

«به نام خدا»



عنوان:

مدل سازی استحکام جوش حاصل از فرآیند جوشکاری مقاومتی
نقطه‌ای برای مقادیر مختلف عوامل اثرگذار



ارائه: مهیار اسدی

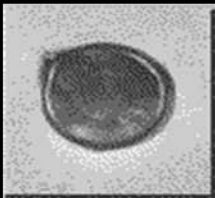
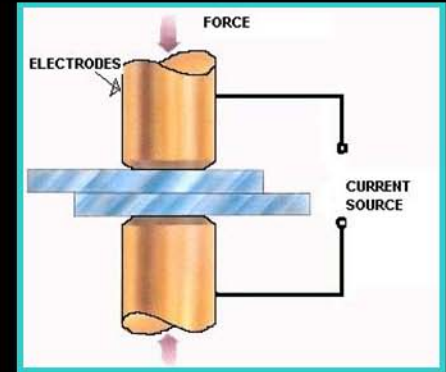
تابستان ۸۵

خواص جوش



FARS NEWS AGENCY

Photo : Hassan Ghaedi

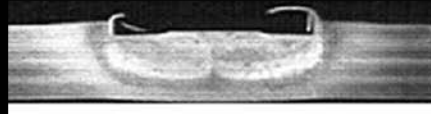


ویژگیهای ظاهری



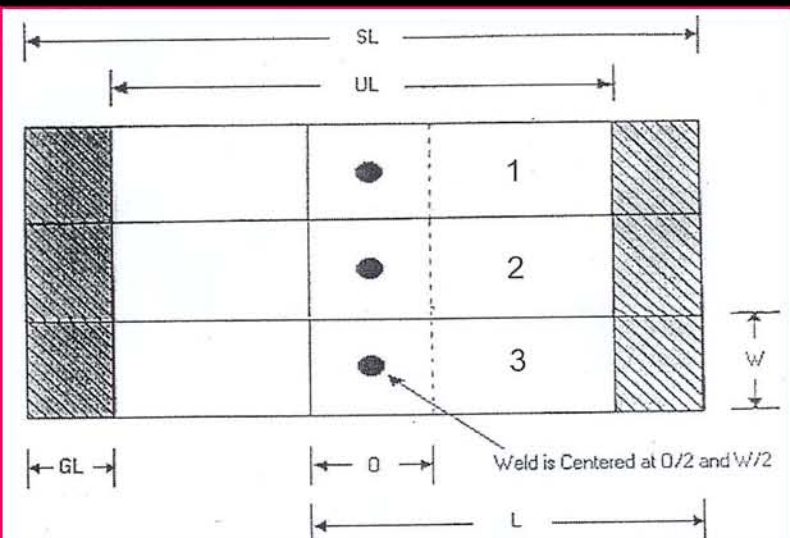
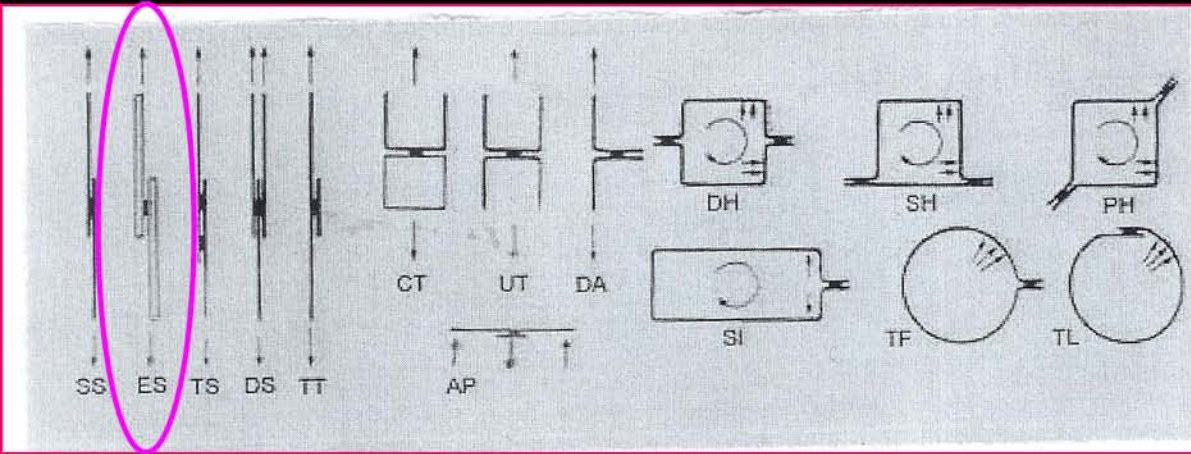
عملکردی
دوام
خوردگی

