A Study of Some factors affecting the quality of Carded Sliver on high production Card.

دراسة بعض العوامل المؤثرة على جودة اشرطة الكرد المنتجة على ماكينات الكرد عالية الانتاج.

By
Ismail RaKha

خلاصـــــة :

استخدمالا لدراسة تاثير سرعات وضبطات ماكينة الكرد عالية الانتاج ى جودة الاشرطة المنتجة منها فان هذا البحث يتركز على دراسة بعض الضبطات ماكينة الكرد مثل الضبطات بين صحن التغذيـــة والمنقـــار ، المنقـــار السلندر ، السلندر والفلاتس وبين السلندر والدوفر عند تغذيل الالطـــان مصرية (جيزة ٧٥ وجيزة ٨٠) . وقـــد صممت التجارب بتغيير الاربعـة عوامل ـــابقة عند مستويين (٢) ومن النتائج امكن تحديد التاثير المعنوى للضبطات ، على حدة وكذلك تفاعلات هذه العوامل وكذلك نوع التغيرات على جودة الفريط لناتج وذلك بحساب عدد العقد بقافة الكرد وانتظامية الفريط . وقد وجد ان دد العقد فى القافة يتاثر معنويا بقيم الضبطات بيـــن السلنـــدر والدوفـــر السلندر والفلاتس وكذلك تتاثر بتفاعلات هذه العوامل . كما وجد ان انتظامية فريط الناتج تتحسن بتضييق المسافات بين الاجزاء التى تم دراستـــها لـــى ماكينة الكرد فى اتجاه مسار القافة .

ABSTRACT

In the present investigation two types of Egyptian Cotton Fibres were processed through higher production m/c into Carded sliver . The experiments were Carried out by varying Four parameters (Card settings) at Four positions at two levels . Using 2^4 Factorial design technique. The sliver quality in terms of uster eveness c.v. % and Card weh neps /100 $inch^2$ were determined .

The experimental results explored the influence of settings between m/c parts on the cotton sliver quality . The results show that the lower rate of neps in the card web is obtained at closer setting between cylinder and doffer and between cylinder and flats , The better sliver regularity resulted by decreasing the discussed setting in the material flow direction . The factors interactions show significant effect on the sliver quality .

1-Introduction

Several Research Workers (3,4,5) Studied the effect of flat carding machine variables on cotton Sliver quality . The card sliver quality was affected significantly by several factors such as : the speed of carding machine organs (11) the setting between these parts (6) the load applied to their surfaces (8). the doffing factor between cylinder and doffer (7) and state of carding cloth (9) .Also they studied the cleaning efficiency of the carded sliver (10), as well as the sliver and yarn evenness (4,5).

The auther (1) studied the dependence of card web neps and trash Content % in card sliver in carding organs speeds , cotton fibre and sliver weight . Thus ,the present work intended to study the influence of card setting on cotton sliver quality . The experiments were carried out cosidering the following :
- Varying four settings at carding m/c : dishplate to takar-in , taker-in to cylinder, cylinder to flats and cylinder to doffer using 2^4 factorial design technique (2) .
-Two egyptian cotton fibres were processed on Toyoda high production machine .

2-Experimental work :

2-1 Material : the experiments were carried out on two types of Egyptian cotton fibres , Giza 75 and Giza-80 having the following properties :

Fiber Properties		Cotton fibre	
		Giza 75	Giza 80
length at	2.5 %	30.50	32.4
	50. %	13.88	14.0
	U.R.%	45.50	43.2
Micronaire	μ g/in	4.500	3.70

Table (1) : The Properties of processed Cotton

2-2 Factorial design The 2^4 factorial design technique applied to investigate the effect of carding machine settinge on the card sliver quality . Four positions between dishplat-taker-in , taker-in-cylinder , cylinder-flats and cylinder-doffer were considered . The actual levels of setting between carding m/c elements ranged at two levels (-1) and (+1) given in Table (2) , while the experimental plan is shown in table (3) .
Cotton fibres es a lap was proceesed through TOYODA CK-C7 high production carding m/c for producing sliver of Ne 0.15

