Endodontic implants: Review

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Abstract

Endodontic implants were one of the early treatment options used for preservation of the natural dentition. This treatment modality was introduced around 1960, and was very useful for different cases. The key point for a successful endodontic implant is the proper case selection. Their advantages include; saving natural teeth; maintaining the natural epithelial junction; the implant extends the root length; and reduces abnormal dental mobility. Currently, due to the rapid progression of endosseous implant materials and techniques, their use has overshadowed the endodontic implants. The purpose of this article is to review the available literature about endodontic implants and their application in dentistry and to highlight the possibility of use, tissue response and limitations of this type of implant**Key words** :MINITAB16- Taguchi method- mathematical equations - surface roughness

المخلص

تعتبر الزرعات اللبية من أحد خيارات العلاج المبكر المستخدمة للحفاظ على الأسنان الطبيعية التي تعرضت للتآكل. حيث بداء تقديم هذه الطريقة العلاجية منذ عام 1960م,

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10.Conclusions

In this paper, which has specialized in the study on the impact on what the external turnings on surface roughness of St 37 alloy steel and workbook by German standards DIN1626 .And American standardA53-A specifications .by Using the Taguchi method for designing the experiments, and with the help of the MINITAB16 software , we obtained a set of nine experiments that were the best for conducting the external lathing process according to the three factors controlled by the cutting speed ,depth of cutting and feed rate . From Analysis of the s/n ration for the average surface roughness Ra was highest three cutting parameters first level was commended for best feed rate while the third level is the best for cutting speed and the first level is the best for depth of cut , and optimum cutting parameters are feed rate 0.1 mm/rev , cutting speed 500r.p.m and depth of cut 0.25mm. from Relationship between surface roughness and three cutting parameters , the relationship between feed rate and surface roughness function any more increase feed rate increase surface roughness value and low-feed rate value is best, cutting speed, reverse effects was with surface roughness, either cutting depth it has had effect on what the increase on surface roughness where surface roughness increases with increasing depth of cut and the relationship between direct and therefore better value for surface roughness at the lower value for depth of cut.

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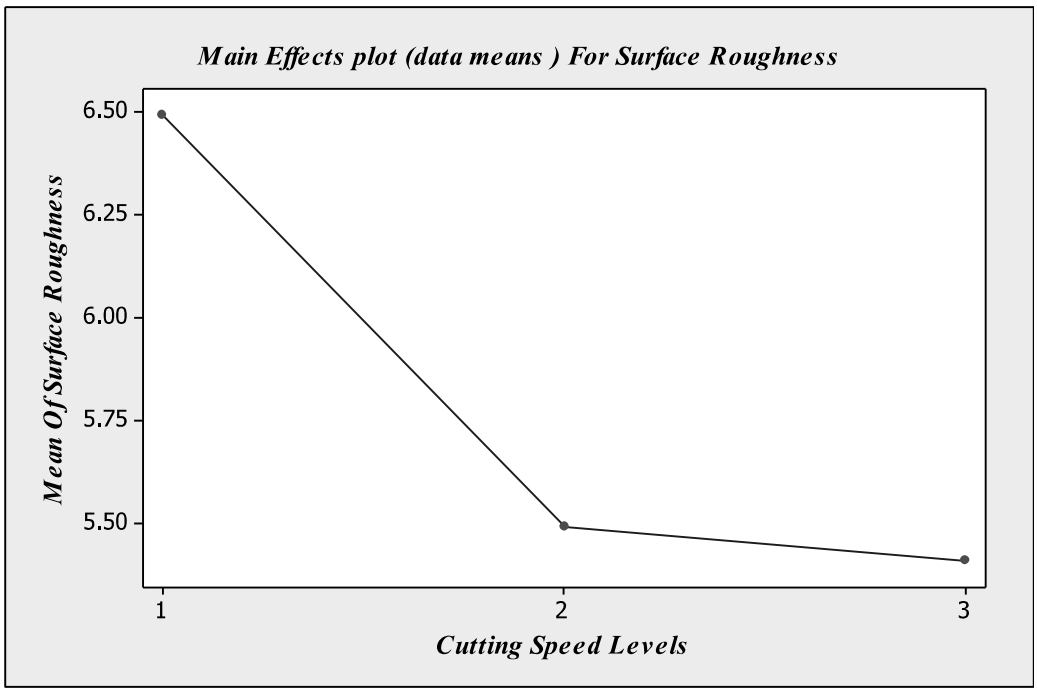

