Turning Equations

**Rotational Speed:** \( N \) (RPM’s)

\[
N = \frac{v}{\pi D_o}
\]

- \( N \) = Rotational Speed (RPM’s)
- \( v \) = Cutting Speed (SFPM)
- \( D_o \) = Original Diameter

**Feed Rate:** \( f_r \) \( (\frac{\text{Dist}}{\text{Min}}) \)

\[
f_r = N \cdot f
\]

- \( f_r \) = Feed Rate \( (\frac{\text{Dist}}{\text{Min}}) \)
- \( N \) = Rotational Speed (RPM’s)
- \( f \) = Feed \( (\frac{\text{Dist}}{\text{Rev}}) \)
Turning Equations

**Machining Time (Min.)**

\[
T_m = \frac{L}{f_r}
\]

- \( T_m \) = Machining Time (Min.)
- \( L \) = Length of Cut
- \( f_r \) = Feed Rate (in./Min.)

**Material Removal Rate (in. cu./Min)**

\[
MRR = v f d
\]

- \( MRR \) = Material Removal Rate (in.cu./Min)
- \( v \) = Cutting Speed (SFPM)
- \( f \) = Feed (Dist./Rev.)
- \( d \) = Depth of Cut
Turning Operations

\[ \text{D}_O = \text{Original Diameter} \]
\[ \text{D}_f = \text{Final Diameter} \]
\[ d = \text{Depth of Cut} \]

\[ d = \frac{\text{Do} - \text{Df}}{2} \]
Turning Example

Data: \( v = 125 \text{ SFPM}; \ f = 0.0015 \text{ in/rev} \)

\[
\begin{align*}
D_o &= 0.250'' \\
D_f &= 0.125'' \\
L &= 6.250''
\end{align*}
\]
Turning Example

**Rotational Speed**

\[ N = \frac{v}{\pi D_o} \]

\[ N = \frac{(125)(12)}{\pi 0.250} \]

\[ N = 1909.8593 \text{ RPM's} \]

**Feed Rate**

\[ f_r = N f \]

\[ f_r = (1909.8593)(0.0015) \]

\[ f_r = 2.8648 \text{ in/min} \]
Turning Example

**Machining Time**

\[ T_m = \frac{L}{f_r} \]

\[ T_m = \frac{6.250}{1.7189} \]

\[ T_m = 2.1817 \text{ Min} \]

**Depth of Cut**

\[ d = \frac{D_o - D_f}{2} \]

\[ d = \frac{0.250 - 0.125}{2} \]

\[ d = 0.0625” \]
Turning Example

**Material Removal Rate**

MRR = v f d

MRR = (125 x 12) (0.0015) (0.0625)

MRR = 0.1406 in³/min