IMPACT AND ANALYSIS IN AISI 1018 STEEL ON LATHE TOOL DYNAMOMETER BY USING STRAIN GAUGE VARRYING WITH HSS AND STS CUTTING TOOL

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ABSTRACT

In This Experimental Study A Piezoelectrical Strain Gauge Is Used To Calculate The Feed Force (X-Axis), Thrust Force/Radial Force (Y-Axis) And Cutting Force/Tangential Force (Z-Axis) . When The Cutting Tool Will Be Engage With The Rotting Work Piece During That Period It Will Be Produce The Forces And That Force Will Be Display On The Screen Of The Strain Gauge In Numerical Forms . To Utilize That Taken Value We Will Analyze The Experiment By Using Taguchi Method On Minitab Software . Then Graphs Are Drown On How These Forces Vary Due To Variation In Speed, Feed And Depth Of Cut Along With Change In Cutting Tool Material.

Keywords: Analysis, Taguchi Method, Piezoelectrical Strain Gauge, Aisi 1018 Steel , Hss And Sts Cutting Tool .

I.   INTRODUCTION

In This Modern Environment The Requirement Of The Products Like Axels, Shafts, Automobile Body Components, Structural Shapes, Gears, Pinions Etc. Increases Day To Day Life. For Producing These Products There Are Much Manufacturing Industries Are Present. In This Competition World Every Manufacturing Industry Wants To Produce Huge Amount Of Production With Less Investment ,Having Good Qualities. A Person Named As Genichi Taguchi Represent A Method Popularly Known As Taguchi Method ,On That Methodology We Can Analysis Our Production And Also Optimize The Problems Like Process Parameters During The Production Time . This Is The Best Optimizing Technic Present In The Today's World . In This Paper Studies Impact In Aisi 1018 Steel On Lathe Tool Dynamometer By Using Strain Gauge Varying With Without Coated Tool (Hss) And With Coated Tool. Then Analysis It By Using Taguchi Method.

II.   METHODOLOGY

The Study Depends Upon Methodology Opted For The Processing As It Decides The Way Of Collecting The Data Manipulation ,Processing And Finally The Display Of The Results.

a)   Measurement Of Cutting Force By Using Piezoelectrical Strain Gauge Is The Best Techniques Available.

b)   The Machining Parameters Will Be Considered During The Machining W.R.T. Cutting Forces ,Trust Force And Feed Forces By Predicting The Cuttting Performance Such As Depth Of Cut ,Feed/Rev And Speed.

c)   The Natural Frequency Of The Tool Holder Of Lathe Tool Dynamometer Will Be Calculated .

d)   Stress Calculation Will Be Carried Out For The Safe Design Of Lathe Tool Dynamometer.

e)   Analysis The Experimental Values By Using Taguchi Methodology.

III.   EXPERIMENTAL PROCEDURE

1.   The Centre Lathe Machine Is Connected With A 3-Phase Ac Supplying Channel Which Will Be Working Under The Voltage In Between 415-440 V .

2.   Then Connect The Piezoelectrical Strain Gauge With 1-Phase Ac Supplying Channel Which Will Be Working Under The Voltage In Between 220-250 V .

3.   Mounted The Sensors Along With The Cutting Tool And Connected That Other Side Of Ware With The Piezoelectrical Strain Gauge .

4.   Setup The Force Calculation Program On Strain Gauge By Computer And Wait For 2 To 5 Minutes . Then Balance The Channel To Get Zero Reading On Display With Tare Posts On The Panel.

5.   The Work Piece Is Mounded On The Chuck Of The Mandrel (Head Stock) Side And Then Facing Operation Is Performed To Make Flat The End Portion Of The Work Piece.

6.   Then We Provide Centre Drilled Over The Work Piece Which Will Be Supported By A Running Center In The Tail Stock.

7. A Reference Point Will Be Required For Undercutting Operation So We Will Provide A Groove On The Work Piece .

8. Then Go For The Turning Operation And Simultaneously Take The Reading By Strain Gauge To Click On The Start Option .

9. Note Down The Reading And Repeat The Procedure For Various Speed Along With Varying The Feed Rate And Also Changing The Cutting Tool Material .

IV.   MODELING AND ANALYSIS

For Hss Tool

Figure1: W/P Material Before And After Machining.

Table 1

At Speed 200 Rpm ,Feed 0.0016 Mm/Rev And Doc 0.2 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	0.13	10.48	7.11
2	2.63	9.24	6.27
3	2.36	0.1	0.07
4	0.13	5.02	3.41
5	0.92	10.82	7.35

Table 2

At Speed 200 Rpm ,Feed 0.0016 Mm/Rev And Doc 0.3 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	6.98	168.36	114.33
2	21.6	66.93	45.45
3	9.05	4.62	3.14
4	27.25	114.47	77.73
5	8.36	160.18	108.76

Table 3

At Speed 200 Rpm ,Feed 0.0016 Mm/Rev And Doc 0.5 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	5.22	4.89	3.32
2	2.72	12.27	8.33
3	7.2	4.16	2.83
4	9.78	20.35	13.82
5	0.74	6.97	4.73

Table 4

At Speed 200 Rpm ,Feed 0.0016 Mm/Rev And Doc 0.6 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	10.63	0.38	0.26
2	1.07	22	14.94
3	2.41	36.69	24.91
4	5.64	12.3	8.35
5	1.26	11.46	7.78

Table 5

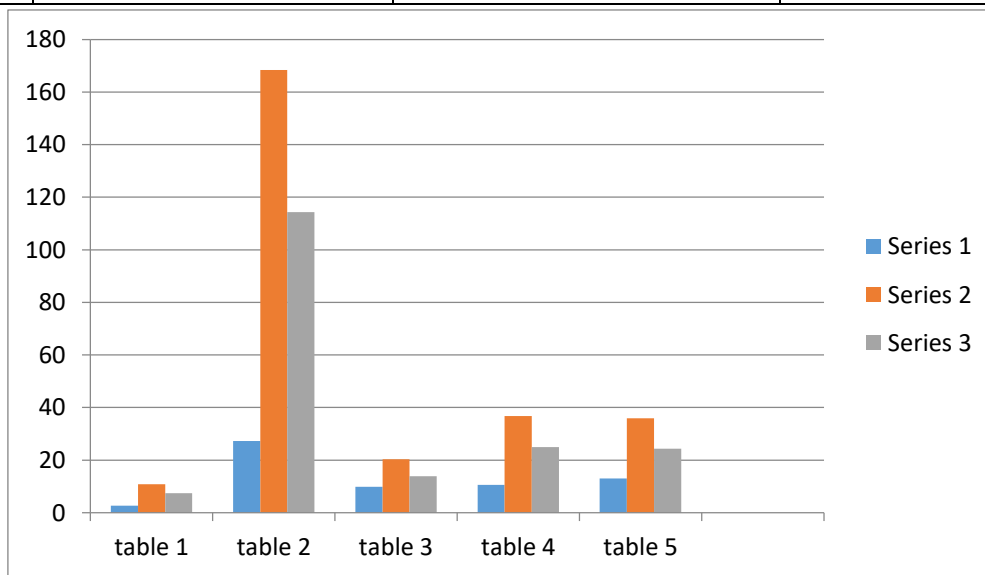| At Speed 200 Rpm ,Feed 0.0016 Mm/Rev And Doc 0.7 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	5.14	35.87	24.36
2	1.71	31.9	21.66
3	13.04	19.8	13.45
4	1.7	3.9	2.65
5	4.26	12.56	8.53