Fig. (13) Relationship between cutting speed and surface roughness

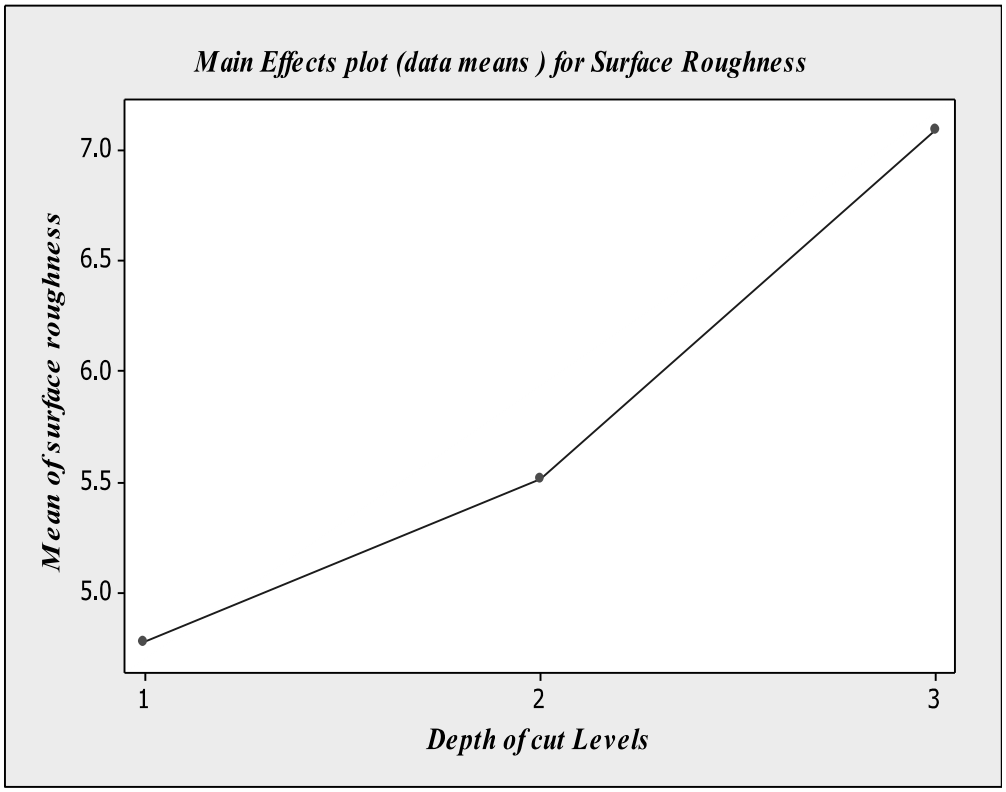

Fig..(14) Relationship between depth of cut and surface roughness

9.2 effect of cutting parameters on surface roughness(Ra)

Note from Figure (12) to increase the feed rate increases value of surf ace roughness. And from Figure (13)Note that increase the value of the cutting speed decrease surface roughness value. In Figure (14)Note to increase the depth of cut surface roughness increases and vice versa, replacing the more we can say that in depth pieces result in significant roughness in surface and replacing the relationship be covariant.

