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LITERATURE REVIEW ON TOOL WEAR IN TURNING OPERATION OF ALUMINIUM

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ABSTRACT
The present work is a literature review of the existing works carried out by the researchers to find out the directions of current research work. The objectives of the research is to specify specific speed, feed, depth of cut which results least tool wear while working with aluminium part & HSS tool. Also to find out the maximum & minimum wear occurring on HSS tool at different cutting speeds.

INTRODUCTION
Tool wear observation should be one of the firsthand objectives in order to produce the needful end products in a machine-controlled industry so that a new tool may be pioneered at the instant at which the present tool has worn out, thus preventing any danger occurring to the device or impairment of the surface finish. Cutting tools may go wrong due to the plastic distortion, mechanical breakage, cutting edge pointless, and tool brittle breaking or due to the rise in the interface temperatures. Throughout the world today, there is a uninterrupted struggle for cheaper production with better quality. This can be achieved only through best utilization of both material and human resources. Machining operations consist a substantial part of world’s manufacturing substructure. They make about 15% of the worth of all mechanical constituent manufactured worldwide. Because of its large economical and specialized importance, a large magnitude of research has been done in order to optimise cutting process in terms of rising quality, flaring productivity and sullen cost. Tool wear causing cutting power, machining quality, tool life and machining cost. When tool wear reaches a definite value, growing cutting force, vibration and cutting temperature cause surface integrity deteriorated and dimension error greater than tolerance. The life of cutting tool comes to an end. Then the cutting tool must be replaced or ground and the cutting process is interrupted. The cost and time for tool replacement and adjusting machine tool increases cost and decreases the productivity. Hence tool wear relates to the economics of machining and prediction of tool wear is of great importance for the improvement of cutting process.

LITERATURE REVIEW
Thamizhmanii S. et al. [1] have recovered that the surface roughness from various tests shows a drop-off in value at higher cutting speed and the feed rate. The cutting tool has produced micro chipping and has not impressed the surface finish. Micro cracks were acquired from the border of micro chipping. The notch wear might have been caused due to difficult particles and other impurities existing in the material. There is no placement of built- up- edge that is normally occurring during machining cast iron at lower cutting speed. Advance work can be carried in the way of measuring the residual stresses by turning and placement of built- up edge under high speed machining.
Ozel Tugrul et al. [2] have deliberated that tool nose design affects the surface finish and productiveness in the finish hard turning processes. Surface finishing and the tool flank wear have been analyzed in finish turning of AISI D2 steels (60 HRC) using ceramic inserts. Twofold linear regression models and neural network models are formulated for predicting surface roughness and the tool flank wear. In neural network modeling, measured forces, power and specific forces are used in training algorithm. Experimental results point that the surface roughness values as degraded as 0.18–0.20μm is attainable with the wiper tools. Tool flank wear reaching to a tool life standard value of VBC = 0.15mm ahead or around 15 min of cutting time at higher cutting speeds due to elevated temperatures.

Omar B. Bin et al. [3] have observed that wear pattern depend on the CBN tools used, work piece material composition, and cutting conditions. They also concluded that generally, adhesion, abrasion and diffusion are reasoned to be main tool wear mechanisms in CBN hard turning: however, the individual effect of each mechanism depends on the combinations of the CBN tool and work materials, cutting conditions, tool geometry etc. A few elementary mechanisms rule cutting tool wear are: 1. Diffusion wear smitten by chemical loading on tool and cutting material 2. Oxidation wear - crusades gaps to occur in coated film and outcome in a loss of the coating at elevated temperature, 3. Fatigue wear - is a thermo-mechanical result and leads to the breakdown of the edges of cutting tool, 4. Adhesive wear happen at devalued machining temperatures on the chip face of tool and leads to shaping of a built up edge, and the perpetual break down of the built up edge and tool edge itself, 5. Abrasive wear affected by hardness of the work material and is restrained by content of the cutting material.

Lin H.M. et al. [4] have found that tool life emerges with the gain of cutting speed until a supreme is reached where it starts to drop-off. In a low-level speed cutting, abrasion is the firsthand form of wear. When cutting speed is augmented, a sticking layer is effected and stays on tool face which prevent tool face from wearing. At graduate cutting speed, the chip is exchanged from continuous type to saw-tooth type. Friction force is inflated consequently, and the layer on tool face is abrased bit by bit. Since scattering between work and the tool materials turn more than intense at higher cutting speed, the bond 'tween the hard particles is vitiated and wear on the rake face is exaggerated drastically.

