

Experimental Design and Analysis Study On the Effect of Process Parameters Using Carbide Tool in Drilling Process for AISI 317 Materials

Jeevanantham R*, Dhanavendhan T, Elavarasan P, Prasanna S.C

Department of Mechanical Engineering, M. Kumarasamy College of Engineering, Karur, Tamil Nadu, India

*Corresponding author: E-Mail: jeevamecha50@gmail.com

ABSTRACT

The drilling parameters have been optimized in this research paper in order to attain roughness and thrust in a radial drilling machine L9 orthogonal array have been used and tested for various drilling testing methods. In 317L AISI steel blocks have been drilled under dry conditions. To identify control factors analysis of variance was engaged. Various parameters have been used like cutting tool, cutting speed and feed rate. The experiment concludes that in order to attain better surface roughness and thrust force taguchi is a best method.

KEY WORDS: Drilling machine, AISI 317, Taguchi, ANNOVA method.

1. INTRODUCTION

The Traditional machining process for drilling is one of the most important material removal operations that have been widely used in manufacturing area. The AISI 317SS stainless steel experimental and investigation process different behavior to attempt will be made to optimize different drilling parameters. Although the AISI 317SS stainless steel are relatively hard materials that can be easily machinability.

The tool was having various type of speeds, various types of cutting diameters then constant feed rate then using the L9 orthogonal array can used to drilling AISI 317SS materials the work piece sizing for 90x50x20. This is material can used to drilling nine average nine holes and we can using the drill dynamometer having the result of thrust force and then torque can be measured. As the project must be tested on the surface roughness for using tele surf surface tester and then applied the values then get to taguchi and ANNOVA method.

2. INVESTIGATIONAL METHODS

Drilling Experiments: Now this project, AISI317L in work piece material steel blocks were recycled. The work piece remained 90x50x20mm.in dry conditions various drilling experiments were conducted.

Thrust force measurement: Now the drilling experiments a Kistler piezoelectric dynamometer 9257B was recycled for extent the thrust force. The signals of thrust force from the dynamometer were communicated to a Kistler 5070-A type multi-channel (8-channel) amplifier and then verified on a personal computer.

The dynamometer and work piece were firmly secure on the CNC machining tool. The investigational set-up for thrust force measurement is shown in components of the cutting forces occurred during drilling process, namely main cutting force(F_c), Thrust force (F_f) and radial force (F_r) are shown.

The forces F_r substitute on both cutting edges is considered to counterbalance each other's, Hence, the forces F_c and F_f only are operative in drill process.

As main critical force values obtained in the drilling tests are considerably reduced than the thrust force values in this project, three cutting forces values were measured, but only thrust force standards were evaluated.

AISI 317SS Stainless Steel:

ISI Type 317L:

Category - steel

Class - stainless steel

Type - austenitic standard

Common Names chromium-nickel steel



Figure.1. Drill Tool Dynamometer

In order to identify torque and power dynamometer is very essential and they can be reused. And in this we have handled a driving dynamometer.

In passive dynamometer they have been give importance for of designing a dynamometer. A universal dynamometer can be used in it. And their torque power characteristics can be easily identify.

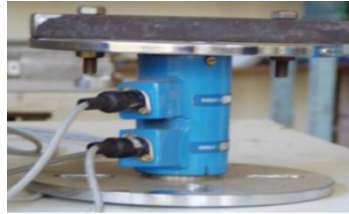


Figure.2. Universal dynamometer

Orthogonal method: Very complex testing methods can be processed through this method. In order to identify best orthogonal array degree of freedom have been plays and a important role in it.

Measurement of Surface Roughness: For of a various kinds of measurement and for of a various holes surface roughness measurement have been used.

And for of a various kinds of material and for of a various kinds of holes this method can be easily used. And their values from a various holes have been taken, and their average value has been taken for calculation.



Figure.3. Measurement of Surface Roughness

Material Removal Rate: The common problem in a various operations was of material removal rate. And it have been calculated by; $MRR = \text{Area of drill} \times \text{feed rate} \times \text{cutting speed}$



Figure.4. Material Removal Rate

Material removal rate consider the three factor, there are;

Machining: Material exclusion through a sharp tool.

Abrasive processes: Material elimination by solid particles.

Nontraditional processes: Different forms added to cutting tool for remove material.

Calculations:

Table.1. Input Parameters

S. No	Speed	feed	Diameter of the drill bit	Depth of hole
1	500	0.075	4	20
2	500	0.17	4	20
3	500	0.25	4	20
4	800	0.075	4	20
5	800	0.17	4	20
6	800	0.25	4	20
7	1250	0.075	4	20
8	1250	0.17	4	20
9	1250	0.25	4	20

Table.2. Performance Report

S. NO	Speed	Feed	Thrust Force	Torque	Mrr
1	500	0.075	15.8	1	471
2	500	0.17	14.7	1.2	1067
3	500	0.25	13.3	1.4	1569
4	800	0.075	16.7	1.6	753
5	800	0.17	12.25	1.9	1707
6	800	0.25	13.65	1.3	2511
7	1250	0.075	13.45	1.5	1176
8	1250	0.17	12.37	1.3	2667
9	1250	0.25	12.27	1.2	3922

Application: AISI 317ss content of c is less than AISI 317, which improves 317ss weldability. This material is mostly used in:

- Heater parts
- Heat exchanger
- Jet aircraft engine parts
- medical
- containers
- Aquatic production
- production and watercolor equipment's

AISISS 317L stainless steels content of C is less than AISISS 317, which improves weldability of AISISS317.

3. CONCLUSION

In this experimental work taguchi design of experiments are used to optimize the drilling parameters of AISI 317 steel by using carbide drill size under dry environment it concludes.

More material removal rate has been occurred at wounding speed 800rpm and feed rate 0.075 using 4mm drill tool. Lowest thrust force has been obtained at cutting speed 500 rpm and feed rate 0.25mm. Lowest torque is produced has been obtained at cutting speed 500rpm and feed rate of 0.075mm.

AISI 317 stainless steel is produced good machinability during drilling operations under dry environment.

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