Variables	lsvel	-1	+1
X_1 : Cylinder to doffer	setting (in)	0.004	0.008
X_2 : Taker-in to cylinder	setting (in)	0.006	0.012
X_3 : Dishplate to taker-in	setting (in)	0.008	0.016
X_4 : Cylinder to flats	Setting (in)	0.010	0.014

Table (2) : Actual levels of variables

Experimental Number	level of variables				Response Y_i
	X_1	X_2	X_3	X_4	
1	+	+	+	+	y_1
2	+	+	+	−	⋮
3	+	+	−	+	⋮
4	+	+	−	−	⋮
5	+	−	+	+	⋮
6	+	−	+	−	⋮
7	+	−	−	+	⋮
8	+	−	−	−	y_8
9	−	+	+	+	⋮
10	−	+	+	−	⋮
11	−	+	−	+	⋮
12	−	+	−	−	⋮
13	−	−	+	+	⋮
14	−	−	+	−	⋮
15	−	−	−	+	⋮
16	−	−	−	−	y_{16}

Table (3) : Experimental plen :

Exp.No.	Cotton sliver quality: Neps / 100 inch^2		Carded sliver evensss(CW)	
	Giza 75	Giza 80	Giza 75	Giza 80
1	12	18	6.38	6.51
2	12	15	5.71	5.39
3	20	50	7.45	9.03
4	0	9	5.89	5.43
5	6	18	6.94	6.14
6	5	7	7.31	5.07
7	4	9	6.50	7.30
8	5	6	7.55	5.20
9	13	24	5.61	6.87
10	12	27	6.55	5.66
11	23	24	6.46	4.85
12	14	9	4.23	6.38
13	39	44	7.77	6.24
14	15	27	6.380	5.59
15	31	31	6.59	6.89
16	15	23	7.20	4.70

Table (4) Cardsd Sliver quality

2-3 Measurements : The carded sliver quality was examined according A.S.T.M. Standard . Neps /100 inch^2 and sliver eveness C.V.% were meesured .

3 Results and statistical analysis :

According to the construction details of experimental plan tables (2 and 3) the results of carded sliver quality have been determined as shown in table (4) the results were fed to a computer equipped with plotter HP , in order to get the rgression cofficients . The significance of tested variables and the response surface equations for carded sliver quality as shown in tables (5 and 6) . The obtained results plotted graphically . The first group of graphs fig(1 and 2) relates to neps and the second group Fig(3 and 4) relates to sliver eveness .

4-Discussion

4-1 Neps in carded web : The contoure of card web neps Fig (1 and 2) show that the cylinder to doffer setting : X_1 and cylinder to flats : X_4 have the majar effect on the nep count level as a main factors .
It is clear that as x_1 (cylinderto doffer setting) decreases the card web nep increases. This trend has been observed for both types of cottons G-75 and G-80. While the increment in

Cotton Type sliver qual.	$Y_i = b_o + b_i \Sigma X_i + b_{ij} \Sigma X_{ij} + b_{ijk} \Sigma X_{ijk}$			
	G -75		G -80	
Coeffici.	Neps /100 in^2	eveness (c.v.%)	Neps/100 in^2	eveness (c.v.%)
b_o	14.124	6.495	21.3125	6.078125
b_1	-6.124	0.22125	-4.8125	0.180625
b_2	-0.874	-0.460	0.6875	0.186875
b_3	0.124	0.01125	1.1875	-0.144375
b_4	4.375	0.1425	5.9375	0.650625
b_{12}	3.8375	0.101	5.8125	0.144375
b_{13}	0.625	-0.142	-3.1875	-0.336875
b_{14}	-1.875	-0.041	1.3125	0.335625
b_{23}	-1.125	0.016	-2.1875	-0.013125
b_{24}	-0.625	0.297	1.0625	-0.100625
b_{34}	-1.125	-0.123	-2.4375	-0.144375
b_{123}	1.375	-0.197	-2.3125	-0.145625
b_{124}	3.125	0.158	2.6875	0.294375
b_{134}	-1.125	0.097	-1.3125	-0.294375
b_{234}	-2.375	-0.383	-4.5625	0.176875
b_{1234}	-0.375	0.187	-1.1875	-0.358125

Table (5) Response surface equations

x_4 (cylinder to flats setting) from 0.010 to 0.014 inch results in increment in neps.

