Wire drawing die formula

Input diameter（D）: $D = \frac{d}{(1-(A_1/100))^{1/2}}$

Output diameter（d）: $d = D(\sqrt{1-(A_1/100)})$

Elongation（E）: $E = 100\left[(D/d)^2 - 1\right]$

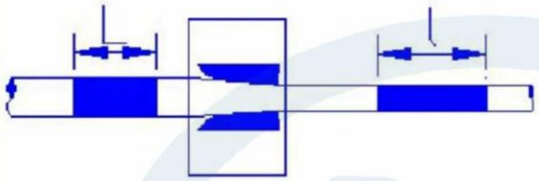
Area reduced rate（Ar）: $A_r = 100\left[1-(d/D)^2\right]$

Whole Area reduced rate（Are）: $A_{re} = 100\left[1-\sqrt[n]{(d/D)^2}\right]$

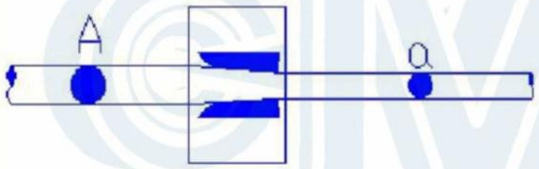
Speed of input wire（VD）: $VD = Vd(d/D)^2$

Speed of output wire（Vd）: $Vd = \frac{VD}{1-(A_r/100)}$

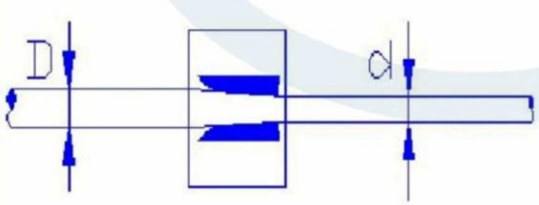
Number of dies（n）: $n = \frac{\log[1-(A_r/100)]}{\log[1-(A_{re}/100)]}$



E – Elongation
L – Input length
l – Output length
$E = \frac{l-L}{L} \times 100\% = \frac{100A_r}{100-A_r}$



A_r – Erea reduced rate
A – Input area
a – Output area
$A_r = \frac{A-a}{A} \times 100\% = \frac{100E}{100+E}$



D_r – Diameter reduced rate
D – Input diameter
d – Output diameter
$D_r = \frac{D-d}{D} = 100 - \left(1 - \sqrt{\frac{A_r}{E}}\right)$