Fig..(12) Relationship between feed rate and surface roughness

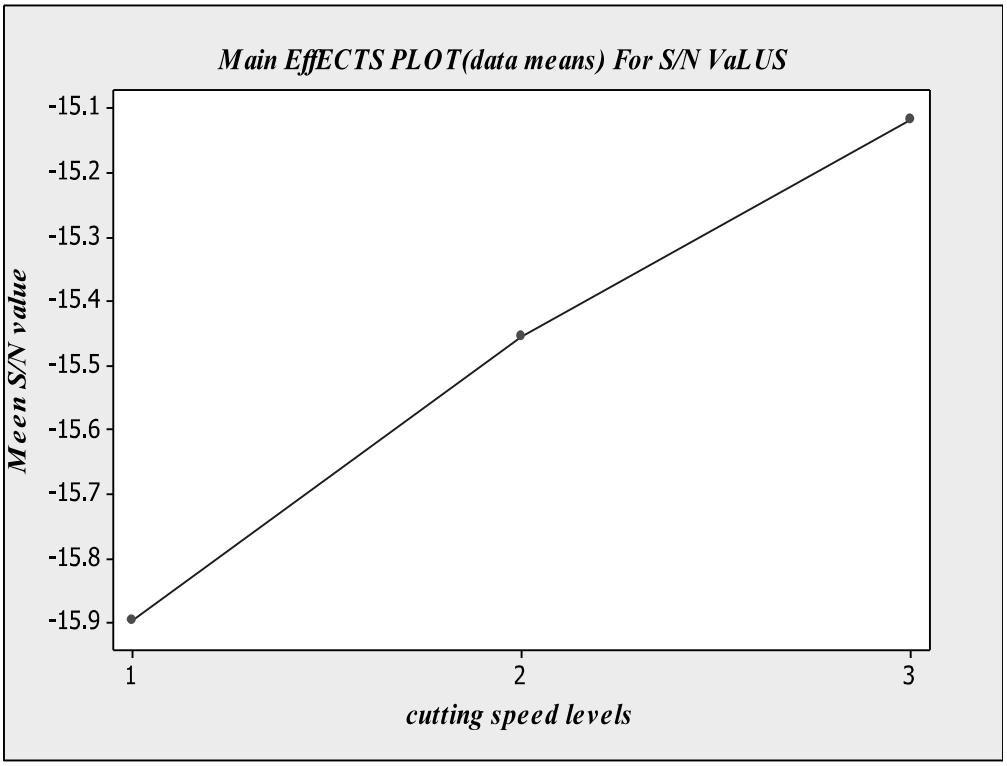

Fig.(10) relationship between cutting speed and signal to noise ration

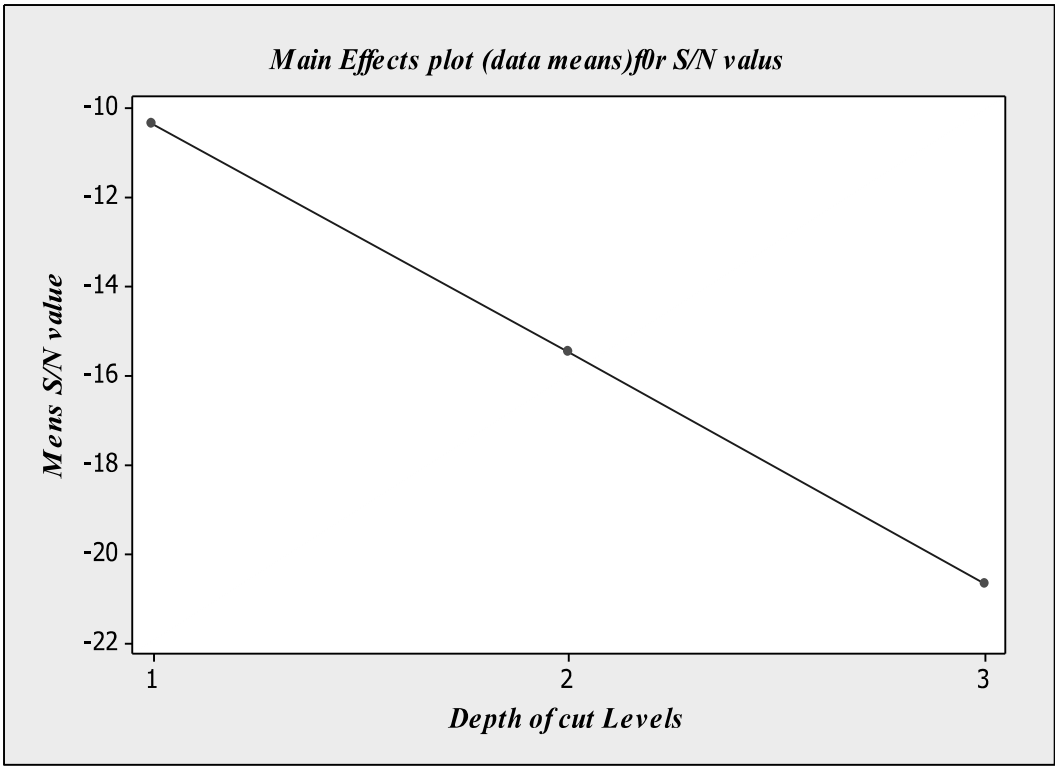

Fig.(11) relationship between depth of cut and signal to noise ration

9.1 Determination of the optimum factor

To find the best level for the three factors used in this paper and knead my table through S/N and the output of averages for each level of factors that by using MINITAB16 to male table 10, and thus the first level of feed rate is better and that the third level of the cutting speed is the best and first level of depth of cut is the best . now three factors with the following symbols, respectively (A1, B3, C1). And from the design of experiments table and identification of the values of each factor levels, the results would be as follows,(A1=0.1mm/rev , B3=500rpm , C1=0.25mm). These three values of the factors are get the best surface roughness value (Ra). The following figures showing these levels and their relationship with the largest values. From fig.11 showing relation between feed rate levels and average signal to noise ration and level one large to S/N that best , and from Fig. 10 showing relation between cutting speed level and average signal to noise ration and level three large to S/N that best , and from fig.9 showing relation between depth of cut levels and average S/N and level one that large value and best .

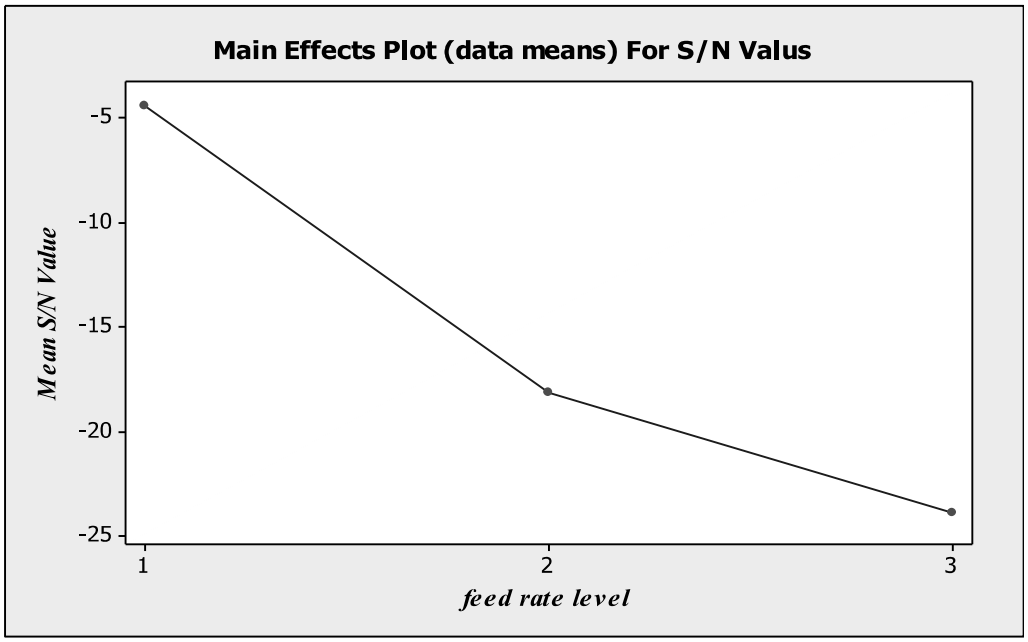

Fig.(9) relationship between feed rate and signal to noise ration

Table18: Regression Statistics for the average values of surface roughness (Ra)

Regression	
Multiple R	1
R Square	1
Adjusted R	65535
Standard	0
Observatio	3

ANO

	df	SS	MS	F	Significa
Regressi	2	2	1		
Residua	0	0	655		
Total	2	2			

	Coefficie	Stand	t	P-	Lower	Upp	Low	Up
Intercep	-3.71	0.00	655		-3.71	-	-	-
Feed rat	0.59	0.00	655		0.59	0.59	0.59	0.5
Cutting	0.39	0.00	655		0.39	0.39	0.39	0.3