From the above discussions the effect of x_1 and x_4 settings on card web neps can be explained as followintg : The fibre transfer Coefflcient from cylinder to doffer reduces as the setting between them increases , and Consequently the revolutions of the carded fibers on the cylinder surface increases , and thus the probability of neps removal between cylinder and flats in the main carding zone increases on the other hand , as X_4 setting increases the interaction between cotton fibers and wires in the main carding zone decreases and consequently , the probability of neps removal decreases.

In addition of the significant effect of X_1 (cylinder to doffer) and X_4 (cylinder to flats) settings at (99% and 95%), the effect of two factor interactions was determined as shown in table (6). It is clear that $X_1 X_2$ affects card web neps whatever the type of cotton fibers.

Material sliver quality	Mean Squares G-75 Neps/100 in^2	G-75 C.V.%	G-80 Neps/100 in^2	G-80 C.V.%
i-Main effects				
x_1	2.34***	0.0031***	1.45*	0.002
x_2	0.048	0.013	0.0295	0.0022
x_3	0.00096***	0.0000079	0.08814**	0.0013**
x_4	1.197	0.0013	2.2	0.0265
ii-Two interactions				
x_1x_2	0.92**	0.00064***	2.11**	0.0013*
x_1x_3	0.0244	0.082	0.64	0.0071**
x_1x_4	0.22	0.00011	0.108	0.007
x_2x_3	0.079	0.000016**	0.3	0.00017
x_2x_4	0.0244	0.0055	0.071	0.00063
x_3x_4	0.079	0.00095	0.37	0.0013

Tabl (6) Analysis of variance

*** Significant at 99%
** Significant at 95%
* Significant at 90%

4.2 Silver eveness.

From the previous work (3,4,5) they found that the silver irregularity was affected by the variation in the fed sheet , cylinder speed , setting to doffer or flats and the type and state of teethes in the flat and cylinderr covers (6).

The effect of carding m/c settings on silver eveness (c.v.%) represented graphically as shown in figs(3 and 4).

The experimental results indicate that a deterioration of silver eveness accompaned with the increase of setting X_1 : cylinder to deffer as well as X_4 : cylinder to flats while the dishaplate -taker - in Setting (X_3) does not show any change in sliver regularity (C.V %) . On the other hand, it is obvious that a closer setting between taker-in and cylinder produce card sliver with higher C.V.% .
Also, it can be stated that the present experimentation, for material procesed and m/c used a wide setting of taker-in-cylinder (X_2), narrow space of cylinder-flats (X_4) and too-narrow spacing between cylinder and doffer (X_1) leads to a better sliver uniformity.

On the other hand, the two factor interaction X_1X_3 , X_1X_4 as well as X_2X_4 affect significantly at (99)% , (95)% , and (95)% respectively on Card Sliver eveness.

Conclusion:

From the above discusions the following conclusions can be drawn

1 - Card web neps:
* The most important factors which affect the Card web neps are that the setting between cylinder and doffer and cylinder and flats .
* The lower rate of neps is obtained by narrow setting of cylinder to flats and a wide setting of cylinder to doffer.
* The two factor interactions such as cylinder to doffer setting and taker-in to cylinder affect siggnificantly in carded web neps.
* Cotton fiber "G-80" show a higher rates of neps compared with those obtained for "G-75" .

2 - Sliver eveness:
* The Carded Sliver eveness deteriorates as the setting of cylinder to doffer and that of cylinder to flats increases.
* The closer setting between taker-in and cylinder produce even sliver while the dishplate setting to taker-in does not show any effect on sliver eveness
* The better sliver uniformity obtained as the discussed carding machine settings decreases in the direction of material flow.