خواص ذاتی



B 13 1216
B 13 1226

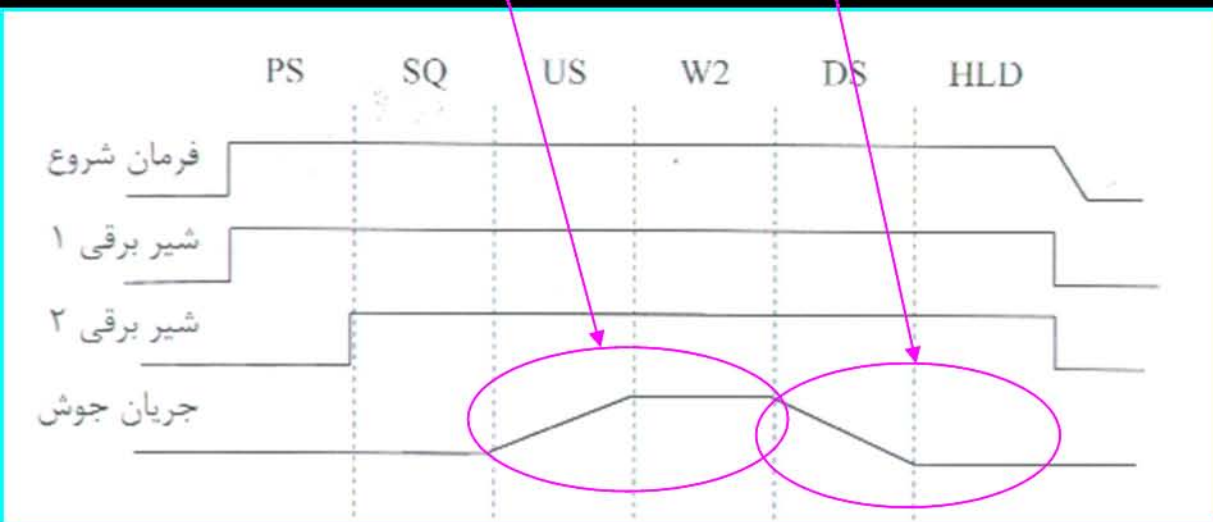
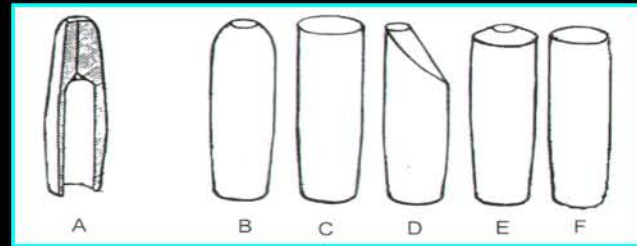
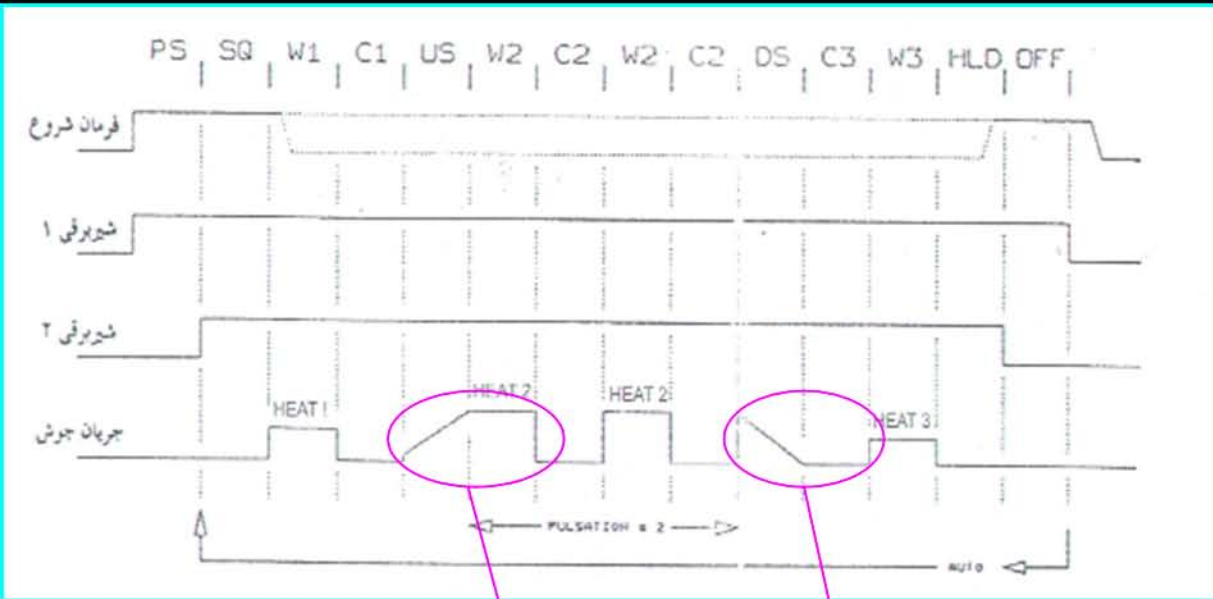
تست استحکام