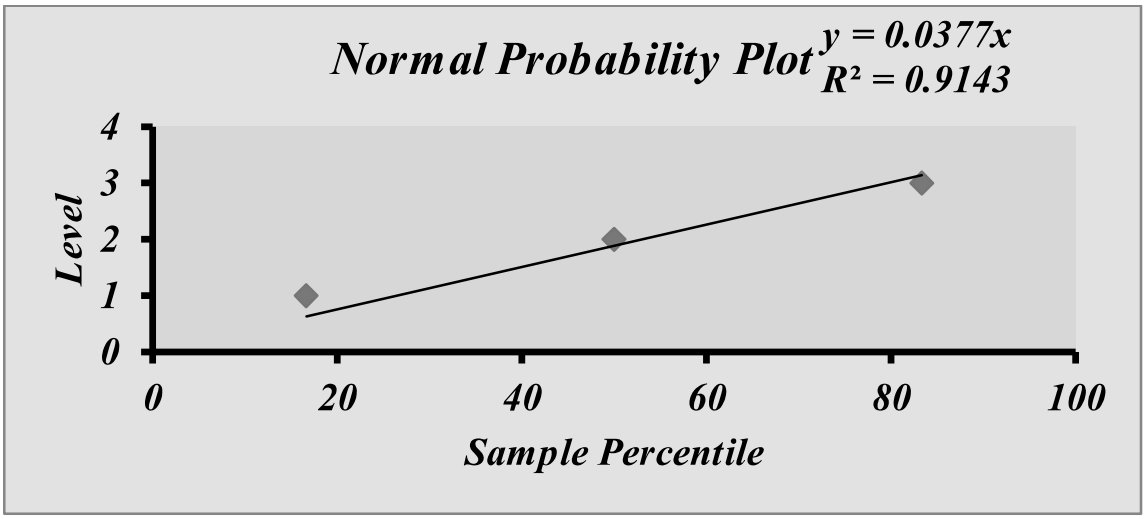

Figure 8: Normal Probability regression plot for theaverage values of surface roughness (Ra)

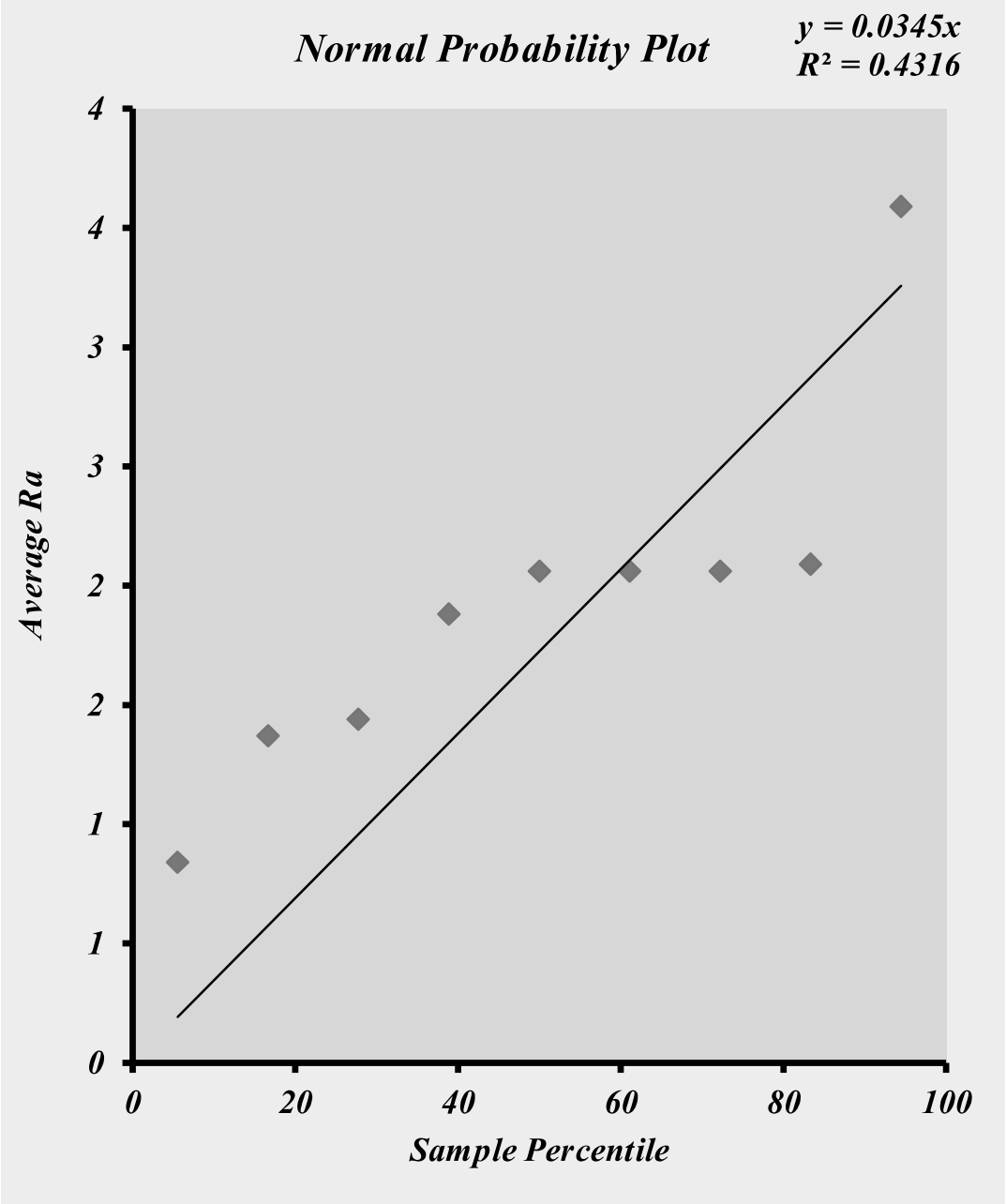

Figure 7: Normal Probability regression plot for the experimental results of the surface roughness and averages values of S/N ratios

