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Literature Review on Mathematical Model Based Analysis of Conventional Machining of Ferrous and Non-Ferrous Materials

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Abstract*— Conventional machining is a complex phenomenon which includes the workers who operate the machines as well as the working environment. In most of the country majority of the machining operations are still executed manually which needs to be develop a mathematical model to identify the strength and weaknesses of the present method. To maximize the accuracy and minimize the error in the obtained mathematical modelling an artificial neural network (ANN) was used to correlate the various dependant and independent parameters.
Keywords*— Mathematical Model, Conventional Machining, Artificial Neural Network

I. INTRODUCTION

Traditional machining is a complex phenomenon which includes the workers who operate the machines and his working environment such as atmospheric parameters, work piece parameters, cutting process parameters, tool parameters, etc. In India and other country the majority of the total machining operations are still executed manually which needs to be focused and develop a mathematical model referred as experimental data based model to correlate the various input parameters with the output parameters.

Turning is a widely used machining process in manufacturing so selection of cutting parameters to satisfy an economic objective within the constraints of turning operations is very important task. The quality of surface is a significantly important factor in evaluating the productivity of machine tool and machined parts. The surface roughness of machined parts is a significant design specification that is known to have considerable influence on properties such as wear resistance and fatigue strength. It is one of the most important measures in finish cutting operations like turning, drilling, milling etc.

In the Indian scenario, conventional machine tools are still extensively used an shop floors .It needs to be focused and develop an approximate generalized mathematical relation which simulate the real input and output data directly from machining field where work is actually being executed.

II. LITERATURE SURVEY

Mangesh R. Phate,et al (2013)[1] Have focused on describing the field data base model (FDBM) considering a case study from real-world production process such as step turning for machine of ferrous and nonferrous materials. A drawing observations has been made in order to determine the selected parameters from the process such as operator, cutting tool, work piece, cutting process parameters as independent parameters while human energy is considered as dependant parameters ANN has been used to simulate the formulated FDBM.

C. Ramudu et al(2012)[2] Have considered many process parameters which directly or indirectly influence the surface roughness and material removal rate of product . Surface roughness and material removal rate in turning process were varied due to various parameters such as speed, feed and depth of cut are important once. Current investigation on turning process is a response surface methodology applied on the most effective process parameters that is speed, feed, and depth of cut while machining aluminium alloy and resin as the two types of work pieces with HSS (High Speed Steel) cutting tool.

A.V.N.L. Sharma et al(2013)[3] Have investigated the use of taguchi parameter design and regression analysis to predict and optimize the surface roughness and material removal rate in turning operations using chemical vapour deposition(CVD) cutting tool. While taking input parameters of cutting speed, feed rate and depth of cut etc. ,where EN553 was taken as work piece material.

M.Kaladhar et al (2011)[4] Have investigated the use of traditional taguchi method to optimize the surface roughness and MRR in turning operations of AISI 202 austenitic stainless steel while consideration of speed, feed, depth of cut and nose radius as input parameters. In current investigation it is concluded that, combination of higher levels of cutting speed, depth of cut and nose radius and lower level of feed is essential to achieve simultaneous maximization of material removal rate and minimization of surface roughness.

Mangesh R.Phate et al (2014)[5] Have investigated the use of Artificial Neural Network(ANN) to optimize the human energy in turning of AL6063 as work piece material. In the given investigation machine operator, cutting tools, work piece, cutting process parameters, lathe machine parameters and environmental parameters were taken as input parameters and it was found that, the impact of various parameters on human energy. Atmospheric parameters and the cutting process parameters were having significant effect on the human energy required for the machining process.

Vikas B.Magdum et al (2013)[6] Have investigated the use of Taguchi method and orthogonal array method to optimize the thrust force and feed force in the turning of EN8 steel as work piece material also tool shape, speed, feed, depth of cut are taken as input parameters. This study investigates the use of tool material and process parameter for machining forces for selected parameter range and estimation of optimum performance characteristic.

F.Mata et al (2010)[7] Have investigated the effect of cutting speed, feed, depth of cut on cutting power, specific cutting pressure and machining force by using response surface method. In current investigation reinforced polyetheretherketone with 30% of carbon fibres was used as work piece material they have found that by increasing the depth of cut, the machining force also increases and at a maximum cutting speed and minimum depth of cut, minimum machining forces were observed.

M.Subramanian et al (2014) [8] Have investigated the effect of nose radius, cutting speed& feed on surface roughness by using response surface method. In current investigation AL7075-T6 was used as work piece material Also mathematical model is optimized by using genetic algorithm to attempt minimum surface roughness and observed values were found very close to the predicted value.

Mr.Ballal Yuvraj P. et al (2012) [9] Have discuss the application of taguchi method to find specific range and combination of turning parameters, cutting speed, feed rate and depth of cut to achieve surface finish, tool were and material removal rate in turning of brake drum of FG 260 gray cast iron.

