

Speed & Feed

Mechanical Engineering

Surface speed, spindle speed and feed per tooth, and how they convert.

Cutting speed is the surface speed at the tool tip, and the material pair sets it, not the machine.

$$V_c = \pi D N \div 1000 \text{ m/min} \cdot \text{feed} = f_z \times \text{teeth} \times N$$

D = 50 mm, N = 1000 rpm

$\pi \times 50 \times 1000 \div 1000.$

Vc about 157 m/min

Vc = 120, D = 20 mm

Rearranged for N.

N about 1910 rpm

4 flutes, fz = 0.05

fz times the teeth.

0.2 mm per rev

THE COMMON MISTAKE

✗ **Holding rpm constant across diameters**

✓ **Hold surface speed constant**

On a facing cut the diameter falls towards zero, so constant rpm drives surface speed to zero and the tool rubs instead of cutting.

**D is the cutting diameter: the tool in milling, the workpiece in turning.
Tool maker data governs.**