Regression matrix

Table 17: Regression Statistics for the experimental results of the surface roughness and averages values of S/N ratios

Multiple R	1.00
R Square	1.00
Adjusted R	1.00
Standard Error	0.02
Observations	9.00

PROBABILITY OUTPUT

Percentile	Average Ra
5.56	0.84
16.67	1.37
27.78	1.44
38.89	1.88
50.00	2.06
61.11	2.06

ANOVA

	df	SS	MS	F	Significance F
Regression	3	4.57	1.52	4798.76	0.00
Residual	5	0.00	0.00		
Total	8	4.58			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.90	0.01	61.04	0.00	0.86	0.94	0.86	0.94
Sum of squares	-665.50	444.38	-1.50	0.19	-1807.83	476.82	-1807.83	476.82
MSD	1996.64	1333.15	1.50	0.19	-1430.34	5423.62	-1430.34	5423.62
S/N Ratio	-0.10	0.00	-23.64	0.00	-0.11	-0.09	-0.11	-0.09

Table 16: Anova-single Factor for the average values of signal –to- Noise ratio (S/N)

Groups	Count	Sum	Average	Variance
Level	3	6.00	2.00	1.00
Feed rat (mm/rev)	3	-46.47	-15.49	99.89
Cutting speed(rpm)	3	-46.47	-15.49	0.15
Depth of cut (mm)	3	-46.47	-15.49	26.57

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	688.24	3.00	229.41	7.19	0.01	4.07
Within Groups	255.22	8.00	31.90			
Total	943.46	11.00				

Groups	Count	Sum	Average	Variance
Ra1	9	17.50	1.94	0.54
Ra2	9	17.30	1.92	0.51
Ra3	9	17.44	1.94	0.72
Average Ra	9	17.39	1.93	0.57
Sum of squares	9	115.33	12.81	111.33
MSD	9	38.44	4.27	12.37
S/N Ratio	9	-46.47	-5.16	11.93

ANOVA

Source of	SS	df	MS	F	P-	F crit
Between Groups	1519.74	6.00	253.29	12.85	0.00	2.27
Within Groups	1103.73	56.00	19.71			
Total	2623.47	62.00				

Table 15: Anova-single Factor for the average values of surface roughness (Ra)

Groups	Count	Sum	Average	Variance
Level	3	6.00	2.00	1.00
Feed rat (mm/rev)	3	17.39	5.80	4.21
Cutting speed(rpm)	3	17.39	5.80	0.36
Depth of cut (mm)	3	17.39	5.80	1.39

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	32.43	3	10.811	6.207	0.017	4.066
Within Groups	13.93	8	1.742			
Total	46.37	11				

Table 11: Correlation matrix of the experimental results of the surface roughness and averages values of S/N ratios

	Ra1	Ra2	Ra3	Average	Sum of	MSD	S/N
Ra1	1.00						
Ra2	0.96	1.00					
Ra3	0.96	0.99	1.00				
Average Ra	0.98	0.99	0.99	1.00			
Sum of squares	0.96	0.95	0.98	0.98	1.00		
MSD	0.96	0.95	0.98	0.98	1.00	1.00	
S/N Ratio	-0.94	-0.98	-0.94	-0.96	-0.88	-0.88	1.00

Table12: Correlation matrix of the average values of surface roughness (Ra)

	Feed rat (mm/rev)	Cutting speed(rpm)	Depth of cut (mm)
Feed rat (mm/rev)	1.00		
Cutting speed(rpm)	-0.93	1.00	
Depth of cut (mm)	0.96	-0.79	1.00

Table 13: Correlation matrix of the average values of signal –to- Noise ratio (S/N)

	Feed rat (mm/rev)	Cutting speed(rpm)	Depth of cut (mm)
Feed rat (mm/rev)	1.00		
Cutting speed(rpm)	-0.99	1.00	
Depth of cut (mm)	0.97	-1.00	1.00

9.1.2.Anova: Single Factor analysis;

Table 14: Anova-single Factor for the experimental results of the surface roughness and averages values of S/N ratios

and parameters are (feed rate 0.1 mm/rev, cutting speed 300 r.p.m and depth of cut of 0.25 mm.