References

1 - I.Rakha and R.El-bealy " Effect of Some Carding parameters on cotton sliver quality" MEJ, Vol.13, No.1, June 1988.
2 - O.Davies " The design and analysis of industrial experiments " publ. Imp. Chem.Indust..LTD. 1979.
3 - Batoren U.A. " The evening action of the carding machine" Technalogia Tekctelnoy promeshlnoste. UZB. BYZOB, 1965, No. 1.

4 - Orenbach S.B. et-al ."The beating effect of cylinder and doffer on the eveness of Cerded Sliver" Priadenia No. 6. 1974.
5 - Koklena N.A.et-al " The periodical effect of setting on the Card Sliver evenese" Technologia Tekstelnoy promiehlnosty. UZB.BYZOB , No.1 ,1976.
6 - J.F.Bogdan , Text-Res. J. No.5, p. 377, May 1955.
7 - Karasiev G.I.Ivuz , Technol . Tekstil . prom. No. 4, 1961.
8 - Prozonov E.G. Ivuz, Tech. of Textile Industry U.S.S.R No. 2, 1962.
9 - Ashnen NM et-al, Ivuz, Technol. Tekstil. prom. No. 1, 1976 .
10 - Hung D. High speed Carding with Crosrol and Crosrol Vorga Textile Bullettin. No. 5, p. 35-37, 1964.
11 - E. Rentzsch., Textil-u. Faser stoffech. , 1956, 6 , 261 .