ANSI/AWS/SAE D8.9-97

Sheet Thickness (mm)	Coupon Length L ^(a) (mm)	Coupon Width W ^(b) (mm)	Overlap O ^(b) (mm)	Sample Length SL ^(a) (mm)	Unclamped Length UL ^(b) (mm)	Gripped Length GL ^(a) (mm)
0.60 -1.29	105	45	35	175	95	40
1.30 -3.00	138	60	45	230	105	62.5

دستگاه جوشکاری

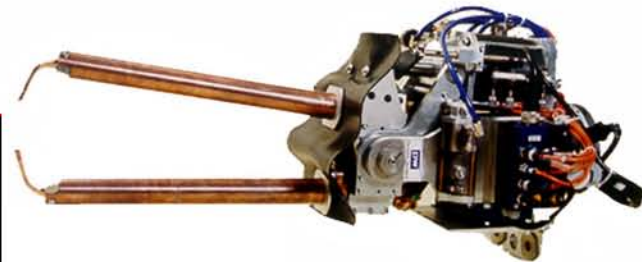
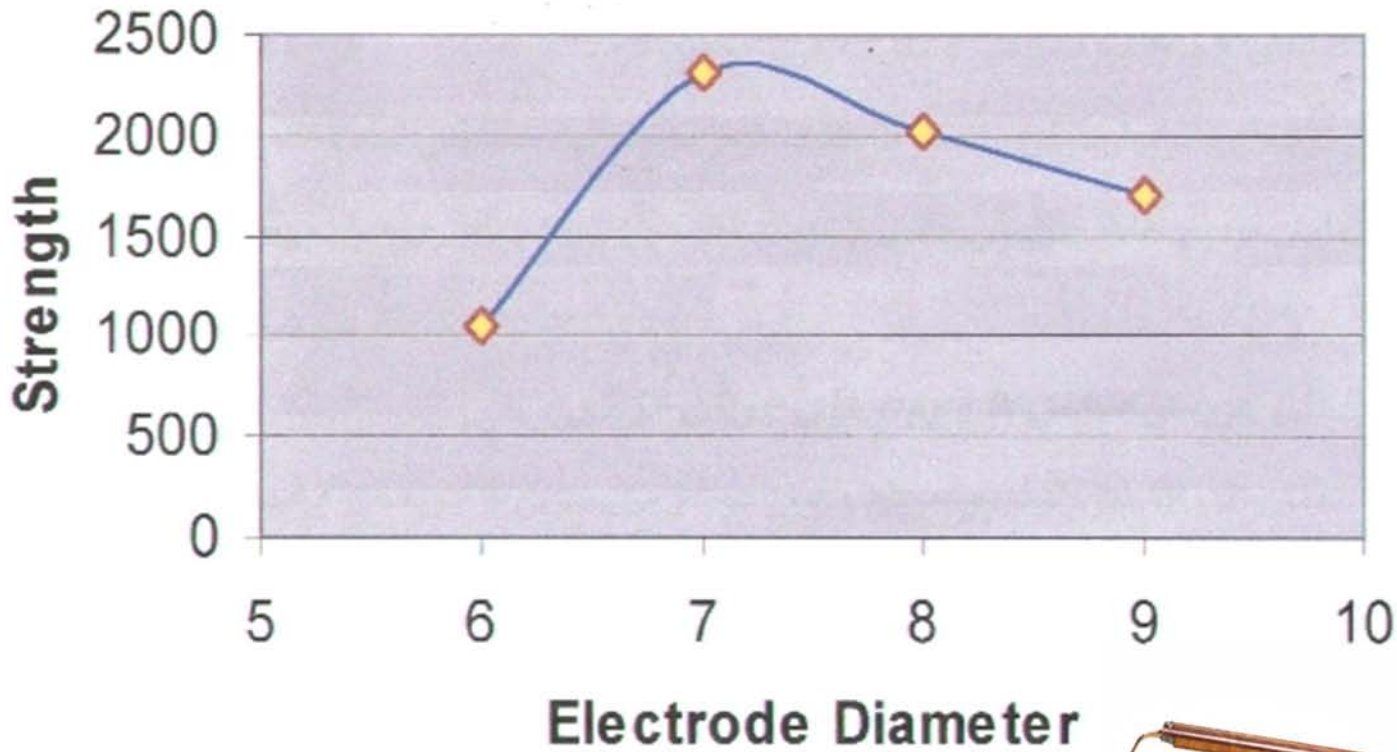


نمودار علت و معلول



اثر قطر الكترود

Strength-Electrode Diameter



تعیین محدوده پارامترها

Thickness: 1.5 to 2.5 mm

Upslope: 0 to 9 cycles (0 to 1.8 S)

