



Uzura sculelor așchietoare

STEM4inclusive schools
WP2 – Toolbox

-1-



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Tipuri de uzură

- uzura pe fața de așezare;
- uzură sub forma de crater;
- uzură sub formă de ciupituri;
- fisuri cauzate de stresul termic;
- depunere pe tăiș;
- uzură catastrofală.

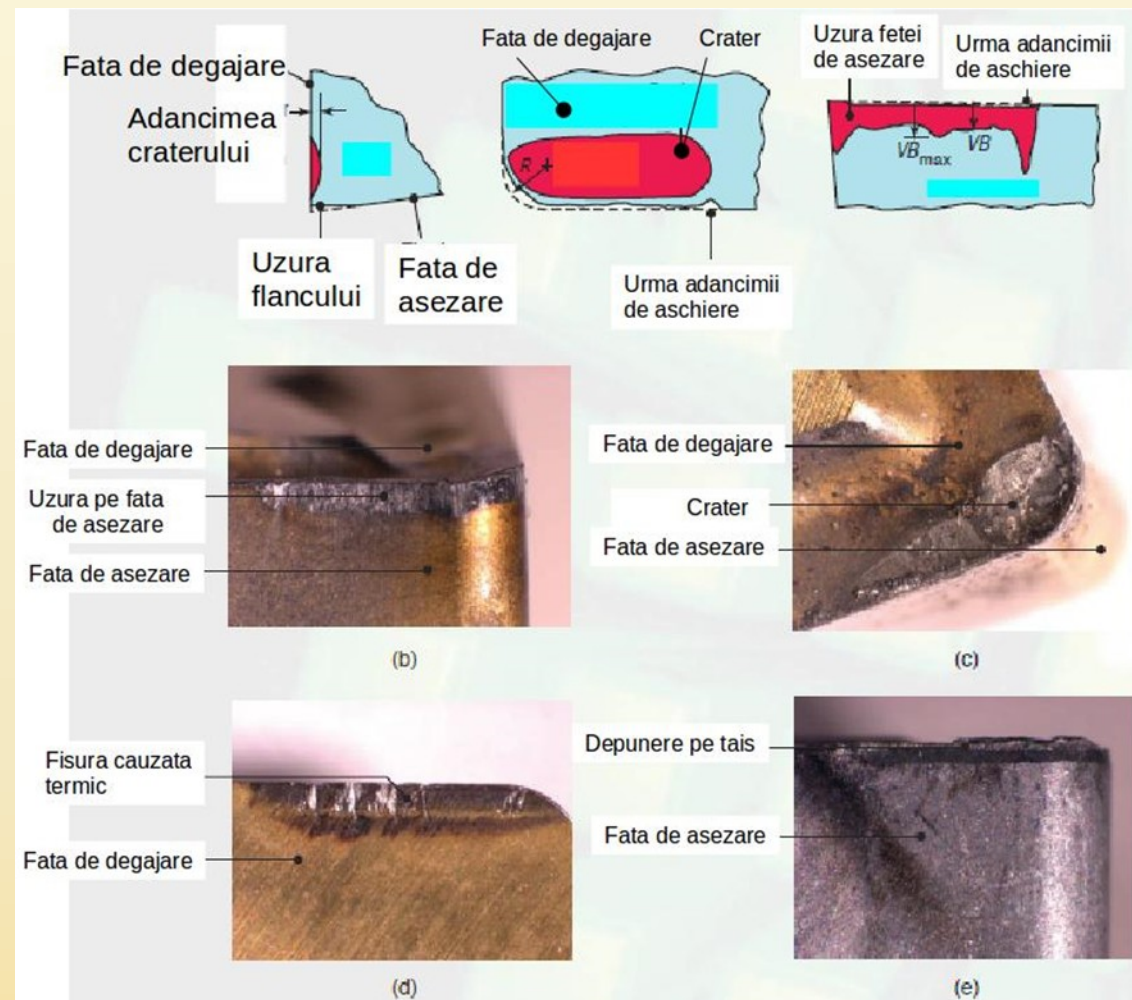
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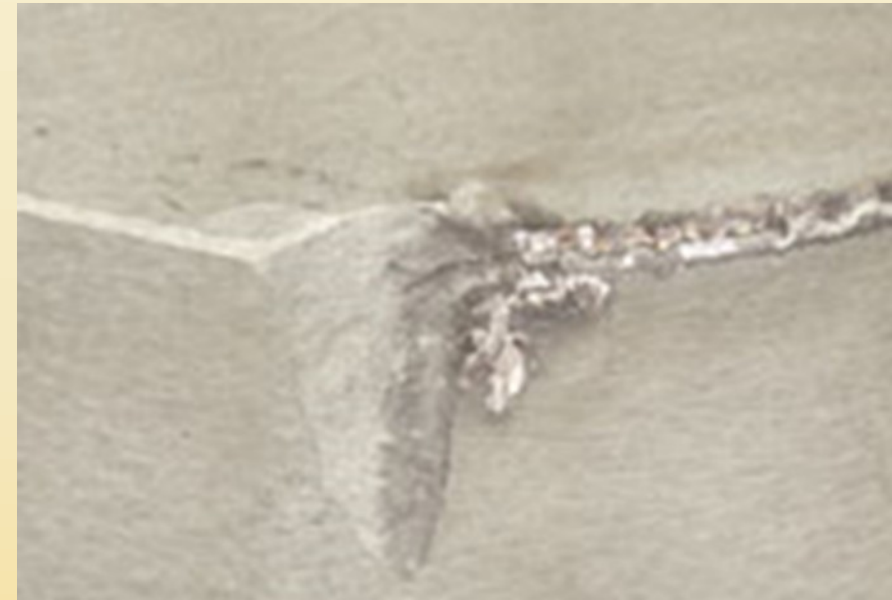
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Tipuri de uzură



-3-



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Tipuri de uzură



-4-



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Ecuatia Taylor

$$VT^n = C$$

Materialul sculei	Exponentul n
Oțel rapid	0,08 – 0,2
Aliaje turnate	0,1 – 0,15
Carburi metalice	0,2 – 0,05
Materiale mineralo-ceramice	0,5 - 0,7

-5-



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Efectul materialului semifabricatului asupra durabilității

Efectul microstructurii semifabricatului asupra durabilității sculei, la strunjire.

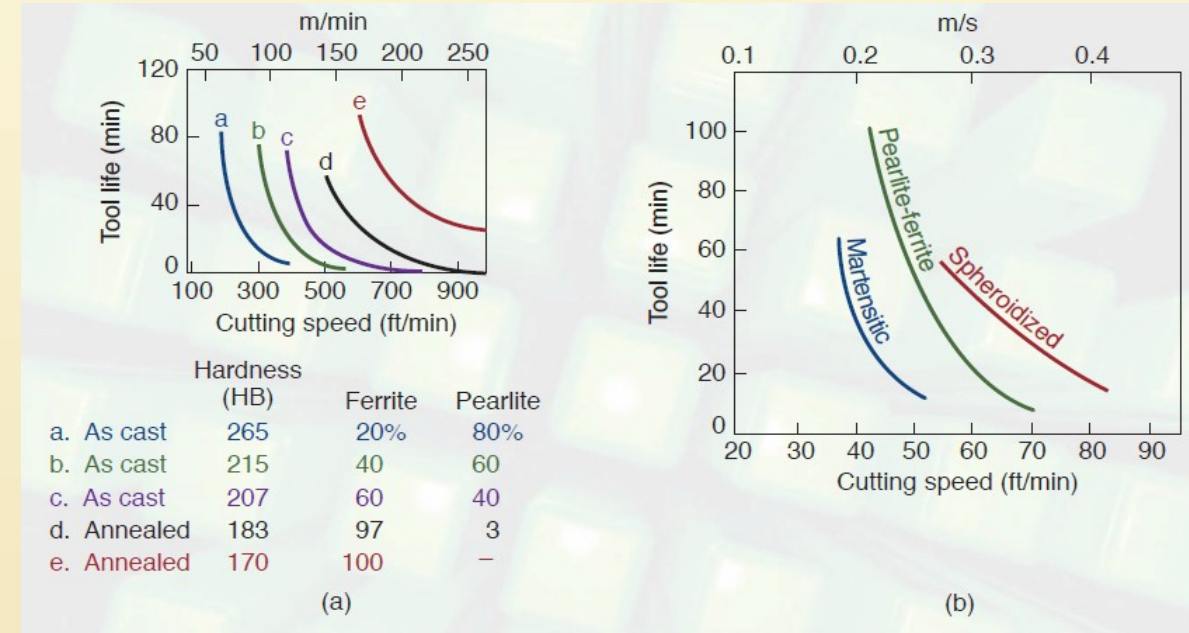
Durabilitatea este dată ca timp (în minute) necesar pentru a se ajunge la o uzură a flancului de o anumită dimensiune.

