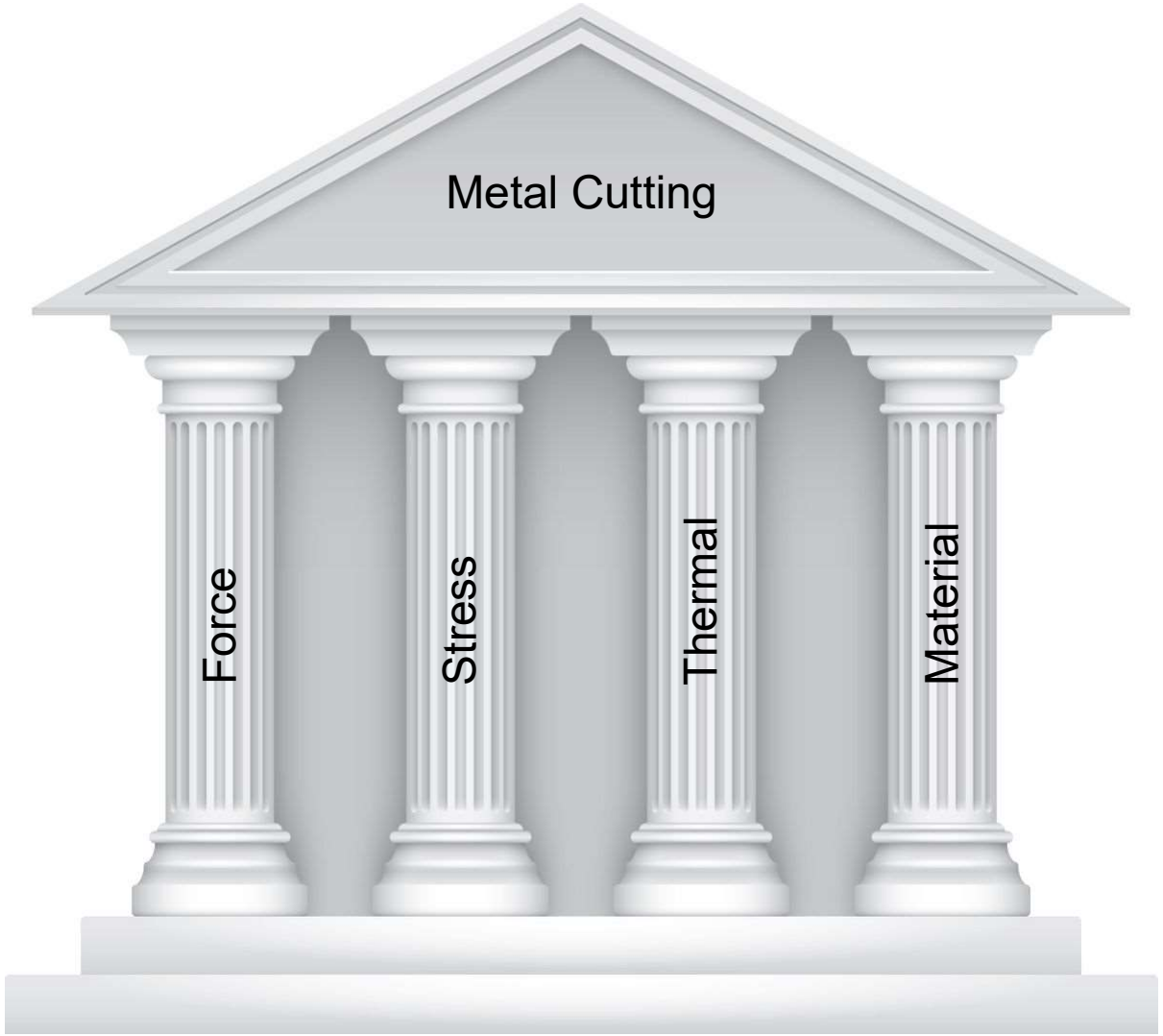
Strictly Confidential

Technical Product Training

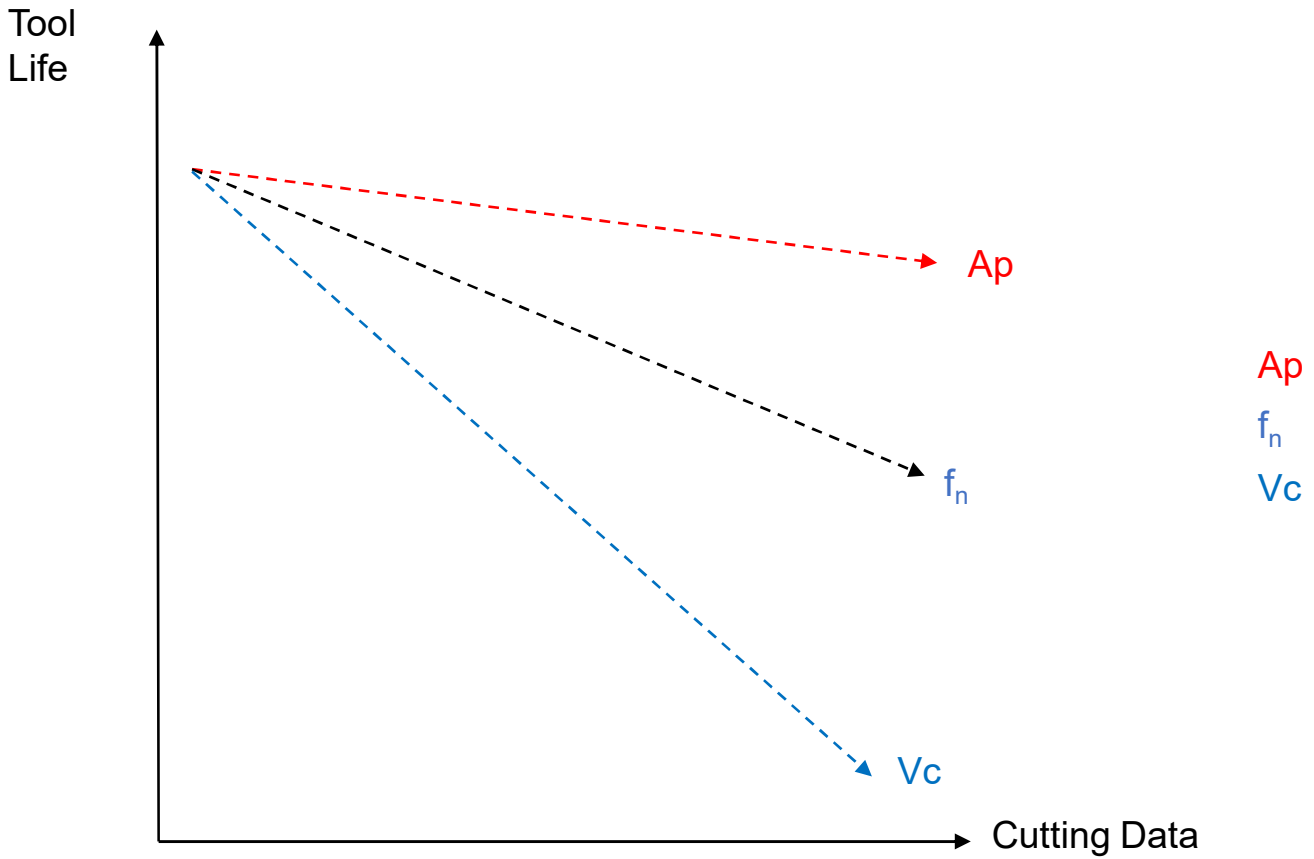
Using Tool Wear to our advantage

April 2019

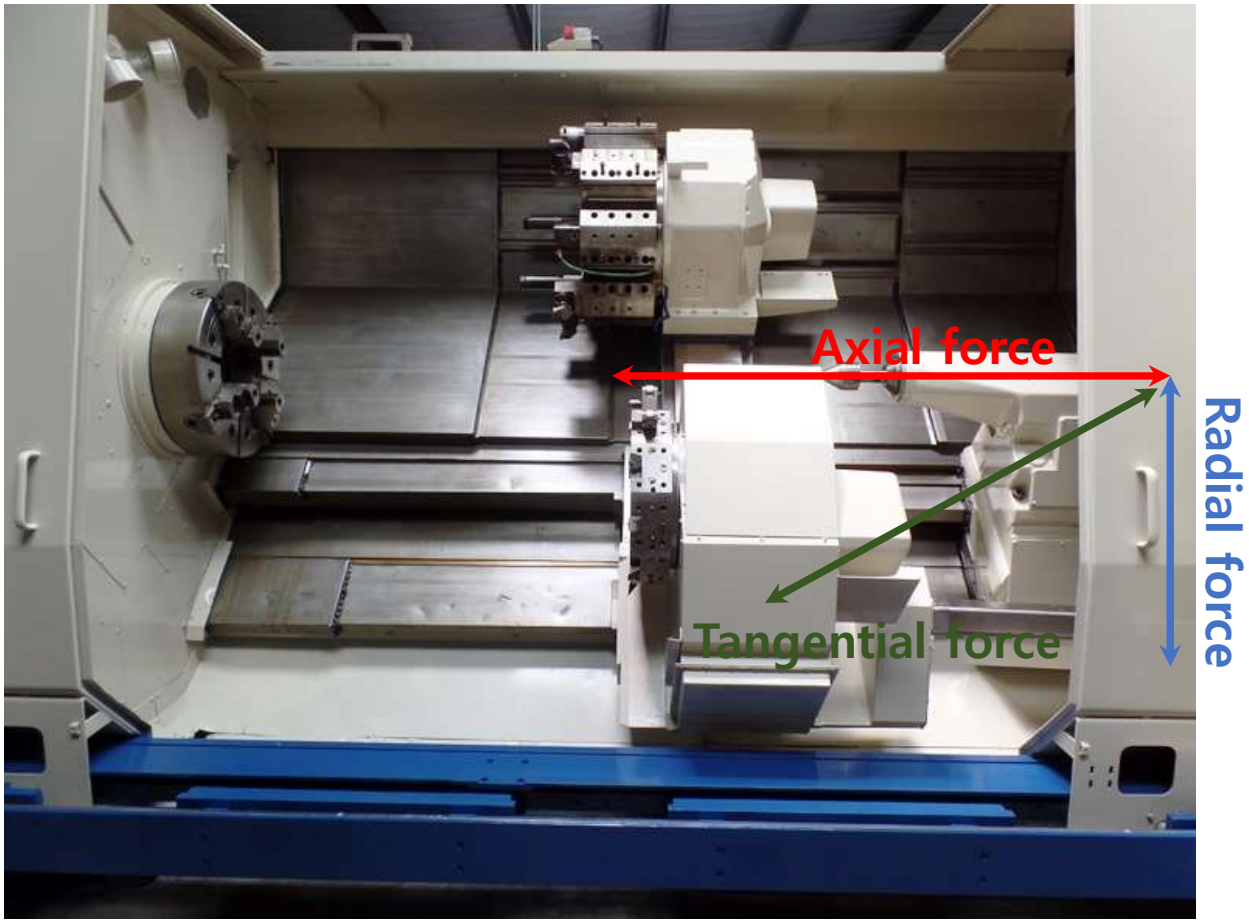
Four pillars of metal cutting



Cutting data and impact on tool life



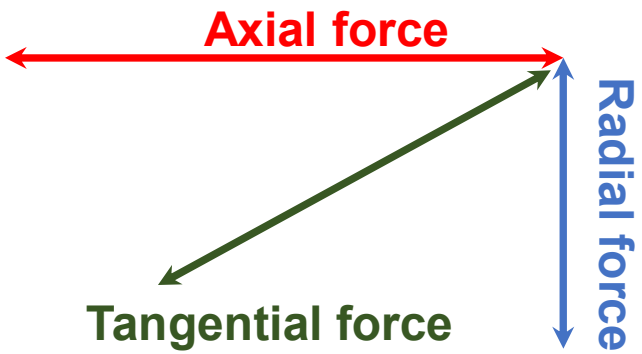
Forces in turning



