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RESEARCH ARTICLE

USAGE OF WASTE CARBIDE INSERTS IN VARIOUS MACHINING OPERATIONS AND OPTIMIZATION OF DATA BY USING TAGUCHI METHODOLOGY

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ABSTRACT

The main objective of this research paper is to utilize the waste carbide inserts in various machining operations by developing the index able boring bars, index able milling cutters which can be used for utilization of waste carbide inserts. The turning insert having size CNMG 120408 is used. In industry this carbide insert is used for turning processes. This is negative insert having 80 degree angle and rhombus geometry. Four edges are used and after using its edges this insert become wastage. To utilize the other edges the special size of boring bar 25mm diameter for turning operation and 63mm diameter milling cutter for gangue milling is developed and used for machining in this research. To evaluate the effects of these special tools the taguchi methodology is used. The output results such as material removal rate and surface roughness is analyzed by taguchi methodology. Various materials are used to optimize and observe the results.

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INTRODUCTION

In current days, it is observed the production rates and margins continuously decreasing due to competition. The survival becomes difficult day by day even for developed and well established industries. So the research and development of new kinds of techniques is totally focused on cost reduction, production improvement, techno saving, energy efficient. The main objectives of businessmen and industrialists are to develop new techniques in lower rates and these techniques give the high marginal gains. In this research the tools are developed to use the waste carbide inserts, which are totally wastage and again high rates are paid for purchase because the production cannot be stopped. Milling and turning are the main operation of mechanical industry. In fact the automation is done for these operations for example CNC and VMC are the machines developed to increase the production and finishing of job work. For these costly machines the costly tools are used which increased the cost of work. But after using the carbide tooling, the tooling can be used in various machining operations and also be used on conventional machines. Milling and turning are the processes which are used in industry (Pugaa*et al*., 2009). Increasing tool life by maintaining quality is essential now these days (Bouzakis*et al*., 2011). The tool periodically loses contact with the chip leading to a reduction in machining forces, friction, and temperature in the cutting zone and the formation of thinner chips, as well as simultaneously preventing generation of micro-cracks on the cutting edge and workpiece surface. As a consequence, this improves cutting stability, surface finish, and tool life when compared to conventional machining(Narasimha*et al*., 2011). The attempts are made in auto part industry, Ludhiana. The attempts are made on various materials. These materials are used in various manufacturing items. The materials are almost used by all kind of manufacturer. The material i.e. aluminum bronze35x65mm, Nylon (45mmx80mm) are used for turning operation, AISI d3, EN 8D 6T. These materials are back bone of industry due to its mechanical properties. The tools are trialed on these materials. Various types of jobs are machined on conventional and non- conventional machines.

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METHODS AND MATERIALS

In this research, the boring bar was designed according to size of other edges of CNMG turning insert. This boring bar was used for turning operation and the set of trails was designed by taguchi design of experiment. The trails were made according to the design. This boring was used for external turning and internal turning of job piece. Earlier the welded tools were used which required 15-20min for sharpening the edges according to requirement of job work. This was time

consuming, energy consuming and production loss. By replacing these tools by other edged boring bar only 10 seconds are required to change the insert and easily used during the production without any interruption. The CNMG120408 used is shown in Fig.1. The other edge boring bar is shown in Fig.2.The material and job pieces turned by this boring bar is shown in Fig.3.

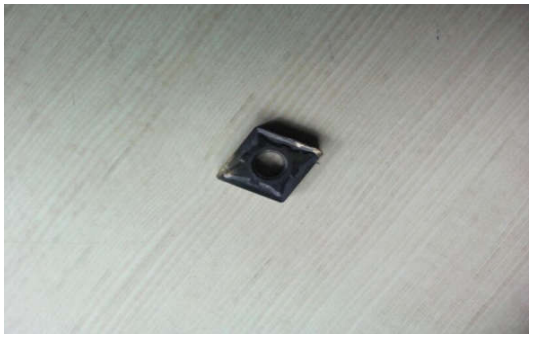

Fig.1. (CNMG120408)

Fig.2. (other edge boring bar 25mm)

Fig.3. Aluminum bronze (35x65)

Fig.4. Nylon (45x80)