Down slope: 0 to 9 cycles (0 to 1.8 S)

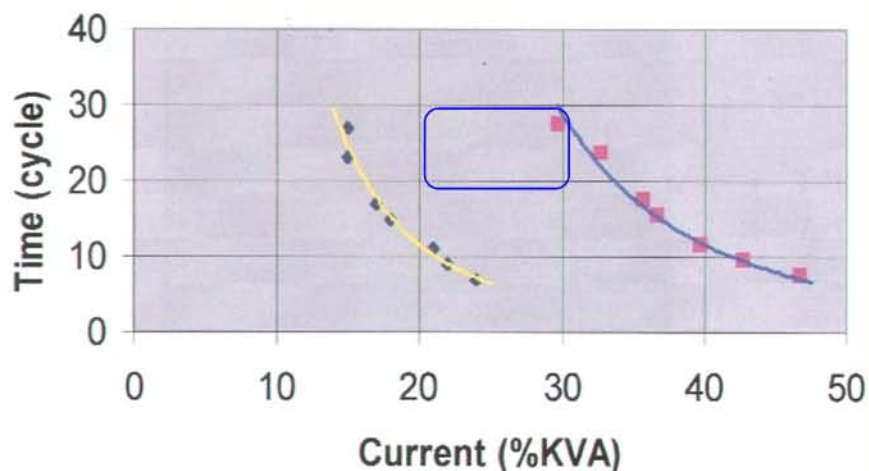
Hold time: 10 to 30 cycles (0.2 to 0.6 S)

Pressure: 1-5 Bar (Electrode diameter is 7 mm)

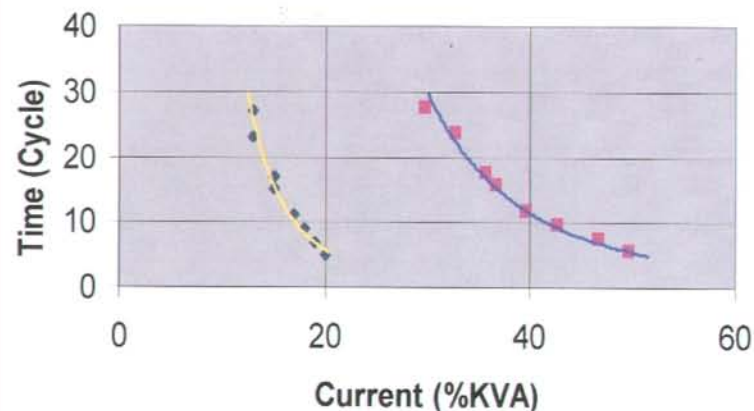
Current: 20 to 30 %Kva

Time: 20 to 30 cycles (0.4 to 0.6 S)

