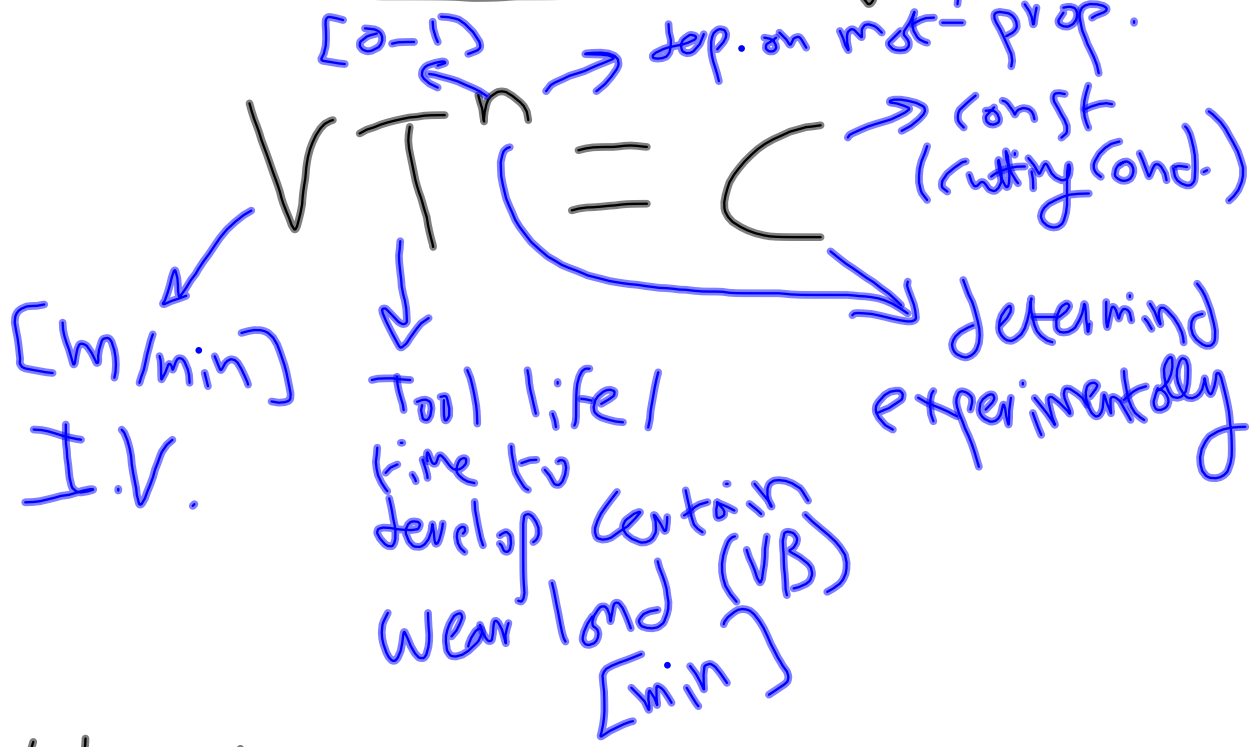
Taylor Tool Life Eq^n



Way to find C:

$$C = V_{@T=1\,min}$$

$$VT^n = C$$

$$V(1)^n = C \Rightarrow C = V_{@T=1\,min}$$

Effect of V on T

$$VT^n = C$$

$$\left[T^n\right]^{1/n} = \left[\frac{C}{V}\right]^{1/n} = \left(C\,V^{-1}\right)^{1/n}$$

$$T = C^{1/n} V^{-1/n} \quad \leftarrow n<1 \Rightarrow \tfrac{1}{n} > 0$$

can: as $V \uparrow \Rightarrow T \downarrow\downarrow$

as $n \downarrow \Rightarrow T \downarrow\downarrow$

Safe for (too) V: small
n: large

TTL Tuning Eqn

$$V T^{n} d^{x} f^{y} = C$$

typical values: $n = 0.15$, $x = 0.15$, $y = 0.60$

$$V T^{0.15} d^{0.15} f^{0.6} = C$$

isolate T:

$$\left[T^{0.15}\right]^{\frac{1}{0.15}} = \left[V^{-1} d^{-0.15} f^{-0.6} C\right]^{\frac{1}{0.15}}$$

