

# Surface Footage Chart and Formula

## Surface Footage

### Theory behind Surface Feet per Minute:

1. Every cutter has a Diameter
2. Diameter x 3.14159 (PI) = Distance cutter travels every revolution
3. Distance cutter travels every Revolution x 12 = Distance traveled in Feet.(SF)
4. Chart is Recommending how far your cutter should travel per minute in feet. (SFM)

### Theory behind Feed Rate formula (inches):

1. It is Always calculated in “Inches per Tooth” (in/tooth)
2. For every time a cutter goes around how far should the cutter advance into the material Per Tooth.
3. The chart is Recommending a Chip Load per Tooth depending on cutter diameter and depth of cut.
4. Chip Load per Tooth x Number of teeth = (Inches per Revolution)

The following chart is Recommended Surface Footage for standard 4-Flute styled endmills. For aluminums, start somewhere in the middle. For steels start on the bottom side and work your way up.

***Always use manufacturers recommended Surface Footage for tooling where applicable.***

**RPM**

$$\text{SFM} \times 3.82 / \text{Cutter Diameter} = \text{RPM}$$

**Feed Rate**

$$\text{RPM} \times \text{Chip Load}_{(\text{FPT})} \times \text{Number of Teeth} = \text{Feed Rate}$$

Material	SFM		FPT for Endmills		FPT for HSS Drill
	HSS	Carbide	HSS	Carbide	1/16-3/4 Ø
1018 CRS	125	350	.001-.005	.0015-.006	.001-.015
6061-T6 ALUM	250-800	800-1300	.002-.006	.002-.010	.001-.016
11L17	170	415	.001-.005	.001-.007	.001-.018
4140	70	300	.001-.004	.0015-.006	.001-.014
A2 TOOL STEEL	50	250	.0005-.003	.001-.004	.001-.007
P20 MOLD STEEL	70	320	.0005-.004	.001-.005	.001-.009
303 SS	100	300	.001-.005	.001-.005	.001-.014
304/316 SS	60	230	.001-.005	.0005-.003	.001-.010
416 SS	110	335	.001-.005	.0005-.005	.001-.014
440C SS	50	205	.001-.004	.0005-.004	.0005-.009
17-4 SS	55	220	.0005-.003	.0005-.004	.001-.008
Delrin	450	800-1300	.003-.010	.003-.010	.001-.006

Example: 1/2" 4-Flute Endmill cutting 1018 CRS  
 $350 \times 3.82 / .500 = \mathbf{2674 \text{ RPM}}$   
 $2674 \times .002 \times 4 = \mathbf{21.4 \text{ in/min}}$

**FPT = Feed Per Tooth**