



**Paragon Machine Technology**  
**Chappell Hill, TX**

PH: 979-836-7300 / FAX: 979-836-7308 / EMAIL: [sales@pmtfx.com](mailto:sales@pmtfx.com)

## TECHNICAL GUIDE – MACHINING FORMULAS

---

### I. TURNING (SINGLE-POINT)

#### A. CUTTING SPEED (SURFACE FEET PER MINUTE)

$$\text{S.F.M.} = \text{R.P.M.} \times \text{CUT } \phi / 3.82 \text{ - OR - } \text{S.F.M.} = \text{R.P.M.} \times \text{CUT } \phi \times 0.262$$

#### B. REVOLUTIONS PER MINUTE

$$\text{R.P.M.} = \text{S.F.M.} \times 3.82 / \text{CUT } \phi \text{ - OR - } \text{R.P.M.} = (\text{S.F.M.} / \text{CUT } \phi) / 0.262$$

#### C. FEED RATE (INCHES PER MINUTE)

$$\text{I.P.M.} = \text{I.P.R.} \times \text{R.P.M.}$$

#### D. MATERIAL REMOVAL RATE (CUBIC INCHES PER MINUTE)

$$\text{IN}^3/\text{MIN} = \text{D.O.C.} \times \text{FEED/REV.} \times \text{S.F.M.} \times 12$$

#### E. SURFACE FINISH ( $R_a$ , $\mu\text{in}$ )

$$R_a = ((\text{FEED RATE}^2) / (8 \times \text{TOOL NOSE RADIUS})) \times 317500$$

#### F. SURFACE FINISH (RMS, $\mu\text{in}$ )

$$\text{RMS} = R_a \times 1.11$$

#### G. CUTTING TIME (t)

$$t = \text{L.O.C. (IN)} / \text{FEED RATE (IN/MIN)}$$

#### H. HORSEPOWER REQUIRED AT MACHINE SPINDLE MOTOR ( $\text{HP}_m$ )

$$\text{HP}_m = (\text{M.R.R. (IN}^3/\text{MIN)} \times \text{MAT'L POWER CONSTANT}) / \text{SPINDLE DRIVE EFFICIENCY (\%)}$$

### II. MILLING

#### A. CUTTING SPEED (SURFACE FEET PER MINUTE)

$$\text{S.F.M.} = \text{R.P.M.} \times \text{CUTTER } \phi / 3.82 \text{ - OR - } \text{S.F.M.} = \text{R.P.M.} \times \text{CUTTER } \phi \times 0.262$$

#### B. REVOLUTIONS PER MINUTE

$$\text{R.P.M.} = \text{S.F.M.} \times 3.82 / \text{CUTTER } \phi \text{ - OR - } \text{R.P.M.} = (\text{S.F.M.} / \text{CUTTER } \phi) / 0.262$$

#### C. MATERIAL REMOVAL RATE (CUBIC INCHES PER MINUTE)

$$\text{IN}^3/\text{MIN} = \text{D.O.C.} \times \text{W.O.C.} \times \text{FEED (IN/MIN)}$$

#### D. CHIP LOAD (FEED PER TOOTH)

$$\text{F.P.T.} = \text{I.P.R.} / \# \text{ TEETH OR } \text{I.P.M.} / (\# \text{ TEETH} \times \text{R.P.M.})$$



**Paragon Machine Technology**  
**Chappell Hill, TX**

PH: 979-836-7300 / FAX: 979-836-7308 / EMAIL: [sales@pmftx.com](mailto:sales@pmftx.com)

## TECHNICAL GUIDE – MACHINING FORMULAS

---

**E. FEED RATE (INCHES PER MINUTE)**

$$\text{I.P.M.} = \text{F.P.T.} \times \# \text{ TEETH} \times \text{R.P.M.}$$

**F. FEED RATE (INCHES PER REVOLUTION)**

$$\text{I.P.R.} = \text{I.P.M.} / \text{R.P.M.}$$

**G. TABLE FEED ( $V_f$ )**

$$V_f = \# \text{ TEETH} \times \text{F.P.T.} \times \text{R.P.M.}$$

**H. CUTTING TIME (t)**

SAME AS TURNING “t” FORMULA

**I. HORSEPOWER REQUIRED AT MACHINE SPINDLE MOTOR ( $HP_m$ )**

SAME AS TURNING “ $HP_m$ ” FORMULA

### III. THREADING & TAPPING

**A. TAP DRILL SIZE (INCH SIZE CUT TAPS)**

$$\text{DRILL } \emptyset = \text{BASIC O.D. OF THD} - ((0.0130 \times \% \text{ OF FULL THD})/\text{PITCH (T.P.I.)})$$

**B. TAP DRILL SIZE (INCH SIZE ROLL FORM TAPS)**

$$\text{DRILL } \emptyset = \text{BASIC O.D. OF THD} - ((0.0068 \times \% \text{ OF FULL THD})/\text{PITCH (T.P.I.)})$$

**C. TAP DRILL SIZE (METRIC SIZE CUT TAPS)**

$$\text{DRILL } \emptyset = \text{BASIC O.D. OF THD} - ((\text{PITCH IN MM} \times \% \text{ OF FULL THD})/76.98)$$

**D. TAP DRILL SIZE (METRIC SIZE ROLL FORM TAPS)**

$$\text{DRILL } \emptyset = \text{BASIC O.D. OF THD} - ((\text{PITCH IN MM} \times \% \text{ OF FULL THD})/147.06)$$

**E. FEED (INCHES PER REVOLUTION - LATHE)**

$$\text{I.P.R.} = 1/\text{T.P.I.}$$

**F. FEED (INCHES PER MINUTE - MILLING)**

$$\text{I.P.M.} = \text{R.P.M.}/\text{T.P.I.}$$

**G. THREAD HELIX ANGLE**

$$\text{HA} = \text{ArcTan}(\text{PL}/\text{PDX}\pi)$$

WHERE:

HA = HELIX ANGLE



**Paragon Machine Technology**  
**Chappell Hill, TX**

PH: 979-836-7300 / FAX: 979-836-7308 / EMAIL: [sales@pmtfx.com](mailto:sales@pmtfx.com)

## TECHNICAL GUIDE – MACHINING FORMULAS

---

PL = PITCH LEAD  
PD = BASIC PITCH  $\emptyset$   
 $\pi = 3.14159$

### H. THREAD HELIX ANGLE – MULTI-START THREADS

HA =  $\text{ArcTan}((\# \text{ OF STARTS}) \times \text{PL}/\text{PDX}\pi)$

## IV. INCH – METRIC CONVERSIONS

### A. INCHES TO MILLIMETERS

MM = IN X 25.4

### B. MILLIMETERS TO INCHES

IN = MM/25.4 - OR - IN = MM X 0.03937

### C. CUTTING SPEED (SURFACE FEET PER MIN TO SURFACE METERS PER MIN)

S.M.M. = S.F.M. X 0.3048

### D. CUTTING SPEED (SURFACE METERS PER MIN TO SURFACE FEET PER MIN)

S.F.M. = S.M.M. X 3.2808399