

Optimising Cutting Tool Performance!



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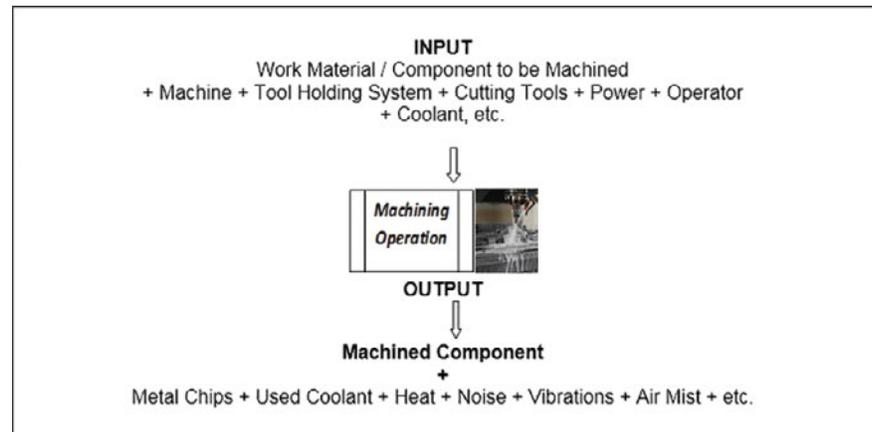
Accusharp strongly believes that the most important expectation of any customer, from any metal cutting tool, always remains that the tool should Cut Fast & Cut Cost.

And therefore, Accusharp has its prime objective to offer the most appropriate tools to customers, which would fulfill both the above expectations.



Mr. Arvind Khadke, Corporate Manager,
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Metal Cutting Process can be analysed as below :



Performance of any cutting tool is the result of complex combination of many factors in the machining process.

Following are some of the influencing factors to be considered to yield out the optimised performance from a metal cutting tool and a machining process.

Type of Tool Metal Cutting Processes and Cutting Tools Used : a) Drilling,

b) Reaming, c) Milling, d) Turning, e) Threading, etc. are some of the common metal cutting processes.

Types of Cutting Tools used for the above processes are: Drills, Step Drills, Reamers, Endmills, Taper Endmills, Ball-Nose Endmills, and various types of Insert, etc.

Cutting geometry of a tool depends upon the type of machining operation to be performed by the tool.

Work Material and its Condition: Various types of ferrous materials are: Cast irons, Carbon steel, Alloy-steel, Tool-Steel, Stainless steel, etc.

Non Ferrous materials are: Aluminium, Copper, Brass, Titanium or cobalt based alloys, etc. Work Material properties like its Strength, Hardness, Toughness, Elasticity, Plasticity, Heat Conductivity, Alloying Ability, etc. affect the machinability the work material.

ISO Grade	Work Piece Material
P	Steel (Un-alloyed, Low-alloyed, High-alloyed) Steel castings
M	Stainless Steels
K	Malleable Cast iron, Grey Cast iron

Machinability is a measure of ease with which a metal can be machined, acceptably. Each of the above work material has different machinability property and therefore different suitable tool material, tool geometry; machining parameters need to be selected, accordingly.

Selection of Tool Material w.r.t. Work-Piece Material:

Tungsten Carbide has been found to be the most suitable and commonly used as a Tool Material for metal cutting applications for ferrous work material. Tungsten Carbide grades have been standardised by ISO Grades; and Tool Material can be selected as per the guidelines below for Work Material and its condition accordingly.

For manufacturing of cutting tools, Accusharp uses world class quality Tungsten Carbide as raw material, of suitable grades, procured from Global brands, like Sandvik, Kennametal, Arno Friedrichs, etc.

Tool Geometry:

It describes overall dimensions of the tool and general geometry of cutting edge of the tool: e. g. Tool Size, Flute Geometry, Rake Angles, Land, Front Geometry, etc.

Our application engineers provide technical guidance to

customers in this matter, for their specific applications needs.