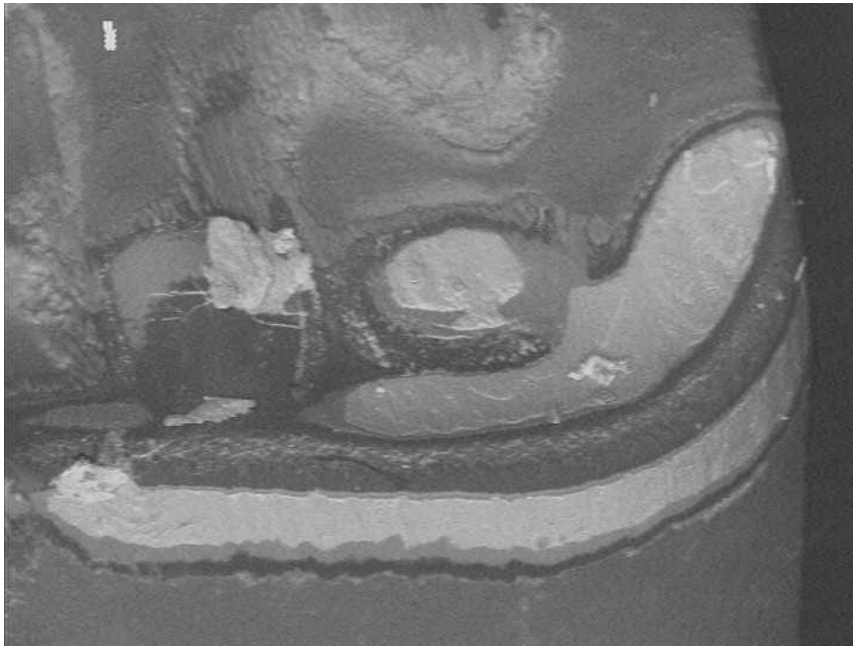
Forces in turning

Axial + Radial ≈ Tangential

Hence, when Axial increases (i.e. feed), the effect of radial decreases, resulting in stability



Defining Insert Wear



Crater wear?

Excessive flank wear?

Edge frittering?

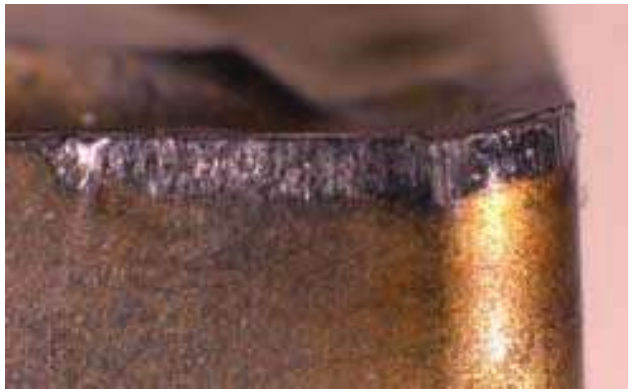
Plastic deformation?

Flaking?

Fracture?

Thermal Cracks?