Figure2

(From The Above Flow Chart It Is Shown That At Speed 200 Rpm And Feed 0.0016 Mm/Rev With Varying Different Type Of Depth Of Cut I.E (0.2 ,0.3 ,0.5 ,0.6 ,0.7)Mm . Series 1 Indicate Feed Force Series 2 Indicate Thrust Force Series 3 Indicate Cutting Force)

Table 6

At Speed 300 Rpm ,Feed 0.00133 Mm/Rev And Doc 0.2 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	1.15	4.83	3.28
2	0.71	7.27	4.93
3	0.05	0.74	0.5
4	1.69	8.94	6.07

| 5 | 0.94 | 0.95 | 0.64 |

Table 7

At Speed 300 Rpm ,Feed 0.00133 Mm/Rev And Doc 0.3 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	4.24	6.31	4.29
2	5.83	52.59	35.71
3	5.51	9.5	6.45
4	3.14	34.8	23.63
5	3.35	19.21	13.04

Table 8

At Speed 300 Rpm ,Feed 0.00133 Mm/Rev And Doc 0.5 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	12.22	16.42	11.15
2	25.15	16.05	10.9
3	20.14	36.88	25.04
4	38.21	24.03	16.32
5	32.59	3.36	2.28

Table 9

At Speed 300 Rpm ,Feed 0.00133 Mm/Rev And Doc 0.6 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	7.4	27.15	18.44
2	12.87	49.87	33.86
3	7.39	32.19	21.86
4	7.8	29.03	19.71
5	1.12	27.64	18.77

Table 10

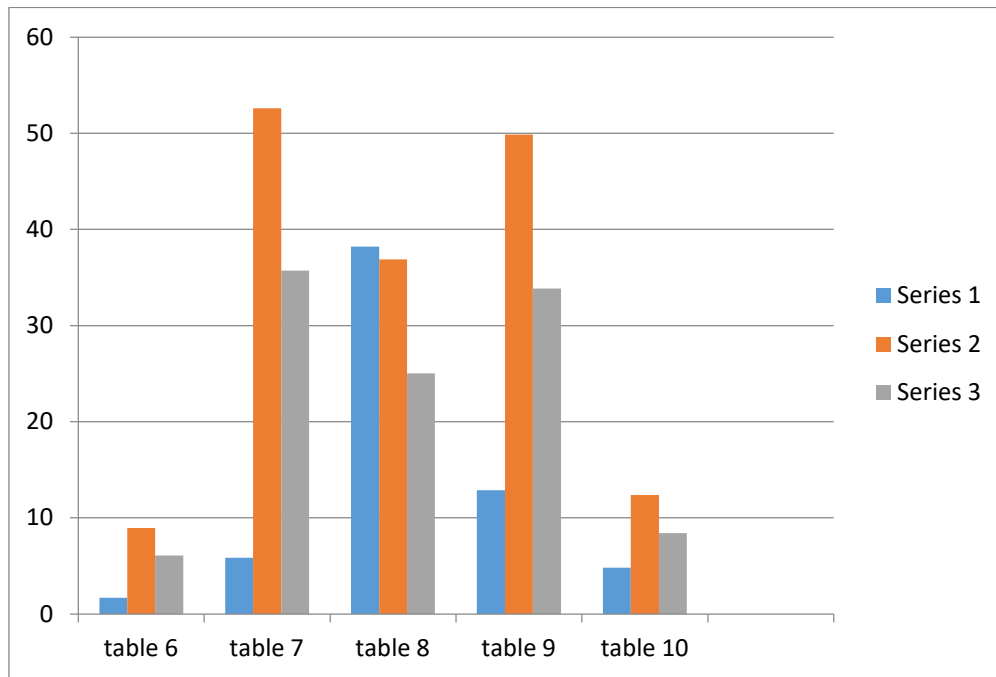| At Speed 300 Rpm ,Feed 0.00133 Mm/Rev And Doc 0.7 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	1.57	9.74	6.61
2	4.81	11.12	7.55
3	1.38	3.7	2.51
4	3.59	9.85	6.69
5	4.77	12.38	8.4

Figure 3

(From The Above Flow Chart It Is Shown That At Speed 300 Rpm And Feed 0.00133 Mm/Rev With Varying Different Type Of Depth Of Cut I.E (0.2 ,0.3 ,0.5 ,0.6 ,0.7)Mm . Series 1 Indicate Feed Force Series 2 Indicate Thrust Force Series 3 Indicate Cutting Force)

Table 11

At Speed 325 Rpm ,Feed 0.00153 Mm/Rev And Doc 0.2 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	4.92	45.78	31.08
2	22.62	28.71	19.5
3	1.34	7.4	5.03
4	8.86	13.14	8.93
5	11.43	48.39	32.86

Table 12

At Speed 325 Rpm ,Feed 0.00153 Mm/Rev And Doc 0.3 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	4.32	3.28	2.23
2	40.55	51.68	35.09
3	17.79	51.58	35.02
4	23.58	10.11	6.86
5	39.7	90.64	61.55

Table 13

At Speed 325 Rpm ,Feed 0.00153 Mm/Rev And Doc 0.5 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	4.68	60.95	41.38
2	11.16	12.45	8.46

3	28.91	51.05	34.66
4	7.9	9.06	6.15
5	12.19	66.44	45.11

Table 14

At Speed 325 Rpm ,Feed 0.00153 Mm/Rev And Doc 0.6 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	17.29	5.74	3.9
2	19.5	7.32	4.97
3	21.96	13.21	8.97
4	26.22	34.78	23.62
5	29.29	34.38	23.35

Table 15

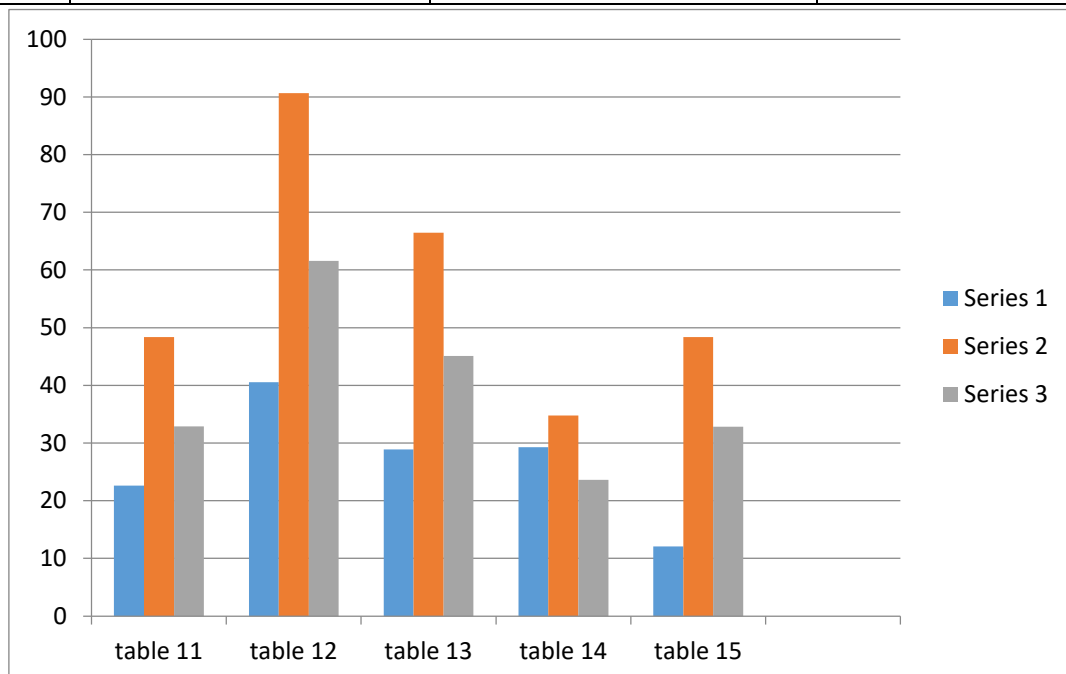| At Speed 325 Rpm ,Feed 0.00153 Mm/Rev And Doc 0.7 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	4.1	48.36	32.84
2	12.08	47.56	32.29
3	0.94	39.38	26.74
4	6.43	35.36	24.01
5	5.74	33.16	22.51

