Insert Wear & Troubleshooting

Read the edge, fix the cause. The common wear patterns on turning and milling inserts and the first changes to make.

Insert wear: what you see and what to do

turning and milling

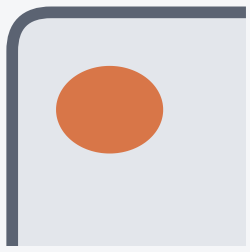


Flank wear

Even wear land on the clearance face. Normal wear; index when the land reaches about 0.3 mm.

Cause: Abrasion; cutting speed too high; grade not wear-resistant enough.

Fix: Lower Vc; choose a more wear-resistant or coated grade.

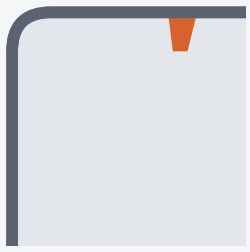


Crater wear

A hollow worn into the rake face behind the edge.

Cause: Heat and diffusion, mostly in steel at high speed.

Fix: Lower Vc and feed; use an alumina-coated grade; more positive geometry.

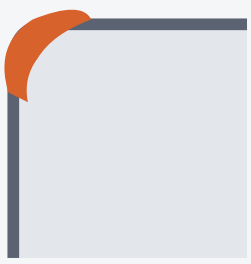


Notch wear

A deep notch at the depth-of-cut line.

Cause: Work-hardened surface, scale or casting skin; common in stainless and superalloys.

Fix: Vary the depth of cut; smaller entering angle or round insert; tougher grade.

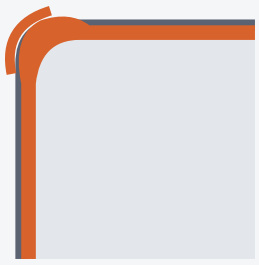


Built-up edge

Workpiece material welded onto the edge, breaking away with bits of edge.

Cause: Speed too low; sticky materials such as stainless, aluminium and low-carbon steel.

Fix: Raise Vc; sharp positive edge; coolant; polished or PVD-coated grade.

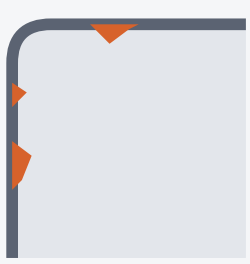


Plastic deformation

The edge sags or bulges from heat and pressure.

Cause: Too much heat and load at the edge.

Fix: Lower Vc and feed; harder grade; larger nose radius; more coolant.

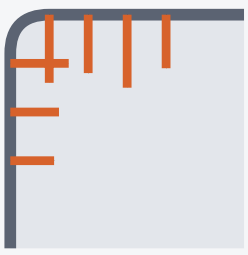


Edge chipping

Small pieces broken out of the edge line.

Cause: Interrupted cuts, vibration, inclusions or a too-brittle grade.

Fix: Tougher grade; honed or chamfered edge; reduce feed on entry; improve rigidity.

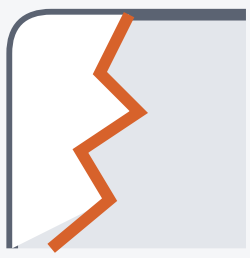


Thermal cracks

Fine cracks across the edge, like a comb.

Cause: Heating and cooling cycles in interrupted cuts or milling.

Fix: Tougher grade; run dry or flood fully, never on-off; reduce Vc.

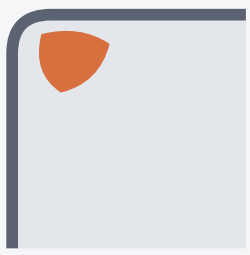


Insert fracture

The corner or a large part of the insert breaks off.

Cause: Overload, late indexing, or a weak set-up.

Fix: Index earlier; stronger insert (thicker, larger angle); lower feed and depth; check clamping.



Coating flaking

Coating peels away, often with built-up material.

Cause: Sticking material and edge loading.

Fix: Raise Vc; sharper PVD grade; check coolant concentration.

Troubleshooting

problem and first things to try

Problem	Try this
Poor surface finish	Raise Vc; larger nose radius or wiper insert; lower feed; check for built-up edge or a worn edge.
Chatter and vibration	Shorten overhang; smaller nose radius; more positive insert; lower depth of cut; try a different speed.
Long, stringy chips	Increase feed or depth of cut; choose a chipbreaker for that feed; use high-pressure coolant.
Chips too short, jamming	Reduce feed; use a more open chipbreaker; increase depth of cut.
Burr at the exit	Sharper edge; chamfer before breaking out; reduce feed at exit; change the entering angle.
Size drifting	Edge wear or heat growth. Warm up the machine, index on schedule, check offsets.
Short tool life	Check Vc against the grade; correct coolant concentration; improve stability; match grade to the ISO material group.

Reference values compiled from the cited standards and published manufacturer data. Always confirm against the tool maker's recommendations for your machine, tool and set-up.

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