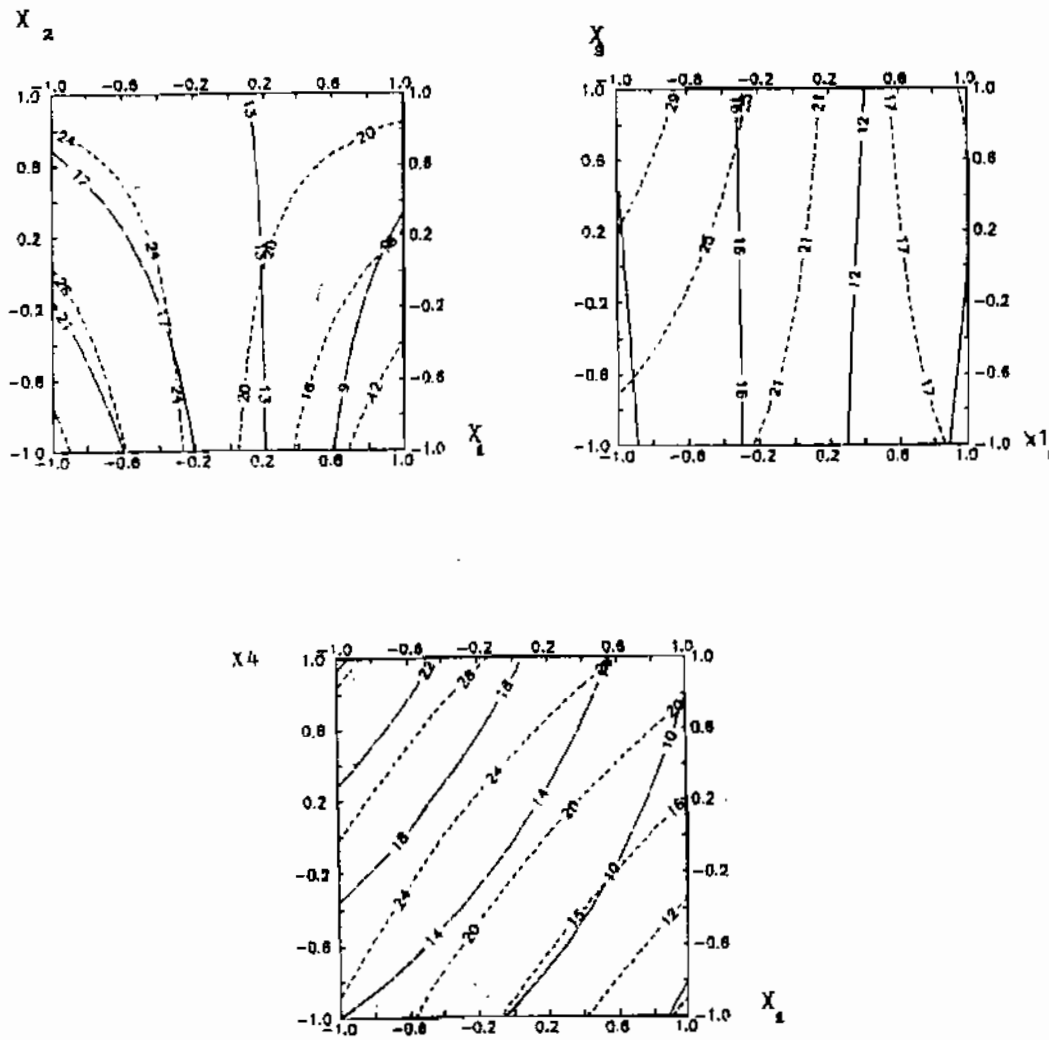

fig.(1) Contours for nep count

(——) Giza-75 (----) Giza-80

X_1 :Cylinder to doffer setting

X_2 :Taker-in to cylinder setting

X_3 :Dishplate to taker-in setting