Predictable Tool Wear



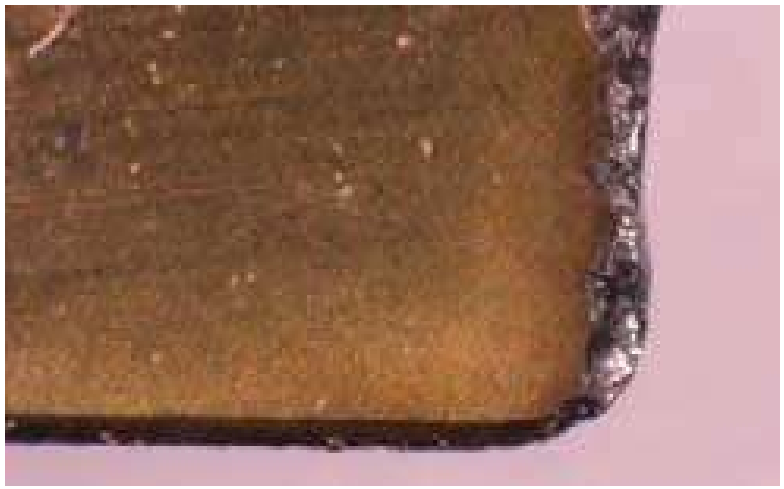
Flank Wear

Notching

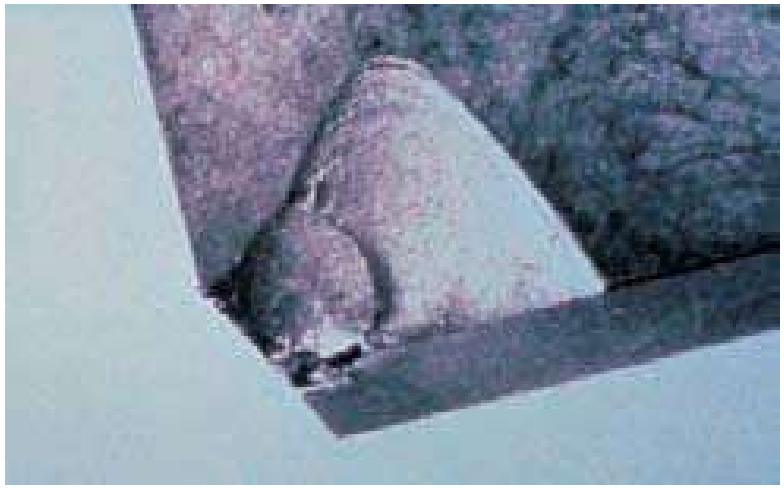
Crater Wear

Unpredictable Tool Wear

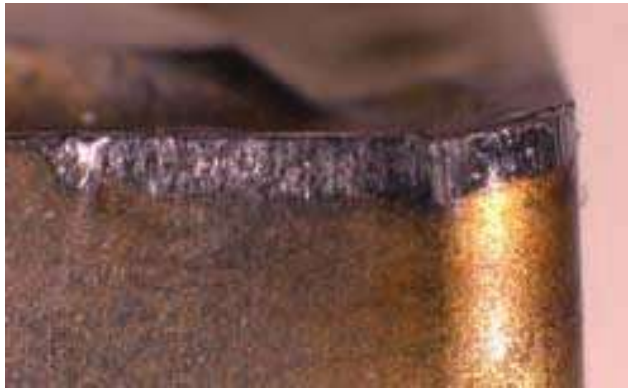
Chipping



Fracture



Flank wear



Flank Wear

- Primary Abrasive wear
- Secondary Chemical wear

Notch wear

- Primary Mechanical wear
- Secondary Chemical wear

Notching

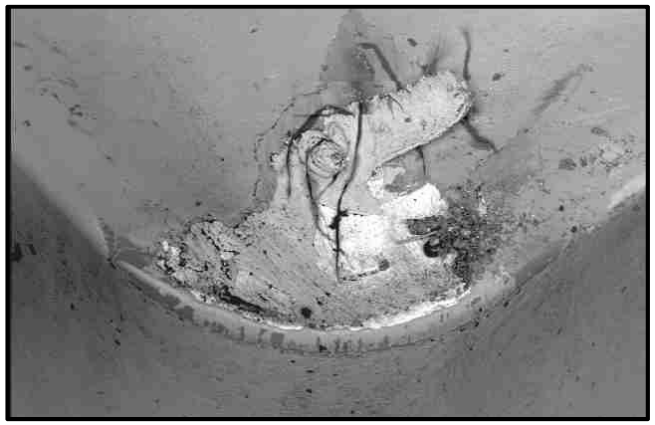
Crater wear

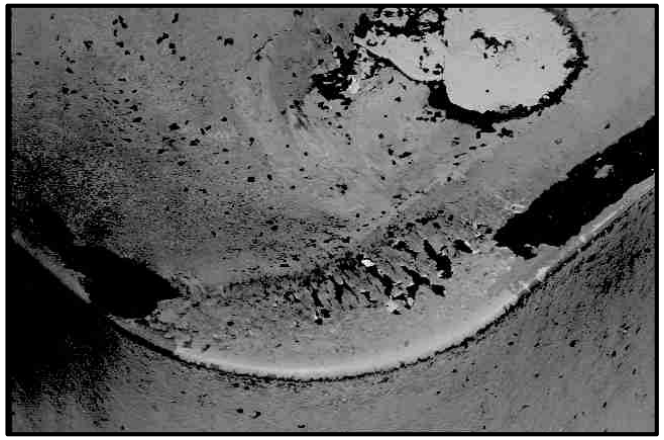
- Primary Chemical wear
- Secondary Mechanical wear