- a). fontă;
- b). oțel.

-6-



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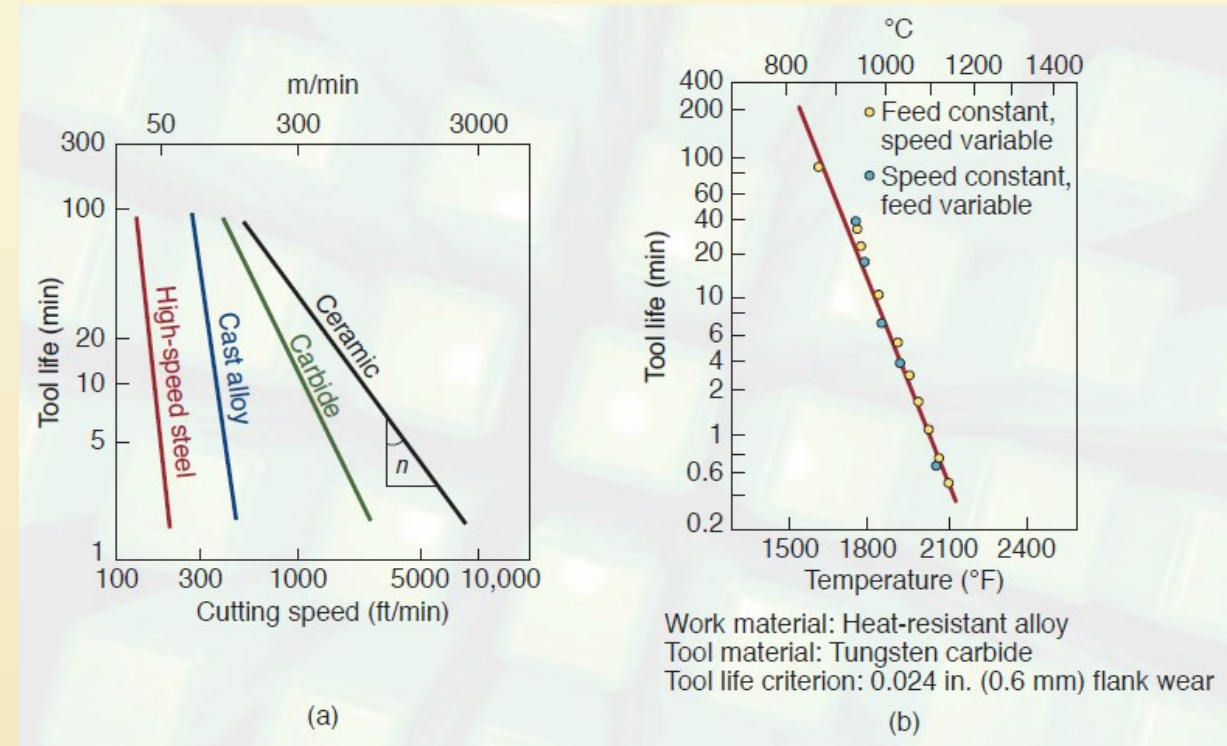


Tool wear monitoring for milling by tracking cutting force model coefficients}, Yanjun Cui, 2008, url <https://api.semanticscholar.org/CorpusID:113926195>



Diagramele durabilității

- a). Diagramele de durabilitate pentru diverse materiale.
Panta curbei corespunde exponentului n al durabilității.
- b). Relațiile între temperatura măsurată în timpul așchierii și durabilitatea sculei (pentru uzura flancului).



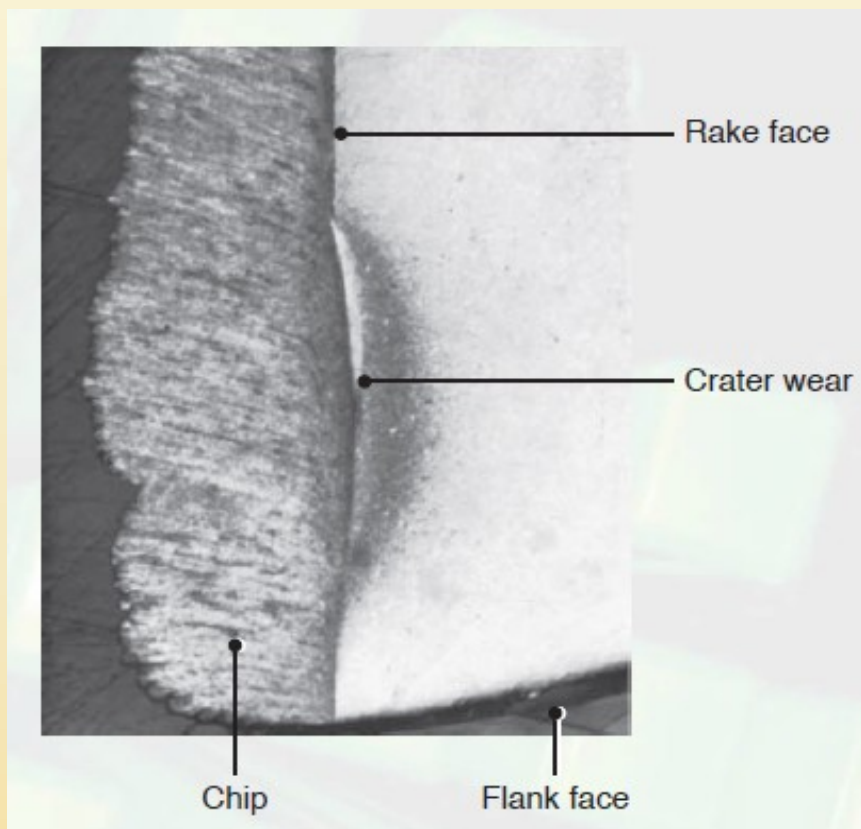
Tool wear monitoring for milling by tracking cutting force model coefficients}, Yanjun Cui, 2008, url <https://api.semanticscholar.org/CorpusID:113926195>

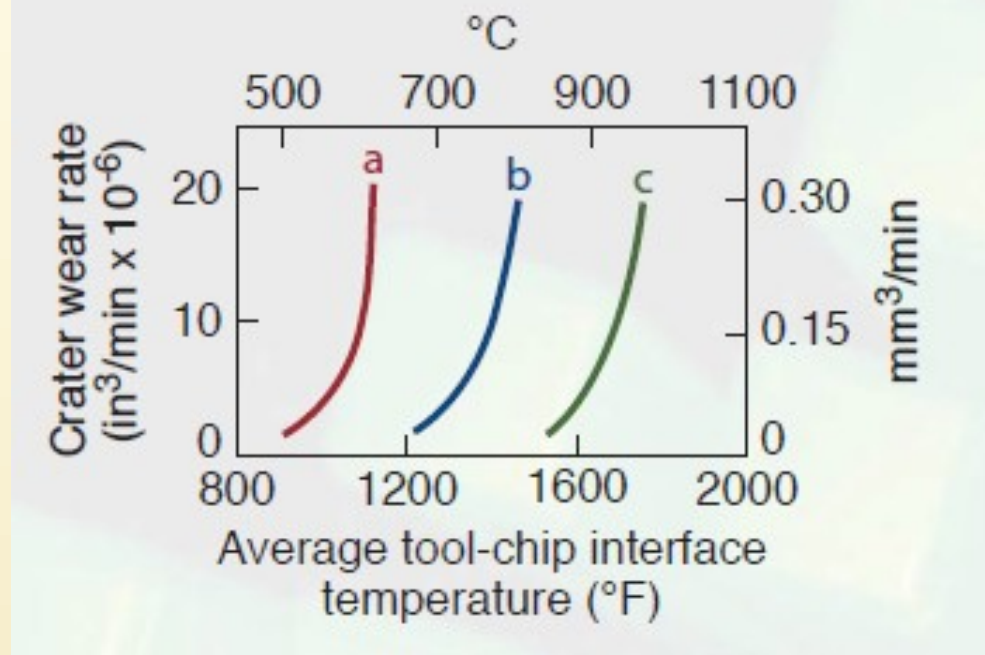




Interfața între așchie (stânga) și fața de degajare a sculei (dreapta), și uzura tip crater la așchiera unui oțel AISI 1040 cu viteza de 3 m/s.

