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Design and Development of Boring Trepanning Association (BTA) Tool to Meet Surface Finish Requirement of Machining For Automobiles Components"

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***Abstract:*-- Boring Trepanning cutting tool (BTA) Ra (Average surface roughness) and Rz (difference between the tallest peak and the deepest value in the surface) are two important criteria of surface finish. And these surface finish values achievement by BTA cutting tool presently by the industries is very difficult and are not able to meet and are expected to meet better Ra values as per Ra (0.2µ) Indian standards .Hence the Objectives of project works are set to Design of boring trepanning Association (BTA) Tools for manufacturing of shock absorbs and landing gears to implement the Ra and Rz Values. and conducted Performance Analysis of BTA Tools for cutting aluminium shocks absorber.**

Key Words- BTA Cutting Tool, Deep Hole Drilling, Surface Finish.

1. INTRODUCTION

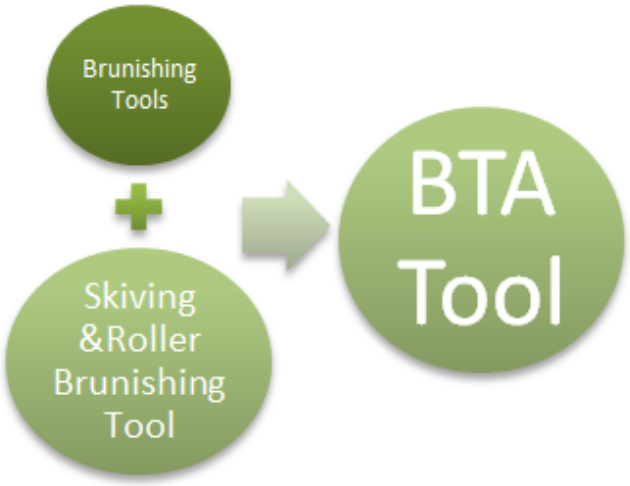
Deep hole drilling

In Deep hole drilling is known as a hole depth greater than ten times the diameter of the hole. This types of holes required special equipment to maintain the straightness and tolerances. Other considerations are roundness and surface finish.

In Deep hole drilling is generally achievable with a few new tooling methods, usually gun drilling or BTA drilling. These are separated because of the coolant passage strategy (inside or outside) and chip expulsion technique (inward or outer). Utilizing strategies, for example, a pivoting instrument and counter-turning work piece are normal systems to accomplish required straightness resistances. Optional tooling strategies incorporate trepanning, skiving and polishing, pull exhausting, or bottle exhausting. At last another sort of penetrating innovation is accessible to confront this issue: vibration boring.

This innovation separates the chips by a little controlled hub vibration of the bore. The little chips are effectively evacuated by the flutes of the bore.

Concept of BTA Tool:



BTA deep hole drilling Tools :

BTA boring is a profound opening boring procedure that uses a specific boring instrument on a long bore tube to create profound gaps in metal, from gaps with a distance across of 20 mm [0.80 in] and bigger, up to profundity to-breadth proportions of 400:1. BTA penetrating is the best strategy for boring profound gaps, as it is a cleaner, more solid and fit process than customary bend bores, and can accomplish bigger breadths and higher bolster rates than the elective firearm boring.

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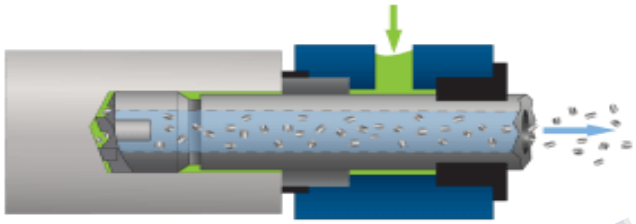
In BTA boring Tools heads, are threaded or mounted onto long bore tubes, and utilize Two or more cutting surfaces on a single tool to expel chips effectively, debilitating them utilizing high-weight coolant through gaps in the device head, at that point out the bore tube and through the machining shaft. BTA tooling is accessible in brazed or embedded carbide arrangements.(BTA) Boring and Trepanning Association, and is likewise now and again alluded to as STS (single tube system) boring, as it utilizes one single penetrate tube for the BTA Tool, contrasted with different procedures, for example, ejector.