Figure 4

(From The Above Flow Chart It Is Shown That At Speed 325 Rpm And Feed 0.00153 Mm/Rev With Varying Different Type Of Depth Of Cut I.E (0.2 ,0.3 ,0.5 ,0.6 ,0.7)Mm . Series 1 Indicate Feed Force Series 2 Indicate Thrust Force Series 3 Indicate Cutting Force)

Table 16

Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
At Speed 500 Rpm ,Feed 0.0013 Mm/Rev And Doc 0.2 Mm			
1	17.56	15.37	10.44
2	3.86	7.5	5.09
3	8.74	30.52	20.72
4	15.66	11.6	7.88
5	2.88	12.22	8.3

Table 17

Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
At Speed 500 Rpm ,Feed 0.0013 Mm/Rev And Doc 0.3 Mm			
1	5.6	15.05	10.22
2	1	11.59	7.87
3	2.6	7.84	5.32
4	7.07	16.33	11.09
5	0.68	1.52	1.03

Table 18

Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
At Speed 500 Rpm ,Feed 0.0013 Mm/Rev And Doc 0.5 Mm			
1	50	84.47	57.36
2	18.14	108.76	73.85
3	36.12	121.9	82.78
4	38.6	85.89	58.32
5	19.41	140.32	95.28

Table 19

Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
At Speed 500 Rpm ,Feed 0.0013 Mm/Rev And Doc 0.6 Mm			
1	2.28	41.4	2.01
2	7.38	58.77	9.79
3	25.67	30.04	9.71
4	1.55	37.24	4.83
5	13.47	44.58	0.16

Table 20

Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
At Speed 500 Rpm ,Feed 0.0013 Mm/Rev And Doc 0.7 Mm			
1	1.97	6.09	4.14
2	0.11	8.5	5.77
3	0.24	8.94	6.07
4	1.91	9.35	6.35

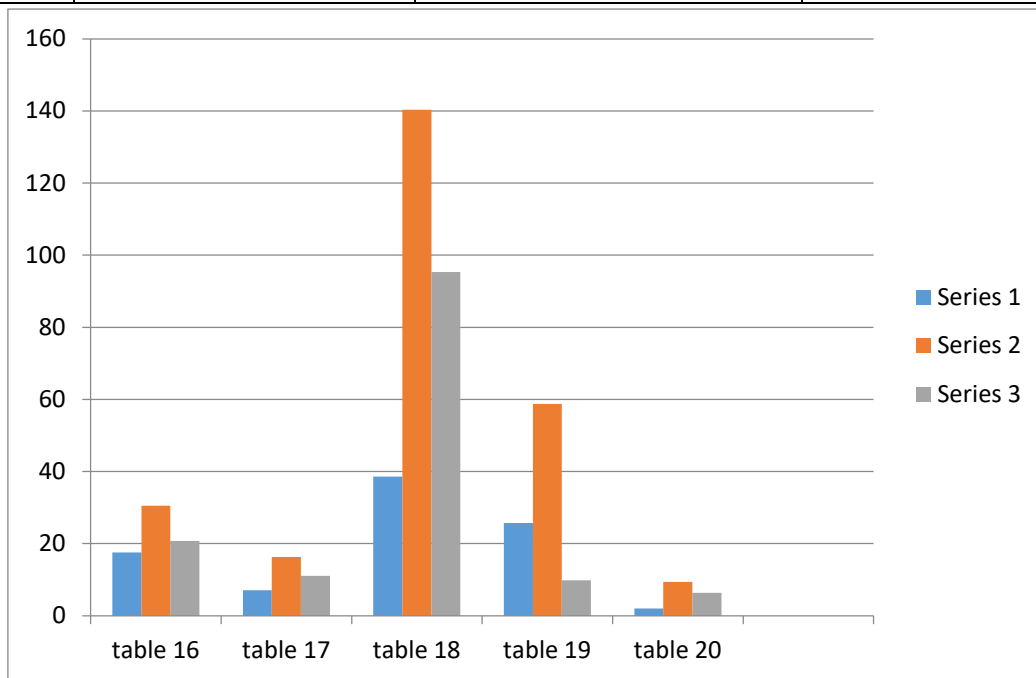| 5 | 1.57 | 5.2 | 3.53 |

Figure 5

(From The Above Flow Chart It Is Shown That At Speed 500 Rpm And Feed 0.0013 Mm/Rev With Varying Different Type Of Depth Of Cut I.E (0.2 ,0.3 ,0.5 ,0.6 ,0.7)Mm . Series 1 Indicate Feed Force Series 2 Indicate Thrust Force Series 3 Indicate Cutting Force)

Table 21

At Speed 750 Rpm ,Feed 0.0011 Mm/Rev And Doc 0.2 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	0.18	0.23	0.16
2	0.38	0.07	0.05
3	0.39	0.09	0.06
4	0.51	0.09	0.06
5	0.25	0.26	0.18

Table 22

At Speed 750 Rpm ,Feed 0.0011 Mm/Rev And Doc 0.3 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	2.73	26.11	14.2
2	1.06	27.45	15.11
3	1.75	30.77	17.36
4	2.48	26.67	14.58
5	3.94	23.2	12.22

Table 23

At Speed 750 Rpm ,Feed 0.0011 Mm/Rev And Doc 0.5 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	0.17	0.74	0.5

2	0.39	0.14	0.1
3	0.49	1.29	0.87
4	0.48	1.12	0.76
5	0.24	1.59	1.08

Table 24

At Speed 750 Rpm ,Feed 0.0011 Mm/Rev And Doc 0.6 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	33.41	90.13	61.2
2	27.05	89.98	61.1
3	24.76	113.39	77
4	28.32	91.63	62.22
5	33.92	108.29	73.53