Schimbarea culorii sculei indica temperatura înaltă. De remarcat coincidența între forma craterului și tiparul modificării culorii.





Tool wear monitoring for milling by tracking cutting force model coefficients}, Yanjun Cui, 2008, url <https://api.semanticscholar.org/CorpusID:113926195>

Relația între uzura de tip crater și temperatura medie la interfața scula-piesa, în cazul strunjirii:

- a). sculă din oțel rapid;
- b). carbură C1;
- c). carbură C5.

De remarcat creșterea rapidă a uzurii într-un domeniu îngust de temperatura.

Uzura admisibilă [mm]		
Procedeul	Oțel rapid	Carburi
Strunjire	1,5	0,4
Frezare cilindrică	1,5	0,4
Frezare frontală	0,3	0,3
Burghiere	0,4	0,4
Alezare	0,15	0,15





Relația între uzura medie pe fața de așezare, uzura maximă tip crater și emisia acustică, funcție de timpul de prelucrare. Tehnica este dezvoltată ca mijloc de monitorizare a uzurii în diverse procedee de așchiere (metodă continuă și indirectă).

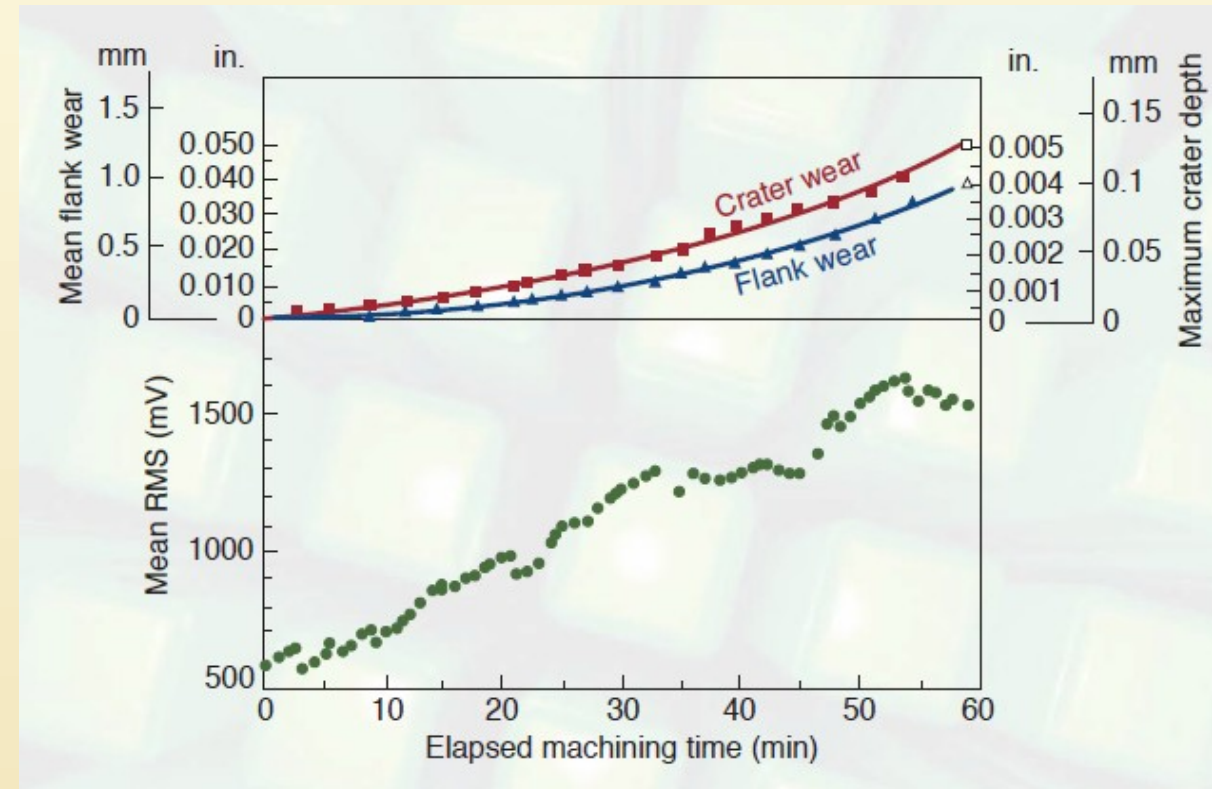
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Tool wear monitoring for milling by tracking cutting force model coefficients}, Yanjun Cui, 2008, url <https://api.semanticscholar.org/CorpusID:113926195>



Mecanisme de uzare

Uzura prin abraziune

Apare în zonele de contact între așchie și fața de degajare a sculei, respectiv între suprafața așchiată și fața de așezare a sculei și este cauzată de particulele abrazive dure (cementita sau carburi ale unor elemente de aliere).

Se manifestă în principal sub formă de uzură pe fața de așezare sau sub formă de crater, la prelucrarea cu scule de oțel carbon.





Mecanisme de uzare

Uzura de adeziune

Este cauzată de adeziunea moleculară a unor constituenți ai materialului aşchiat, la materialul sculei (de exemplu adeziunea între ferita din materialul de prelucrat și cobaltul din materialul sculei).

-12-



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Mecanisme de uzare

Uzura de difuziune

Se produce ca urmare a difuziunii unor elemente din materialul sculei în soluția solidă a materialului de prelucrat.

De exemplu, la prelucrarea cu scule din carburi metalice, carbonul din materialul aculei, sub acțiunea temperaturilor și presiunilor înalte migrează în materialul așchiei.

-13-



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Mecanisme de uzare

Uzura prin transport de ioni

Materialul sculei și al piesei formează un cuplu galvanic. În acest cuplu se formează un curent ionic, cu sensul de la sculă la piesă. Prin acest curent, scula pierde ioni și se uzează.

-14-



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Mecanisme de uzare

Uzura prin fărâmițare

Apare ca urmare a solicitărilor sculei realizate din materiale casante (de exemplu carburi metalice).

-15-



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Criterii de uzură

Momentul apariției unei uzuri inacceptabile a sculei așchietoare poate fi sesizat prin diverse semne:

- apariția unor dungi lucioase pe suprafața așchiată.
- creșterea forței de așchiere;
- schimbarea formei și culorii așchiei (apariția culorilor de revenire pe suprafața așchiei);
- creșterea rugozității suprafeței așchiate;
- apariția vibrațiilor în sistemul tehnologic.





Criterii de uzură

Uzura diferitelor elemente ale părții active a sculei se stabilește în mod convențional. De exemplu: $V_B=0,2$ mm, $K=0,1$.

În acest fel se pot defini indicatorii de prelucrabilitate de tipul:

$V_{60\ B\ 0,2}$ – viteza de așchiere pentru care, după 60 de minute de așchiere continuă, apare pe suprafața de așezare a sculei o uzură V_B de 0,2 mm, în condiții de așchiere obișnuite.