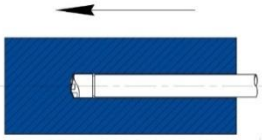


BTA Block Diagram

Types of BTA tool:

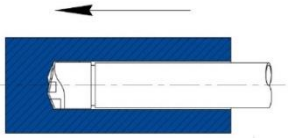
1. Brazed BTA Tools

Brazed BTA boring devices are dispensable, and powerful at penetrating profound gaps at generally littler distance across.



2. Indexable BTA Tools

Indexable BTA boring devices utilize carbide embeds which are expended amid the metal cutting procedure.



2. LITERATURE REVIEW:

Advances in the precision machining of small deep holes [1]

The analysis of the forces acting on a deep-hole drilling head and the understanding of the burnishing action of the carbide guide pads, a study of the exactness penetrating technique for little profound openings in hard to-remove materials was conveyed. The influence of tool geometry and cutting parameters (cutting speeds and feed rates) on the surface quality of the drilled holes were investigated, the results of which indicating that ~10-~20 mm small deep holes of high tolerance grades (IT7 to IT9) and lower surface roughness values that is termed as Ra in the range of 0.2-1.6 µm can be achieved and the problem of axial deviation of holes drilled minimized under optimized cutting parameters by means of the new/improved BTA drill. An advanced self-piloting BTA drilling head has been developed which results an experimental results show that the tool geometry has a remarkable influence on the quality of the machined hole.

Analysis of the deep hole drilling with BTA system by the characterization of the cutting process [2]

This study says the analysis of the cutting process in the BTA (Boring Trepanning Association) in deep hole drilling. The process is used when the machining with a conventional tool is not possible. Poor training and/or poor chips which are generated were the cause a temperature rise and excessive wear which affect the dimensional stability of machined parts. The process for analyzing the chips morphology was relatively not explored enough, because it is difficult to instrument experimental tests a phenomena are localized at the end of the BTA drilling head and confined in a zone inaccessible to the observation. Thus, a study of this process has been proposed. The evaluation of the chips morphology has been performed, it is a good indicator of the stability of the cutting process and it can therefore be a serious help in the selection of optimal cutting parameters optimum parameters are proposed to highlight the impact of cutting conditions on the cutting process. Macro and microscopic observations of generated chips under several cutting conditions are performed. Experimental tests have been conducted. The chips have been sorted according to their morphology and identified according to their origin and then proposed physical parameters are given. The quantitative and qualitative analysis of chips allowed identifying the impact of the cutting speed and feed rate on the cutting process was studied.

3. PROBLEM DEFINATION AND OBJECTIVES:

Problem definition:

In machining using Boring Trepanning Association cutting Tool (BTA), Ra (average surface roughness) and Rz(difference between the tallest peak and the deepest value in the surface) are two important criteria of surface finish. And these surface finish values achieved by BTA cutting tool Presently by the industries are not in the position to meet

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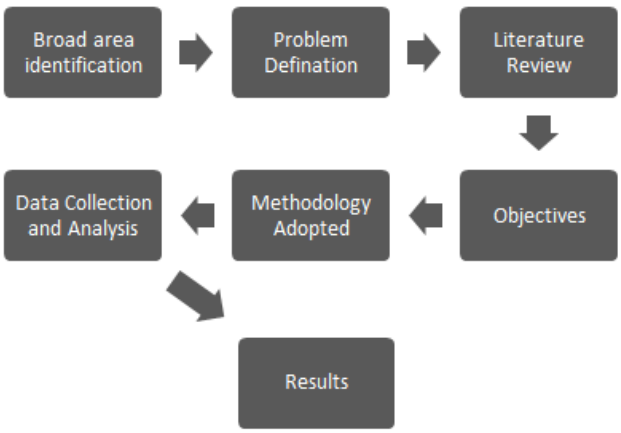
better Ra values and also available Ra is 0.2 µ according to Indian standards. As per now It's difficult to meet the Ra values less than 0.2 µ using BTA tool.

