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Turning and Drilling of HSS using ALNOVA Coating

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Abstract: ***BALINI ALNOVA enhanced wear resistance as well as increased corrosion resistance and warm hardness makes this new coating the choice for end mill. The service life of BALINIT ALNOVA coated end mills is up to 30 times longer compared to other high coatings. Performance coating with BALINIT ALNOVA we can machine challenging material High performance and high quality. AlCrN is the coating material and the coating structure is multilayer.***

KEY WORDS: ALNOVA, SEM, HSS.

I. INTRODUCTION

In recent days the manual gear box automobiles are equipped with an organized automatic transmission. Transmission gears are always looped and rotated, but the gears on a shaft can be rotated freely or tightened to the shaft. The sealed structure for a machinery subsist of a collar on the pole and can be slide sideways so that choppers on its interior surface of the bridge between two circular rings with choppers to the outer surface of the circumference [1]. These collars are made up of Steel material with heat treated surface on the outer side. The heat-treated surface on the collar's outer surface increases the wear resistance of the element [3].

The equipped collars to power their closing magnitude with precise magnitude tolerances[4]. While equipping thermal conducted metal by traditional formulation such as milling and turning, two types of cutting tools are used carbide based particles are stick together and CBN (Cubic boron nitride) [2],[5]. There is a critical test in equipping thermal conducted metal applying cemented carbide based cutting tools. This is reported to cutting tools. This high hardness of the work piece reduces the life of the tool because the tool fails because of its cutting edge [6]. To improve the life of the cutting tool the following approach is used along with sufficient cooling and lubricating fluids brighten the cutting tool face, absolute clear angles and fine pointed corners.

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II. METHODOLOGY

The methodology of the present work is given in below Fig. 1. CNC lathe machine specification is detailed in Table I.

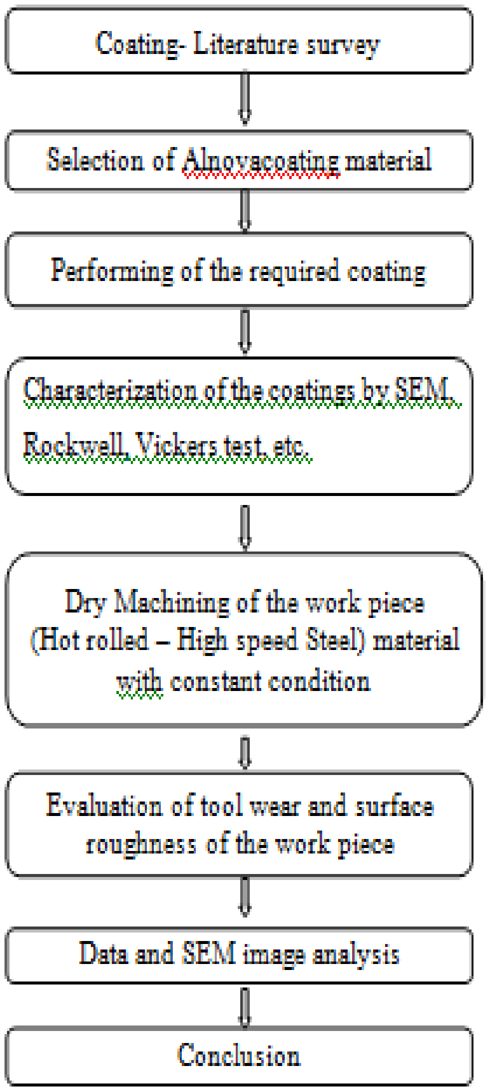

Fig. 1. Flow chart of the proposed methodology

Table- I: Specification of the CNC Lathe

Machine : JOBBER DX CNC Lathe		
Capacity	Swing over bed	500 mm
	Distance between centers	425mm
	Maximum Machining diameter	270mm
	Maximum longitudinal travel(Z axis)	4000mm
	Maximum traverse travel(X axis)	140mm
	Maximum power requirements	20KWA
	Approximate weight	3800 Kg
Spindle	Spindle speed	50-4000 rpm
	Spindle motor (AC motor)	Fanuc Beta 6/6000 i, 7.5KW/11 KW

A. Machining parameters

The cutting parameters selected for machining Hot rolled - Low Carbon Steel are

Feed rate : 0.2 mm/rev
Depth of cut : 0.5 mm
Cutting speed` : 250 rev/min
Machining time : 5 min

The parameters are kept constant throughout the machining processes.

III. RESULTS AND DISCUSSION

A. Preamble

The coated and uncoated High speed steel tools have been analyzed with SEM for its microstructure. Fischer scope analysis has been made to identify the thickness of the coating material. Vickers hardness test has been done to identify the micro hardness of the coated and uncoated insert tool. After machining of the heat treated Heat treated Hot rolled - Low Carbon steel material, the work piece has been measured for its surface roughness. Both coated and uncoated tool has been measured for its flank and crater wear using SEM analysis.

B. Scanning Electron Microscope (SEM) Analysis

The microstructures of the uncoated, Alnovacoated end mill cutter are shown in Fig. 2 respectively. It can be verified that the uncoated tool depicts a larger and coarse grain structure and Alnovacoated has finer grain structure when compared to that of uncoated end mill cutter.