$$T = V^{-\frac{1}{0.15}} d^{-1} f^{-4} C^{\frac{1}{0.15}}$$

$$\approx V^{-7} d^{-1} f^{-4} C^{7}$$

$$\approx V^{-7} f^{-4} d^{-1} C^{7}$$

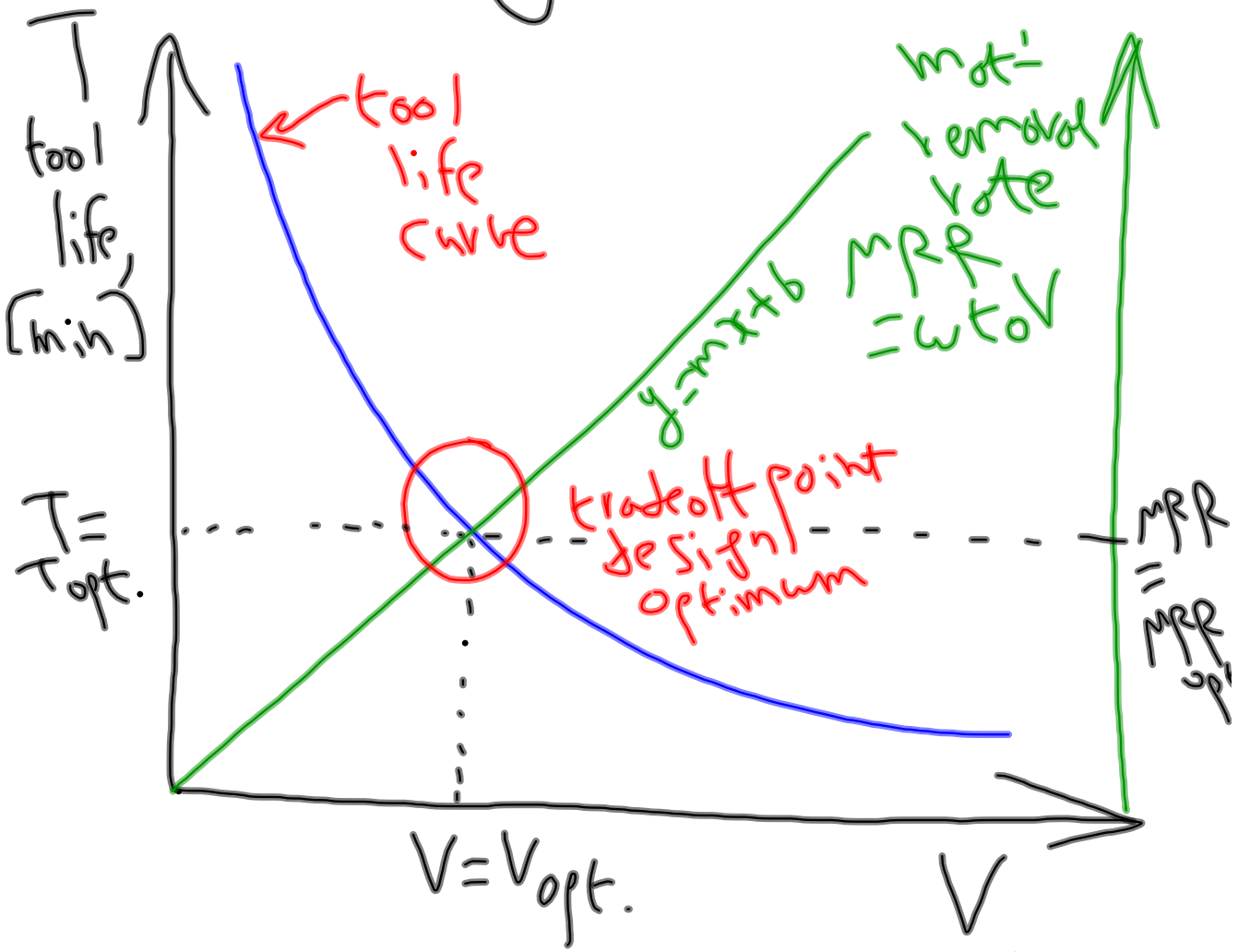
Conc. or: T (worst impact on) > V (less impact than) > f (less impact than)

- $V \uparrow \Rightarrow T \downarrow$
- $V \downarrow \Rightarrow$ MRR $\downarrow$ material cut $\downarrow$

try to make balance:

→ next.

Machining Tradeoff

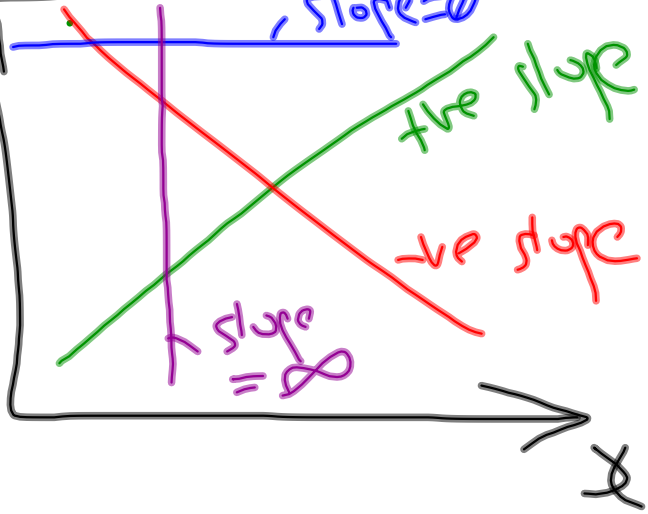


will cont. discussion in Machining Economics (later)

Tool life curves

$y = mx + b$

slope y-intercept



$VT^n = C$

$$n = -\frac{1}{m}$$

in tool life curve (log) S1.57

BONUS:

Prove this!