In Indian Standard of Surface Finish value is Ra 0.2µm and International Standard of Surface finish is up to Ra 0.4µm. In any other country till now it is not possible to implement the Ra 0.2µm in this BTA Tool And Ours is a brazed BTA Tool, three cutting points are there and two burnishing pads and two different materials are used in this BTA Tool and now we are reached Ra 0.105µm and Rz 0.587µm and still we implementing the Ra and Rz value.

3.1 Objectives of project works are:-

1. To Design of boring trepanning Association (BTA) Tools for manufacturing of shock absorbs and landing gears etc.
2. To Development of BTA Tools
3. To Performance Analysis of BTA Tools for cutting aluminum shock absorbs
4. To implement Ra and Rz value.

4. METHODOLGY :



4.1 Methodolgy Adopted in Pervious Methods:

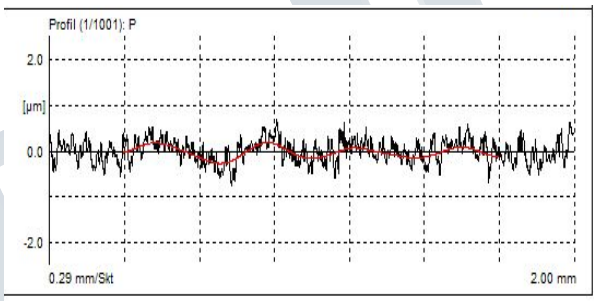
Steps:
1. Hand lapping @1Degree or straight lapping.
2: Straight lapping with 800/2000stick @ 0 Degree.
3: lapped land value should be between 0.5 to 0.55mm.
4: Entry champer should be 0.3 to 0.4 behind the cutting edge.
5: It also depends up on the Speed, Feed and coolant flow rate.
6: Cylindrical land 1.4/1.5.

4.2 New proposed method/ steps for further improvement Ra and RZ value:

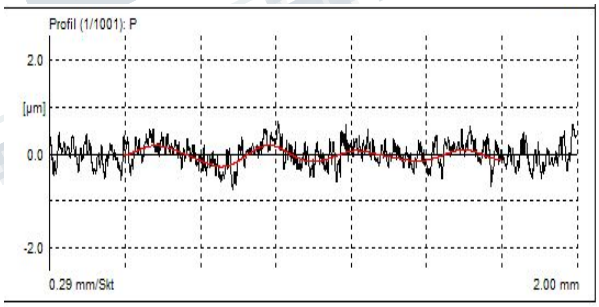
Steps:

1. 2/8 Degree is changed to 5/8 Degree.
2. Entry champer should be 0.4 behind the cutting edge.
3. Grind Rake face 0.60mm above center line.
4. Chip breaker run angle 45 Degree.
5. Surface machine lap @1degree Clearance.
6. Not using the hand lapping.
7. After 1degree lap, and polishing.

Tool results: Ra and Rz values:



Ra: 0.102µm



Rz: 0.587µm

Surface Roughness Profile Graphs, Formulation & Cal Parameters:
Surface Roughness Profile Parameters:-

- Ra: The average surface roughness.
- Rz: The average distance between the highest peak and the lowest valley.
- Rmax: Maximum Roughness Depth.
- Rt: Maximum height of Profile.
- Rq: Root Mean Square (RMS) Roughness.

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CONLUSION:

In this paper problem with surface finish has been identified in the manufacturing process and designed and developed Boring Trepanning cutting tool (BTA) to meet better Ra values as per Ra (0.2µm) Indian standards. And we achieved Ra 0.1µm and Rz 0.5µm.

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