Table 25

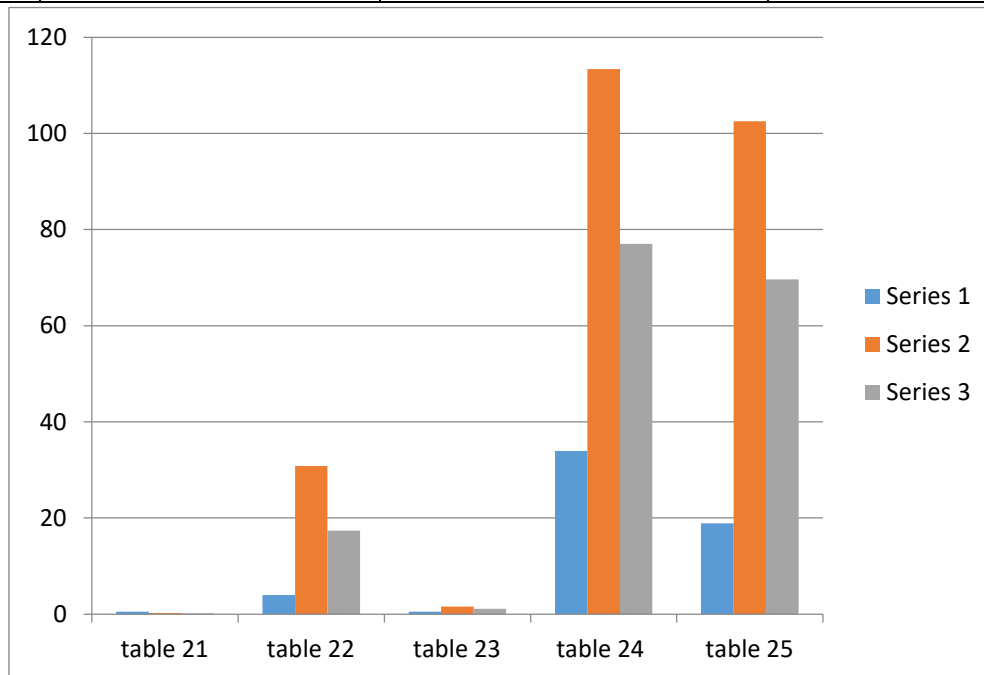| At Speed 750 Rpm ,Feed 0.0011 Mm/Rev And Doc 0.7 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	13.6	86	58.4
2	9.82	80.02	54.34
3	6.62	102.53	69.62
4	14.5	89.15	60.54
5	18.87	89.08	60.49

Figure 6

(From The Above Flow Chart It Is Shown That At Speed 750 Rpm And Feed 0.0011 Mm/Rev With Varying Different Type Of Depth Of Cut I.E (0.2 ,0.3 ,0.5 ,0.6 ,0.7)Mm . Series 1 Indicate Feed Force Series 2 Indicate Thrust Force Series 3 Indicate Cutting Force)

For Sts Tool

Figure 7

Table 26

At Speed 200 Rpm ,Feed 0.0016 Mm/Rev And Doc 0.2 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	0.55	28.81	19.56
2	2.67	31.76	21.57
3	0.75	14.15	9.61
4	11.76	31.38	21.31
5	6.09	20.42	13.86

Table 27

At Speed 200 Rpm ,Feed 0.0016 Mm/Rev And Doc 0.3 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	13.42	107.05	72.69
2	3.21	80.2	54.46
3	10.03	114.73	77.91
4	5.45	136.49	92.68
5	14.44	94.41	64.11

Table 28

At Speed 200 Rpm ,Feed 0.0016 Mm/Rev And Doc 0.5 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	57.53	93.37	63.4
2	49.04	46.21	31.38
3	28.28	103.67	70.4
4	62.8	138.61	94.12
5	59.48	92.46	62.78

Table 29

At Speed 200 Rpm ,Feed 0.0016 Mm/Rev And Doc 0.6 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	26.32	109.15	74.11
2	17.08	115.36	78.34
3	22.69	133.8	90.86

| 4 | 22.76 | 138.81 | 94.26 |
| 5 | 24.98 | 105.67 | 71.75 |

Table 30

At Speed 200 Rpm ,Feed 0.0016 Mm/Rev And Doc 0.7 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	18.29	17.55	11.92
2	17.22	13.47	9.15
3	8.82	39.63	26.91
4	20.5	7.26	4.93
5	6.26	4.1	2.79
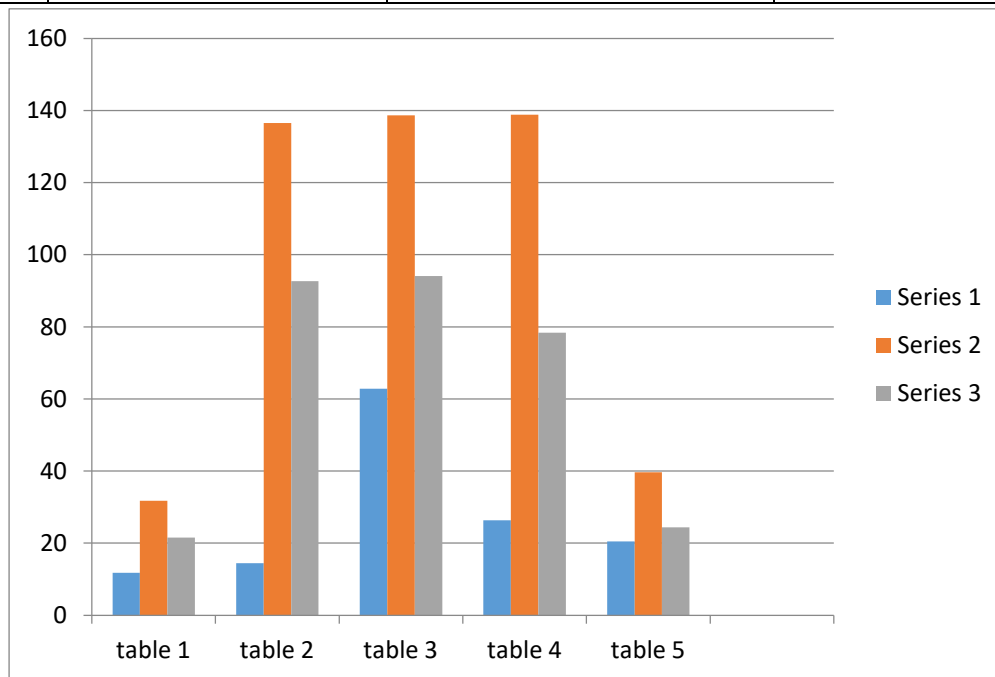
Figure 8

(From The Above Flow Chart It Is Shown That At Speed 200 Rpm And Feed 0.0016 Mm/Rev With Varying Different Type Of Depth Of Cut I.E (0.2 ,0.3 ,0.5 ,0.6 ,0.7)Mm . Series 1 Indicate Feed Force Series 2 Indicate Thrust Force Series 3 Indicate Cutting Force)

Table 31

At Speed 300 Rpm ,Feed 0.00133 Mm/Rev And Doc 0.2 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	8.8	32.8	22.28
2	3.45	33.68	22.87
3	4.53	14.24	9.67
4	4.43	42.9	29.13
5	21.54	7.7	5.23

Table 32

At Speed 300 Rpm ,Feed 0.00133 Mm/Rev And Doc 0.3 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)

1	1.3	10.33	7.02
2	8.15	4.59	3.12
3	5.26	9.95	6.76
4	2.83	2.63	1.79
5	3.57	9.53	6.47

Table 33

At Speed 300 Rpm ,Feed 0.00133 Mm/Rev And Doc 0.5 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	32.92	106.62	72.4
2	33.3	114.4	77.68
3	39.71	111.83	75.94
4	37.91	95.79	65.05
5	33.78	107.63	73.08

Table 34

At Speed 300 Rpm ,Feed 0.00133 Mm/Rev And Doc 0.6 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	13.87	20.39	13.84
2	14.88	14.53	9.87
3	11.09	0.16	0.11
4	12.48	8.06	5.47
5	8.74	18.9	12.83