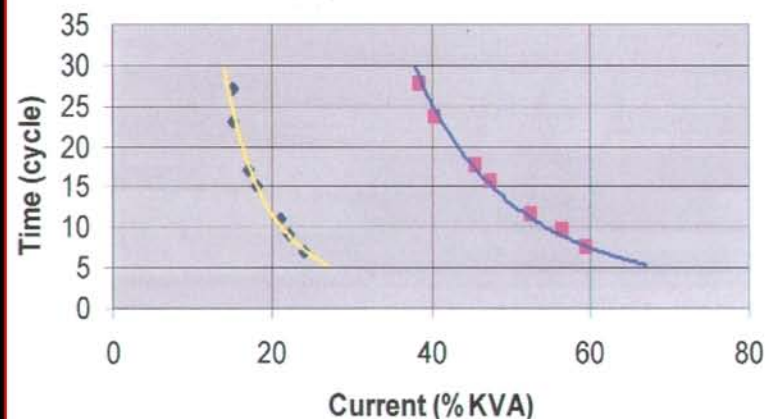
Allow Range



Lobe For t=1.5



Lobe For t=2.5

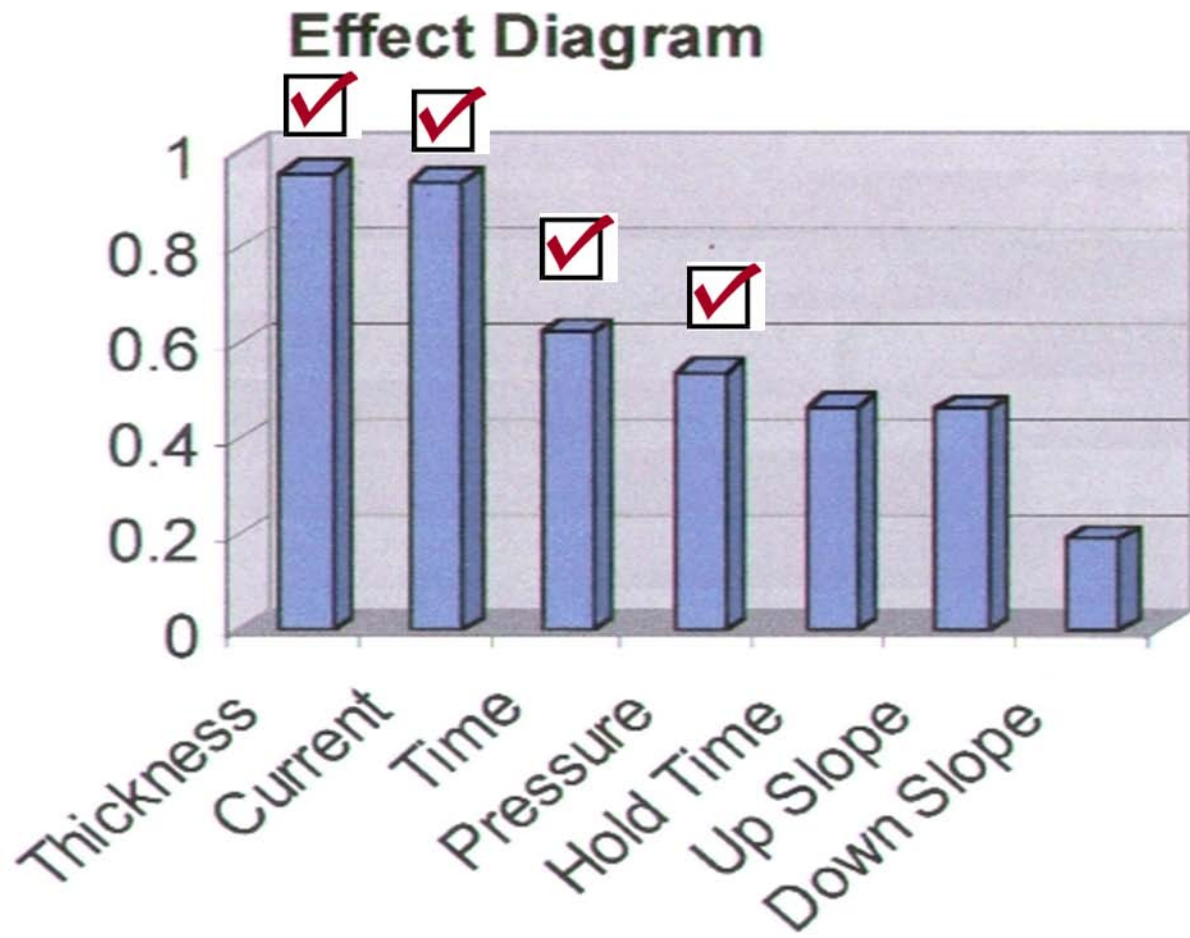


Screening يا تعيين پارامترهاي اصلي

Run	Thickness	Current	Time	Pressure	Upslope	Downslope	Hold time	Strength (Kg/spot)
3	1	-1	1	1	-1	1	1	2130
2	-1	1	-1	1	1	1	1	1985
12	-1	-1	-1	-1	-1	-1	-1	1712
1	1	1	1	-1	1	1	-1	2212
10	-1	1	1	1	-1	-1	-1	2099
8	1	1	-1	-1	-1	1	-1	2280
5	-1	-1	-1	1	1	1	-1	1545
4	-1	1	1	-1	1	-1	1	2177
9	1	1	-1	1	-1	-1	1	2050
6	-1	-1	1	-1	-1	1	1	1712
7	1	-1	-1	-1	1	-1	1	2200
11	1	-1	1	1	1	-1	-1	2015

Factor	Thickness	Current	Time	Pressure	Upslope	Downslope	Hold time
Level +1	2.5	30	30	5	7	7	25
Level -1	2	25	25	3	3	3	15

Screening یا تعیین پارامترهای اصلی



Run	Thickness (mm)	Current (%Kva)	Time (Cycle)	Pressure (Bar)	Strength (Kg/spot)
15	1	-1	0	0	1152
1	-1	-1	-1	-1	1272
17	0	0	0	1	1664
4	-1	-1	-1	0	1252
18	1	-1	0	1	980
2	0	1	-1	-1	1690
23	0	-1	1	0	1620
22	-1	0	1	0	1308
27	1	1	1	1	1940
24	1	1	1	0	2264
12	1	-1	0	-1	1438
14	0	0	0	0	1764
21	1	1	1	-1	2084
5	0	1	-1	0	1652
20	0	-1	1	-1	1712
19	-1	0	1	-1	1460
16	-1	1	0	1	1360
26	0	-1	1	1	1316
25	-1	0	1	1	1354
6	1	0	-1	0	1416
13	-1	1	0	0	1392
3	1	0	-1	-1	1464
10	-1	1	0	-1	1436
9	1	0	-1	1	1192
11	0	0	0	-1	1776
8	0	1	-1	1	1476
7	-1	-1	-1	-1	1032

