General Formulations

Equivalent grinding wheel diameter ("De" Value)

$$D_e = \frac{D_w \bullet D_s}{D_w + D_s}$$ For external O.D. Grinding

D_w = Diameter of work

D_s = Diameter of wheel

$$D_e = \frac{D_w \bullet D_s}{D_w - D_s}$$ For internal I.D. Grinding

$D_e = D_s$ For surface Grinding

Knowing the "De" (equivalent diameter) value can be very helpful in understanding what to expect during the grinding process. Since the equation above shows that the value of De is the same value as the diameter of the wheel in surface grinding, imagine the value of De as the diameter of a wheel grinding a flat surface. The larger the number the more force and the higher required horsepower. Conversely, the smaller the number the less force and the smaller required horsepower. The De value is most significant when grinding difficult to grind materials. The amount of force needed to create a chip is much higher for M series steel as compared to 4140.

"G" Ratio – Grinding Ratio

$$G = \frac{V_w}{V_s}$$

V_w = Volume of work

V_s = Volume of wheel

Q' (in³/in•min.) – Q Prime (Cylindrical Grinding)

$$Q' = D_w \bullet \pi \bullet V_f$$

$$V_f = \frac{Q'}{D_w \bullet \pi}$$

D_w = Work piece diameter

π = 3.14

V_f = in-feed rate

Q' (in3/in•min) – Q' Prime (Reciprocating Surface Grinding)

$$Q' = a \bullet V_t$$

a = Depth of cut

V_t = Traverse rate

Q' (in3/in•min) – Q' Prime (Rotary Surface Grinding)

$$Q' = a \bullet V_f$$

a = Depth of cut

V_f = in-feed rate