Level	Feed rat (mm/rev)	Cutting speed(rpm)	Depth of cut (mm)
1	3.65	6.49	4.78
2	6	5.49	5.52
3	7.74	5.41	7.09
Large- Small	4.09	1.08	2.31
Rank.	1	3	2

Table 9 : Shows average values of surface roughness

Table 10 : Shows average values of signal –to- noise ratio (S/N)

Level	Feed rat (mm/rev)	Cutting speed(rpm)	Depth of cut (mm)
1	-4.4273*	-15.896	-10.3543*
2	-18.173	-15.4548	-15.4516
3	-23.8684	-15.1179*	-20.6628
Large- Small	19.4411	0.7781	10.3085
Rank.	1	3	2

*** Best level of parameter**

9.1.Statistical Analysis of Results

9.1.1.Correlation Matrix:

Due to variability in cutting, feeding levels forth same steel with surface roughness, correlation metric between variables were determined separately Table 11,12 and 13, which enabled the interpretation of correlation of factors on the study metal. In the Table, the bold numbers indicate astrong significant correlation .The estimated correlations between surface roughness and all measures factors in the present work are listed in Tables and can be summarized as follow:

Table 8: Experimental results of Ra and averages the values S/N

No.	Response value			Average Ra	Sum of squares	MSD	S/N Ratio
	Ra1	Ra2	Ra3				
1	0.90	0.80	0.82	0.84	2.1224	0.70746	1.5033
2	1.40	1.38	1.34	1.37	5.6600	1.88665	-2.7567
3	1.48	1.48	1.36	1.44	6.2304	2.07680	-3.1739
4	2.08	2.08	2.02	2.06	12.7332	4.24440	-6.2781
5	2.28	1.94	1.98	2.06	12.9988	4.33293	-6.3677
6	1.98	1.94	1.74	1.88	10.7116	3.57053	-5.5272
7	3.54	3.40	3.84	3.59	38.8372	12.94573	-11.1212
8	1.74	2.18	2.26	2.06	12.8876	4.295866	-6.3304
9	2.10	2.10	2.08	2.09	13.1464	4.382133	-6.4168
Averages				1.93			-4.8105

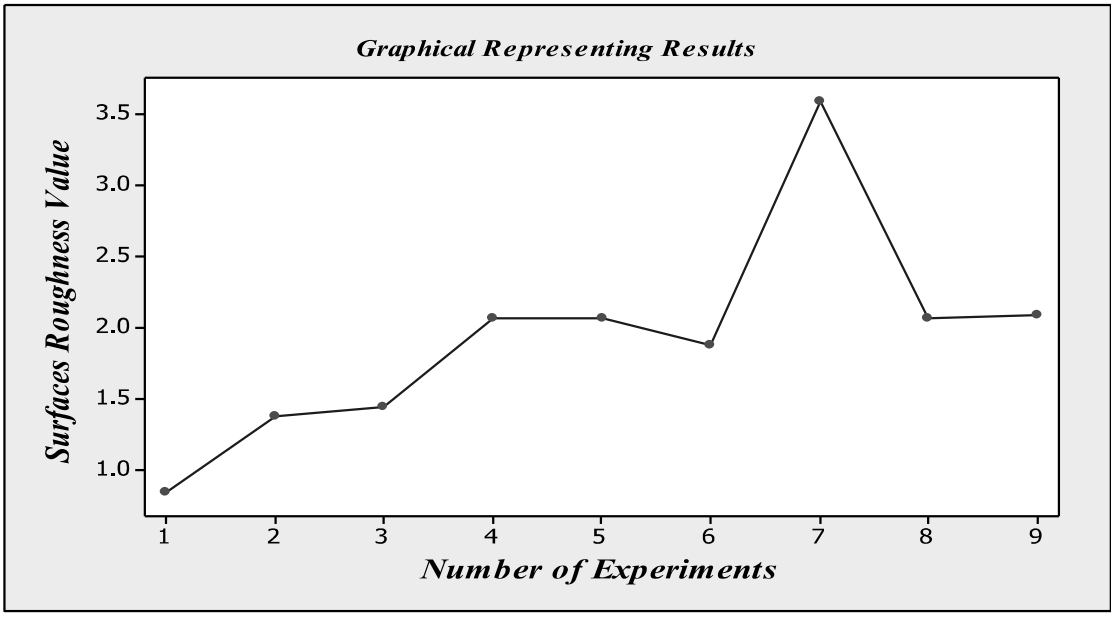

Fig (6) shows average values of surface roughness of all Tests.

From fig.(3) note that surface roughness value Ra was least in average value of (0.84μm) and the experimental number one is the best experience

$MSD =$ Square $\boldsymbol{average\ deviation}$

n= Number of measurement

No.	Feed rate (mm/rev)	Cutting speed (rpm)	Depth of cut (mm)	Ra1 (μm)	Ra2 (μm)	Ra3 (μm)
1	0.1	300	0.25	0.90	0.80	0.82
2	0.1	400	0.50	1.40	1.38	1.34
3	0.1	500	0.75	1.48	1.48	1.36
4	0.2	300	0.5	2.08	2.08	2.02
5	0.2	400	0.75	2.28	1.94	1.98
6	0.2	500	0.25	1.98	1.94	1.74
7	0.3	300	0.75	3.54	3.40	3.84
8	0.3	400	0.25	1.74	2.18	2.20
9	0.3	500	0.5	2.10	2.10	2.08

Table 7 : Experimental results of surface roughness(Ra).

9. Results and discussion.

To access the results and discuss and analyses them and that through data obtained from past experiences and after using equations can reach several analyses, S/N values can be analyzed and Ra and knead using equations 1, 2, 3 or by software MINITAB 16 where we got the results shown in the following table.

8-Conducting The Experiments.