Crater Wear

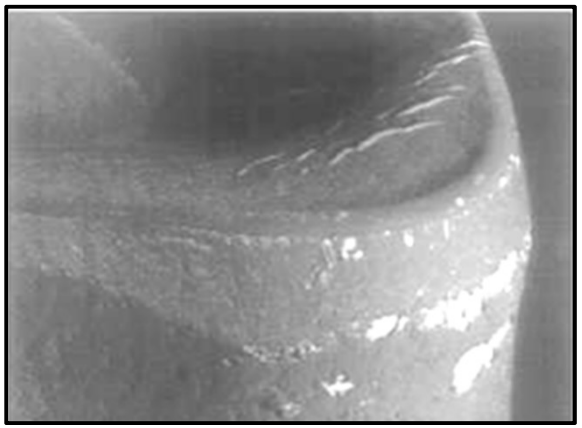
False Crater wear

Flaking





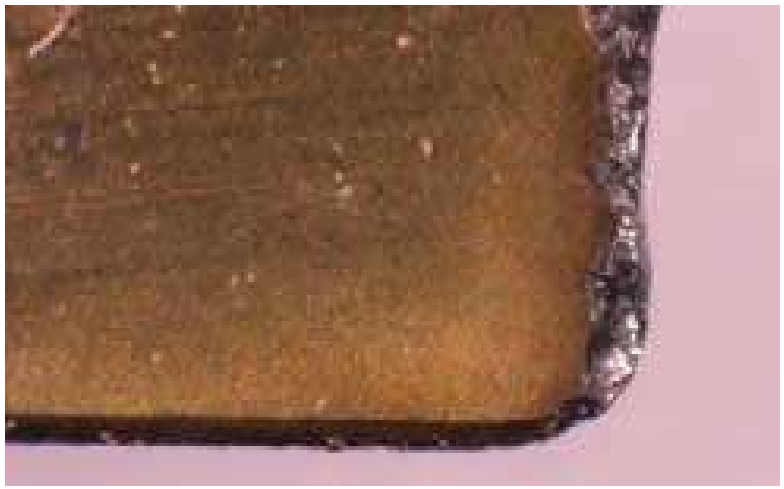
Plastic deformation



Tell-tale sign:
Crater has jagged edges
= not crater

Chipping

Chipping

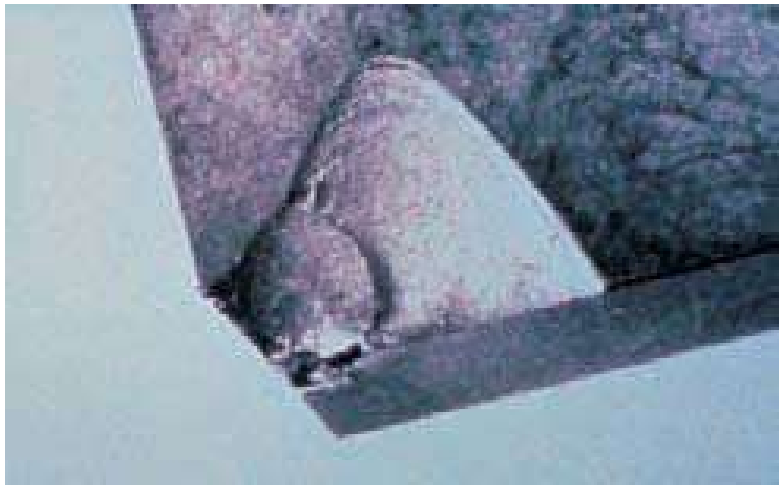


- Primary mechanical wear

Fracture

- Primary mechanical wear

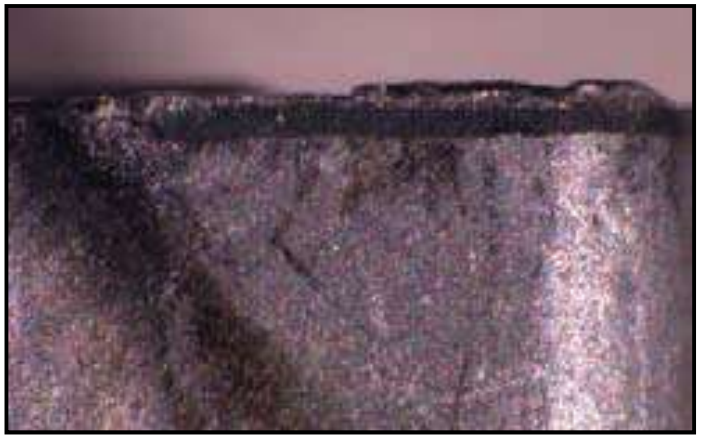
Fracture

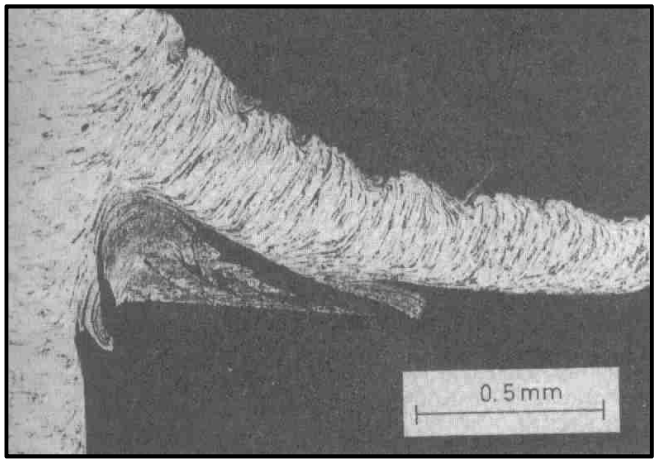


Built Up Edge

- Primary thermal wear

Built Up Edge

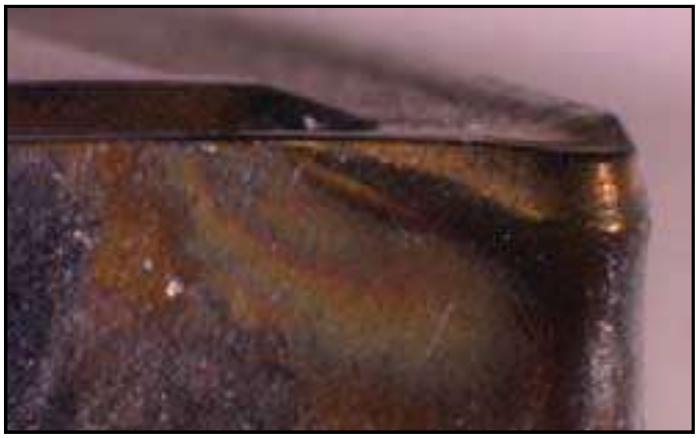




Plastic Deformation

- Primary thermal wear

Plastic deformation

