



ภาคผนวก

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ภาคผนวก ก

ข้อมูลผลการทดลองเชิงแฟคทอเรียลแบบเต็มจำนวน 2^k

Test No.	Anneal Temp (°C)	Anneal Time (Min)	Keep Fan (Hr.)	Q'ty (Sheet)	TD2 (1)	MD2 (1)	TD2 (2)	MD2 (2)
1	150	30	3	5	-0.081	-0.070	-0.083	-0.041
2	150	30	3	15	-0.027	-0.067	-0.025	-0.049
3	150	30	5	5	-0.048	-0.051	-0.083	0.028
4	150	30	5	15	-0.060	-0.077	-0.256	-0.144
5	150	90	3	5	-0.077	-0.075	-0.161	-0.036
6	150	90	3	15	-0.052	-0.056	0.123	-0.247
7	150	90	5	5	-0.106	-0.058	-0.145	-0.154
8	150	90	5	15	-0.058	-0.065	-0.233	0.021
9	180	30	3	5	-0.047	-0.048	-0.055	-0.057
10	180	30	3	15	-0.567	-0.085	-0.079	-0.078
11	180	30	5	5	-0.084	-0.107	-0.058	-0.041
12	180	30	5	15	-0.061	-0.075	-0.107	0.077
13	180	90	3	5	-0.083	-0.085	0.001	-0.079
14	180	90	3	15	-0.050	-0.152	0.035	-0.139
15	180	90	5	5	-0.144	-0.051	-0.043	-0.081
16	180	90	5	15	-0.095	-0.100	-0.040	0.024

ภาคผนวก ข

ข้อมูลผลการทดลองแบบทฤษฎี L9

Test No.	Anneal Temp (°C)	Anneal Time (Min)	Keep Fan (Hr.)	Q'ty (Sheet)	TD2 (1)	MD2 (1)	TD2 (2)	MD2 (2)
1	150	30	3	5	0.105	0.078	0.062	0.072
2	150	60	4	10	0.066	0.074	0.090	0.120
3	150	90	5	15	0.066	0.044	0.054	0.067
4	165	30	4	15	0.021	0.045	0.060	0.001
5	165	60	5	5	0.086	0.075	0.108	0.110
6	165	90	3	10	0.045	0.052	0.064	0.075
7	180	30	5	10	0.054	0.070	0.084	0.080
8	180	60	3	15	0.043	0.053	0.084	0.075
9	180	90	4	5	0.093	0.107	0.129	0.131

ภาคผนวก ก

รายการผลการวิเคราะห์การทดลองเชิงแฟกทอเรียลแบบเต็มจำนวน 2^k

การทดสอบปัจจัยที่มีผลต่อการยึด-หดของแผ่น PET Film ที่จุด TD2

Factorial Fit: DTD (2) versus Aneal Temp, Aneal Time, ...

Estimated Effects and Coefficients for DTD (2) (coded units)

Term	Effect	Coef	SE Coef	T	P
Constant		-0.08903	0.01977	-4.50	0.000
Aneal Temp	-0.00656	-0.00328	0.01977	-0.17	0.870
Aneal Time	0.01106	0.00553	0.01977	0.28	0.783
Keep Time	-0.08781	-0.04391	0.01977	-2.22	0.041
Quantity	-0.00744	-0.00372	0.01977	-0.19	0.853
Aneal Temp*Aneal Time	0.01681	0.00841	0.01977	0.43	0.676
Aneal Temp*Keep Time	-0.01206	-0.00603	0.01977	-0.31	0.764
Aneal Temp*Quantity	-0.03194	-0.01597	0.01977	-0.81	0.431
Aneal Time*Keep Time	0.02156	0.01078	0.01977	0.55	0.593
Aneal Time*Quantity	0.05394	0.02697	0.01977	1.36	0.191
Keep Time*Quantity	-0.08319	-0.04159	0.01977	-2.10	0.052
Aneal Temp*Aneal Time*Keep Time	0.03956	0.01978	0.01977	1.00	0.332
Aneal Temp*Aneal Time*Quantity	0.01119	0.00559	0.01977	0.28	0.781
Aneal Temp*Keep Time*Quantity	-0.00244	-0.00122	0.01977	-0.06	0.952
Aneal Time*Keep Time*Quantity	0.02194	0.01097	0.01977	0.55	0.587
Aneal Temp*Aneal Time*Keep Time*Quantity	0.02844	0.01422	0.01977	0.72	0.482