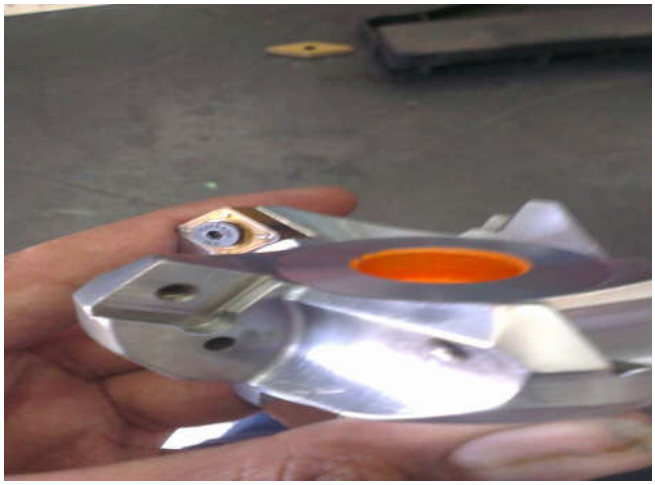

Fig.5. Other edge CNMG 120408 milling cutter 63 mm diameter

Fig.6. AISI d3 material 75mmx30mmx 90mm

Table 1. Results for MRR (Other edge CNMG 120408 boring bar 25mm)

S.NO	RPM	FEED (m/min)	CUT (mm)	MRR Aluminum bronze (mm^3/min)	MRR Nylon (mm^3/min)
1	540	0.1	.5	2.53	12.65
2	540	0.1	1	3.31	16.55
3	540	0.1	1.5	2.375	13.675
4	540	0.15	.5	2.78	13.9
5	540	0.15	1	3.056	15.28
6	540	0.15	1.5	3.1	15.5
7	540	0.2	.5	2.89	13.45
8	540	0.2	1	3.89	18.91
9	540	0.2	1.5	3.12	14.6
10	540	0.1	.5	8.345	41.725
11	900	0.1	1	9.31	46.55
12	900	0.1	1.5	9.78	48.9
13	900	0.15	.5	9.19	45.95
14	900	0.15	1	11.21	56.05
15	900	0.15	1.5	10.42	52.7
16	900	0.2	.5	8.65	43.55
17	900	0.2	1	10.17	48.85
18	900	0.2	1.5	10.508	51.54
19	900	0.1	.5	15.2	74.76
20	1550	0.1	1	18.1	89.6
21	1550	0.1	1.5	18.5	87.1
22	1550	0.15	.5	16.78	82.79
23	1550	0.15	1	19.81	97.78
24	1550	0.15	1.5	21.4	106.4
25	1550	0.2	.5	15.5	76.44
26	1550	0.2	1	17.9	82.89
27	1550	0.2	1.5	20.3	101.8

Earlier the milling cutters of high cost were used for various milling operations i.e. face milling, side and face milling, gangue milling. These machining operations can be performed by this cutter. The inserts used for these milling operations having high operational cost. By replacing the other edge

cutter, the waste CNMG 120408 was utilized and the cost of inserts also decreased by changing any method of machining.

Table 2. Results for MRR (Other edge CNMG 120408 milling cutter 63 mm diameter)

Experiment No:	Pressure (lb/in^2)	Speed (rpm)	Feed Rate(mm/min)	DOC (mm)	MRR (mm^3/min)
1	10	540	50	0.5	123
2	10	540	80	0.75	226
3	10	540	150	1	430
4	10	900	50	0.5	119
5	10	900	80	0.75	276.6
6	10	900	150	1	607.3
7	10	1500	50	0.75	130.9
8	10	1500	80	1	396.5
9	10	1500	150	0.5	433.5
10	15	540	50	1	186.1
11	15	540	80	0.5	167.4
12	15	540	150	0.75	321.3
13	15	900	50	0.75	140.9
14	15	900	80	1	223.4
15	15	900	150	0.5	223.7
16	15	1500	50	1	198.6
17	15	1500	80	0.5	211.7
18	15	1500	150	0.75	299.7

The milling cutter of 63mm was used for gangue milling. In gangue milling the 90 degree angle is required and the other edges of insert are also at 90 degree. So the milling cutter have perfect angle for gangue milling. The milling cutter is shown in Fig.5. The material and work piece used for milling is shown in Fig.6

In Table 1 indicates the output results of turning operations. The other edge boring bar is used for and 27 trails are made to evaluate the performance of developed boring bar. The results of material aluminum bronze and nylon are shown in table. In Table.2 the results obtained by using other edge CNMG120408 milling cutter. The results of material removal rate is shown in Table.2

Conclusion

1) The tools used on various materials did not show any problem.
2) These tools decreased the cost of tooling.
2) The results obtained are similar to the previous tools used. As there is no difference between these tools. These tools did not effect the methods of operating
3) These boring bar and milling cutter are the solution of wastage inserts. We should develop special tools for reducing the cost of cutting tools according to requirement.
4) The chattering and accidental problems are not observed during the work.
5) These tool can be used on conventional machines and CNC,VMC machines.
6) These tools did not effect the material surface, material removal rate and production rate.

Future Scope

These tools can be used according to job size and any size of boring bar can be developed according to size of insert . The diameter of milling cutter can be increased according to requirement.

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