

Machining Feed Rate Calculations Example 1

Machining Specifications

Type of Operation: Turning

Stock Material: Aluminium Alloy

Tool Type: Right Hand Knife Edge

Tool Material: Cemented Carbide

Stock Size: Ø30mm

We need to find:-

- 1) The Spindle Speed (RPM)
- 2) The Feed Rate (mm/min)

We will need to identify the correct spindle speed to determine a corresponding feed rate. The spindle speed must therefore be calculated first.

To find the spindle speed we use:-

$$\text{Spindle Speed (RPM)} = \frac{1000 \times \text{Cutting Speed (m/min)}}{\pi \times \text{Work Diameter (mm)}}$$

The cutting speed (m/min) can be found in the ‘**Surface Cutting Speeds**’ table on page one of the ‘**Typical Machining Speeds and Feeds**’ handout.

$$\begin{aligned}\text{Spindle Speed (RPM)} &= \frac{1000 \times 250 \text{ (m/min)}}{\pi \times 30 \text{ (mm)}} \\ &= \mathbf{2652.58 \text{ (RPM)}}\end{aligned}$$

To find the Feed Rate (mm/min) we use:-

$$\text{Feed Rate (mm/min)} = \text{Feed Rate (mm/rev)} \times \text{Spindle Speed (RPM)}$$

We already know the Spindle Speed so we must now determine the Feed Rate (mm/rev). To do this we must use the ‘**Typical Feed Rates for Turning**’ table.

$$\begin{aligned}\text{Feed Rate (mm/min)} &= 0.3 \text{ (mm/rev)} \times 2652.58 \text{ (RPM)} \\ &= \mathbf{795.774 \text{ (mm/min)}}\end{aligned}$$

When using a conventional lathe, the spindle speed and feed rate values must be rounded up (or down) to the nearest increment. However, when programming a numerically controlled machine tool, the exact spindle speed and feed rate could be used.

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Machining Feed Rate Calculations Example 2

Machining Specifications

Type of Operation: Milling

Stock Material: Cast Iron

Tool Type: End Mill

Tool Material: High-Speed Steel

Tool Size: Ø12mm

Number of Teeth: 6

We need to find:-

- 1) The Spindle Speed (RPM)
- 2) The Feed Rate (mm/min)

We will need to identify the correct spindle speed to determine a corresponding feed rate. The spindle speed must therefore be calculated first.

To find the spindle speed we use:-

$$\text{Spindle Speed (RPM)} = \frac{1000 \times \text{Cutting Speed (m/min)}}{\pi \times \text{Tool Diameter (mm)}}$$

The cutting speed (m/min) can be found in the ‘**Surface Cutting Speeds**’ table on page 1 of the speeds and feeds handout.

$$\begin{aligned}\text{Spindle Speed (RPM)} &= \frac{1000 \times 18 \text{ (m/min)}}{\pi \times 12 \text{ (mm)}} \\ &= \mathbf{477.46 \text{ (RPM)}}\end{aligned}$$

To find the feed rate we use:-

$$\boxed{\text{Feed Rate (mm/min)} = \text{Feed Rate (mm/rev)} \times \text{Spindle Speed (RPM)}}$$

The Spindle Speed has already been calculated so we must now determine the Feed Rate (mm/rev). To do this we must use:-

$$\boxed{\text{Feed Rate (mm/rev)} = \text{Feed Rate (mm/tooth)} \times \text{Number of Cutting Teeth}}$$

To determine the Feed Rate (mm/tooth) we must use the ‘**Typical Feed Rates for Milling**’ (mm/tooth) table on page two of the ‘**Typical Machining Speeds and Feeds**’ handout.

$$\begin{aligned}\text{Feed Rate (mm/rev)} &= 0.18 \text{ (mm/tooth)} \times 6 \\ &= 1.08 \text{ (mm/rev)}\end{aligned}$$

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We can now use the Feed Rate (mm/min) formula:-

$$\text{Feed Rate (mm/min)} = \text{Feed Rate (mm/rev)} \times \text{Spindle Speed (RPM)}$$

$$= 1.08 \text{ (mm/rev)} \times 477.46 \text{ (RPM)}$$

$$= \mathbf{515.65 \text{ (mm/min)}}$$

When using a conventional milling machine, the spindle speed and feed rate values must be rounded up (or down) to the nearest increment. However, when programming a numerically controlled machine tool, the exact spindle speed and feed rate could be used.

Machining Feed Rate Calculations Example 3

Machining Specifications

Type of Operation: Drilling

Stock Material: Brass

Tool Type: Twist Drill

Tool Material: High-Speed Steel

Tool Size: Ø10mm

Number of Flutes: 2

We need to find:-

- 1) The Spindle Speed (RPM)
- 2) The Feed Rate (mm/min)

We will need to identify the correct spindle speed to determine a corresponding feed rate. The spindle speed must therefore be calculated first.

To find the spindle speed we use:-

$$\text{Spindle Speed (RPM)} = \frac{1000 \times \text{Cutting Speed (m/min)}}{\pi \times \text{Tool Diameter (mm)}}$$

The cutting speed (m/min) can be found in the ‘**Surface Cutting Speeds**’ table on page 1 of the speeds and feeds handout.

$$\begin{aligned}\text{Spindle Speed (RPM)} &= \frac{1000 \times 75 \text{ (m/min)}}{\pi \times 10 \text{ (mm)}} \\ &= \mathbf{2387.32 \text{ (RPM)}}\end{aligned}$$

We must now calculate the Feed Rate (mm/min) for the drilling operation. To do this we must use:-

$$\boxed{\text{Feed Rate (mm/min)} = \text{Feed Rate (mm/rev)} \times \text{Spindle Speed (RPM)}}$$

The spindle speed has already been determined and we can reference the feed rate (mm/rev) from the ‘**Typical Feed Rates for High-Speed Steel Drills**’ table on page three of the ‘**Typical Machining Speeds and Feeds**’ handout.

$$\begin{aligned}\text{Feed Rate (mm/min)} &= 0.18 \text{ (mm/rev)} \times 2387.32 \text{ (RPM)} \\ &= \mathbf{429.71 \text{ (mm/min)}}\end{aligned}$$

When using a conventional drilling machine, the spindle speed and feed rate values must be rounded up (or down) to the nearest increment. However, when programming a numerically controlled machine tool, the exact spindle speed and feed rate could be used.