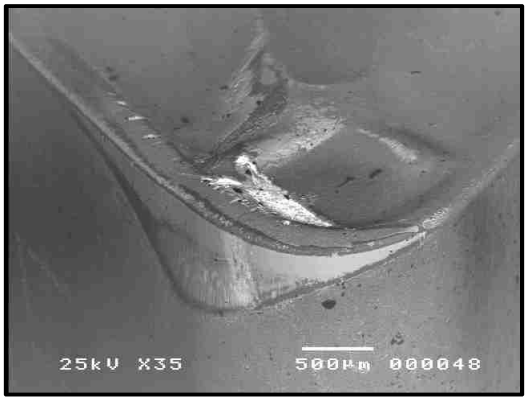


Two types of Plastic Deformation

Plastic depression

High feed

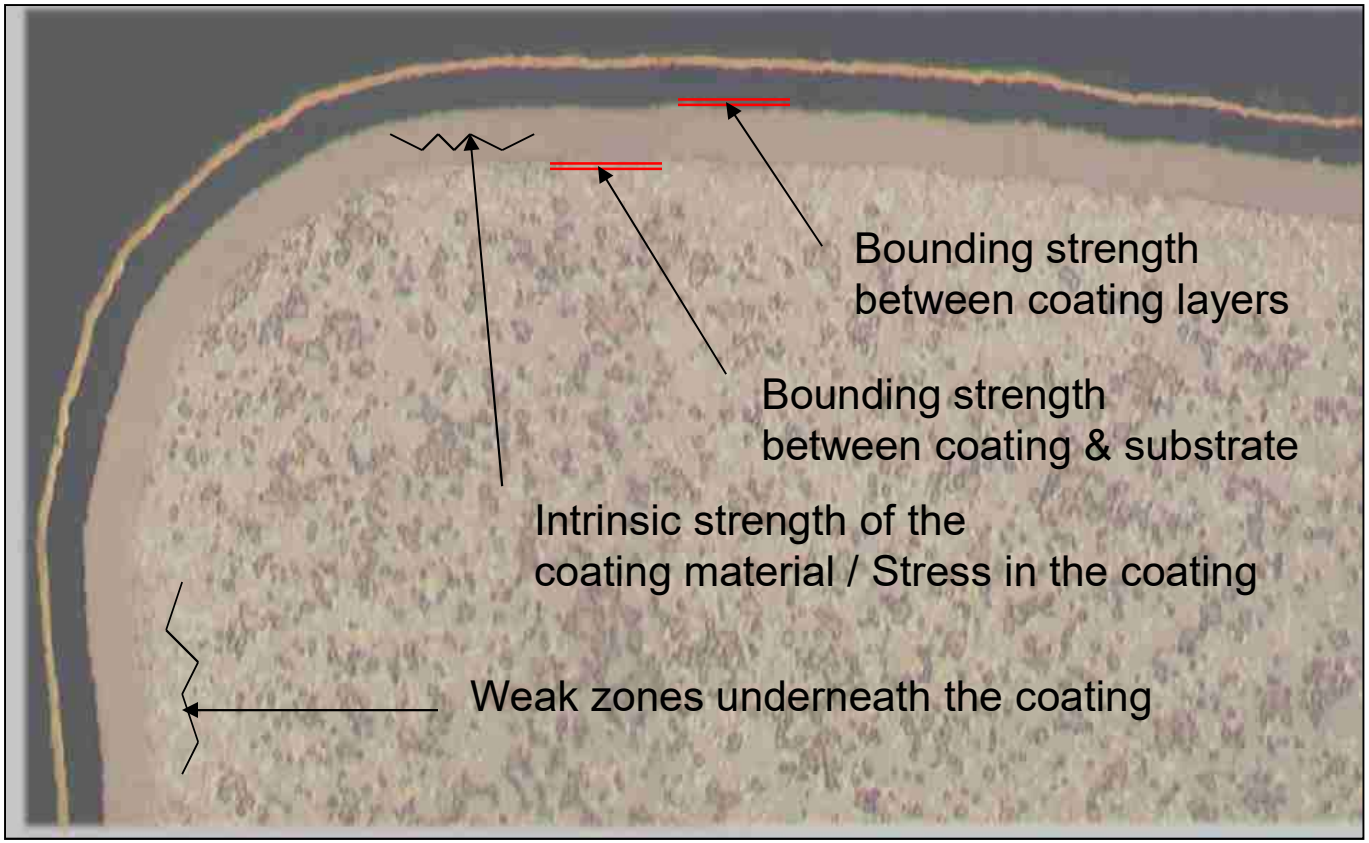
Plastic impression



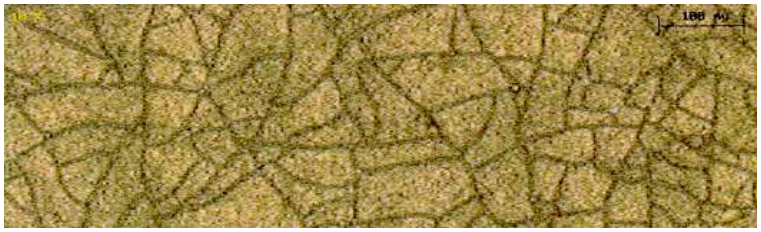
High speed

Flaking/delamination

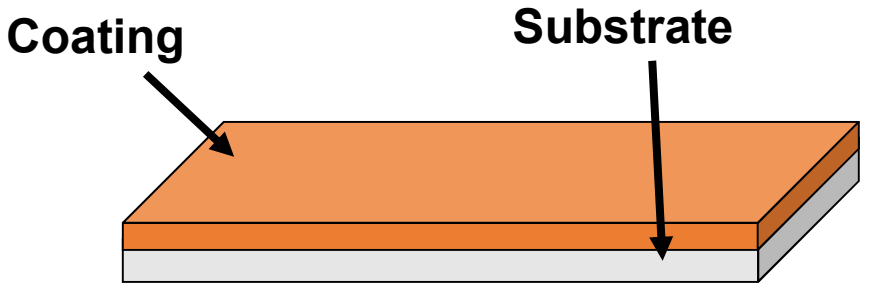
Load= Adhesion/ Strength of BUE
Adhesion= Chemical affinity/ Surface roughness



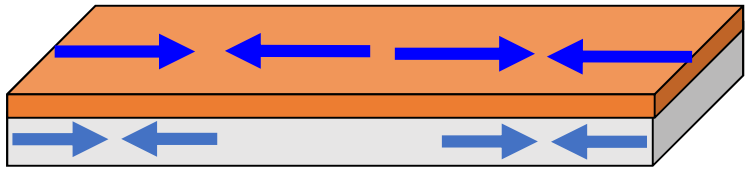
Thermal cracks in CVD coatings



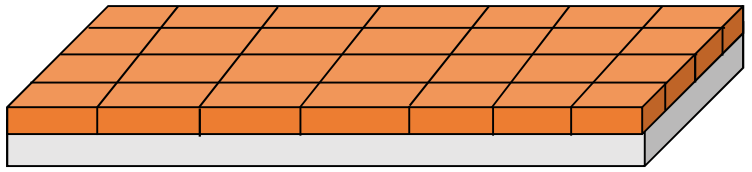
CVD coating
Network of cooling cracks & tensile stress due to high deposition temperature*)



During deposition

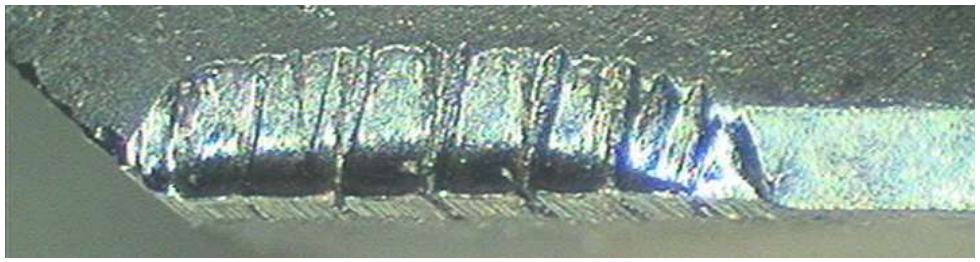


During cooling

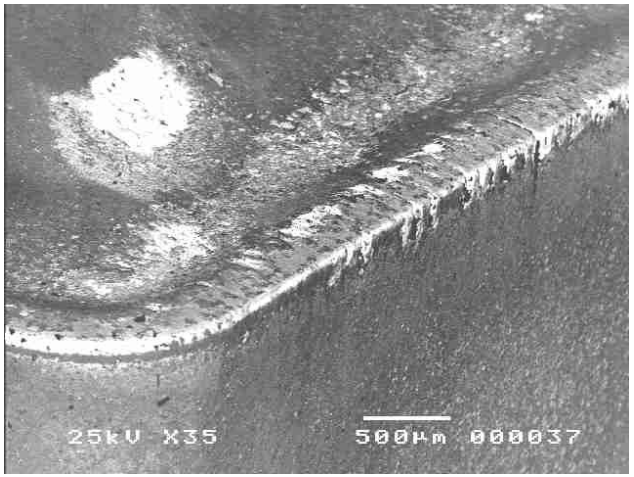


After cooling

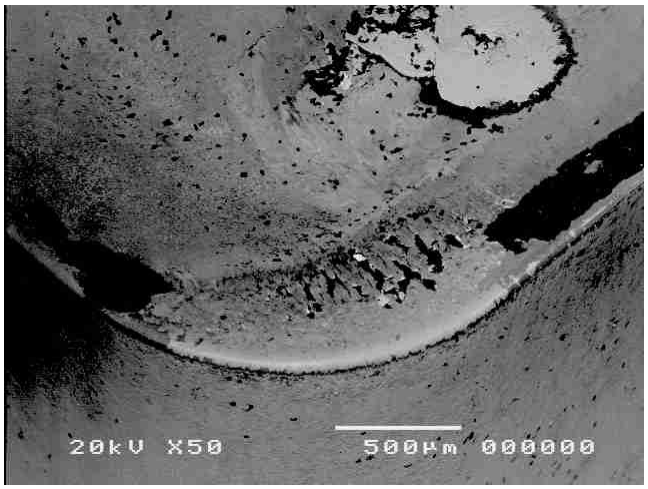
Thermal cracking



