	IPM = RPM X chipload per tooth X Number of flutes
IPM (inches per minute) **RPM** (revolutions per minute) Number of Flutes on tool	IPT = IPM ÷ RPM ÷ Number of flutes
IPM (inches per minute) **RPM** (revolutions per minute)	IPR = IPM ÷ RPM

A working example to calculate RPMs…

Whereby you want to run a 3/8" diameter, 4 fluted endmill at the suggested 200 SFM. What are your suggested RPMs?

RPMs = SFM X 3.82, ÷ Diameter of tool
So… 200 SFM X 3.82, ÷ .375"… equals 2,037 RPM

A working example to calculate the SFM… for the same 3/8" diameter tool when you know that your spindle runs at 18,000 RPMs…

SFM = .262 X RPM X Diameter of tool
So… 262 X 18,000 X .375"… equals 1,768.5 SFM

A working example to find the work material's suggested feed-rate, for the same 3/8" diameter, 4 fluted tool, when I know the spindle is running at 2,500 RPM and a chip load of .0025" per tooth…

IPM = RPM X Chip Load per Tooth X Number of Teeth
So… 2,500 X .0025" X 4… equals 25 IPM (inches per minute)

A working example to see if your chip-load is correct, for a 3/8" diameter, 2 fluted tool routing aluminum at 5,000 RPMs at 45 IPM feed…

IPT = IPM ÷ RPM ÷ Number of flutes
So… 45 ÷ 5,000 ÷ 2 flutes… equals .0045" per tooth

Courtesy of Amana Tools™