Table 35

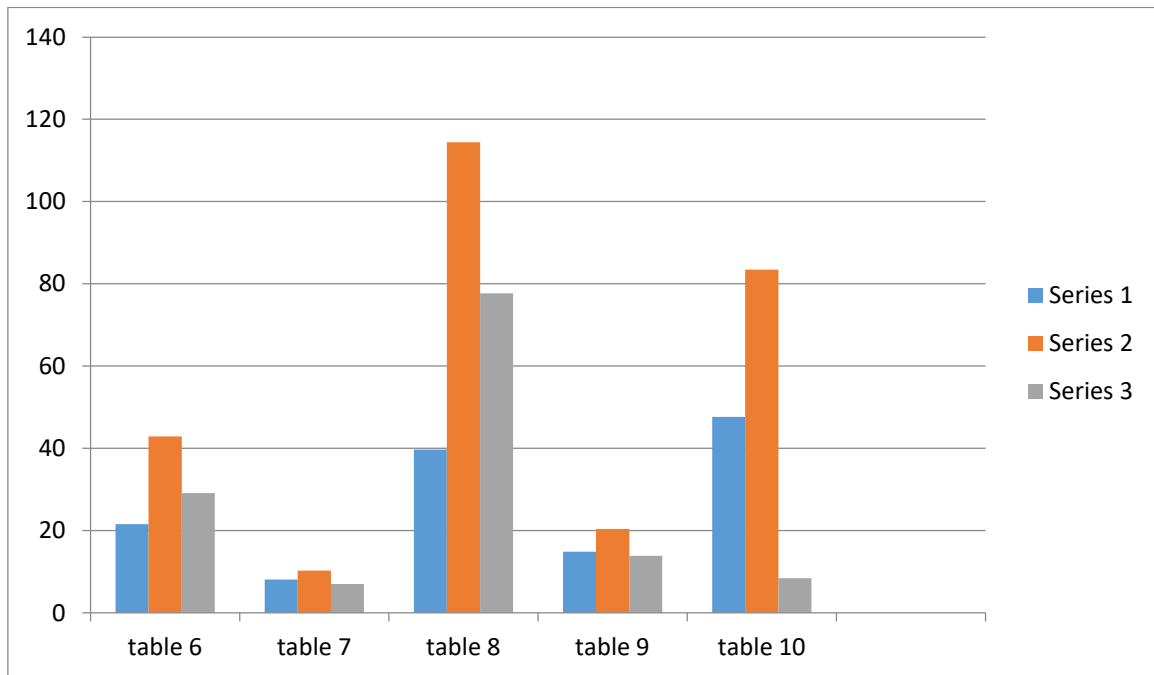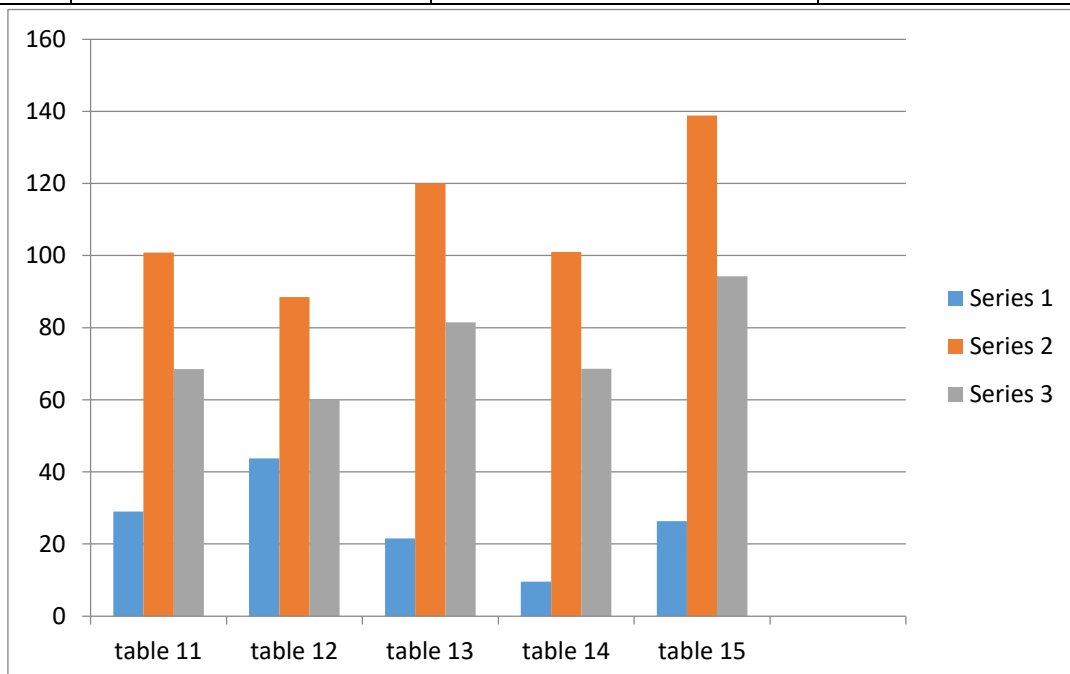| At Speed 300 Rpm ,Feed 0.00133 Mm/Rev And Doc 0.7 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	33.78	83.22	56.51
2	47.66	70.17	47.65
3	37.67	71.51	48.56
4	34.01	83.47	56.68
5	26.4	78.64	53.4

Figure 9

(From The Above Flow Chart It Is Shown That At Speed 300 Rpm And Feed 0.00133 Mm/Rev With Varying Different Type Of Depth Of Cut I.E (0.2 ,0.3 ,0.5 ,0.6 ,0.7)Mm . Series 1 Indicate Feed Force Series 2 Indicate Thrust Force Series 3 Indicate Cutting Force)

Table 36

At Speed 325 Rpm ,Feed 0.00153 Mm/Rev And Doc 0.2 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	2.64	53.06	36.03
2	4.88	38.94	26.44
3	13.61	100.84	68.48
4	15.66	11.54	7.84
5	28.99	75.1	51

Table 37

At Speed 325 Rpm ,Feed 0.00153 Mm/Rev And Doc 0.3 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	42.67	88.48	60.08
2	42.8	76.68	52.07
3	43.7	61.47	41.74
4	38.38	75.52	51.28
5	36.63	78.87	53.56

Table 38

At Speed 325 Rpm ,Feed 0.00153 Mm/Rev And Doc 0.5 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	15.12	108.97	73.99
2	21.51	102.54	69.63

3	17.89	115.29	78.29
4	18.13	120.02	81.5
5	21.02	110.19	74.82

Table 39

At Speed 325 Rpm ,Feed 0.00153 Mm/Rev And Doc 0.6 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	9.52	83.96	57.01
2	1.44	90	61.11
3	0.25	100.98	68.57
4	4.56	77.5	52.62
5	7.94	90.37	61.37