مدل کردن



	T	I	t	P
+1	2.5	30	30	5
0	2	25	25	3
-1	1.5	20	20	1

رابطه استحکام با متغیرها

Combination of factors	Coefficients
1 (constant)	1764
I	42.1865
T	32.6829
P	-40.9795
D	263.306
IxT	-8.3065
IxP	5.55166
IxD	58.3325
TxP	0.62963
IxD	160.8
PxD	-37.8129
IxTxP	0.0340937
I ²	-13.8467
P ²	-11
I ² xP ²	1.72956
T ² xP ²	1.47395
P ² xD ²	-97.4565
I ² xT ² xP ²	-0.141958
I ² xT ² xP ² xD	-0.0608
I ² xT ² xP	-0.0538292
IxPxD	10.3082

I (%Kva) denote the actual amount of Current-25

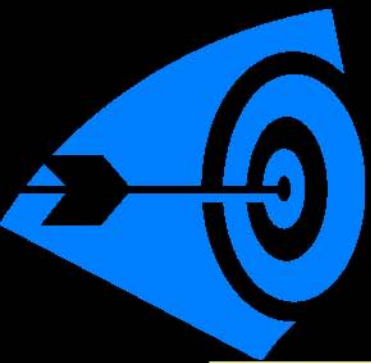
T (Cycle) denote the actual amount of Time-25

P (Bar) denote the actual amount of Pressure-3

D (mm) denote the actual amount of Thickness-2

صحة گذاری رابطه بدست آمده

Run	Prediction	Actual
15	1192.72	1152
1	1272.00	1272
17	1638.04	1664
4	1252.00	1252
18	997.39	980
2	1696.20	1690
23	1577.98	1620
22	1393.76	1308
27	1940.00	1940
24	2264.00	2264
12	1451.05	1438
14	1764.00	1764
21	2084.00	2084
5	1673.01	1652
20	1699.30	1712
19	1437.55	1460
16	1342.61	1360
26	1299.26	1316
25	1361.85	1354
6	1330.24	1416
13	1351.28	1392
3	1462.24	1464
10	1422.95	1436
9	1210.11	1192
11	1801.96	1776
8	1492.74	1476
7	1032.00	1032



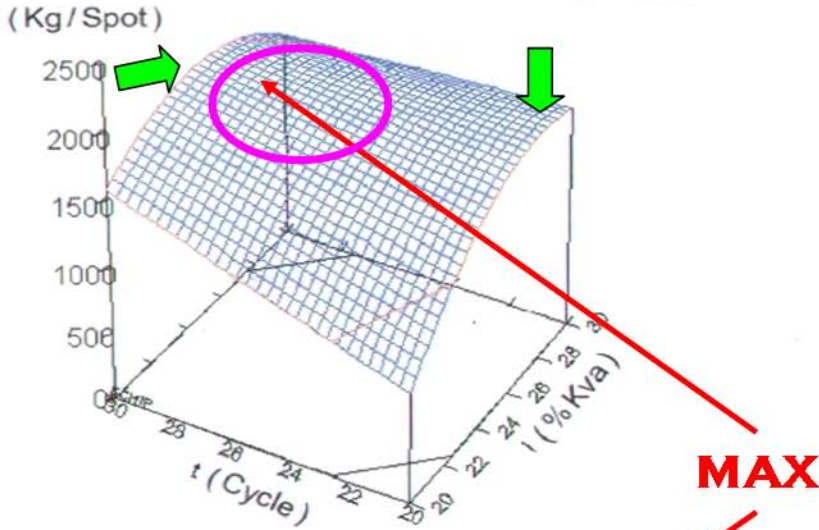
صحة گذاري رابطه بدست آمده

Thickness	Current	Time	Pressure	Prediction	Actual
2	30	20	1	1692.20	1650
2.5	25	25	3	1895.65	1810
1.5	21	27	2	1346.92	1283
2	26	24	4	1723.88	1684
2.5	23	28	5	1838.01	1757

Condition	Thickness	Current	Time	Pressure	Prediction	Actual
Maximum	2.5	28	29	3.5	2349.30	2307
Minimum	2	20	22	5	874.06	894