S = 0.111852 R-Sq = 47.52% R-Sq(adj) = 0.00%

Analysis of Variance for DTD (2) (coded units)

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Main Effects	4	0.063454	0.063454	0.015864	1.27	0.323
2-Way Interactions	6	0.093940	0.093940	0.015657	1.25	0.333
3-Way Interactions	4	0.017420	0.017420	0.004355	0.35	0.841
4-Way Interactions	1	0.006470	0.006470	0.006470	0.52	0.482
Residual Error	16	0.200175	0.200175	0.012511		
Pure Error	16	0.200175	0.200175	0.012511		
Total	31	0.381459				

Unusual Observations for DTD (2)

Obs	StdOrder	DTD (2)	Fit	SE Fit	Residual	St Resid
4	30	-0.047000	-0.307000	0.079091	0.260000	3.29R
7	14	-0.567000	-0.307000	0.079091	-0.260000	-3.29R

R denotes an observation with a large standardized residual.

Estimated Coefficients for DTD (2) using data in uncoded units

Term	Coef
Constant	-0.00394
Aneal Temp	-0.0013771
Aneal Time	-0.0118021
Keep Time	-0.08931
Quantity	-0.161938
Aneal Temp*Aneal Time	0.000070764
Aneal Temp*Keep Time	0.00091458
Aneal Temp*Quantity	0.00121958
Aneal Time*Keep Time	0.0028021
Aneal Time*Quantity	0.00364792
Keep Time*Quantity	0.0525375
Aneal Temp*Aneal Time*Keep Time	-1.92361E-05
Aneal Temp*Aneal Time*Quantity	-2.27917E-05
Aneal Temp*Keep Time*Quantity	-3.95417E-04
Aneal Time*Keep Time*Quantity	-0.00096958
Aneal Temp*Aneal Time*Keep Time*Quantity	6.31944E-06

การทดสอบปัจจัยที่มีผลต่อการยืด-หดของแผ่น PET Film ที่จุด MD2

Factorial Fit: DMD(2) versus Aneal Temp, Aneal Time, ...

Estimated Effects and Coefficients for DMD(2) (coded units)

Term	Effect	Coef	SE Coef	T	P
Constant		-0.06931	0.01065	-6.51	0.000
Aneal Temp	0.00400	0.00200	0.01065	0.19	0.853
Aneal Time	-0.00187	-0.00094	0.01065	-0.09	0.931
Keep Time	0.01400	0.00700	0.01065	0.66	0.520
Quantity	-0.01875	-0.00937	0.01065	-0.88	0.392
Aneal Temp*Aneal Time	0.02300	0.01150	0.01065	1.08	0.296
Aneal Temp*Keep Time	-0.00362	-0.00181	0.01065	-0.17	0.867
Aneal Temp*Quantity	0.00962	0.00481	0.01065	0.45	0.658
Aneal Time*Keep Time	0.03075	0.01537	0.01065	1.44	0.168
Aneal Time*Quantity	0.01100	0.00550	0.01065	0.52	0.613
Keep Time*Quantity	0.01237	0.00619	0.01065	0.58	0.569
Aneal Temp*Aneal Time*Keep Time	0.00887	0.00444	0.01065	0.42	0.683
Aneal Temp*Aneal Time*Quantity	-0.01137	-0.00569	0.01065	-0.53	0.601
Aneal Temp*Keep Time*Quantity	-0.00850	-0.00425	0.01065	-0.40	0.695
Aneal Time*Keep Time*Quantity	0.00612	0.00306	0.01065	0.29	0.777
Aneal Temp*Aneal Time*Keep Time*Quantity	-0.06300	-0.03150	0.01065	-2.96	0.009

S = 0.0602624 R-Sq = 48.02% R-Sq(adj) = 0.00%

Analysis of Variance for DMD(2) (coded units)