Table 40

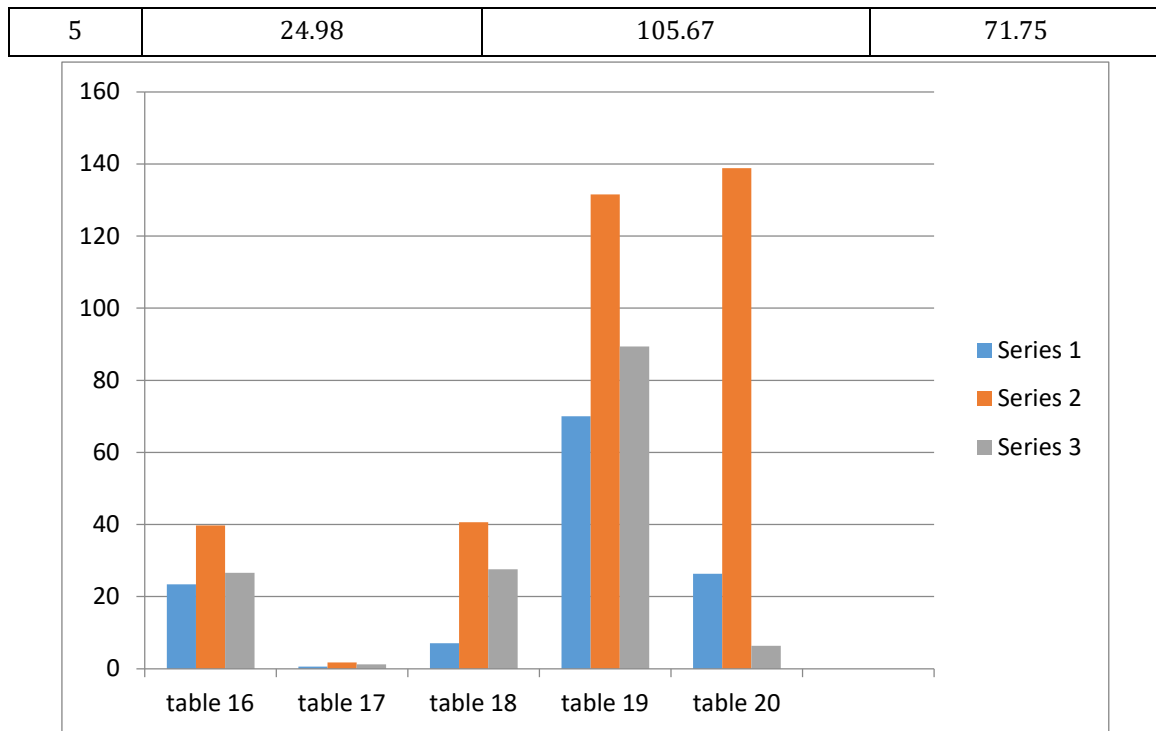| At Speed 325 Rpm ,Feed 0.00153 Mm/Rev And Doc 0.7 Mm			
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	26.32	109.15	74.11
2	17.08	115.36	78.34
3	22.69	133.8	90.86
4	22.76	138.81	94.26
5	24.98	105.67	71.75

Figure 10

(From The Above Flow Chart It Is Shown That At Speed 325 Rpm And Feed 0.00153 Mm/Rev With Varying Different Type Of Depth Of Cut I.E (0.2 ,0.3 ,0.5 ,0.6 ,0.7)Mm . Series 1 Indicate Feed Force Series 2 Indicate Thrust Force Series 3 Indicate Cutting Force)

Table 41

Sl . No.	At Speed 500 Rpm ,Feed 0.0013 Mm/Rev And Doc 0.2 Mm		
	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	18.41	24.83	16.86
2	4.89	38.02	25.82
3	2.15	4.39	2.98
4	23.43	39.76	27
5	0.06	39.15	26.59

Table 42

Sl . No.	At Speed 500 Rpm ,Feed 0.0013 Mm/Rev And Doc 0.3 Mm		
	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	0.18	0.97	0.66
2	0.11	0.22	0.15
3	0.25	1.74	1.18
4	0.54	0.18	0.12
5	0.05	1.53	1.04

Table 43

Sl . No.	At Speed 500 Rpm ,Feed 0.0013 Mm/Rev And Doc 0.5 Mm		
	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	0.04	40.63	27.59
2	5	14.73	10
3	5.74	4.26	2.89
4	5.15	6.34	4.31
5	7.04	17.14	11.64

Table 44

Sl . No.	At Speed 500 Rpm ,Feed 0.0013 Mm/Rev And Doc 0.6 Mm		
	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	59.51	128.27	87.1
2	62.86	120.47	81.8
3	53.01	123.24	83.69
4	58.85	131.58	89.35
5	69.98	127.35	86.47

Table 45

| Sl . No.	At Speed 500 Rpm ,Feed 0.0013 Mm/Rev And Doc 0.7 Mm		
	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	26.32	109.15	74.11
2	17.08	115.36	78.34
3	22.69	133.8	90.86
4	22.76	138.81	94.26

| 5 | 24.98 | 105.67 | 71.75 |

Figure 11

(From The Above Flow Chart It Is Shown That At Speed 500 Rpm And Feed 0.0013 Mm/Rev With Varying Different Type Of Depth Of Cut I.E (0.2 ,0.3 ,0.5 ,0.6 ,0.7)Mm . Series 1 Indicate Feed Force Series 2 Indicate Thrust Force Series 3 Indicate Cutting Force)

Table 46

	At Speed 750 Rpm ,Feed 0.0011 Mm/Rev And Doc 0.2 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	0.35	1.4	0.95
2	0.48	1.69	1.15
3	0.12	0.24	0.16
4	0.74	0.64	0.43
5	0.91	2.17	1.47

Table 47

	At Speed 750 Rpm ,Feed 0.0011 Mm/Rev And Doc 0.3 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	1.55	21.38	14.52
2	3.03	18.98	12.89
3	2.87	25.25	17.15
4	3.02	19	12.9
5	5.03	24.2	16.44

Table 48

	At Speed 750 Rpm ,Feed 0.0011 Mm/Rev And Doc 0.5 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	13.42	107.05	72.69

2	3.21	80.2	54.46
3	10.03	114.73	77.91
4	5.45	136.49	92.68
5	14.44	94.41	64.11

Table 49

At Speed 750 Rpm ,Feed 0.0011 Mm/Rev And Doc 0.6 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	57.53	93.37	63.4
2	49.04	46.21	31.38
3	28.28	103.67	70.4
4	62.8	138.61	94.12
5	59.48	92.46	62.78

Table 50

| At Speed 750 Rpm ,Feed 0.0011 Mm/Rev And Doc 0.7 Mm		
Sl . No.	Feed Force (X)	Thrust Force (Y)	Cutting Force (Z)
1	26.32	109.15	74.11
2	17.08	115.36	78.34
3	22.69	133.8	90.86
4	22.76	138.81	94.26
5	24.98	105.67	71.75

