A Study Paper of the New Trend of the Face Milling Method

Manoj Kumar, Department of Mechanical Engineering,
Galgotias University, Yamuna Expressway
Greater Noida, Uttar Pradesh
Email ID: manojkumar@Galgotiasuniversity.edu.in

ABSTRACT: ***The paper explains about tool life, life of tool can be increased by proper selection of process parameters, geometry parameters, and machining parameters. The design of experiment has been used to study the effect of the main milling parameters such as feed rate, cutting speed, and depth of cut for tool life. Limiting factors to be considered are area for face milling and depth of slot. Tool Life Relationship Equation is established by Taylor Tool Life Equation and Tool Life is determined. The effect of these parameters on surface roughness must be studied using Response Surface Methodology (RSM). Thus, experimental and theoretical data optimization of process parameters is to be carried out.***

KEYWORDS: Face milling, Methodology, Optimization, Tool life, Response surface, Surface roughness.

INTRODUCTION

The milling machine [1] is one of the most valuable machine tools in the room, as virtually all operations can be carried out with high precision. The indexing head makes the machine ideal for so many applications that it can be used to accurately rotate the work. The milling machine improves the work of the lathe and can create smooth and angled surfaces and helical grooves, etc. The milling machine can be arranged in such a way that multiple cutters are placed on the arbour at the same time, thereby improving the rate of metal removal and allowing several surfaces to be machined at the same time and also ensuring precision. Is a process in which the metal removal takes place as the job is fed past a spinning cutter?

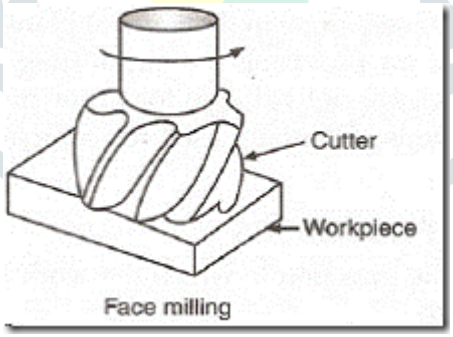

Figure 1: Typical Face milling

The milling machine is one of the most valuable machine tools in the room, as virtually all operations can be carried out with high precision. The indexing head makes the machine ideal for so many applications that it can be used to accurately rotate the work [2]. The milling machine improves the work of the lathe and can create smooth and angled surfaces and helical grooves, etc. The milling machine can be arranged in such a way that multiple cutters are placed on the arbour at the same time, thereby improving the rate of metal removal and allowing several surfaces to be machined at the same time and also ensuring precision. Face milling is carried out by a face milling cutter turned along an axis perpendicular to the work surface. Face milling cutters with multiple-tooth inserts are used to eliminate high metal removal speeds. Generally, it consists of a broad diameter cutter body with a variety of mechanically fastened inserted instruments.

1.1 Tool Life:

During the machining process, the cutting edge of the tool eventually wears out and ceases cutting metal at some point. After a certain amount of wear, the tool needs to be re-sharpened to make use of it. Tool life is the useful cutting life of a tool reflected in time or some other unit. This time is determined from the start of the cut to the point at which the tool no longer performs the intended purpose specified by the failure criterion. The cycle of adequate tool cuts is called life. This results in low surface finish or dimensional precision. Tool life is the time between two successive tool replacements [3].

Taylor's equation for finding the tool life, which depends on the cutting speed, and the equation is given below, $VT^n=C$. When C and n are constant, V is the cutting speed (mm/min), T is the tool life in minutes. Tool wear is a time-dependent process. If the cutting process continues, the volume of tool wears increases steadily. However, tool wear must not be permitted to reach a certain amount in order to prevent tool failure [4]. Each machine operation is dependent on certain parameters such as machining parameters, geometric and process parameters. Machining parameters are cutting speed, feed rate, cutting depth. Geometric parameters are the geometry of the instrument. Process parameters are coolant, system rigidity, function piece. The tool life depends on these parameters and therefore the selection of optimal parameters would increase the tool life [5].

1.2 Optimization

The RSM (Response Surface Methodology) will be used to maximize the result. It is a set of mathematical and computational techniques for constructing an analytical model. Through careful design of the experiments, the goal is to maximize the response (output) that is affected by multiple independent variables (Input variables). An experiment is a sequence of experiments, called runs, in which adjustments are made to input variables in order to determine the causes for changes in output response [6]. The application of RSM to Design Optimization is aimed at minimising the expense of costly methods of analysis (e.g. finite element method or CFD analysis) and their related numerical noise.

LITERATURE REVIEW

During the machining process, the cutting edge of the tool eventually wears out and ceases cutting metal at some point. After a certain amount of wear, the tool needs to be re-sharpened to make use of it. Tool life is the useful cutting life of a tool reflected in time or some other unit. This time is determined from the start of the cut to the point at which the tool no longer performs the intended purpose specified by the failure criterion. The cycle of adequate tool cuts is called life [7]. Milling requires many more factors than average turning operations, and many manufacturers have come to conclude that only a milling master can combine these factors and find the best possible solution to a given milling problem. While it is definitely true that a milling specialist is a wonderful asset to any machine shop team, comprehensive expertise is not needed for effective milling [8].

DISCUSSION

About every machine shop uses face-to-face mills for roughing, semi-finishing and finishing, but all of these shops skip improved material removal rates (MRRs) because they use today's machine tools yesterday. Big spindle tapers and higher horsepower ratings, feeds and speeds of modern machines need to operate with the new face milling cutter and insert technologies to optimize machine face milling potential. That's how stores speed up output, increase productivity and reduce costs per component, particularly for larger work pieces. The newest face milling cutters incorporate a new line of multi-sided, multi-edged insert solutions

that help to improve current machine tool performance with their free-cutting capability. These insert geometries improve tool life, minimize cutting forces and create open-form chips that reduce cutting edge tension.

Milling requires many more factors than average turning operations, and many manufacturers have come to conclude that only a milling master can combine these factors and find the best possible solution to a given milling problem. While it is definitely true that a milling specialist is a wonderful asset to any machine shop team, comprehensive expertise is not needed for effective milling. Owing to the large range of considerations involved in a specific milling application, some milling specialists claim that it is simply much easier to manage, since more variables to play with means more chances to find a near-optimal solution for a given problem.

CONCLUSION

Thus, by conducting experiments, by considering three stages of feed rate, cutting depth and cutting direction. Thus, by conducting tests, optimized parameters for optimum tool life can be defined by restricting the machining area. Thus the reduction of the corner radius would lead to a reduction in the life of the instrument. It can be technically demonstrated with the aid of the Response Surface Technique.

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