Grinding Process used for manufacturing the Cutting Tools:

Tungsten Carbide being a brittle material, it is highly sensitive to shocks during its grinding process. Grinding process used for manufacturing Tungsten Carbide tools is therefore critical; and needs proper selection of a stable grinding equipment, having rigid grinding wheel spindle, and 'creep' feed arrangement. Diamond wheels having suitable grit size and free cutting bond is another critical requirement to achieve desired surface finish and also to avoid micro cracks on the cutting edges of the tool. Micro cracks occur due to machining vibrations or due to use of unsuitable grinding wheel. Such micro cracks are not easily visible on the tool; however may cause premature failure of the tool in the machining operation and sometimes likely to damage the work piece. Therefore, Tool grinding process needs to be carried out carefully.

Accusharp tools are ground on rigid and high power, modern CNC equipment. Suitable imported, world class quality diamond wheels are used for grinding the tools. Dimensional and surface quality norms on the tools are checked on Zoller Q.C. equipment.

Micro Geometry of Cutting Edge:

'Micro Geometry' of cutting edge rounding (ER) really contributes towards the *Major Performance* of machining process.

Sharpness of cutting edge provides penetration ability to a tool, and Roundness on edge provides stress bearing ability against cutting forces on the tool.

However, sharper edge may break at even lower cutting forces; and bigger roundness edge will have lower penetration ability. Therefore, scientifically designed ER Norm and ER profile on cutting edge is the most important requirement to have **optimised penetration, as well as,**

stress bearing ability of the cutting edge.

Accusharp cutting tool designers design such ER norms according to the respective cutting application requirements. ER is done on sophisticated equipment with controlled process parameters, ensuring high accuracy norms. ER measurement is also done on special Zoller systems.

PVD Coating on Tools:

PVD (Physical Vapor Deposition) coating adds increased cutting efficiency and extended tool life.

PVD coating on our tools is done at our sister unit, Pune Carbide - an authorised Coating Center of 'CemeCon' AG, Germany.

We offer following coating solutions, according to customer's application requirements:

1. **TINALOX® SN²** : Premium and 1st preferred choice of coating, most suitable for Drills, End Mills, Taps, Reamers, Inserts and Hobs.
2. **HYPERLOX®** : Extremely smooth, Specialty coating designed for high performance of End Mills and Gear Cutting Tools (Hobs)
3. **ALOX® SN²** : Very thick, ultra-modern super nitride coating recommended for Drills and Inserts.
4. **HSN²** : Unique advance coating for HARD material machining. It is a 2nd Generation TiAlxN super nitride Nanocomposit, 3- layer coating. Most effective solution for applications above 50 HRC.

Coolant System:

Heat generated during metal cutting process causes thermal stresses on the cutting edge, and affects cutting performance and tool life. Efficient coolant system, as per the application requirement, helps to keep temperature of cutting edge stable during the machining process. This helps to have longer tool life. Adequate pressure and flow of coolant helps for chips disposal. Coolant also provides lubrication

between tool edge and work material contact, and assists for better surface finish on the work piece thereby.

Chips Disposal Mechanism:

During machining process, it is essential to remove chips quickly away from the cutting edge, to avoid damages to cutting edge quality due to chip attack on the cutting edge. Clogging of chips, near the cutting edge, spoils the cutting performance of the tool. And therefore, higher rate of chip disposal is recommended for better cutting performance of the tools

Metal Cutting Machine and Tool-Holding System:

Machine power, RPM, rigidity and accuracy of tool-holding system, machining parameters, etc. have a vital

role and influence on the cutting tool performance.

Accusharp has a special division named TMS (Tooling Management System).

Tooling experts from TMS division carry out detailed study of the entire metal cutting process, at the customer end. This study includes collection of data about dimensional and surface finish requirements on work component, work material properties, machine power, RPM, holding system, coolant system, etc. According to the recommendations from TMS experts, cutting tools with specific tool material, special cutting geometry and special PVD coating are manufactured and supplied to respective customers. TMS experts also recommend customers about the

suitable machining parameters for the optimal performance of the machining process.

Our TMS team offers 'Total-Solution' to customers to help them to perform their machining operations at higher metal removal rates, coupled with increased tool life. This sounds to be the most techno-economic solution for customers.

And therefore, Accusharp would always be there to assist you as
'Your Productivity Partner',

With our mission to give customers the most appropriate tools, which
"Cut Fast & Cut Cost".



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