X_4 :Cylinder to flats setting

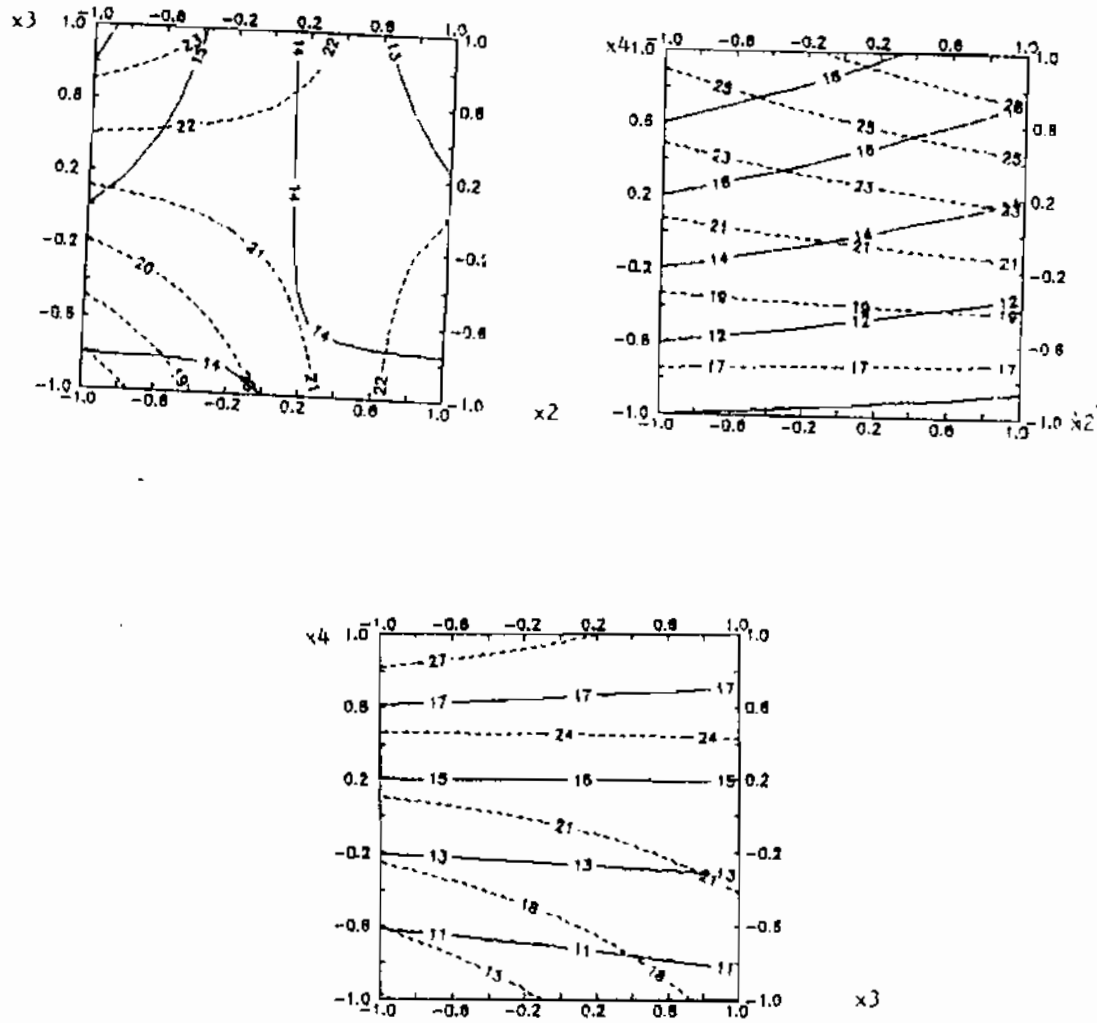

fig.(2) Contours for nep count

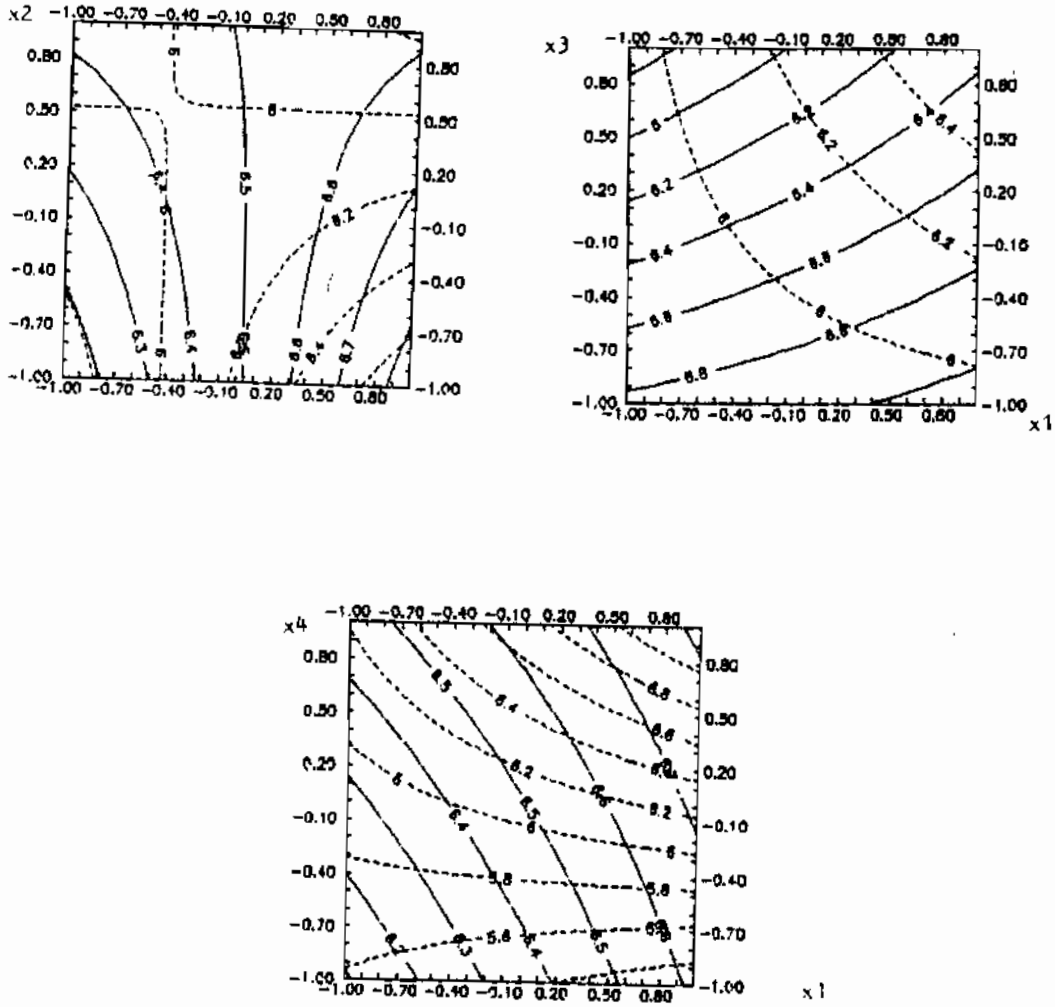

fig.(3) Contours for sliver eveness

(——) Giza-75 (----) Giza-80