Mr.Rahul Thombre et al(2014)[10] Have investigated the cutting speed ,feed, and depth of cut on a surface roughness and machine tool vibration.

III.CONCLUSION

Based on the above literature references it is concluded that,

1] The modelling and analysis of the machining process is done by using cutting speed, feed and depth of cut as main parameters and response surface method and Taguchi Method as main Methodology.

2] The various cutting process parameters such as cutting speed, feed and depth of cut affects the surface roughness and material removal rate.

3] Little work has been done on a uncontrollable variables such as tool temperature, humidity, atmospheric temperature, and machine specification.

4] From above literature survey whatever the work for analysis of conventional machining process have been completed ,is based on Response Surface Methodology and Taguchi method so we can develop a new mathematical model for analysis of conventional machining processes by using experimental data based model.

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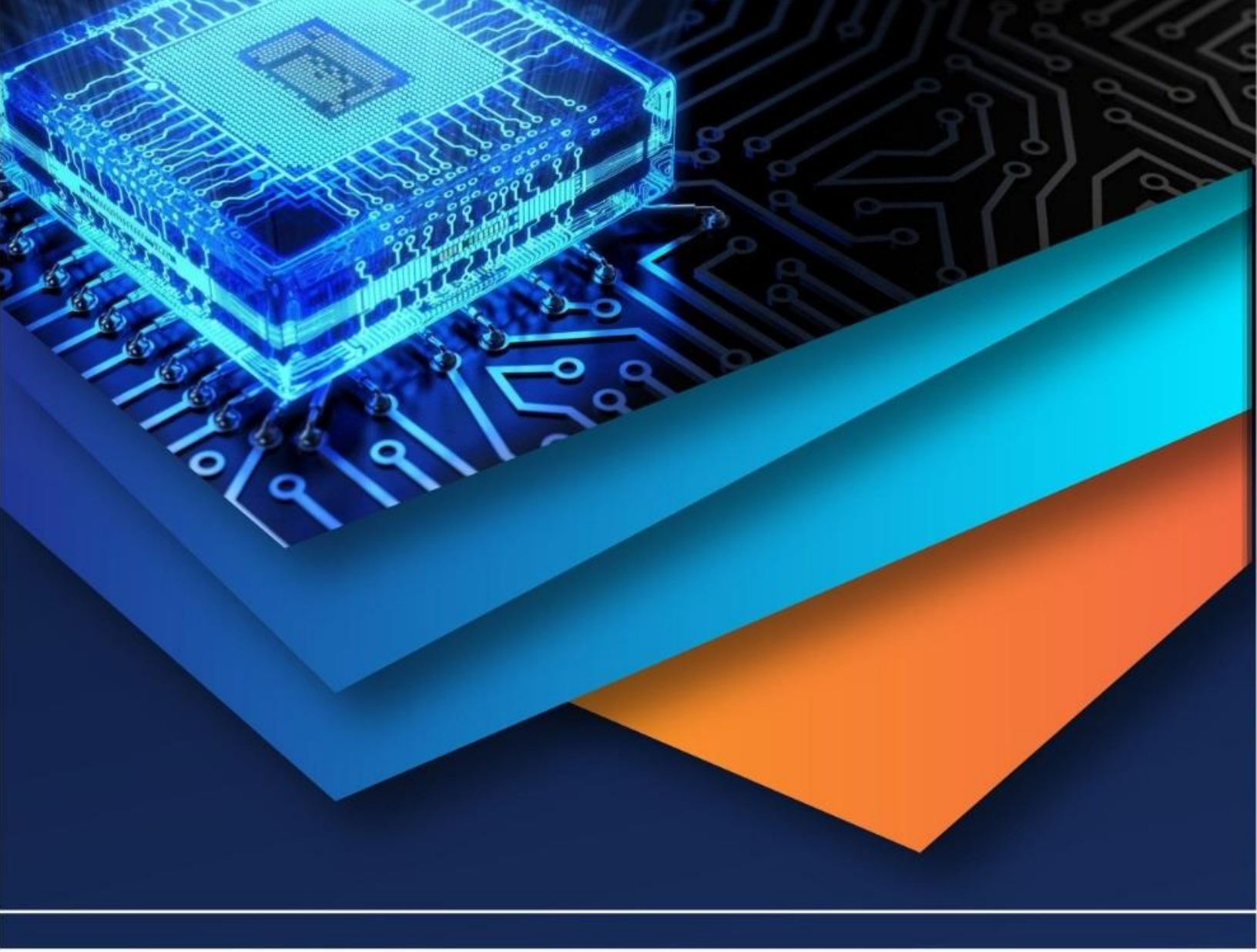

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