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Main Effects	4	0.004537	0.0045366	0.0011342	0.31	0.866
2-Way Interactions	6	0.014836	0.0148359	0.0024726	0.68	0.668
3-Way Interactions	4	0.002543	0.0025434	0.0006358	0.18	0.948
4-Way Interactions	1	0.031752	0.0317520	0.0317520	8.74	0.009
Residual Error	16	0.058105	0.0581050	0.0036316		
Pure Error	16	0.058105	0.0581050	0.0036316		
Total	31	0.111773				

Unusual Observations for DMD(2)

Obs	StdOrder	DMD(2)	Fit	SE Fit	Residual	St Resid
10	27	-0.056000	-0.151500	0.042612	0.095500	2.24R
29	11	-0.247000	-0.151500	0.042612	-0.095500	-2.24R

R denotes an observation with a large standardized residual.

Estimated Coefficients for DMD(2) using data in uncoded units

Term	Coef
Constant	-4.98431
Aneal Temp	0.0306250
Aneal Time	0.0888896
Keep Time	1.38619
Quantity	0.477262
Aneal Temp*Aneal Time	-5.48611E-04
Aneal Temp*Keep Time	-0.00854583
Aneal Temp*Quantity	-0.00291750
Aneal Time*Keep Time	-0.0244187
Aneal Time*Quantity	-0.00886792
Keep Time*Quantity	-0.129237
Aneal Temp*Aneal Time*Keep Time	0.000149861
Aneal Temp*Aneal Time*Quantity	5.34722E-05
Aneal Temp*Keep Time*Quantity	0.000783333
Aneal Time*Keep Time*Quantity	0.00233042
Aneal Temp*Aneal Time*Keep Time*Quantity	-1.40000E-05

ภาคผนวก ง

รายการผลการวิเคราะห์การทดลองแบบทากูชิ L9

การทดสอบปัจจัยที่มีผลต่อการยืด-หดของแผ่น PET Film ที่จุด TD2

Taguchi Design

Taguchi Orthogonal Array Design

L9(3**4)

Factors: 4

Runs: 9

Columns of L9(3**4) Array

1 2 3 4

Response Surface Regression: DTD, DMD versus Aneal temp, Aneal time, ...

The following terms cannot be estimated, and were removed.

Aneal temp*Aneal time

Aneal temp*Keep time

Aneal temp*Quantity

Aneal time*Keep time

Aneal time*Quantity

Keep time*Quantity

Response Surface Regression: DTD versus Aneal temp, Aneal time, Keep time, ...

The analysis was done using coded units.

Estimated Regression Coefficients for DTD

Term	Coef	SE Coef	T	P
Constant	0.068167	0.015645	4.357	0.002
Aneal temp	0.003667	0.006387	0.574	0.580
Aneal time	0.005417	0.006387	0.848	0.418
Keep time	0.004083	0.006387	0.639	0.539
Quantity	-0.021250	0.006387	-3.327	0.009
Aneal temp*Aneal temp	0.013500	0.011063	1.220	0.253
Aneal time*Aneal time	-0.009750	0.011063	-0.881	0.401
Keep time*Keep time	-0.005250	0.011063	-0.475	0.646
Quantity*Quantity	0.008750	0.011063	0.791	0.449

S = 0.02213 R-Sq = 63.5% R-Sq(adj) = 31.0%

Analysis of Variance for DTD

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Regression	8	0.007658	0.007658	0.000957	1.96	0.169

Linear	4	0.006132	0.006132	0.001533	3.13	0.071
Square	4	0.001526	0.001526	0.000381	0.78	0.566
Residual Error	9	0.004406	0.004406	0.000490		
Pure Error	9	0.004406	0.004406	0.000490		
Total	17	0.012064				

Estimated Regression Coefficients for DTD using data in uncoded units

Term	Coef
Constant	1.58867
Aneal temp	-0.0195556
Aneal time	0.00148056
Keep time	0.0460833
Quantity	-0.0112500
Aneal temp*Aneal temp	6.00000E-05
Aneal time*Aneal time	-1.08333E-05
Keep time*Keep time	-0.00525000
Quantity*Quantity	0.000350000

Response Surface Regression: DTD versus Quantity

The analysis was done using coded units.