C. Work piece with Surface Roughness

The workpiece with surface roughness is measured by Surface profilometer after each machining .The values measured are given in the table. II.

Table- II: Measured Values of Surface Roughness

SL. NO	RANDOM SAMPLE NO.	Alnova (microns)	Uncoated (microns)
1	10	0.811	0.698
2	20	0.793	0.711
3	30	0.892	0.789
4	40	0.842	0.978
5	50	0.965	0.921
6	60	0.897	1.042
7	70	0.946	1.072
8	80	1.021	1.788
9	90	0.991	1.934
10	100	1.071	1.898
11	110	1.041	1.967
12	120	1.112	1.956
13	130	1.072	2.031
14	140	1.235	2.079
15	150	1.337	2.184

The surface finish of workpiece is better when machined by Alnova coated inserts than by Uncoatedend mill cutter.

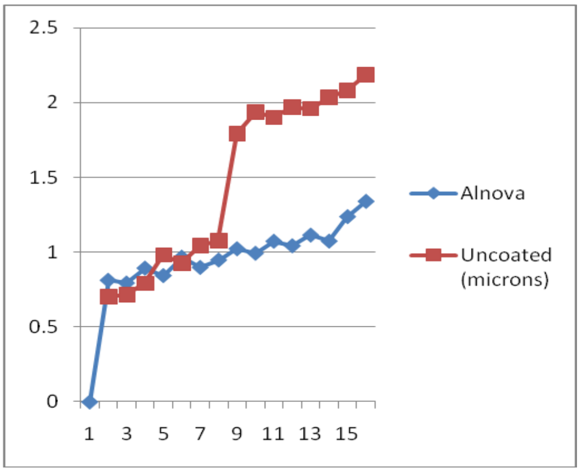

Fig. 2. Microstructures of the uncoated, Alnovacoated end mill cutter

D. Based on Tool Life

Components produced by the both uncoated endmill and Alnova coated endmill and its total value is tabulated in table.III, and graphical representation of uncoated and Alnova coated endmill is represent in fig.3 and fig.4.

Table- III: comparison of Uncoated and Alnova coated endmill

S. No	No.of Component Produced Uncoated Endmill	No.of Component Produced Alnova Coated Endmill	Difference
1	80	220	140
2	155	240	85
Total	235	460	225

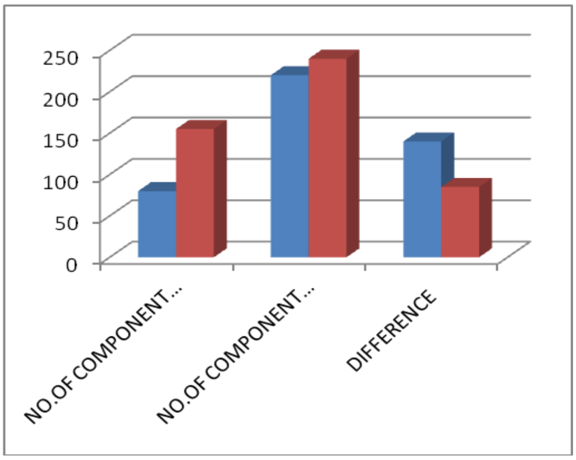

Fig. 3. Comparative analysis of Uncoated and Alnova coated endmill

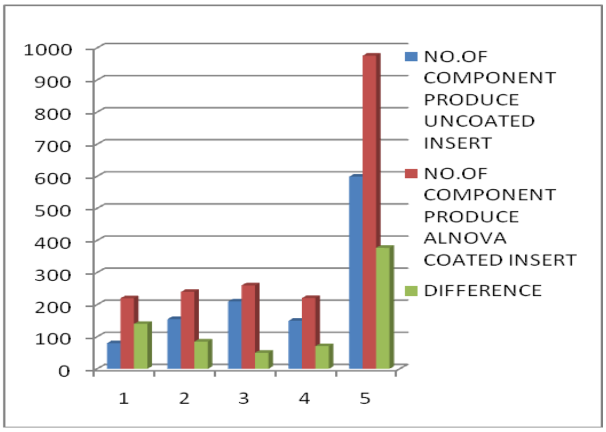

Fig. 4. Comparative analysis of Uncoated and Alnova coated insert

IV. CONCLUSION

- The effect of drilling is to reduce wear and tear of tool tip as well as to reduce more heat dissipation to surrounding hence the increase in tool life. Surface finishing of the material to be drilled with increased cutting depth, surface roughness is decreased, so experimental results show that by choosing the right cutting parameters, the coated tools are ideal for finishing the surface. Tool life extended for around 90% in some cases especially in bumper toos**.** The adhesion of all the coating on the substrate was evaluated using Rockwell indentation test and was found to be in HF1 scale.
- The end factory shaper wear was estimated for after each machining. Surface harshness of the work piece was estimated by contact type surface unpleasantness analyzer. Another arrangement of trial was done to break down the flank and hole wear on the supplement for 30 minutes. Flank wear was broke down by SEM. It was discovered that Alnova covered end factory shaper gives better surface completion when contrasted with uncoated supplements. No unmistakable wear was been noticeable on the supplements following 3 hours of machining however chip off of the addition showed up for uncoated embeds. From SEM investigation it is obvious that the wear pace of the apparatus is less when contrasted with uncoated devices.

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