Figure 12

(From The Above Flow Chart It Is Shown That At Speed 750 Rpm And Feed 0.0011 Mm/Rev With Varying Different Type Of Depth Of Cut I.E (0.2 ,0.3 ,0.5 ,0.6 ,0.7)Mm .)
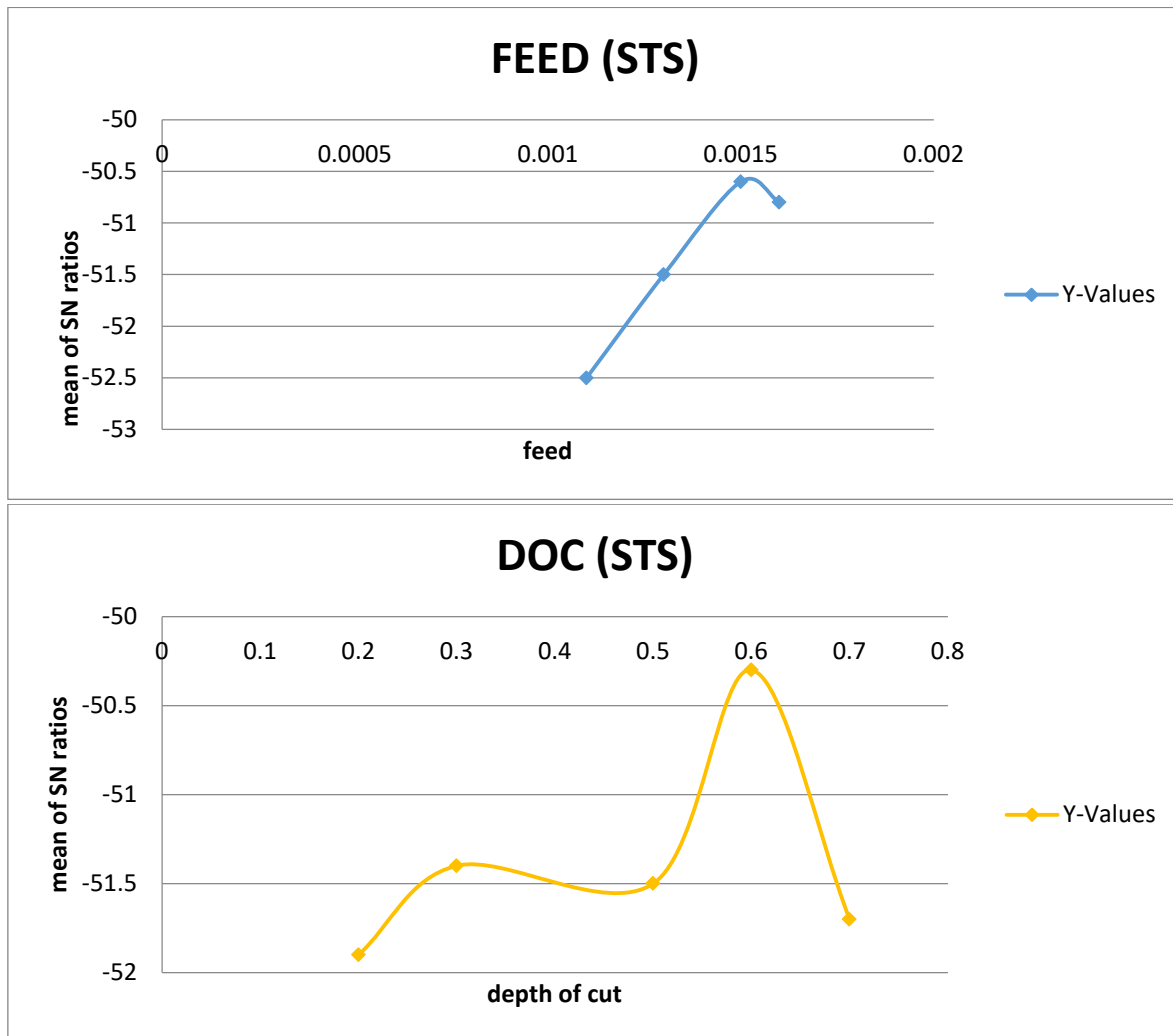
V.   TAGUCHI METHOD ANALYSIS

For Hss Tool

For Sts Tool

FEED (STS)

DOC (STS)
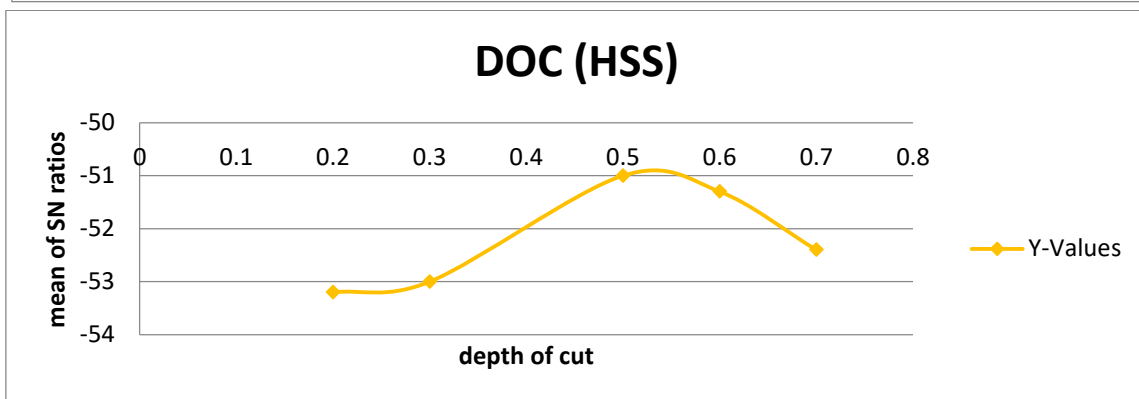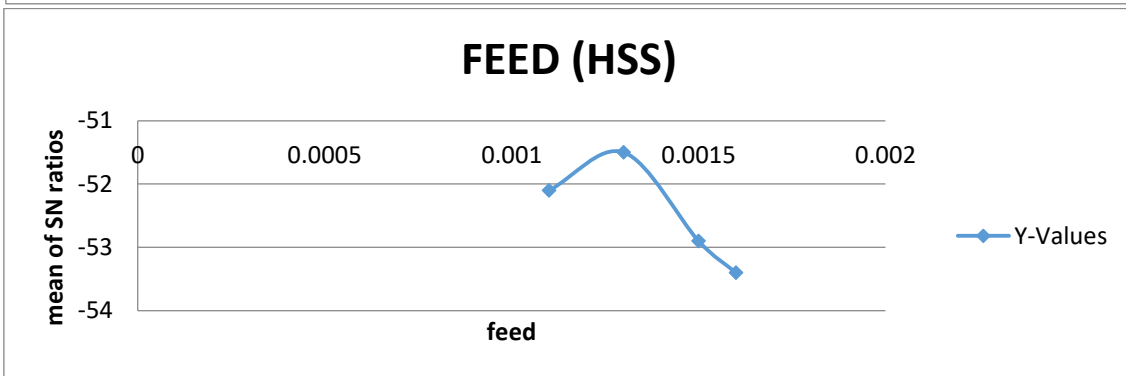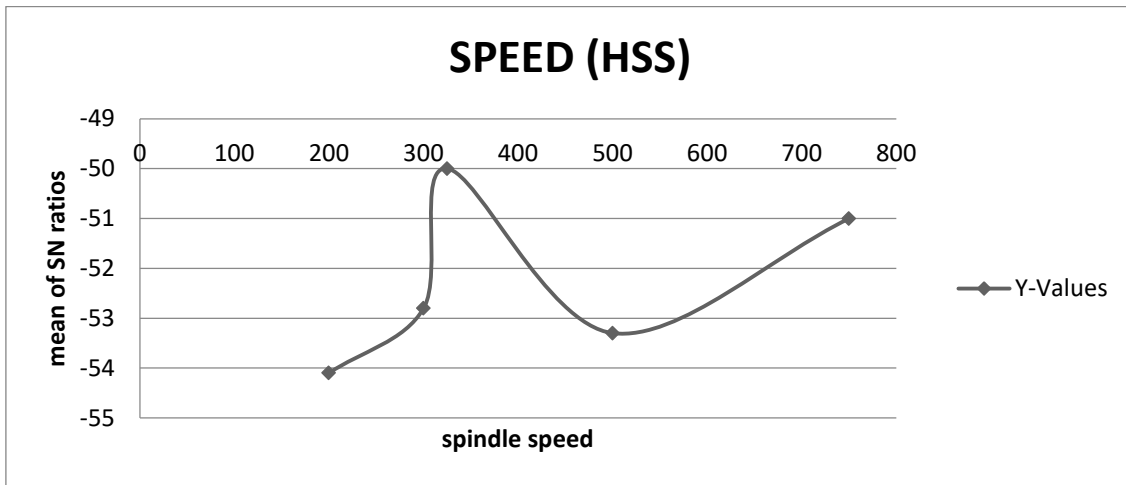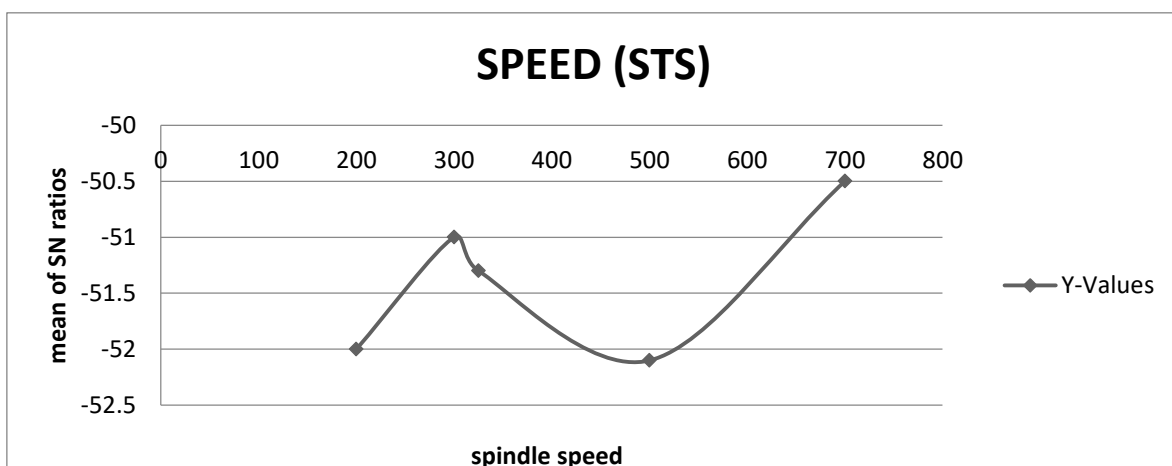
VI.   CONCLUSION

