Troubleshooting

The Problem	Possible Causes	Possible Solution
Breakage	Work piece rigidity	Ensure work piece is secure and supported - a common issue
	Speed too low	Increase the cutting speed (RPM's)
	Feed rate too high	Reduce IPT
	Chip compaction	Reduce MRR
	Heavy depth of cut	Reduce RDOC & ADOC
	Part Entry	Reduce IPT on entry - implement radius in or sweeping entrances - avoid 90º (perpendicular) entry
	Milling Strategy	Review tool path and ensure there are no arbitrary moves, extreme angle of engagement increases & undesirable situations for the tool.
	Tool Overhang	Use shortest OAL, shortest LOC & reduce overhang from tool holder. Consider necked down tooling for long reach.
	Tool Runout	Check tool runout in holder/spindle. Utilize collet, milling chuck or shrink fit holders if possible. Hand ground shank flats can be suspect and a common cause of run out. (<.0003 TIR desired)
	Built up edge (BUE)	See the BUE section to increase IPT, utilize tool coatings (pg. 6)
	Reconditioning	Improper regrind/reconditioning – try factory service
Excessive Wear (Flank)	Speed too high	Reduce the cutting speed (RPM's)
	Feed rate too low	Increase feed rate (IPT)
	RDOC too high	Lessen RDOC as % of dia. - start with 10% reduction increments
	Chip Thinning	Utilize chip thinning adjustment (pg. 104)
	Tool Runout	Check tool run out in holder/spindle. Utilize collet, milling chuck or shrink fit holders if possible. Hand ground shank flats can be suspect and a common cause of runout. (<.0003 TIR desired)
	Recutting Chips	Re-adjust coolant flow, air blast or "op stop" to clear chip build up
	Milling Strategy	Ensure you are climb milling unless the material has hard/abrasive outer skin then convention milling technique is preferred for breakthrough. (pg. 60)
	Tool Coating	Ensure you have the appropriate coating for material being cut (pg. 6)
	Hard Materials (> than 55Rc)	Try 90-100 SFM with multi-fluted tool (5 flutes +)
Chipped Cutting Edge	Work piece rigidity	Check work piece is secure and supported - a common issue
	Tool holder rigidity	Use shortest holder possible and investigate for no tool slippage
	Feed rate too high	Reduce IPT
	Tool Heavy of a RDOC	Reduce RDOC
	Part Entry	Reduce IPT on entry – implement radius in or sweeping entrances - avoid 90º (perpendicular) entry
	Milling Strategy	Ensure you are climb milling unless the material has hard/abrasive outer skin - then conventional milling technique is preferred for breakthrough (pg. 60).
	Tool Overhang	Use shortest OAL, shortest LOC & reduce overhang from tool holder. Consider necked down tooling for long reach.
	Tool Run out	Check tool run out in holder/spindle. Utilize collet, milling chuck or shrink fit holders if possible. Hand ground shank flats can be suspect and a common cause of run out. (<.0003 TIR desired)
	Tool Coating	Implement proper tool coating for material to be cut (pg. 6)
	Edge prep	Ensure tool has proper edge prep
	Built Up Edge (BUE)	See BUE section to increase IPT, utilize tool coatings (pg. 6)
Excessive Corner Wear	No Corner Radius	Implement corner radius on tool - adds strength & tool life
	Speed too high	Reduce RPM's
	Tool Run out	Check tool run out in holder/spindle. Utilize collet, milling chuck or shrink fit holders if possible. Hand ground shank flats can be suspect and a common cause of run out. (<.0003 TIR desired)
	Tool Overhang	Ensure you are using the shortest OAL/LOC possible. Utilize necked tooling for longer reach.

Troubleshooting

The Problem	Possible Causes	Possible Solution
Chip Compaction	Insufficient chip room	Reduce number of flutes
	Feed rate too high	Reduce IPT and increase RPM
	Heavy depth of cut	Reduce ADOC/RDOC in side milling & ADOC in Slotting
	Coolant flush	Re-adjust coolant flow, air blast or "op stop" to clear chip build up
	Heavy depth of cut	Reduce RDOC & ADOC
	Large chip size	Utilize chip breaker style tool to better manage chip size
Built up Edge (BUE)	Chip welding	Utilize proper tool coating for material being cut
	Feed rate too low	Increased IPT
	Speed too low	Increase RPM's
	Coolant Strategy	Re-adjust coolant flow & check coolant mixture percentage
Chatter/ Vibration	Work piece rigidity	Check work piece is secure and supported
	Tool holder rigidity	Use shortest holder possible and investigate for no tool slippage
	Tool Overhang	Use shortest length tool, shortest loc, and reduce overhang from tool holder. Consider necked down tooling for long reach.
	Tool Run out	Check tool run out in holder/spindle. Utilize collet, milling chuck, or shrink fit holders if possible. Hand ground shank flats can be suspect and a common cause of run out. (<.0003 TIR desired)
	Chip Thinning	Utilize chip thinning adjustment (pg. 104)
	Speed too high	Lower the RPM's
	Feed rate too low	Increased IPT
	Angle of engagement violation	Use smaller tools generating corner radi in pockets - avoid tool diameters that match corner dia./radius.
	Too much surface contact	Try utilizing a lower flute count tool
	Milling Strategy	Ensure you are climb milling unless the material has hard/abrasive outer skin then convention milling technique is preferred for breakthrough. (pg. 60)
Poor Surface Finish	Feed rate too high	Reduce IPT
	Speed too low	Increase RPM's
	Too light of a RDOC	Increase RDOC to stabilize tool in cut.
	Tool Run out	Check tool run out in holder/spindle. Utilize collet, milling chuck, or shrink fit holders if possible. Hand ground shank flats can be suspect and a common cause of run out. (<.0003 TIR desired)
	Helix Angle	Change to tool with higher helix angle.
	Need more Flutes	Choose end mill with higher number of flutes
	Recutting Chips	Redirect/evaluate coolant flush – or use less number of flutes
	Built Up Edge	Increase IPT - Increase RPM - Utilize tool coatings (pg. 6)
Deflection	Tool Overhang	Use shortest length tool, shortest loc, & reduce overhang from tool holder.
	Milling Strategy	Climb milling can help reduce the amount of deflection in some cases.
	Too heavy of a RDOC	Reduce ADOC/RDOC in side milling & ADOC in slotting
	Feed rate too high	Decrease IPT
	End Mill Diameter	Increase diameter of end mill for higher strength-to-length ratio
	Increase Number of Flutes	Higher number of flutes = larger core diameter = increased strength
Dimension Accuracy (Tapered Wall)	Coolant Strategy	Re-adjust coolant flow & check coolant mixture percentage
	Deflection	Refer to deflection section above or (pg. 105)
	Feed rate too high	Lower feed rate (IPT)
	RDOC too high	Reduce RDOC
	Tool Run out	Check tool run out in holder/spindle. Utilize collet, milling chuck, or shrink fit holders if possible. Hand ground shank flats can be suspect and a common cause of run out. (<.0003 TIR desired)