Kamarudin K. et al. [5] have discovered that Flank wear in the ceramic cutting tools is mechanically stained wear ordinarily by the abrasive state of the hard work piece material with ceramic tools. The flank wear is characterized by the abrasive groove and elevation on the flank face. The flank wear of the cutting tool has a momentous result on the attribute of the machined surface. Flank wear has a prejudicial effect on the surface finish, residual stress and the micro structural changes, shape of tool, as well cutting conditions. The flooding temperature bring forth 'tween the cutting face and work piece justifies abrasive and or adhesive wear. These types of wear impact the tool materials attribute as well as work piece surface. The reasons for gain in flank wear were due to increase in temperature at the cutting edge due to more interaction time between tool and work piece. The temperature may causing to lose its hardness and wear. When the cutting speed was take down, the flank wear was taken down and as these parameters are accrued, the flank wear also exaggerated.

Vikas B. Magdum, Vinayak R. Naik. [6] in their paper used the cutting forces in a turning process of EN 8 steel to estimate the tool wear effect. Tool wear effect is obtained by monitoring the variation in the cutting forces. The intent of this study is to develop an on-line observation system. By distinguishing one or more than one criteria to efficiently specify and determine rapid tool wear, it can be ascertained when to change the tool. This work provides some interesting results about the tool wear in a machining process of the EN 8: the correlation between the tool wear and cutting forces shows that, the cutting forces are increased as the tool wear increases.

Nithyanandhan.T T, Manickaraj.K and Kannakumar.R [7] in their study, an endeavor has been made to analyze the result of cutting parameters on the cutting forces and the tool wear in the hard turning of AISI 304 steel using the coated carbide tools. The results revealed that the feed and nose radius is the almost important process parameters on work piece surface roughness. Even so, the depth of cut and feed are the significant factors on MRR.

S. Thamizhmnaii, B. Bin Omar, S. Saparudin, S. Ha [8] have conducted research to exhibit tool wear with the help of hard turning of martensitic stainless steel and this material is articulated as difficult to machine material. The judgment was done utilizing CBN cutting tool on SS 440 C stainless steel with hardness between 45 to 55 HRC. The flank wear occurred at low cutting speed with high feed rate and more depth of cut i.e. at cutting speed of 125 m/min, feed rate of 0.125 mm/rev and DOC of 1.00 mm. The influence of tool flank wear was due to abrasive action between tool tip and cutting tool, hard carbides in the work piece material. At low cutting speed of 125 m/min. formation of built up edge was inevitable due to more contact time. The flank wear was also due to heat generated at low cutting speed.

Ning Fang, P Srinivasa Pai & Nathan Edwards [9] have analyzed tool-edge wear (i.e., the wear of a tool cutting edge before it is meagerly worn away) is among momentous concerns in high-speed machining because it can effect in early tool failure and decayed quality of machined parts. Founded on extensive experimental effect, this paper display how tool-edge wear is correlative with the cutting forces and vibrations in high-speed turning of Inconel 718. As tool-edge geometry show a important role in machining at small feed rates, tool-edge wear importantly contributes to primal tool failure and crumbled quality of machined components and parts.

Pramod Kumar N.et al. [10] in their present work which involve the study of thermal and wear behavior of tool and work interface. Experiments were conducted on a Turn master 35 automatic lathe. Different cutting forces, temperature of tool tip, thickness and the weight of the chips settled during machining along with tool wear information were canned. The causation of the cutting parameters was deliberated. Based on the research data plots are acquired. The mild steel turning procedure provided some helpful results in abstraction to machining parameters, which will be utile in developing turning process improvement with respect to power consumption and tool life.

PROBLEM IDENTIFICATION

The turning operation is one of the main operations used in machining of different parts. Mainly single point cutting tool is used in the turning operation. For this purpose, variety of cutting tools available in the market. These tools have different geometry and different materials to machine a variety of metals and alloys. Aluminium is widely used in the automotive construction and aerospace industries. It also finds application in different because of intrinsic properties of lightness and corrosion resistance. The present study is carried out for different cutting parameters & its effects on machining of aluminium parts. The primary & secondary force which causes tool wear is analyzed. A number of tests are performed with different cutting speed and feed rates. Cutting forces and tool wear is measured from these experiments. This data will be assistive in analyzing cutting process. Various graphs of cutting forces Vs cutting speed and tool wear Vs cutting speed are premeditated and these graphs display the fluctuation of tool wear and cutting forces. Further SEM tests are taken to notice the tool wear surface of the carbide tool.

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