iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** XII **Month of publication:** December 2023

DOI: https://doi.org/10.22214/ijraset.2023.57304

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue XII Dec 2023- Available at www.ijraset.com

Machining (A Case Study) - Nature of Different Tools

Aditya Kumar Singh[1], Ajay Solanki[2], Arnav gupta[3]
Delhi technological university

Abstract: Metal cutting and forming depend heavily on machining, also on tool nature which is very important , which is a significant component of metal working. Machine tools, in particular cutting tools, are crucial for efficient metal cutting in machining. This is as a result of their contributions to the creation of various shapes and forms.

I. INTRODUCTION

Machine tools are typically cutting tools or metal farming equipment used to reshape or transform the workpiece to the desired size and shape by various operations such as drilling, cutting, and machining.

II. DISCUSSION

In a machine shop, 150 mm diameter AISI 4140 steel rods that have been annealed must be reduced down to 149 mm. The material has a BHN 250 hardness rating. The rods measure 100 mm in length. Machinery's Handbook (30th edition, p 1071) provides the ideal cutting speed and feed for various cutting tool materials. For instance, 108, 192, and 375 m/min are the ideal cutting speeds for the following tool materials listed in the table. 0.43, 0.43, and 0.25 mm/rev are the feed rates. These feeds and speeds are good for a 15-minute tool life. Regular production necessitates replacing the tool every 15 minutes, which increases the amount of idle time on the machine and the operator involvement. From the Taylor tool life equation, it is noticed that for increasing the tool life the cutting speed needs to be reduced. For carbide tools, to increase the tool life the cutting speed is to be multiplied by 0.86 for 45-minute tool life, 0.78 for 90-minute tool life, 0.71 for 180-minute tool life. The factors for coated carbides are 0.80. 0.70 and 0.61 respectively. Similarly for ceramic tools are 0.89, 0.82 and 0.76 respectively. When the cutting speed is decreased, the machining time will increase. It may be noticed that the increase in tool life is not directly proportional to the reduction in cutting speed. The machining times can therefore be recalculated for all tool lives as given in the following table:

TOOL LIFE, MIN	MACHINING TIME, MINUTES		
	Uncoated carbides hard grade	Coated carbides hard guide	Ceramics, hard
15	1.01	0.57	0.50
45	0.90	0.39	0.94
90	1.07	0.49	1.11
180	1.27	0.61	1.10

By comparing the number of parts that can be fully machined before a tool change is made in the machine, the relationship between tool life and machining time can be better understood. When the data are calculated, the following outcomes are obtained:

TOOL LIFE, MIN	NO. OF PARTS MADE BEFORE TOOL CHANGE		
	Uncoated carbides hard grade	Coated carbides hard guide	Ceramics, hard
15	15	26	30
45	38	63	80
90	70	111	148
180	127	193	274

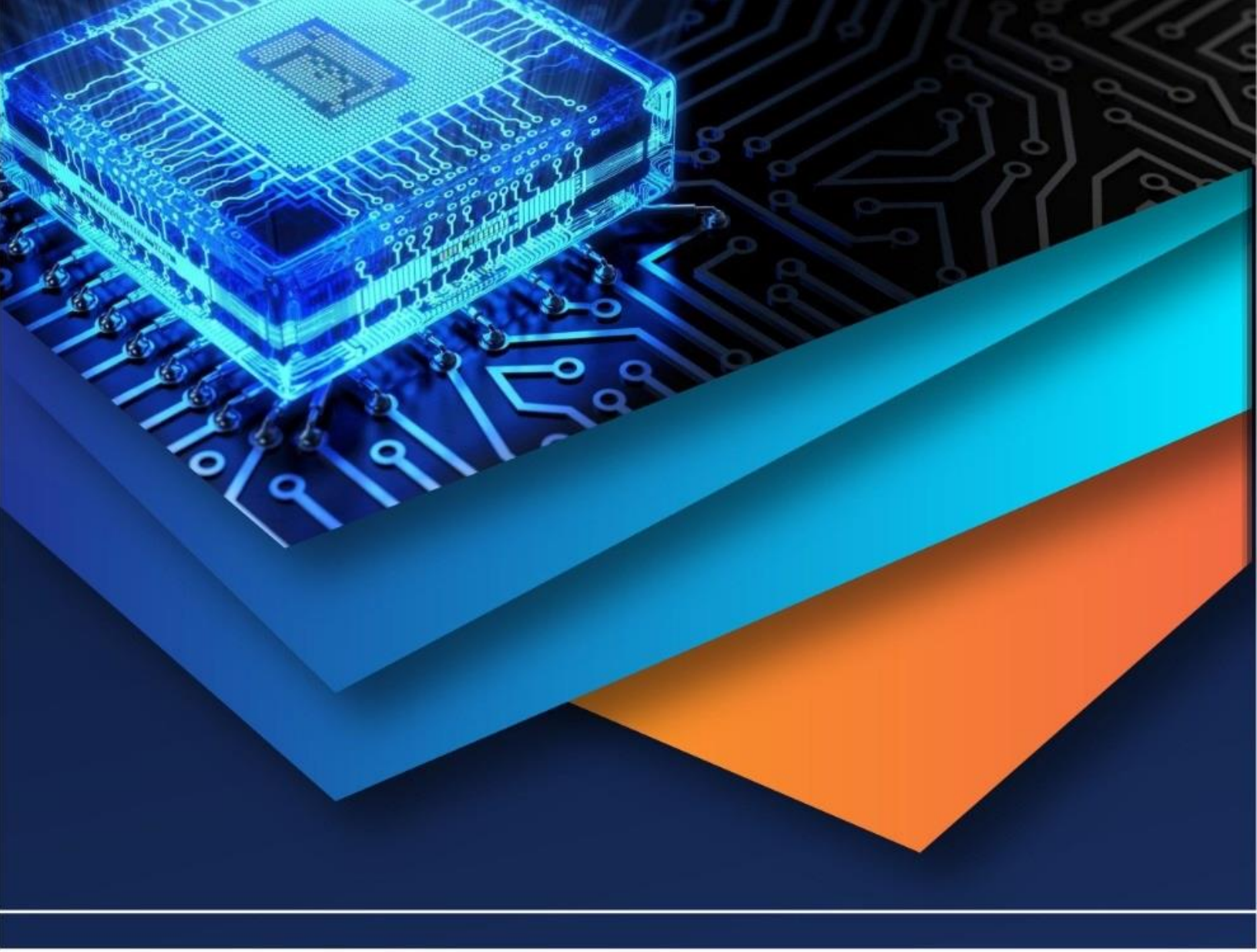
Assuming the tool cost of coated carbides and ceramic tools to be 1.4 times and 1.2 times respectively, compared to uncoated carbides, work out the economics for each tool/ work piece combination. One word of caution is that the relationship of the surface finish produced based on the cutting speed and feed used as well as the rigidity of the machine for suitability of the process was not considered in the above calculations.

III. CONCLUSION

Tool nature and its variable are very important for the machining efficiency and we can conclude its parameter affects the workpiece heavily.

REFERENCES

[1] https://www.researchgate.net/publication/291139018_DISCUSSION_OF_MACHINE_TOOL_INTELLIGENCE_BASED_ON_SELECTED_CONCEPTS_AND_RESEARCH
[2] https://www.journalcra.com/sites/default/files/issue-pdf/8733.pdf
[3] https://worldwidescience.org/topicpages/m/machine+tool+technology.html
[4] https://link.springer.com/referenceworkentry/10.1007/978-1-4471-4976-7_4-1
[5] https://www.sciencedirect.com/topics/engineering/machine-tool-design



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY