Drilling Calculations
Production Design
IET 215

Exercise 1: Calculate the spindle speed for drilling a 1.375 diameter through hole in 1.250 inch thick S.S. 304 with a 265 BHN. The drill is made of HSS.

Given:  
D = 1.375 inch  
Drill Material = HSS  
V = 50 fpm … from Table 19 in Machinery's Handbook  

Find: N = Spindle Speed?

Solution:  
\[ N = \frac{12V}{\pi D} = \frac{(12\text{in/ft})(50 \text{ fpm})}{[\pi](1.375 \text{ inch})} = 139 \text{ rpm's} \]

Exercise 2: Calculate the depth of cut, cutting time, and metal removal rate for the above drilling operation.

Given:  
D = 1.375 inch  
Drill Material = Carbide  
N = 138.899 rpm's  
f_r = 0.007 ipr … from Table 19 in Machinery's Handbook  

\begin{align*}  
t &= \frac{f_r}{2} \\
CT &= \frac{(L + A)}{f_m} \\
A &= \frac{D}{2} \\
f_m &= f_r N \\
MRR &= \left(\pi D^2 / 4\right) f_r N \end{align*}
Find:  \( t = \) Depth of Cut?

\[ CT = \text{Cutting Time?} \]

\[ MRR = \text{Metal Removal Rate?} \]

Solution:  \( t = \frac{f_r}{2} = 0.007 \text{ ipr} / 2 = \mathbf{0.0035 \text{ inch}} \)

\[ A = \frac{D}{2} = \frac{1.375 \text{ inch}}{2} = 0.6875 \text{ inch} \]

\[ f_m = f_r N = 0.007 \text{ ipr} \times 138.899 \text{ rpm} = 0.972 \text{ inches per minute} \]

\[ CT = \frac{(L + A)}{f_m} = \frac{(1.250 \text{ inch} + 0.6875 \text{ inch})}{0.972 \text{ ipm}} = \mathbf{1.993 \text{ minutes}} \]

\[ MRR = \frac{\pi D^2}{4} f_r N = \frac{\pi \times (1.375 \text{ inch})^2}{4} \times 0.007 \text{ ipr} \times 138.899 \text{ rpm} = \mathbf{1.444 \text{ inch}^3/\text{min}} \]