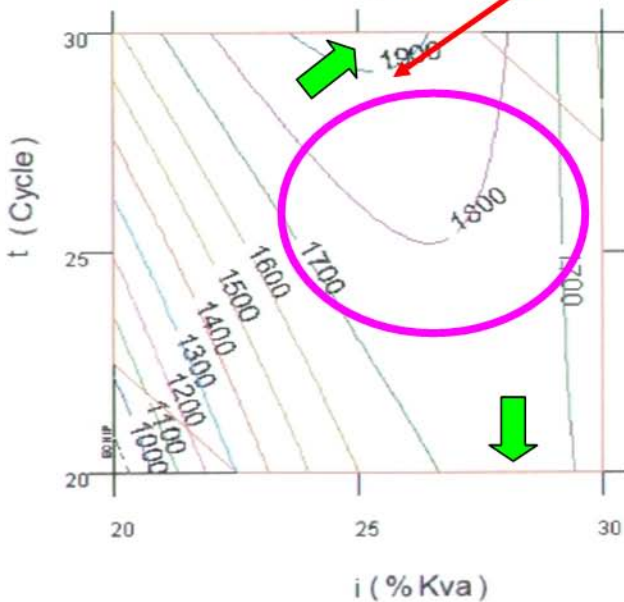
strength

$p = 3.0$ bar
 $d = 2.00$ mm



strength (Kg/Spot)

