

Technical Tip #30 – Formulas for Cutting Tool Speeds and Feeds

Speeds and feeds are the most important considerations to achieve the best results from cutting tools. Improper speeds and feeds often cause low production, poor quality, and damage to the tool. Speeds that are too high or feeds that are too light can lead to rapid wear and dulling of the cutter, reducing tool life.

Speed is measured in peripheral feet per minute. It is often referred to as cutting speed or surface speed. Feed is usually measured and stated in inches per minute (IPM). It takes into consideration the number of cutting teeth (or flutes), the feed per tooth (or cutting edges), and the revolutions per minute. Feed recommendation tables for drills are based on 2-flute drills.

To establish operating conditions, all feeds rates should be calculated from the chipload or feed per tooth. The highest possible feed per tooth will usually provide longer tool life. However, excessive feeds may overload the tool and cause the cutting edges to chip or break.

Following are many of the commonly used formulas for calculating operating parameters for cutting tools:

NOTE: for all formulas, D = diameter.

SFM: surface feet per minute/cutting speed: $.262 \times \text{RPM} \times D$

RPM: revolutions per minute/rotational speed: $(3.82 \times \text{SFM})/D$ or $\text{SFM}/(.262 \times D)$

IPM: inches per minute/machine feed rate: $\text{RPM} \times \text{IPR}$ (or) $T \times \text{IPT} \times \text{RPM}$ (T = # of teeth)

IPT: inches per tooth/feed per tooth: $\text{IPM}/(\text{RPM} \times T)$

IPR: inches per revolution-feed per revolution: $\text{IPT} \times T$ (or) IPM/RPM

Inches to mm: Inches $\times 25.4$ or Inches $/ 0.03937$

MM to inches: mm $/ 25.4$ (or) mm $\times 0.03937$