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Review on Single Point Cutting Tool

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Abstract - *In this review paper, a single point cutting tool-tip interface is determined. In which we are going to explain a study which we have done on the Geometry of single point cutting tool. In this the no. of angles, edges.*

Single point cutting tool have only a one cutting point through which they perform various type of functions such as Turning, Boring, and Shaping operations. These tools are used in lathe, Boring, and shaper machines.

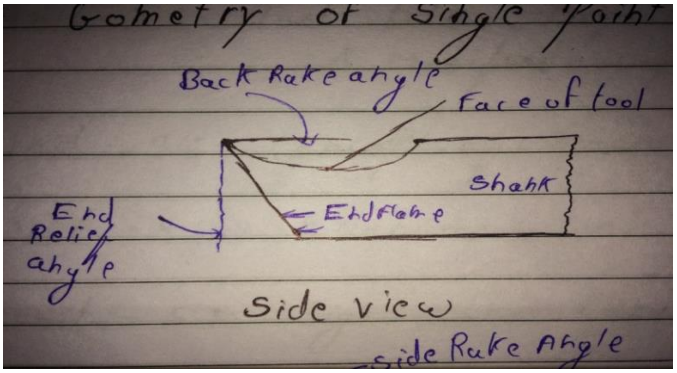
S.P.C.T has a sharp cutting edges to remove the material a large cutting forces get develop on S.P.C.T due to which various noise or vibration created cutting forces get increase while the Depth of Cut. As our paper is on single point cutting tool the Tool Signature will be there for the arrangement of 6 angles and nose radius.

Key Words: Cutting Tool, Tool Signature, Angles, Edges

1. INTRODUCTION

The history of cutting tool is during industrial revolution in 1800 AD. F.W Taylor had discovered the number of research in metal cutting tool. S.P.C.T is very important to remove the material from the job there are three tool material tool such as Carbide tool, Ceramic Tool, H.S.S Tool. In the single point cutting tool parts are there such as Shank, Face of Tool, Cutting Edges, Flank, Nose, Rake Angle, Back Rake Angle, End Relief Angle, Side Relief Angle. Tool Signature also introduce with a two tool signature 1. ASA (American Standard Association) 2. ORS (Orthogonal Reflection System).

Geometry of Cutting Tool



- **Shank: -** This is the main body of the tool on which cutting edges are formed The tool is hold in the lathe with the help of shank.

- **Face of tool** :- This is the surface through which chips slides during machining operations a heavy drag or friction is always present which increases the temperature of the tool over the rock face.

- **Back Rake Angle**: - I. Tool Material is extremely hard and brittle like carbide in order to give the strength to the tool negative rake angle is provided over the tool. During the machining of a strong material like brass Zero rake angle provide over the tool. The combine effect of back rake angle and side rake angle the direction of chip flow over the rake face will be decided.

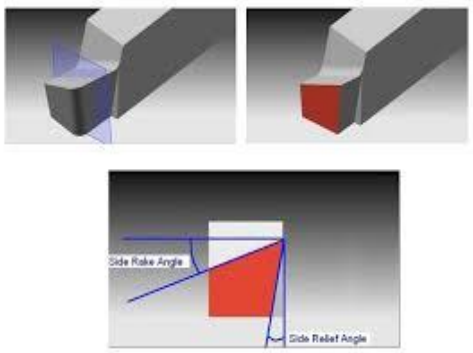
- **Rake Angle**: - It is the angle between rake face and the line passing through the tip parallel to the tool axis. During plastic deformation of material a heavy drag exist between chips and drag face and as a result temperature over the rake face increase. The maximum temperature over the rake face is recorded at a distance 2 to 3 mm away from the side cutting edge. Due to the high temperature the diffusion of the carbon atom into the chip is also minimum and due to continues carbon atom into the chip tool become weak after certain period of time a creator will be produce at same location this is known as creator wear and since creator wear takes place due to diffusion of creator hence it is known as diffusion. By increasing the value of back rake angle the chip flow over the rake is becomes easy as a result the maximum temperature over the rake face decreases with increase in tool life but when the back rake angle increases the certain value due to decrease in the area of the tool life decreases.

- **End Relief Angle**: - The Finished Portion of the work piece comes in contact with the end flank of the tool and after plastic deformation there is elastic recovery in which material tries to recover its original size and shape during elastic recovery the finished portion of the work piece the material try to heat the end flank of the tool and to avoid these end relief angle is provided.

- **Cutting Edges**: - There are two cutting edges provided over tool. I. Major Cutting edge (Principle Cutting edge) II. Minor Cutting edge or(auxiliary cutting edge angle)

Since major cutting edge Is provided at the side of the tool and the minor cutting edge is provided of the cutting tool hence it is also known as auxiliary cutting edge angle.

- **Flank**: - Portion below the cutting edge is flank of the tool. Portion below the end cutting edge is known as end flank. And portion below the side cutting edge is side flank.



The Point where end cutting edge and side cutting edge meets. The nose is a sharp point over a tool and due to stress concentration over the sharp point it may decrease the tool life. Hence, in order to avoid stress concentration over the nose fillet is provided and the radius of fillet is known as nose radius. By increasing the value of nose radius the tool life as well as surface finish of the work piece increase into but when the nose radius increase the certain value of tool start producing a small vibrations known as chatter which spoils or decrease the surface finish and tool life.

- **Side Relief Angle**: - The material is going to be remove invert revolution try to heat the side flank of the tool and to avoid these side relief angle is provide (the value of end relief and side relief is in the water of 5 and 15 degree.

Tool Signature

Tool signature means the arrangement of 6 angles and nose radius in systematic manner.

- There are two tool signature

1. ASA (American standard association)
2. ORS (Orthogonal Reflection System)

- ASA

Back Rake Angle – Side rake angle- End Relief Angle- Side relief- End Cutting Edge Angle- Side cutting edge angle.

- ORS

Inclination Angle (I)- Normal Rake Angle – End Relief angle – Side Relief angle

E.C.E.A.- Approach angle ()-R (90- SCEA).

Relation between ASA & ORS System

1. Tan = $CosY_s$. $tan\alpha_{ab}$- $SinY_s$. $tan\alpha_{as}$
2. Tan α_n= $CosY_s$. $tan\alpha_{as}$+$sinY_s$. $tan\alpha_{ab}$

Y_s= side cutting Edge angle

α_{ab}=Back Rake angle

α_{as}= Side Rake Angle

Depth of Cut

Feed, Speed, and Depth of Cut. Cutting speed is defined as the speed at which the work moves with respect to the tool (usually measured in feet per minute). Feed rate is defined as the distance the tool travels during one revolution of the part.

Tool Wear

Tool wear describes the gradual failure of cutting tools due to regular operation. It is a term often associated with tipped tools, tool bits, or drill bits that are used with machine tools. Flank wear in which the portion of the tool in contact with the finished part erodes.

Cutting Force Acting on Single Point Cutting Tool

Most of the time cutting force acting on a tool is measured experimentally. But it is also important to predict quantity of cutting force and how different cutting parameters are affecting cutting force even before setting up the machining operation due to following reasons.

In order to design of mechanical structure of cutting machine. which will withstand cutting force and thrust force effectively.

To determine power consumption during machining process. This will help in selecting suitable motor drive.

To predict tool life.

To increase productivity.

CONCLUSION

As we have discus, Due to Cutting Force large number of force and temperature get develop between due to which it can damage by using thermocouple we can measure its temperature and we can do research in this topic and we can increase its tool life.

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