Milling, typical comb cracks

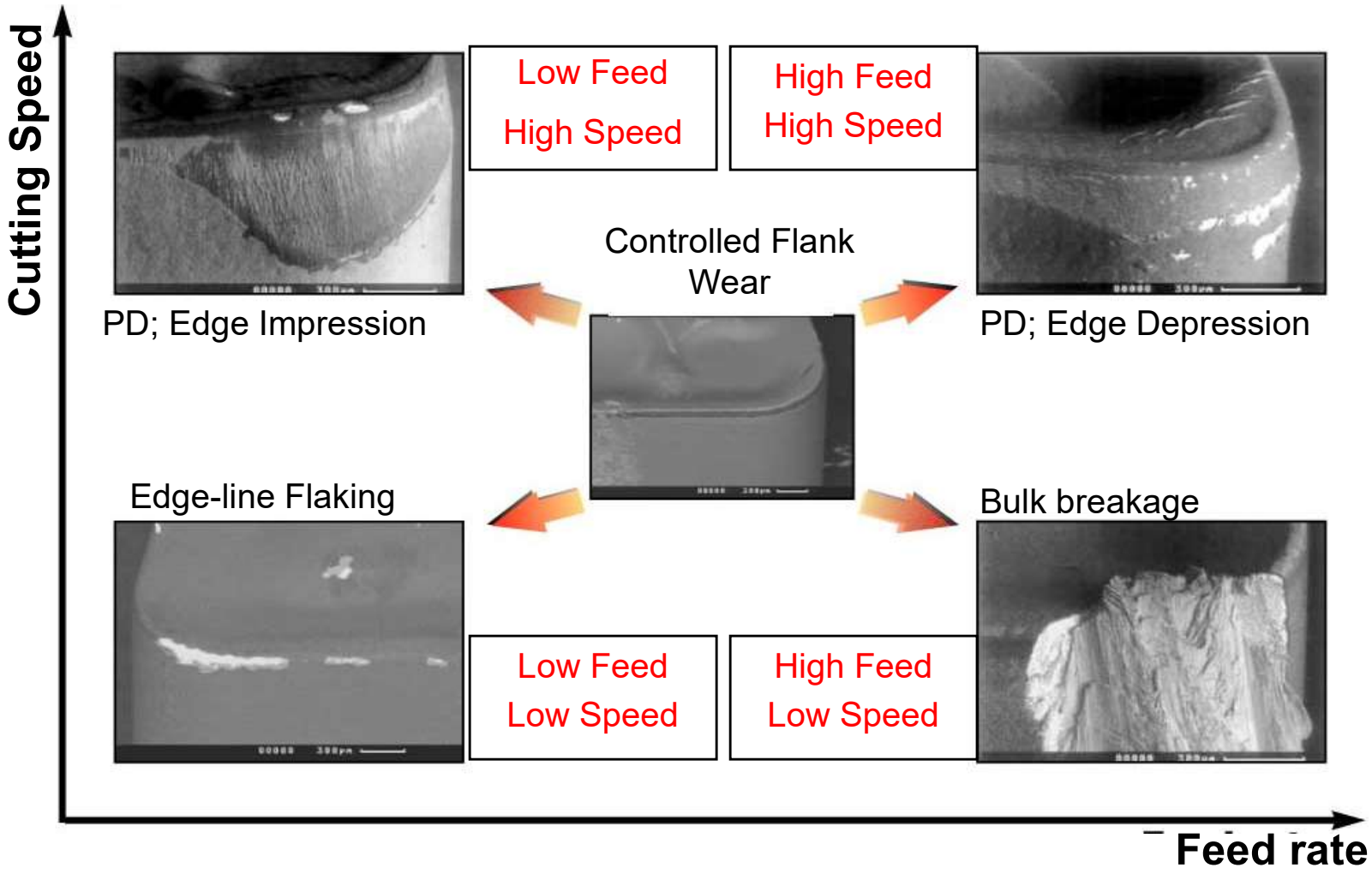


Turning, Heavy roughing
Short cuts, high DOC

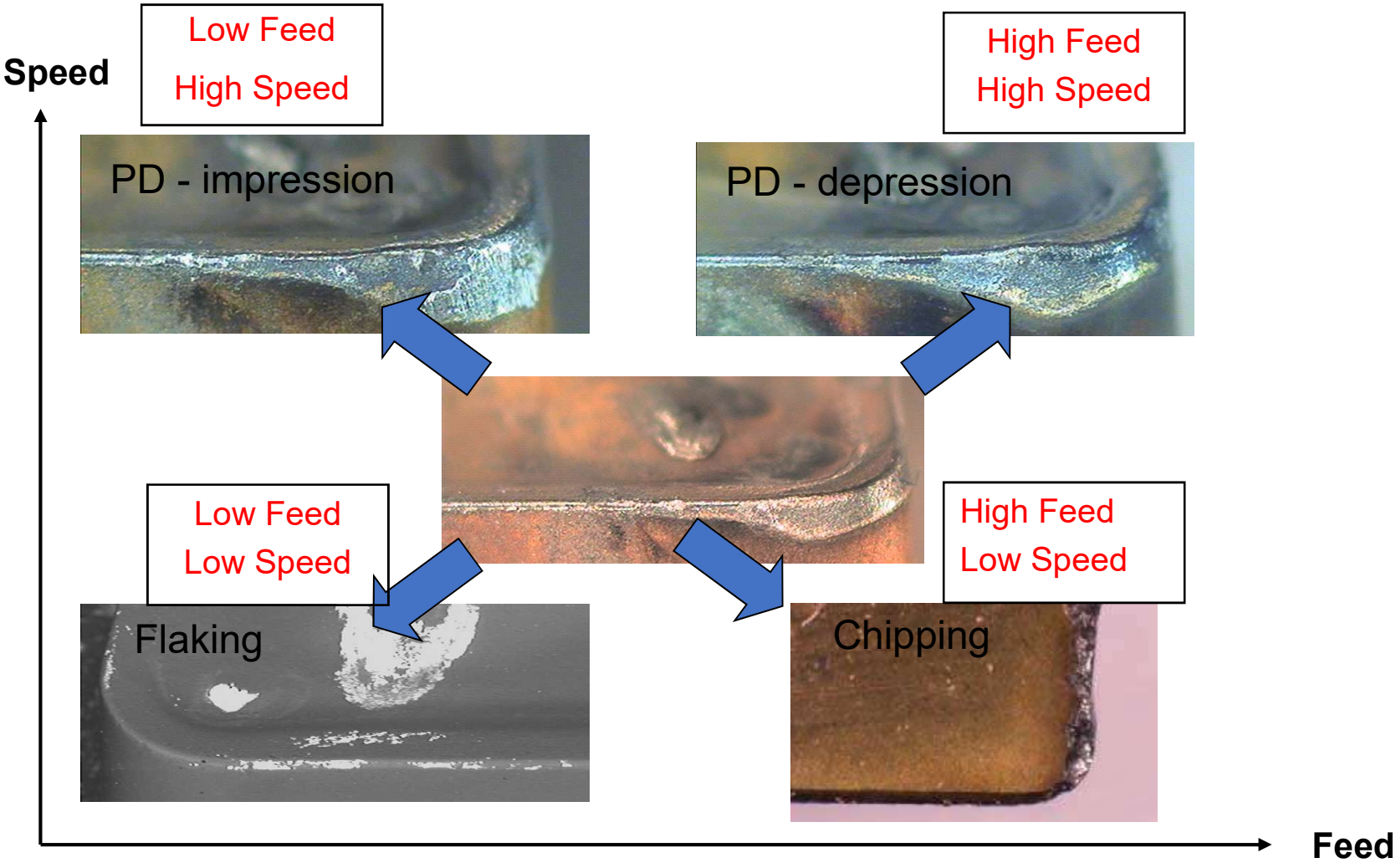


Rapid interruption in turning