From This Experiment We Conclude That When The Spindle Seed At 300 Rpm Or 325 Rpm It Gives Good Surface Finish .But When We Doing Optimization By Using Taguchi Methodology To Taken The Experimental Force Values We Got, For The Material Aisi 1018 We Should Taken The Sts (Special Treatment Steel) Cutting Tool With Spindle Speed 325 Rpm, Feed Rate 0.0013 Mm/Rev And Depth Of Cut 0.3 Mm It Will Give The Better Surface Finish With Less Wastage Of Material From The Work Piece.

VII.   REFERENCES

[1]   Byrne Ga., Dornfled Di., Inasaki Ia., Ketteler Konig Ga. W. And Teti Re. (1995), "Tool Condition Monitoring (Tcm)—The Sculpture Of Research And Industrial Application," Ann. Cirp, Vol. 44, No. 2, Pp. 541–567.

[2]   Brett J.F, Warren T.M, Behr S.M And Whirl Bit (1990), "A New System Of Pdc Bit Breakdown, Spe Drilling Erg", Vol. 5, Pp. 275-281.

[3]   Evans J.C. And Morgan I.G. (1964), "The Pneumatic Gauging Technique In Its Operation To Dimensional Measurement", Int. J. Of Manufacturing Sc., Vol. 31, No. 3, Pp. 979-985.

[4]   Field J.S. (1967), "A Compact Dynamometer Using Strain Gauge Principles", The International Journal Of Production Research, Notes On Applied Science No.34, H.M.S.O, London, 6(2):75-82.

[5]   Gautschi G.H., Gibson A. And Kobler H. (1971), "Cutting Forces (F_c) In Machining Design And Research Conference, Removal Of Interactions In Dynamometer Instrumentation Manchester", The International Journal Of Production Research, P.1- 8. 6(2):83-86.

[6]   Li D. And Mathew J. (1990), "Tool Wear And Failure Monitoring Techniques For Turning—A Review", Int. J. Mach. Tools And Manu Fact, Vol. 30, No. 4, Pp. 579–598.

[7] Murty S.S.N. (1977), "A Study On The Precision Of Metal Cutting Dynamometers. Microtecnic", Asme, 4: 37-40.

[8] Ohtani T. (1986), "Cutting Force Characteristics In Machining Of Hardened Steel. Bul", Japan Soc. Of Prec. Eng., (2):127-129.

[9] Stein J. L. And Huh K. (2006), "A Design Procedure For Model-Based Monitoring Systems: Cutting Force Estimation As A Case Study, In Control Of Manufacturing Processes", Asme, Pp. 45–57.

[10] Stein J. L. And Huh K. (1991) "A Design Procedure For Model-Based Monitoring Systems: Cutting Force Estimation As A Case Study, In Control Of Manufacturing Processes", Asme, Pp. 45–57.

[11] Tlusty J. And Andrews G. C. (1983), "A Critical Review Of Sensors For Unmanned Machining" , Ann. Cirp, Vol. 32, No. 2, Pp. 611–622.

[12] Suresh R., Basavarajappa S., Gaitonde V. N., & Samuel G. L. (2012). Machinability Investigations On Hardened Aisi 4340 Steel Using Coated Carbide Insert. International Journal Of Refractory Metals And Hard Materials, 33, 75-86.

[13] Lalwani D. I., Mehta N. K., & Jain P. K. (2008). Experimental Investigations Of Cutting Parameters Influence On Cutting Forces And Surface Roughness In Finish Hard Turning Of Mdn250 Steel. Journal Of Materials Processing Technology, 206(1), 167-179.

[14] Nayak M., Sehgal R., & Sharma R. K. (2015). Mechanical Characterization And Machinability Behavior Of Annealed Aisi D6 Cold Working Steel. Indian Journal Of Materials Science, 2015.

[15] Pramanik A., Zhang L. C., & Arsecularatne J. A. (2006). Prediction Of Cutting Forces In Machining Of Metal Matrix Composites. International Journal Of Machine Tools And Manufacture, 46(14), 1795-1803.

[16] Yiğit R., Findik F., & Celik E. (2010). Performance Of Multilayer Coated Carbide Tools When Turning Cast Iron. Turkish Journal Of Engineering And Environmental Sciences, 33(3), 147- 158.

[17] Gaitonde V. N., Karnik S. R., Figueira L., & Davim J. P. (2009). Machinability Investigations In Hard Turning Of Aisi D2 Cold Work Tool Steel With Conventional And Wiper Ceramic Inserts. International Journal Of Refractory Metals And Hard Materials, 27(4), 754-763.

[18] Chou J. H., Chen S. H., & Li J. J. (2000). Application Of The Taguchi-Genetic Method To Design An Optimal Grey-Fuzzy Controller Of A Constant Turning Force System. Journal Of Materials Processing Technology, 105(3), 333-343.

[19] Wang W. P., Peng Y. H., & Li X. Y. (2002). Fuzzy–Grey Prediction Of Cutting Force Uncertainty In Turning. Journal Of Materials Processing Technology, 129(1), 663-666.

[20] Fetecau C., & Stan F. (2012). Study Of Cutting Force And Surface Roughness In The Turning Of Polytetrafluoroethylene Composites With A Polycrystalline Diamond Tool. Measurement, 45(6), 1367-1379.

[21] Yaldız S., & Ünsaçar F. (2006). A Dynamometer Design For Measurement The Cutting Forces On Turning. Measurement, 39(1), 80-89.

[22] Kopač J., & Šali S. (2001). Tool Wear Monitoring During The Turning Process. Journal Of Materials Processing Technology, 113(1), 312-316.

[23] Kirby E. D., Chen J. C., & Zhang, J. Z. (2006). Development Of A Fuzzy-Nets-Based Inprocess Surface Roughness Adaptive Control System In Turning Operations. Expert Systems With Applications, 30(4), 592-604.