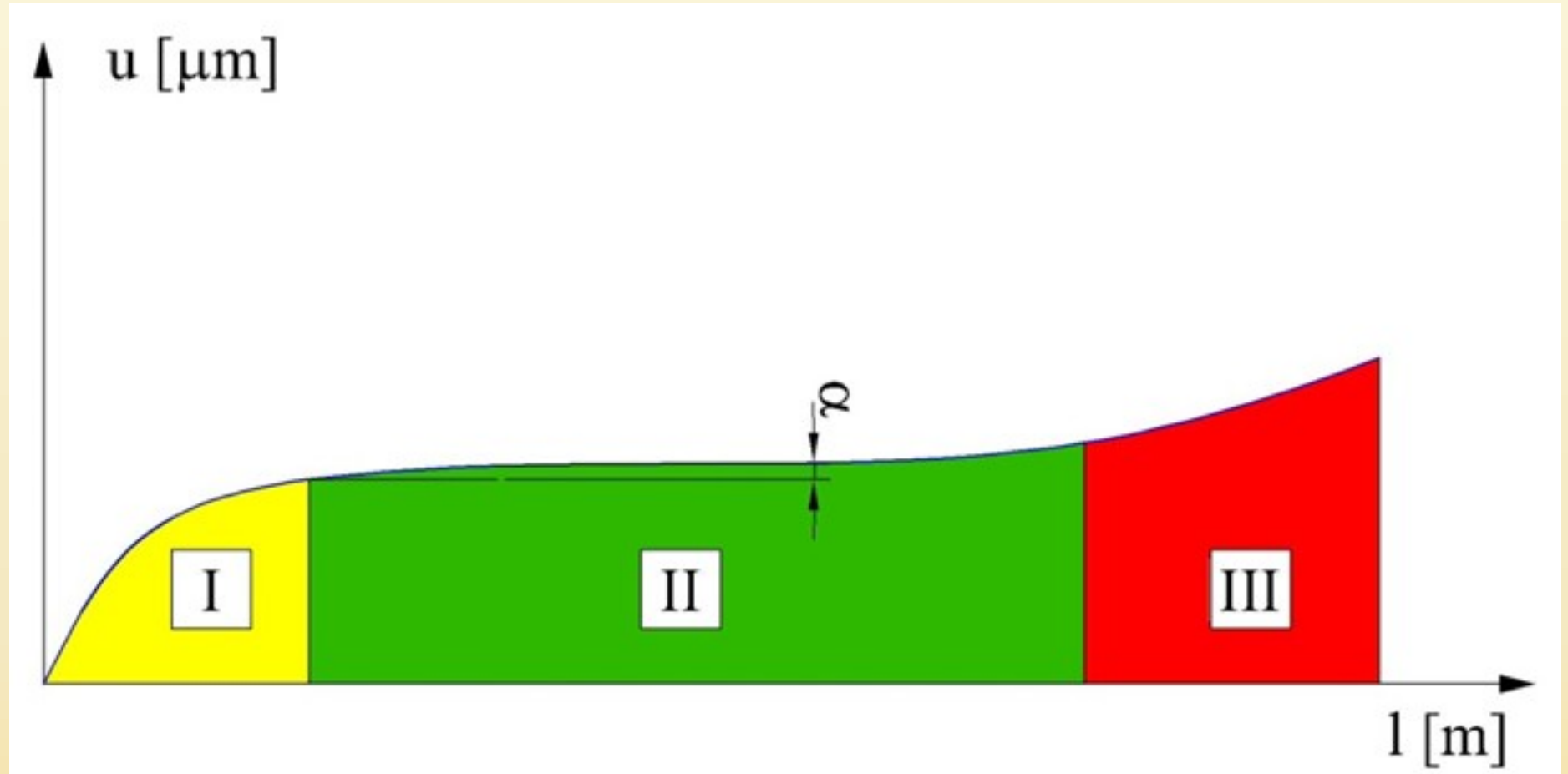
$V_{60\ K\ 0,1}$ – viteza de așchiere pentru care, după 60 de minute de așchiere, se produce un crater pe suprafața de degajare, caracterizat de raportul $K=0,1$, în condiții de așchiere obișnuite.

V_{60} – viteza de așchiere pentru care, după 60 de minute de așchiere continuă, în condiții obișnuite de lucru, se produce o uzură catastrofală.



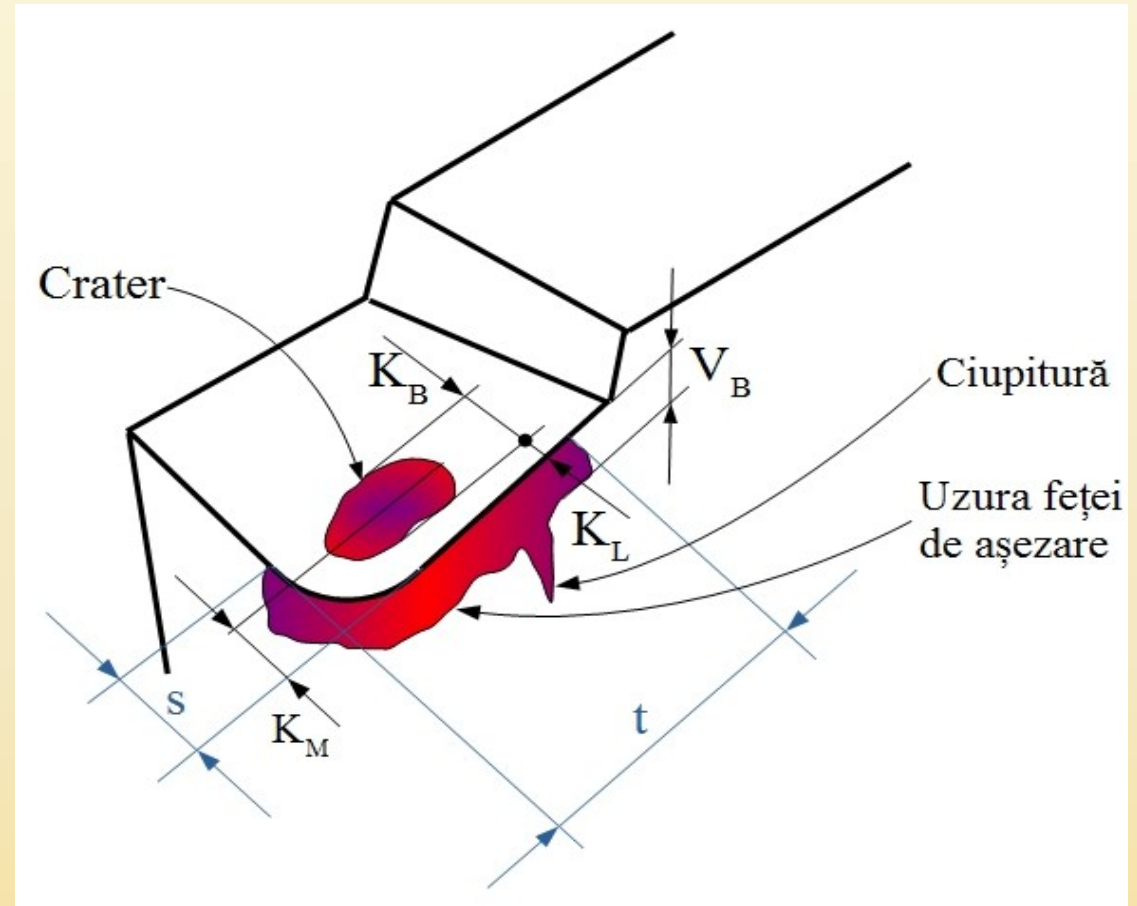


Analizând uzura sculei aşchietoare în timp se pot distinge trei zone principale pe diagrama de uzură.





