HEAT AND TOOL WEAR

- **FACT:**
  - Heat accelerates chemical reactions?
- **FACT:**
  - Hot corrosion is frequently the leading cause of tool wear?
- **FACT:**
  - Hot corrosion is a chemical reaction between Cobalt and the Material being machined?
- **RESULT:**
  - Less heat slows hot corrosion which reduces tool wear.

REDUCING HEAT

FACT: AS CHIP SIZE INCREASES, THE VOLUME)/(SURFACE AREA) RATIO INCREASES.

FACT: THE LARGER THAT RATIO, THE MORE HEAT A CHIP CAN STORE

FACT: AS CHIPS ARE EJECTED, THEY CARRY AND RETAINED HEAT WITH THEM.

RESULTS: LARGER CHIPS CARRY MORE HEAT FROM THE CUT AND DO NOT ALLOW IT TO BE TRANSFERRED TO THE CUTTER.

ADDITIONAL METHODS OF HEAT REDUCTION

- **AVOID DEAD STOPS:**
  - SE Tools contact a part 300 times/sec?
  - DE Tools contact a part 600 times/sec?
  - 3E Tools contact a part 900 times/sec?
- **PLUNGING:**
  - Get in and start making chips?
- **COOLANT:**
  - Water
  - Air
  - Ramped Plunging into the workpiece
  - Higher Plunge Speeds

TYPICAL FEED RATES IN WOOD

- **1/4" CED - 1/4" DEPTH OF CUT:**
  - Wood Routs: 150ipm to 300ipm
  - Finishers: 150ipm to 250ipm
- **1/2" CED - 1/2" DEPTH OF CUT:**
  - Wood Routs: 200ipm to 400ipm
  - Chipbreaker/Finishers: 350ipm to 1200ipm
  - Roughers/Hoggers: 500ipm to 1500ipm
  - Compression Spirals: 400ipm to 1500ipm
  - Finishers: 200ipm to 600ipm

ALL FEED RATES BASED ON 18,000RPM SPINDLE SPEED

CNC FEED & SPEEDS FORMULAS

Chip Load (Inches) = Feed Rate (IPM) / RPM x No. Of Flutes

Spindle Speed Feed (IPM) (RPM) = Feed Rate / RPM x Number Of Flutes x Chip Load / Number Of Flutes x Chip Load

FOR TIME STUDIES AND TRUE AVERAGE CHIP LOADS USE THE FOLLOWING:

ACTUAL FEED RATE (IPM) =
INCHES ROUTED ÷ CUTTING TIME X 60

BIT DIAMETER ADJUSTMENTS:
1/4" CED = CHART FEED x .6
5/8" CED = CHART FEED x 1.2
3/8" CED = CHART FEED x .8
3/4" CED = CHART FEED x 1.4

DEPTH OF CUT ADJUSTMENTS BASED ON CUTTING EDGE DIAMETER

3/8" AND BELOW SIZES:
Normal Depth Of Cut = 2 x Cutting Edge Diameter
Feed Rate = .75 x Value Found In Bit Diameter Adjustments

Always remember make chips not dust!

TYPICAL FEED RATES IN PLASTICS

- **1/4" CED - 1/4" DEPTH OF CUT:**
  - Acrylics 125ipm to 250ipm
  - Polypropylene: 150ipm to 300ipm
  - Polyethylene or HDPE: 150ipm to 300ipm
  - Polycarbonate: 100ipm to 200ipm
- **1/2" CED - 1/2" DEPTH OF CUT:**
  - Acrylics 150ipm to 300ipm
  - Polypropylene: 150ipm to 400ipm
  - Polyethylene or HDPE: 200ipm to 500ipm
  - Polycarbonate: 100ipm to 250ipm

ALL FEED RATES BASED ON 18,000RPM SPINDLE SPEED

TYPICAL FEED RATES IN ALUMINUM

- **1/8" CED - .060" DEPTH OF CUT (Single Sheet):**
  - SC Spiral "O" Flutes: 150ipm to 300ipm
  - SC Standard Spirals: 60ipm to 125ipm
  - HSS Standard Spirals: 45ipm to 90ipm
- **1/4" CED - .25" DEPTH OF CUT (Stacked Sheet or Plate):**
  - SC Spiral "O" Flutes: 125ipm to 250ipm
  - SC Standard Spirals: 90ipm to 175ipm
  - HSS Standard Spirals: 75ipm to 150ipm

  Stacked sheet will typically feed faster than plate

ALL FEED RATES BASED ON 18,000RPM SPINDLE SPEED AND MIST COOLANT CONDITIONS

1/2" AND ABOVE SIZES:
Normal Depth Of Cut = 3 x Cutting Edge Diameter
Feed Rate = Full Chart Values
Feed Single Flutes Slightly Faster x 1.1