Estimated Regression Coefficients for DTD

Term	Coef	SE Coef	T	P
Constant	0.07300	0.004804	15.197	0.000
Quantity	-0.02125	0.005883	-3.612	0.002

S = 0.02038 R-Sq = 44.9% R-Sq(adj) = 41.5%

Analysis of Variance for DTD

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Regression	1	0.005419	0.005419	0.005419	13.05	0.002
Linear	1	0.005419	0.005419	0.005419	13.05	0.002
Residual Error	16	0.006645	0.006645	0.000415		
Lack-of-Fit	1	0.000306	0.000306	0.000306	0.72	0.408
Pure Error	15	0.006339	0.006339	0.000423		
Total	17	0.012064				

Estimated Regression Coefficients for DTD using data in uncoded units

Term	Coef
Constant	0.115500
Quantity	-0.00425000

การทดสอบปัจจัยที่มีผลต่อการยึด-หดของแผ่น PET Film ที่จุด MD2

Response Surface Regression: DMD versus Aneal temp, Aneal time, Keep time,

...

The analysis was done using coded units.

Estimated Regression Coefficients for DMD

Term	Coef	SE Coef	T	P
Constant	0.080833	0.014464	5.589	0.000
Aneal temp	0.005083	0.005905	0.861	0.412
Aneal time	0.010833	0.005905	1.835	0.100
Keep time	0.003417	0.005905	0.579	0.577
Quantity	-0.024000	0.005905	-4.065	0.003
Aneal temp*Aneal temp	0.021250	0.010227	2.078	0.068
Aneal time*Aneal time	-0.016000	0.010227	-1.564	0.152
Keep time*Keep time	-0.008750	0.010227	-0.856	0.414
Quantity*Quantity	-0.007000	0.010227	-0.684	0.511

S = 0.02045 R-Sq = 76.3% R-Sq(adj) = 55.2%

Analysis of Variance for DMD

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Regression	8	0.012103	0.012103	0.001513	3.62	0.036
Linear	4	0.008771	0.008771	0.002193	5.24	0.019
Square	4	0.003333	0.003333	0.000833	1.99	0.180
Residual Error	9	0.003766	0.003766	0.000418		
Pure Error	9	0.003766	0.003766	0.000418		
Total	17	0.015869				

Estimated Regression Coefficients for DMD using data in uncoded units

Term	Coef
Constant	2.37683
Aneal temp	-0.0308278
Aneal time	0.00249444
Keep time	0.0734167
Quantity	0.000800000
Aneal temp*Aneal temp	9.44444E-05
Aneal time*Aneal time	-1.77778E-05
Keep time*Keep time	-0.00875000
Quantity*Quantity	-2.80000E-04

Response Surface Regression: DMD versus Quantity

The analysis was done using coded units.

Estimated Regression Coefficients for DMD

Term	Coef	SE Coef	T	P
Constant	0.07383	0.005577	13.240	0.000
Quantity	-0.02400	0.006830	-3.514	0.003

S = 0.02366 R-Sq = 43.6% R-Sq(adj) = 40.0%

Analysis of Variance for DMD

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Regression	1	0.006912	0.006912	0.006912	12.35	0.003
Linear	1	0.006912	0.006912	0.006912	12.35	0.003
Residual Error	16	0.008957	0.008957	0.000560		
Lack-of-Fit	1	0.000196	0.000196	0.000196	0.34	0.571
Pure Error	15	0.008761	0.008761	0.000584		
Total	17	0.015869				

Unusual Observations for DMD

Obs	StdOrder	DMD	Fit	SE Fit	Residual	St Resid
11	11	0.120	0.074	0.006	0.046	2.01 R
13	13	0.001	0.050	0.009	-0.049	-2.22 R

R denotes an observation with a large standardized residual.

Estimated Regression Coefficients for DMD using data in uncoded units

Term	Coef
Constant	0.121833
Quantity	-0.00480000

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ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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