Valori admisibile pentru parametrii criteriilor de uzură



-19-



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-20-



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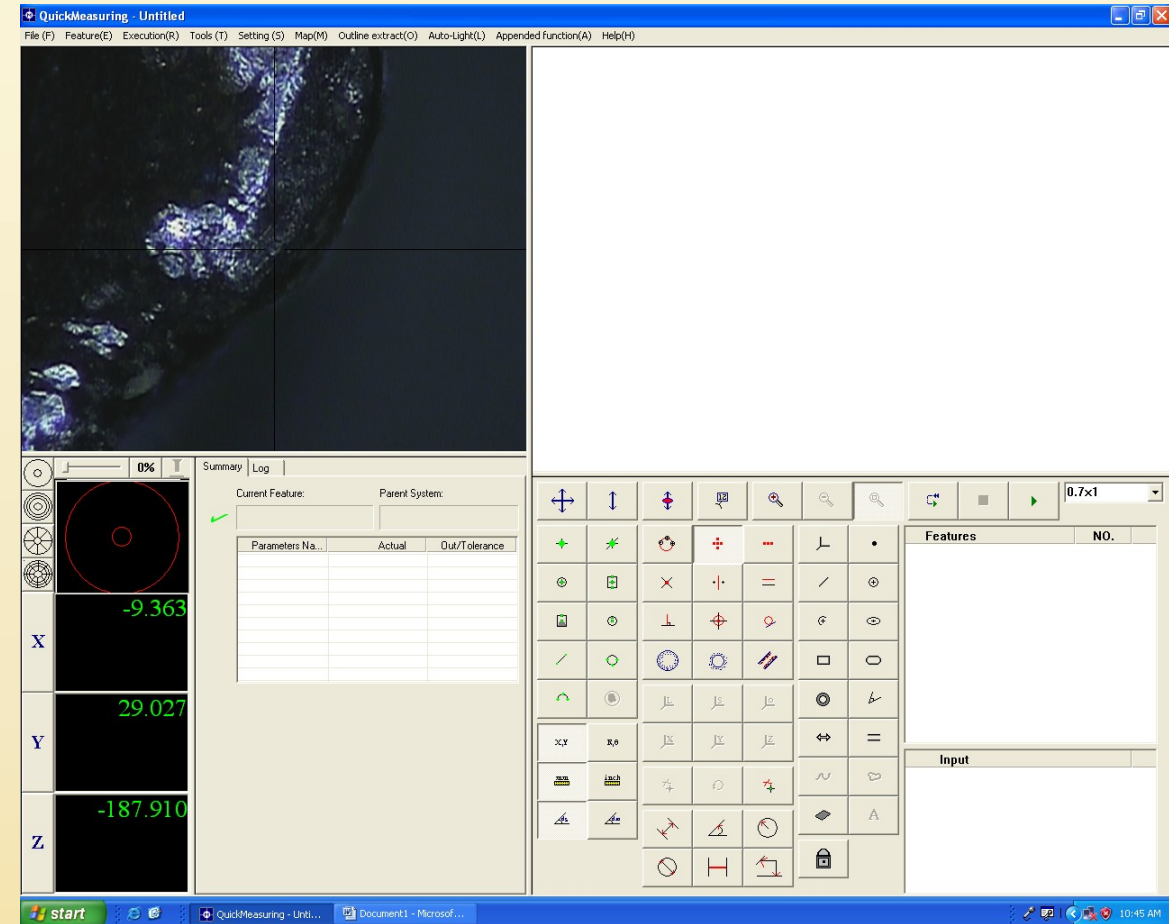
Tipuri de uzură



-21-

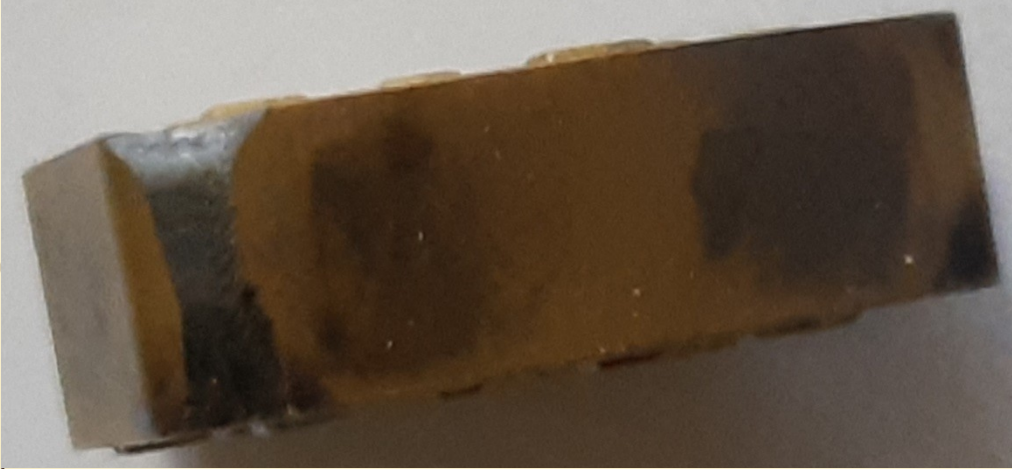


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-22-



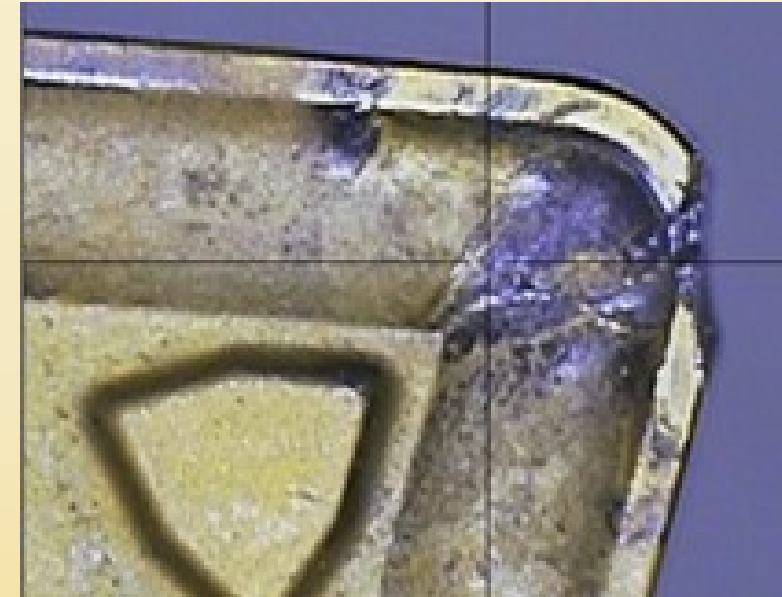
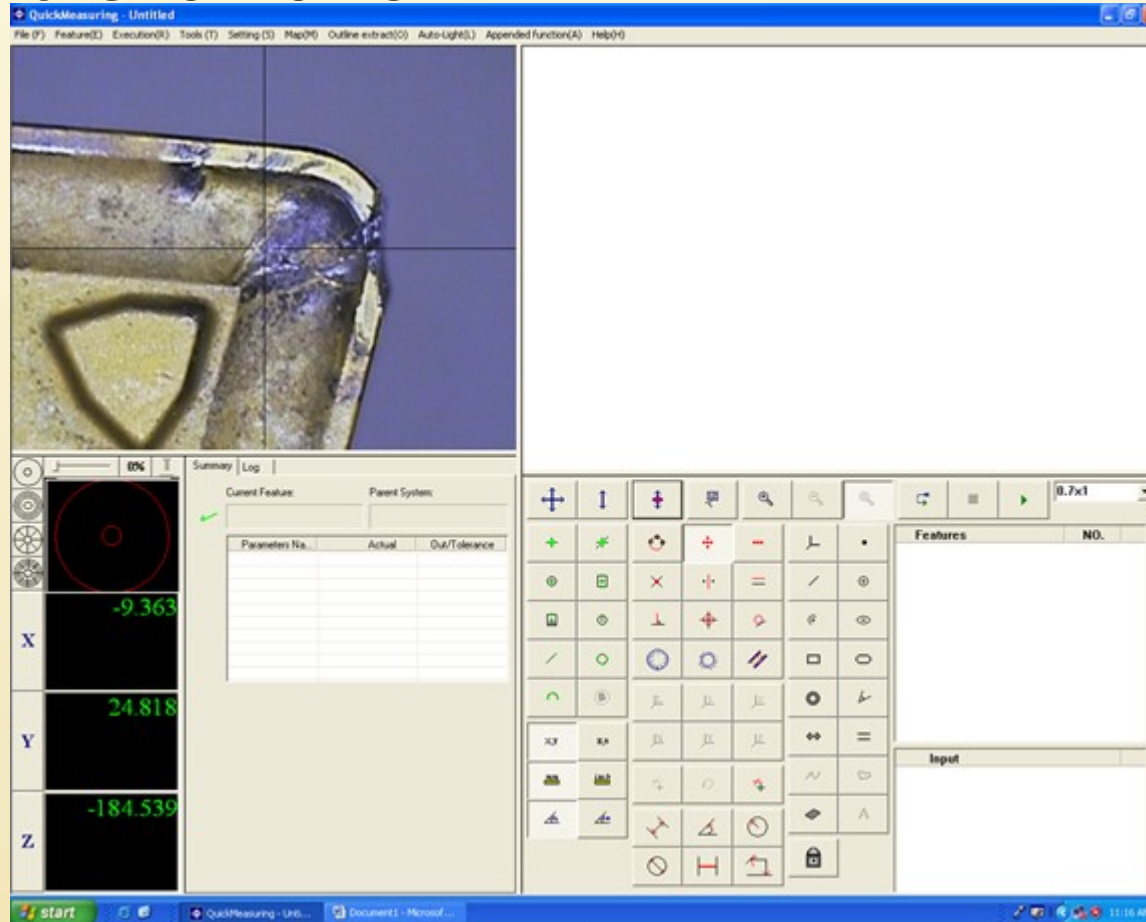
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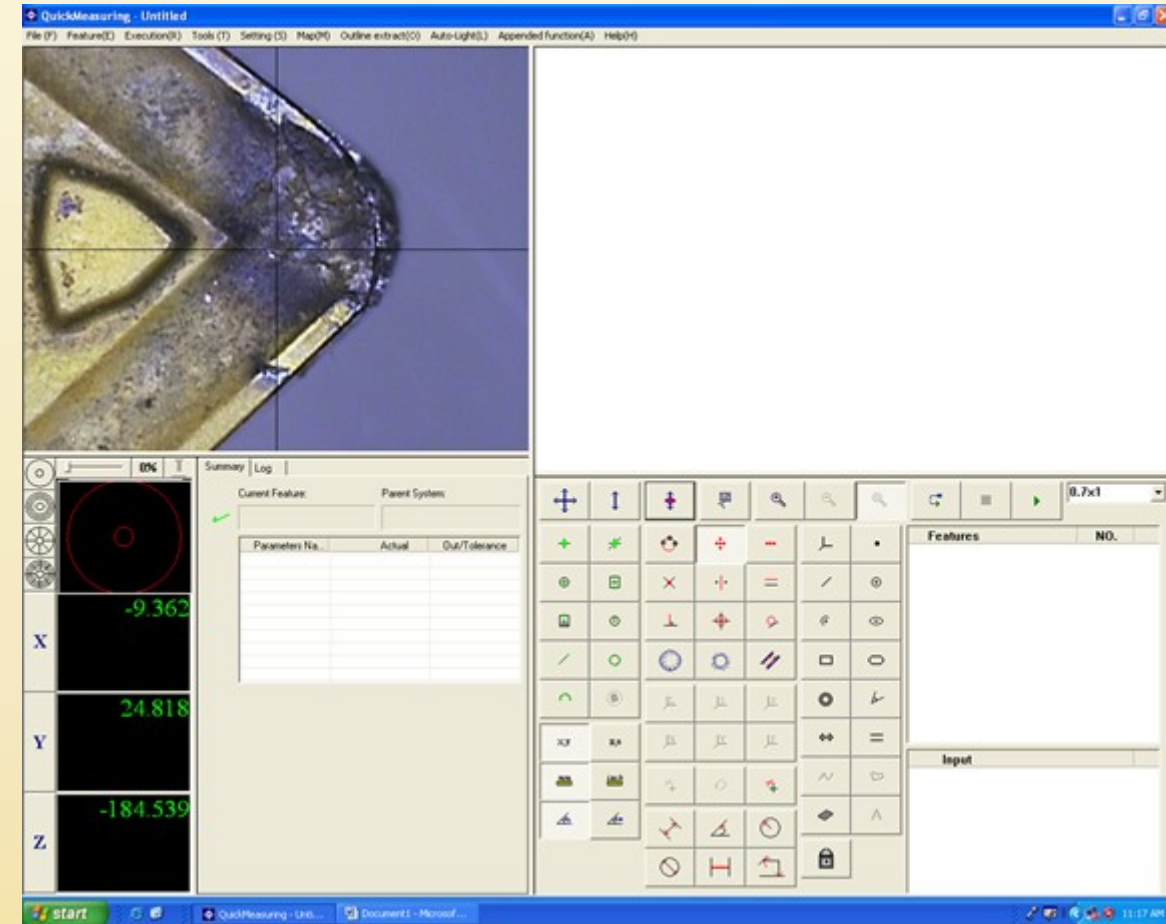
Tipuri de uzură