$p = 3.0$ bar
 $d = 2.00$ mm

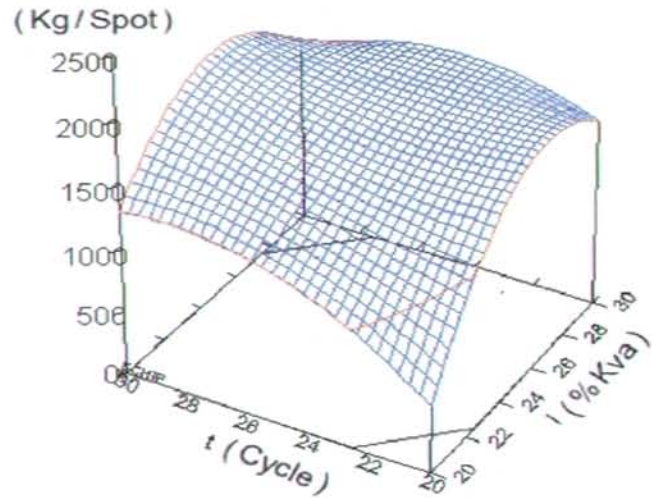


بررسی و تحلیل



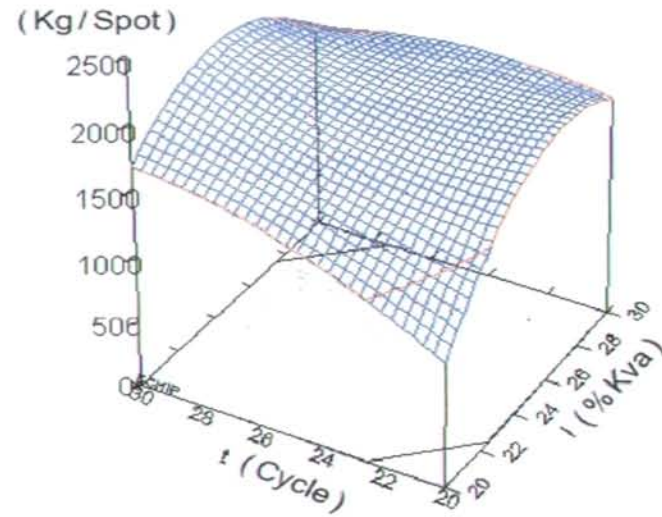
strength

$p = 5.0$ bar
 $d = 2.00$ mm



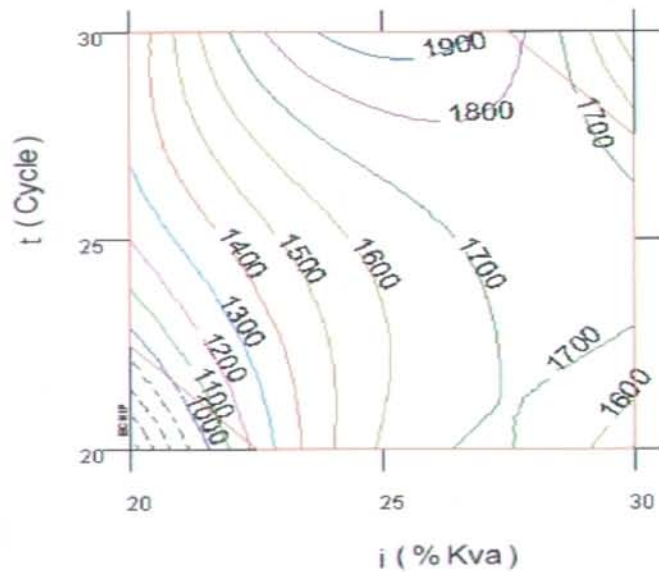
strength

$p = 1.0$ bar
 $d = 2.00$ mm



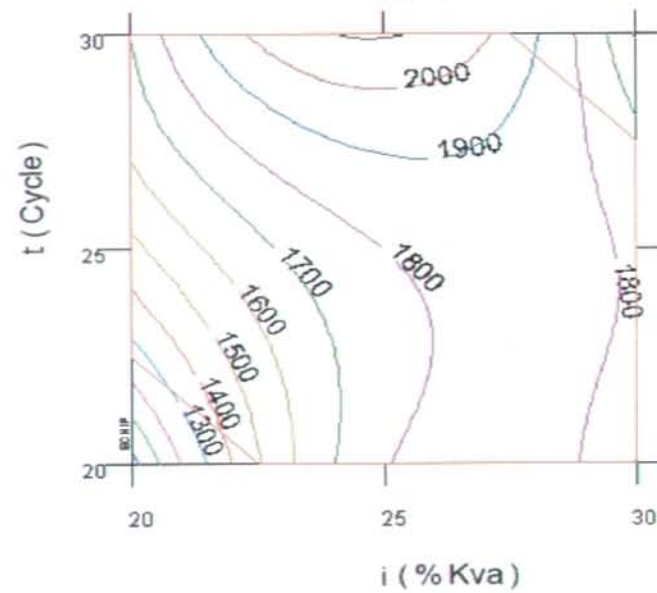
strength (Kg/Spot)

$p = 5.0$ bar
 $d = 2.00$ mm



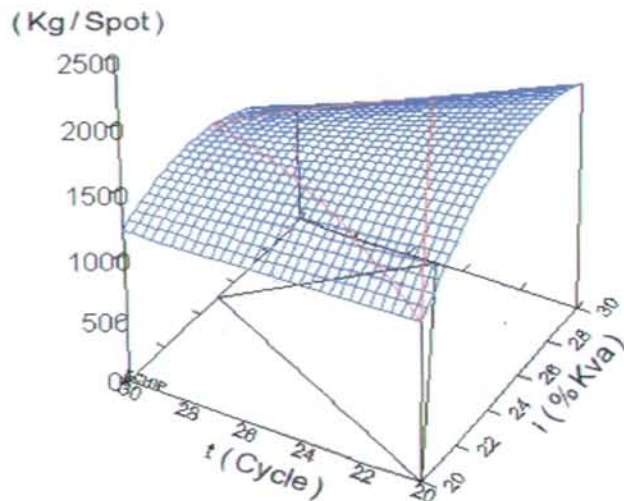
strength (Kg/Spot)

$p = 1.0$ bar
 $d = 2.00$ mm



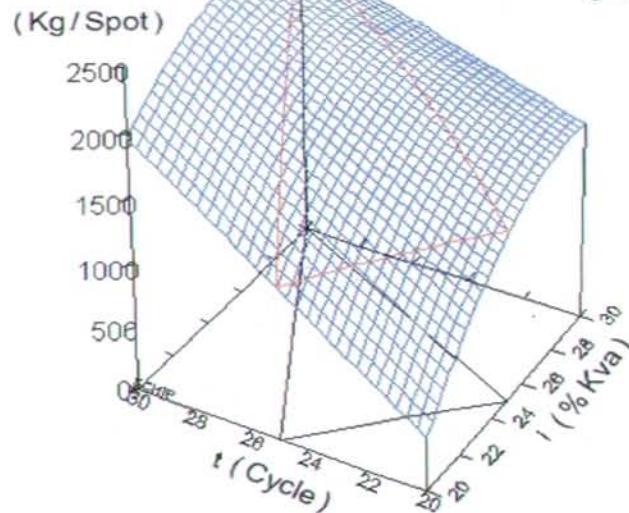
strength

$p = 3.0$ bar
 $d = 1.50$ mm



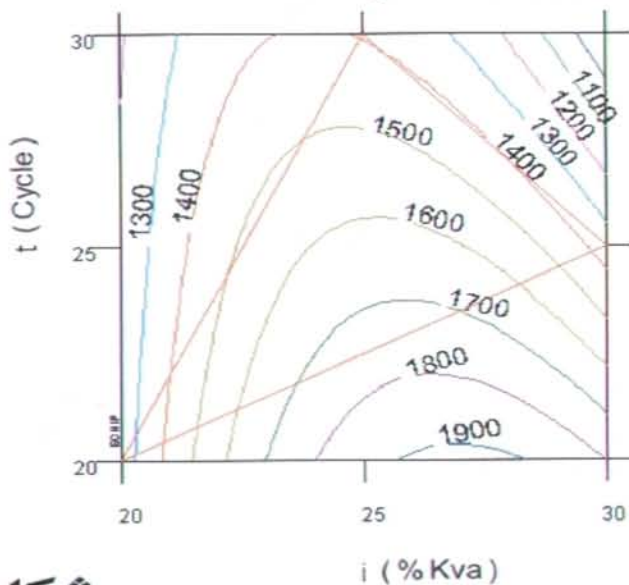
strength

$p = 3.0$ bar
 $d = 2.50$ mm



strength (Kg/Spot)

$p = 3.0$ bar
 $d = 1.50$ mm



strength (Kg/Spot)

$p = 3.0$ bar
 $d = 2.50$ mm

