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A Review on Selection of Input Decision Variables & Response Variables of Machining Process by using Optimization Techniques

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Abstract- In this research paper we discuss the selection of input parameters of the machining process and output parameters of composite materials. And we also discuss the various optimization techniques. In today's life the manufacturing industries is focused on the accuracy of the product, increasing the demand of product, increasing production rate without increasing the cost. Optimization techniques or methods are used improve the output quality in products, to establish the relationship between input variables and response variables, and to determine the optimum cutting conditions of the composites.

Keywords: Input Parameters, Output Parameters, Composites, Optimization Techniques

I. INTRODUCTION

In manufacturing industries optimization is a major factor which effect on the quality of the product and production rate. To improve the performance of the system and to increase the yield of the process without increasing the cost, this method is called optimization. Machining operation has the base of the manufacturing industry since the industrial revolution. We apply different machining process on different composite material.

Composite material is composed of two types of material in which one material is named as matrix and the other is named as reinforcement. There are different type of composite material based on type of matrix and reinforcement.

1. Metal matrix composite
2. Ceramic matrix composite
3. Reinforced concrete and masonry
4. Composite wood like as plywood
5. Reinforced plastic such as fiber
6. Advanced composite material

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Machining is a process of material removal using cutting tool and machine tool to accurately obtain the desired measure of the product dimension with good surface finish. The manufacturing industries strive to achieve an optimal combination of the quality of the better product at the time of machining, as well as the minimum production cost and maximum production rate.

Machining process input variables are the process-independent variables. Various types of input decision variables are shown in table 1.

Table 1: Input Decision Variable With Parameters

Input Decision Variable	Parameters
1. Machine Tool	Rigidity, Capacity, Accuracy etc.
2. Cutting Tool	Material, Coating, Geometry, Nature of engagement with the work material, Tool rigidity etc.
3. Cutting Condition	Cutting Speed, Fees Rate and Depth of Cut
4. Work Piece Material Properties	Hardness, Tensile Strength, Chemical Composition, Microstructure, Method of production, Thermal Conductivity, Ductility, Shape and dimensions of the job, Work piece rigidity etc.
5. Cutting Fluid	Properties and Characteristics.

Machining process output variables are the process-dependent variables and include the following:

- Cutting Tool Life/ Tool Wear/ Tool Wear Rate
- Cutting Forces/ Specific Cutting Forces
- Power Consumption/ Specific Power Consumption
- Processed Surface Finish
- Processed Dimensional Accuracy
- Material Removal Rate (MRR)
- Noise, Vibration
- Cutting Temperature, Chip Characteristics.

Machining optimization process include traditional process (such as Turning, Milling, Grinding, Drilling, Finishing etc.) and advanced process (such as electrical discharge machining, drilling, electro-chemical machining, ultra-sonic machining, Abrasive jet machining, Laser beam machining etc).

Due to Complexity and uncertainty of the machining process, soft computing techniques (Such as Neural Network, Fuzzy Sets, Generic Algorithms, Simulated Annealing, Particle Swarm Optimization, Artificial Bee Colony Algorithms, Response Surface Methodology, Taguchi

Method etc) are being preferred to physics-based model for predicting the performance of the machining process and optimization them.

II. METHODOLOGY (Selection Process)

In the section of methodology firstly we will select one type of composite material from different types of composite materials. According to the composite material we choose a single machining process from different types of machining process. Than we select the input decision variables which effect has shown on the composite material as a response variables. Finally, we get optimum cutting condition and optimum results using Optimization Techniques.

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