-24-



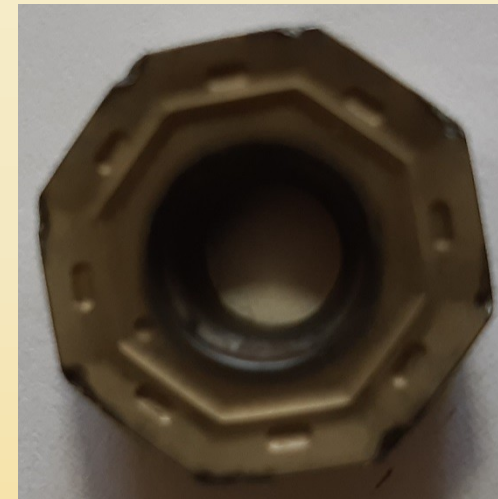
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-25-



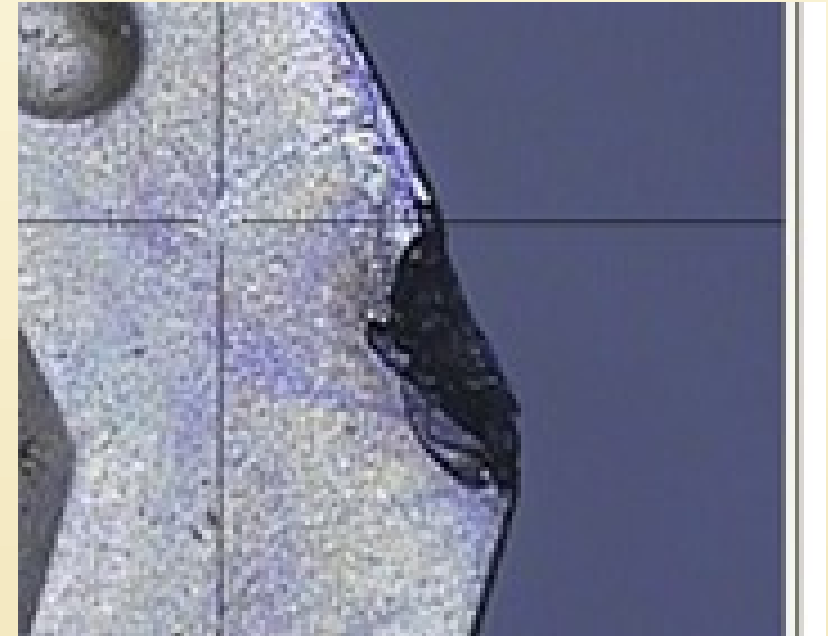
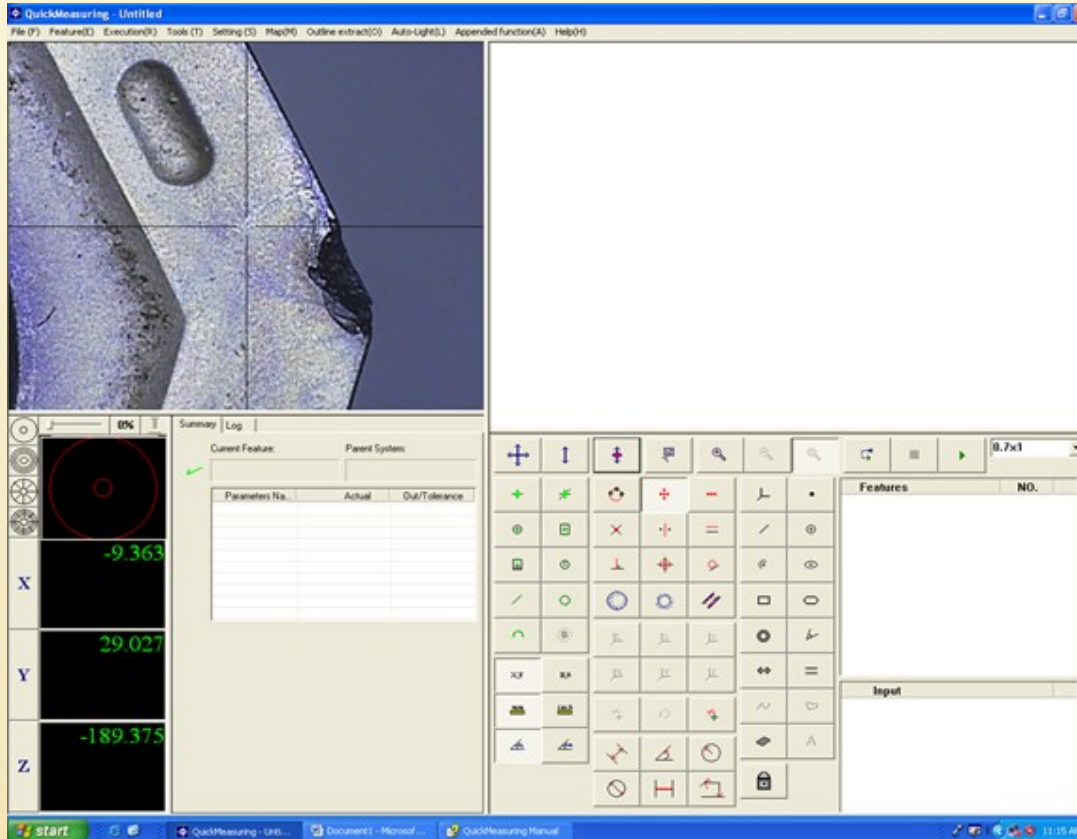
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Tipuri de uzură