X_1 :Cylinder to doffer setting

X_2 :Taker-in to cylinder setting

X_3 :Dishplate to taker-in setting

X_4 :Cylinder to flats setting

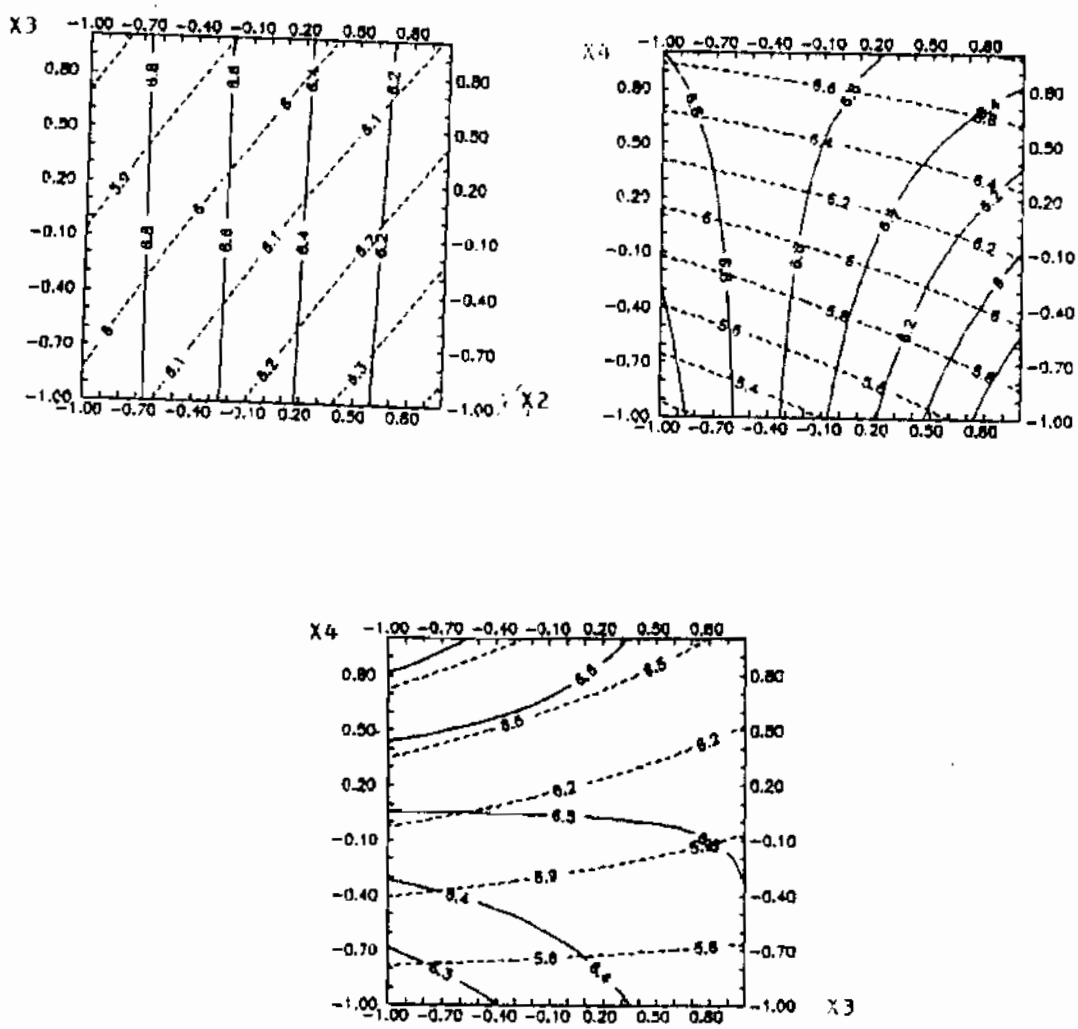

fig.(4) Contours for sliver eveness