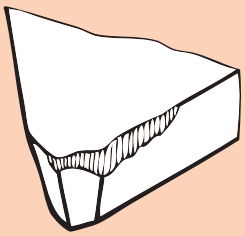
Technical Information - Turning

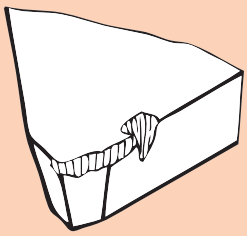
Trouble Shooting for Turning Applications



Flank Wear

General criteria for end of tool life, characterized by an admissible amount of flank wear. Figures usually relate to a tool life of T = 15 min.

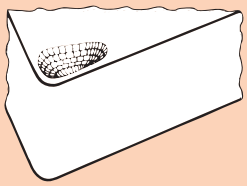
Remedy:
- select more wear resistant grade
- reduce cutting speed



Notch Wear

Occurs locally in the area of the primary cutting edge where it contacts the workpiece surface. Caused by hard surface layers and work-hardened burrs, especially on austenitic stainless steels. Danger of breakage!

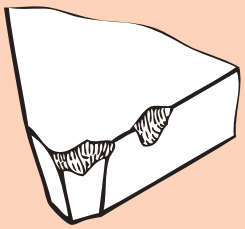
Remedy:
- strengthen cutting edge
- select smaller approach angle (45°)
- reduce feed



Crater Wear

Wear on the rake face, primarily characterized by crater depth. Not a tool-life criterion with modern coated carbide inserts and positive chipbreaker geometries.

Remedy:
- use coated carbide grades
- select positive insert geometries
- reduce cutting speed

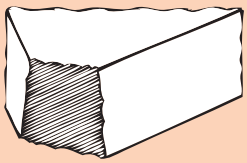


Edge Chipping

Minor chipping along the cutting edge, usually accompanied by flank wear and therefore not always identifiable. Danger of breakage! Edge chipping outside the cutting area is the result of chip impact due to unfavorable chip removal.

Remedy:
- select tougher grade
- use insert with stronger cutting edge geometry
- reduce feed when starting the cut

Damage Caused by Chip Impact:
- varying feed
- change chipbreaker geometry
- change approach angle



Insert breakage

Insert breakage usually means damage to tool and workpiece. Causes are varied and depend on machine and workpiece. Often originates in notches or excessive wear.

Remedy:
- select tougher grade
- use insert with stronger cutting edge geometry
- select chipbreaker geometry for heavier chip sections
- reduce feed and possibly also depth of cut

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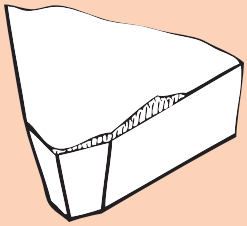
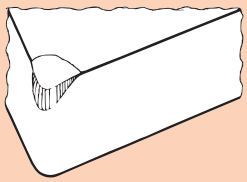


Built-Up Edges

Edge build-up occurs on the rake face as a result of the work material welding together with the cutting material, especially when cutting difficult-to-machine materials. From time to time the built-up edge will break off and may cause damage to the cutting edge. Built-up edges result in poor surface finish.

Remedy:

- increase cutting speed
- use coated carbides or cermets
- select positive cutting edge geometry
- use cutting fluid

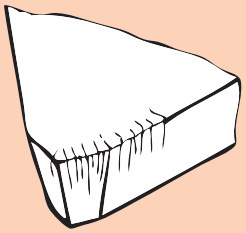


Plastic Deformation

Caused by overloading of the cutting edge combined with high machining temperatures. Danger of breakage!

Remedy:

- reduce cutting speed
- lower feed
- use a more wear-resistant carbide grade

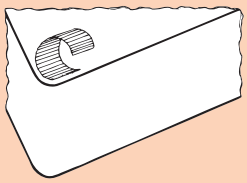


Thermal Cracks

Effective chip control is essential for trouble-free operation. Key factors are work material, feed, and depth of cut. Too-short chips result in vibrations and cutting edge overloading. Danger of breakage!

Remedy:

- use grade with greater resistance to thermal shock
- check use of cutting fluid



Chip Control

Effective chip control is essential for trouble-free operation. Key factors are work material, feed, and depth of cut. Too-short chips result in vibrations and cutting edge overloading. Danger of breakage!

Remedy:

- avoid too small depths of cut below 1x radius, except in finishing
- if chips too long: select chipbreaker geometry for smaller chip sections or increase feed
- if chips too short: select chipbreaker geometry for larger chip section or reduce feed
- when form turning shoulders, check sequence of operations

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Surface Finish

Surface roughness is a tool-life criteria often applied in finishing operations. It is affected by the configuration and condition of the cutting point, the cutting conditions, and the rigidity of the machining setup.

Remedy:
- increase cutting speed
- use cermets where possible when cutting steel
- reduce feed
- avoid vibrations
- increase radius
- use cutting fluid

Chatter Marks

Chatter marks or surface damage due to unfavorable chip flow call for special measures.

Remedy:
- vary feed slightly
- select different chipbreaker geometry
- change approach angle
- check rigidity of tool and holding system

Shape & Dimensional Accuracy

Shape and dimensional accuracy are affected by the condition of the overall machine-part-tool setup.

Remedy:
- select grade with adequate wear resistance
- keep cutting forces low systems
- check cutting parameters, including machining allowance
- avoid unbalance
- check rigidity of tool and work holding

Vibrations, Instability

Vibrations in the workpiece usually occur with thin-walled parts and non-rigid setups. Unbalance and excessive cutting forces also cause problems.

Remedy:
- select larger approach angle for the tool
- change turning frequency (rpm)
- use positive geometries
- reduce chip section
- use smaller radii

Burring

Burring cannot always be avoided when cutting steel workpieces. Chamfering operations should therefore be planned where possible.

Remedy:
- select inserts with positive geometry
- reduce approach angle
- use sharpest possible cutting edges, e.g., cermets
- check sequence of operations