-26-

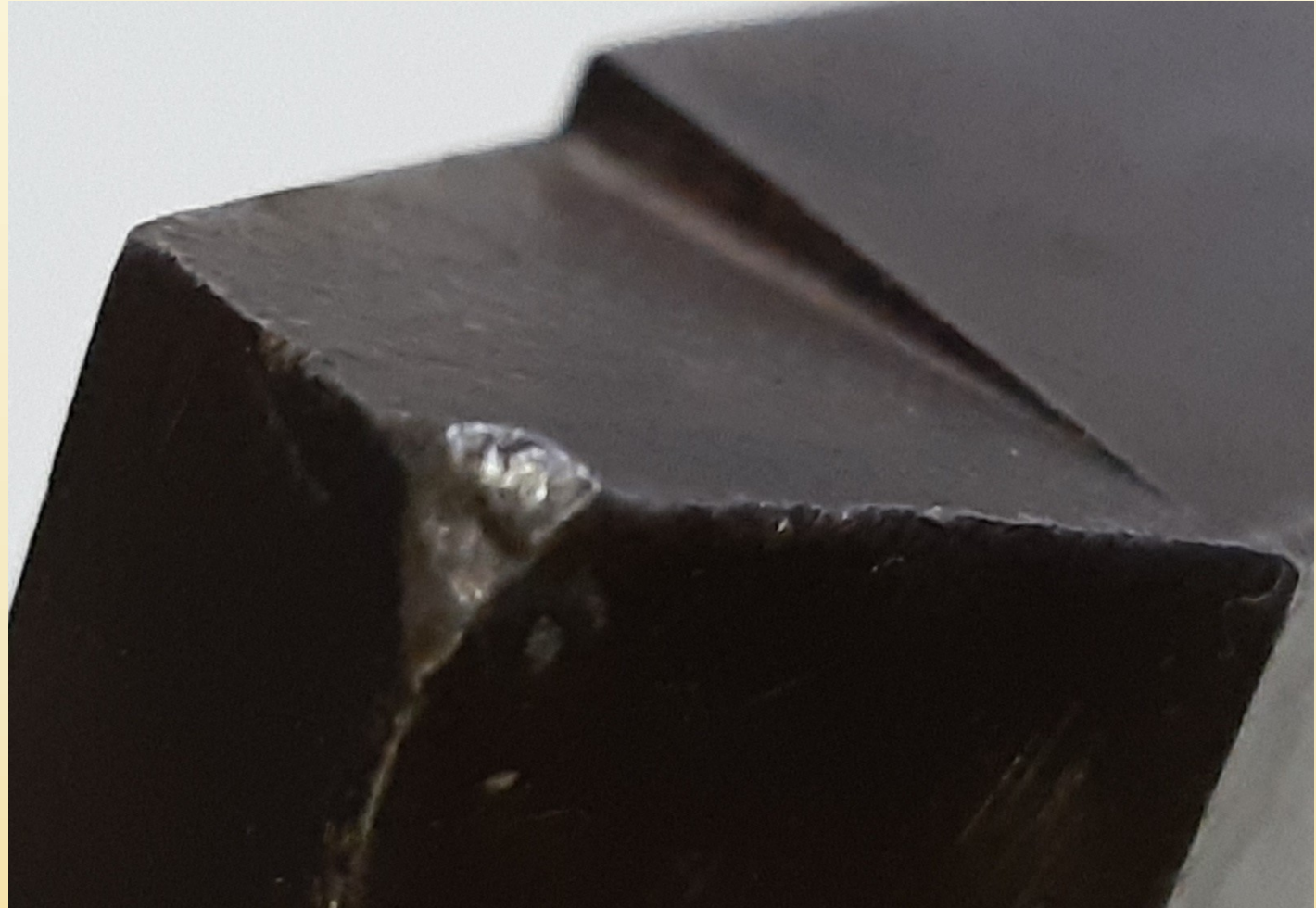
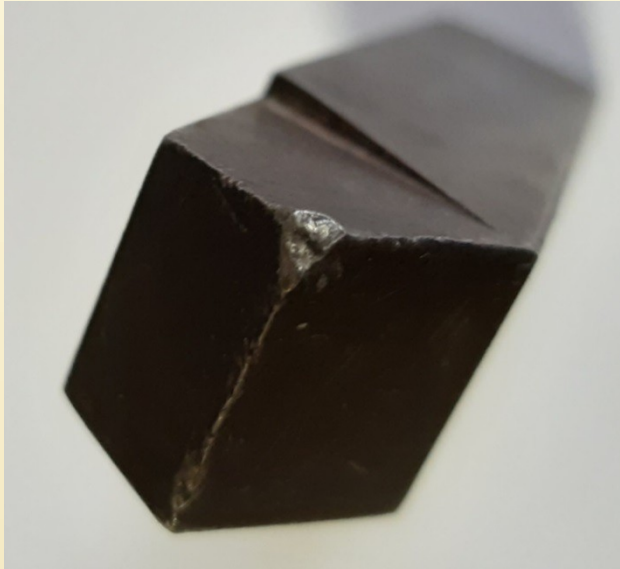