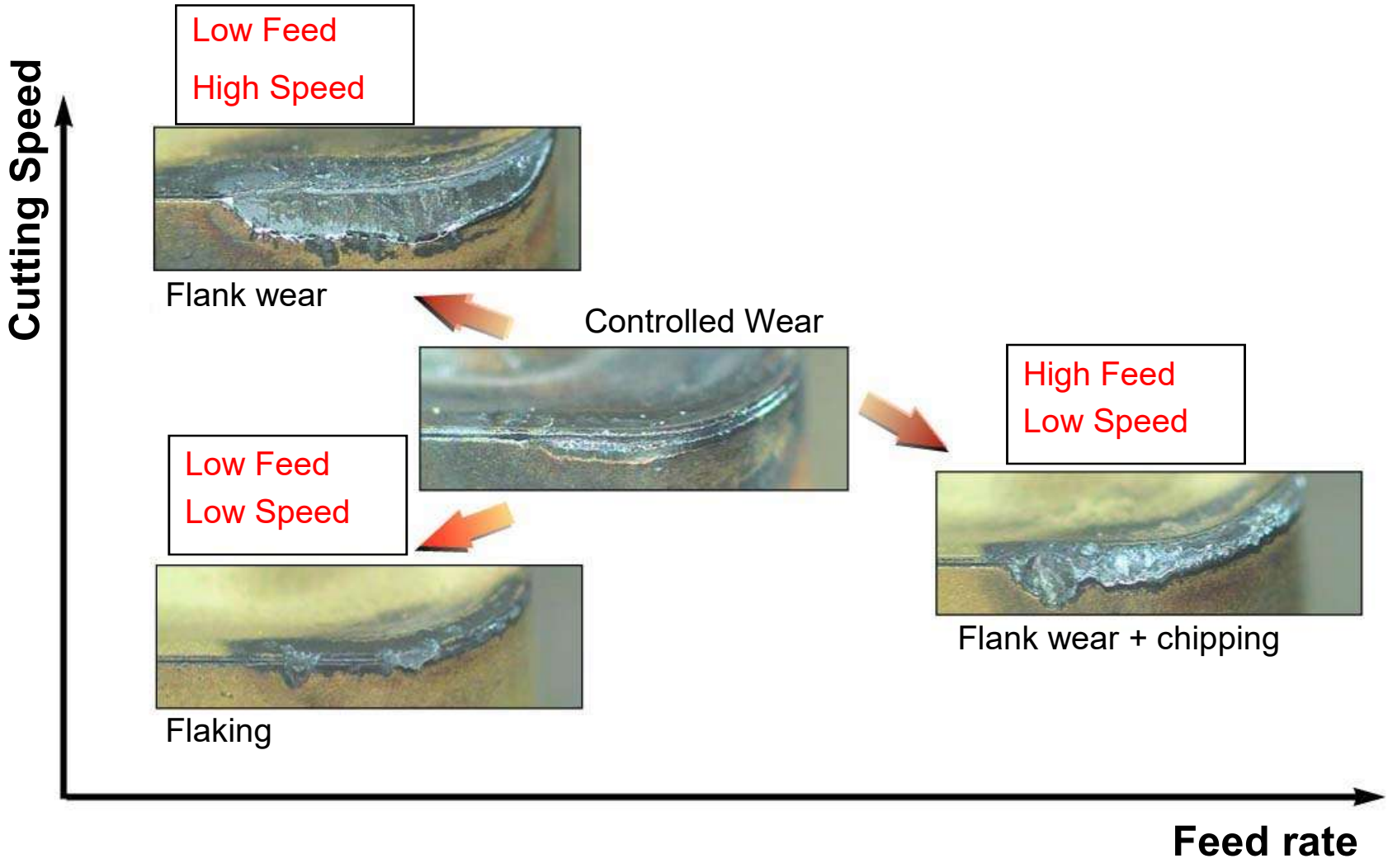
Tool wear, ISO-P



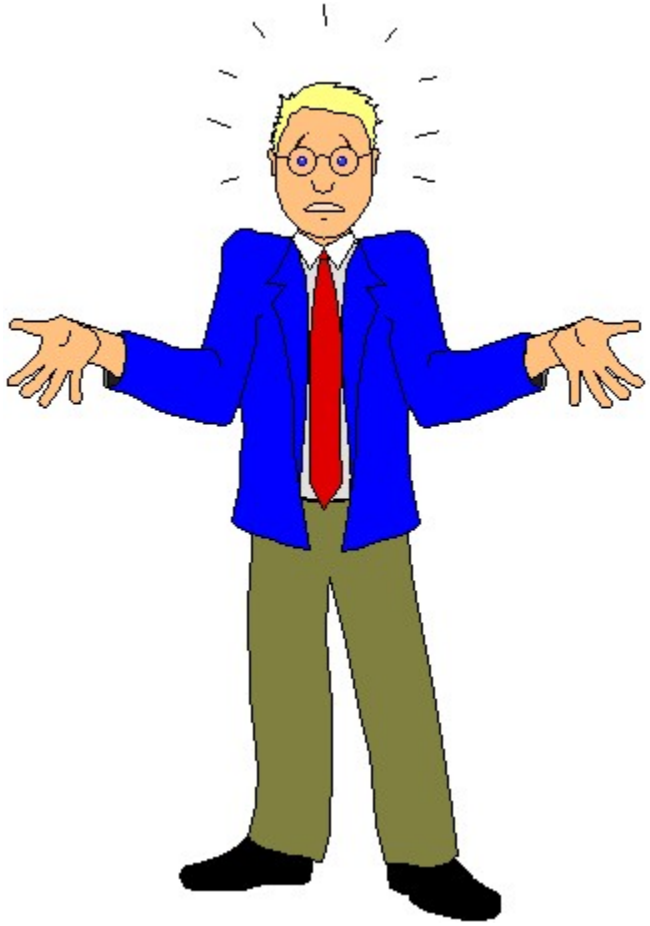
Tool wear, ISO-M



Tool wear, ISO-K



Questions?



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