At this stage the process is testing all samples according to data given by the software. All samples are processed with the same measurements in any dimensions, length 110 mm, and 50 mm diameter and then turning its foreign operation for the purpose of settling on that last stage using constant values of any parameter cutting speed 700rpm and feed rate 0.1 mm/rev and depth of cut 0.5 mm to reach diameter 46 mm and length of 100 mm for all samples. And then after that external turnings process all nine samples takeover by changing the rate of three parameter factors , feed rate , cutting speed and depth of cut and follow this excellent property measurement process stage that have been selected in our position that is surface roughness Ra and be less average value in nine tests are the best experience, it is known that in the process of measuring surface roughness take average surface roughness is measured where measurements at three different position in the vicinity of sample, average of these values be (Ra) as shown in the table(5). It is noted that after turning on samples that some determinants and changing and that have been identified but there are other factors non controlled it for example spindle vibration and the age of the machine and cutting tool vibration during cutting process, it's(called signal-to-noise ratio) (S/N) is an expression of signal strength excellent property Ra here have a higher value and be the best.(Maht and kumar,2008). Using some mathematical statistics to calculate values (S/N) for any of the three factors have the biggest effect the property profile and specify that transcends effect, and have been using mathematical and statistical equations and knead to shred value reference expressed by S/N.

$$S/N = -10 \log MSD \quad ----------(1)$$

$$MSD = \frac{Y_1^{\,2} + Y_2^{\,2} + Y_3^{\,2} + Y_4^{\,2} + \cdots \ldots\ldots\ldots\ldots\ldots\ldots + Y_N^{\,2}}{n} \quad ---------- (2)$$

$$S/N = -10 \log \frac{Y_1^{\,2}+Y_2^{\,2}+Y_3^{\,2}+Y_4^{\,2}+\cdots\ldots\ldots\ldots\ldots+Y_N^{\,2}}{n} \quad ---------- (3)$$

$-10 \log = \text{Logarithm}\ \mathrm{x}$

Symbol	Control factor	Unit	Level I	Level II	Level III
A	Cutting speed	RPM	300	400	500
B	Feed rate	mm/rev	0.1	0.2	0.3
C	Depth of cut	mm	0.25	0.50	0.75

Table 5 :Experimental layout using an L9 orthogonal array

EXP.NO	Control factor		
	Speed (rpm)	Feed rate (mm/rev)	Depth of cut (mm)
1	1	1	1
2	2	1	2
3	3	1	3
4	1	2	2
5	2	2	3
6	3	2	1
7	1	3	3
8	2	3	1
9	3	3	2

Table 6 : Experimental design matrix in actual value

EXP.NO	Control factor		
	Speed (rpm)	Feed rate (mm/rev)	Depth of cut (mm)
1	300	0.1	0.25
2	400	0.1	0.50
3	500	0.1	0.75
4	300	0.2	0.5
5	400	0.2	0.75
6	500	0.2	0.25
7	300	0.3	0.75
8	400	0.3	0.25
9	500	0.3	0.5

terms of the best larger or smaller is better. As it can be by using this way achieve optimum factors for the ongoing process as turning for example and knead with the so called signal to noise ratio (S/N) and knead to determine which factors have the greatest effect on properties to study as it better levels for these key factors changing the ratio and proportion of effect , in this paper, three factors are cutting speed, feed rate and depth of cut and the property measured is surface roughness(Ra)and replacing you can find any of the three factors that have the greatest effect on Surface roughness and the effect ratio (Osaman,2001).

6. User program (software) (MINITAB 16).

In this paper have been using (MINITAB 16) statistical chose the number of tests and data analysis that produces the relationship between three factors used and its relation with surface roughness saluted several program benefits mainly contains full statistical analyses with high accuracy and produces high resolution graphics we can control some results in quality and purpose of study design applied to any part of or all of the data. Overall, the program (MINITAB 16) was used for statistical analysis of experimental work and it can shred the best experience and to obtain the calculated results Signal ratio to-noise to better illustrate the level of factors and also effect three factors on surface roughness.

7 .Taguchi Method

Taguchi has developed a methodology for the application of designed experiments, including a practitioner's handbook. This methodology has taken the design of experiments from the exclusive world of the statistician and brought it more fully into the world of manufacturing. His contributions have also made the practitioner work simpler by advocating the use of fewer experimental designs, and providing a clearer understanding of the variation nature and the economic consequences of quality engineering in the world of manufacturing.(Kirby,2006).

Table 3: machining parameters and their levels

indicate some mechanical properties. The elements in the sample rate was defined by using (Spectrometer Analysis) device .

Table 1 : Chemical composition of steel 37

Material	STEEL37				
Elements	c	si	Mn	p	cu
Percent %	≤0.3	≥0.1	0.29	≤0.035	≤0.4
Elements	ni	v	S	cr	mo
Percent %	0.4	0.08	0.035	0.4	0.15

Table 2: Mechanical properties of steel 37

Tensile Strength (MPa)	Yield point
≥ 415	≥240

3.2Lathe machine used

Used in the turning lathe machine programmed type (Biglia B.131/S2 CNC)

3.3 Cutting tool used.

In these experiments, we used a cutting tool turning left carbides insert with nose radius 0.8 mm.

4.Measurement of surface roughness

There are several types and methods used to measure the surface roughness in this study we used the device (Taylor-Hobson surtronic 3 + profilometer) to measure the surface roughness (Ra).

5.Design of experiments.