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-27-



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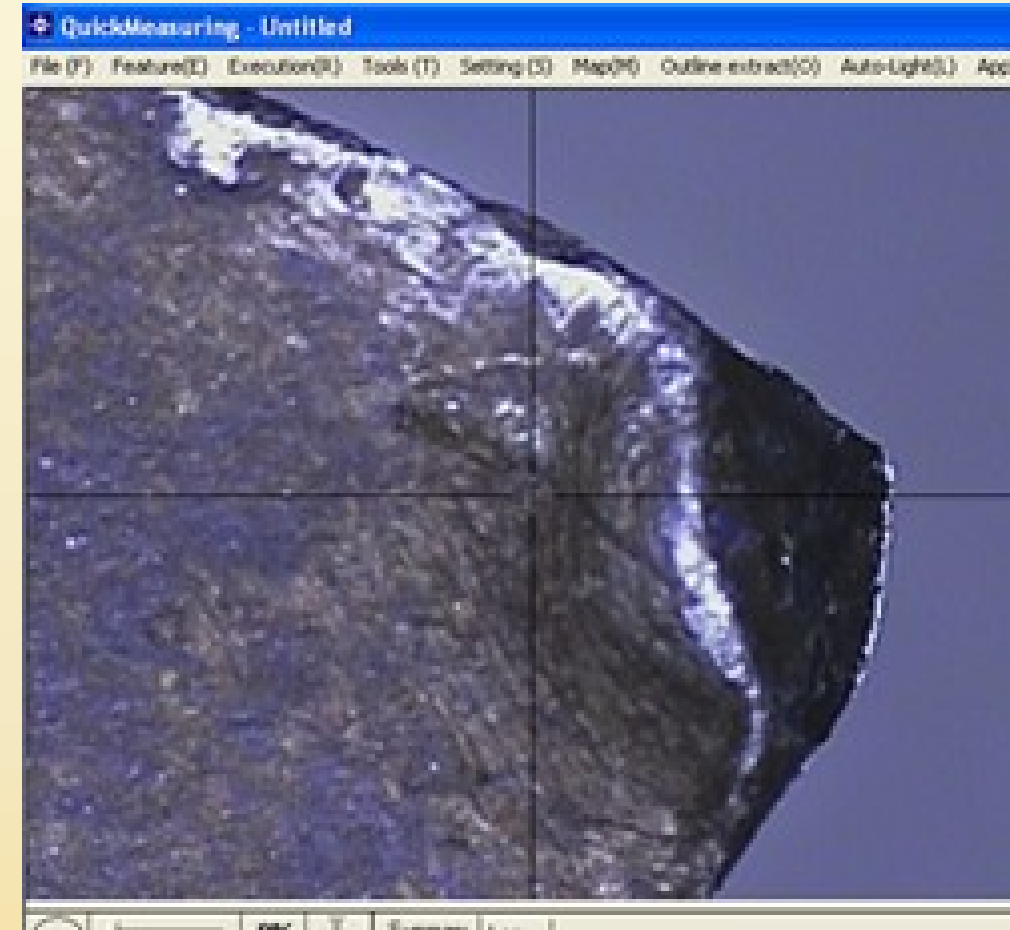
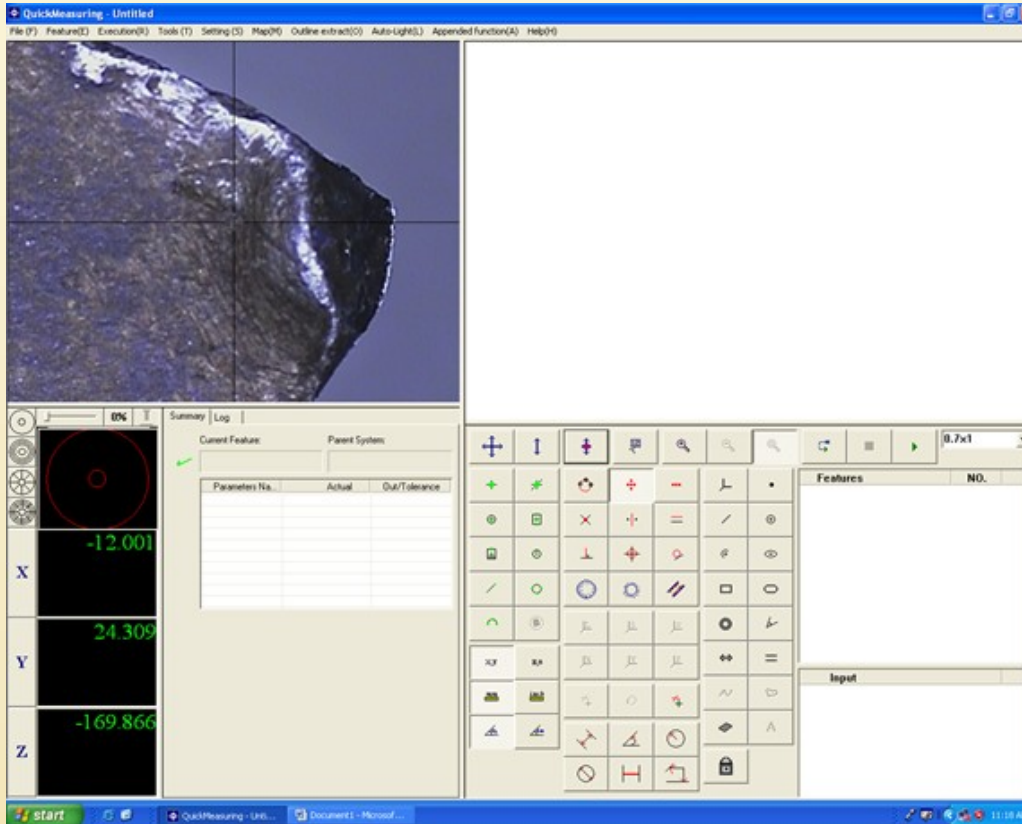


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-28-



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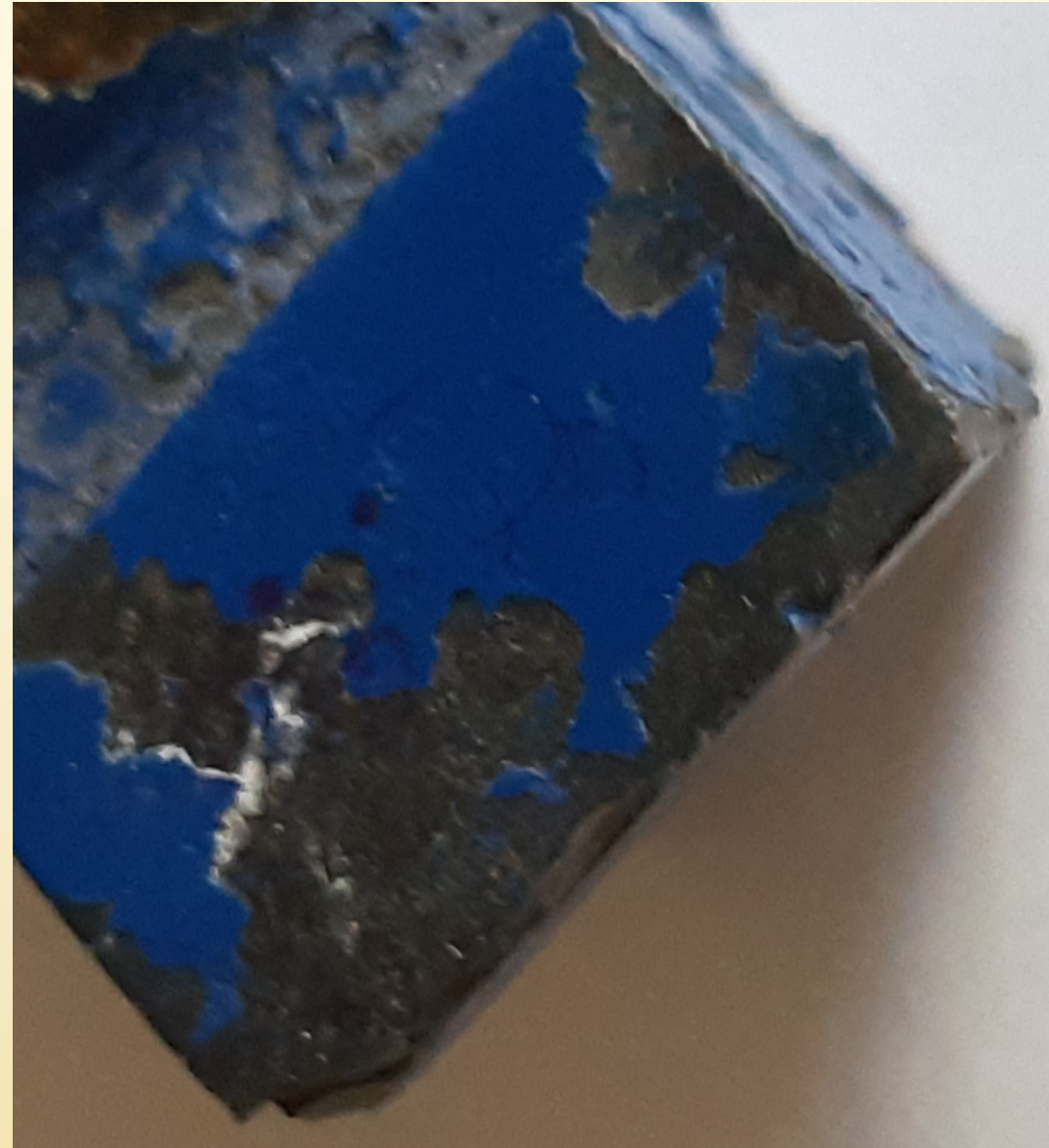


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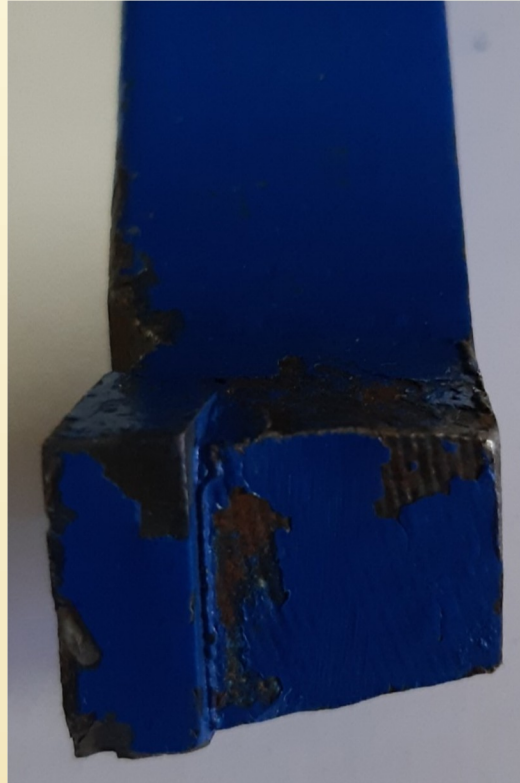


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