The method used in this paper to design a number of tests is a way Taguchi,One of the most important statistical techniques for total quality management as a way to improve the cost performance and improve the design quality and performance compared to the traditional way that need large number of experiments and credited an increase in the financial cost. Method by Taguchi depends on the particular design of orthogonal rows, resulting in a small number of experiments only importance and usefulness of this method is experimental design where time produces the best experience as it best factors that shapes on the property to be examined in

feed rate variables defined at three levels , cutting tool and coolant liquid are constant at all experimental . In the first step the sample is cut length 110 mm and 60 mm Dim. and then perform facing process to reach a length of 100 mm and external turning to reach Dim 50 mm for the sample . And each sample tests are executed using variables using a lathe Taguchi method completion of all samples are measured surface roughness (Ra) for each sample three times the circumference of the circular sample in different places to take our average measurements and are charting the relationship between surface roughness and three factors are changing cutting speed , depth of cut and feed rate and analysis of nutrition rate averages for each of the (Ra) and S/N is any of the three factors most effect on the surface roughness and the bulls for optimal level of each factor based on results Determine the on what each factor effect on surface roughness and draw the relationship between them and the subject of the study(effect of external turning process on the surface roughens to tool steel St37.

2.literature Review.

The terms surface roughness is used very widely in industry. In 1947,the American Standard B46.1-1947, Surface Texture, defined many of the concepts of surface metrology and terminology which overshadowed previous standards. Using the Taguchi method gives the least number of experiments, and instead reduces the cost.(Maekawa,2000).In a study before the use of the Taguchi methodology in applying the best factors in the turning process on titanium alloy(Ti-6AL-UV.ELI) with the use of lathing tools for coated and uncoated carbide insert , as well as cutting speeds, feed rate, depth of cut and types of inserts of different angles with the use of Coolant has three levels of these factors.(Osaman,2001).

3. Equipment and material.

3.1 work piece material

We choose the metal (Steel 37) according to the German Standard (German Standard) and American standard A53-A (American Standard) and knead for multiple area used in industry and mechanical equipment and parts, machinery. The Table (1)indicate the chemical composition and Table (2)

finish quality is one of the basic requirements to cut the engines, machinery, mechanical parts and friction between moving parts at least to increase the quality of the surface roughness and thus reduce temperature, ease of movement and minimize corrosion between moving parts and downplaying of metal fatigue stress because of this important technical and mechanical engineer should have knowledge of the methods of measuring and checking work piece surfaces roughness, through this paper we will look to basic concepts about surface roughness Piece of work, you need to remove part of the article to get to the final product. The final product is a manufactured piece of work according to the specifications of engineering drawing, for example may need a specific piece of work, we can use an external diameter the lathe that can produce this diameter rotate piece work and remove excess metal chips by using cutting tool to produce a smooth surface and rounded as desired outer diameter , You can use the process of acceptance of a cylindrical hole metal removal and other machines are used for different purposes to remove metal, milling and agency saw grinding machine there are many modern techniques for metalworking metal electrical discharge machine (EDM) , And metal operating electrochemical and laser cutting corrosively and cutting by water jet and balsam and the operation requires attention to many details of the access to the work piece specific geometric graphic specifications in addition to the obvious problems of access to the selected dimensions highlighted a problem accessing a surface finish, may produce bad work piece surface quality of a way bad fixed of the work piece using the binding or bad tools or non-professional in machining process . That the purpose of this paper is to study the effect of the cutting speed , depth of cut and feed rat with use coolant and tool used in turning on surface roughness (Ra). Then choose the work piece material tool steel (St37) and knead for multiple uses in many parts and industrial products, where diameter of samples prepared 50 mm and a length of 100 mm and using a tool turning with insert carbide nose radius (0.8) with the use of liquid cooling in all turnings by using MINITAB 16 and by using Taguchi method number of experimental is selected used in this study and at the same time identified the changing basic factors , the cutting parameters , speed , depth of cut and

Key words :MINITAB16- Taguchi method- mathematical equations - surface roughness

المخلص

تلعب جودة السطح دور مهم لأي منتوج وهي أحد متطلبات الزبون ، حيت جودة الإنهاء السطحي تقلل الاحتكاك بين الأجزاء المتحركة، وينتج عن ذلك إطالة عمر الآلة ومن تم تقليل التكاليف وتحضي عملية تحسين جودة السطح اهتمامات كبري في عالم الصناعة بحيث توجد عدة متغيرات مهمة مثل سرعة القطع ومعدل التغذية وعمق القطع وهي تؤثر بشكل واضح على جودة السطح, تم في هده الورقة دراسة جودة السطح المتحصل عليه من خلال تشغيل مادة من سبيكة الحديد باستخدام آلة الخراطة المبرمجة واستخدام التلاتة عوامل المؤثرة مع ثبوت عوامل أخري مثل عملية التبريد ونوع الحد القاطع وبتطبيق برنامج ميني تاب 16 وطريقة تاقوتشي تم إيجاد عدد التجارب وباستخدام المعادلات الرياضية والتحليل الإحصائي أتضح أن المؤثر الأكبر هو معدل التغذية ثم عمق القطع فكلما قلت قيمتهما تحسنت جودة السطح وكلما زادة سرعة القطع تحسنت جودة السطح وثم الحصول على قيم للمتغيرات المثلي وهي سرعة القطع 300دورة /دقيقة ,معدل التغذية 0.1ملم/دورة , عمق القطع 0.25ملم.

الكلمات المفتاحية: ميني تاب 16- طريقة تاقوتشي-المعادلات الرياضية –خشونة السطح.استخدام برنامج ABAQUSE .

1Introduction

The surfaces Roughness of the important factors in mechanical design and manufacturing, also leaking oil and gas and other fluids as knead the parts under severe mechanical stresses or vibrations movements and some cracks lead to concentration of stresses in those respects and be broken piece and be broken piece and breakdown.(Lawrence,1985). The Surface