



ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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ตารางผลการทดลอง Correlation โดย MiniTAB

Area	%Splash	%Void
14.4	0	15.56
14.4	0	14.44
14.4	0	15.56
14.4	0	16.67
14.4	0	14.44
14.6	0	4.44
14.6	0	7.78
14.6	0	8.89
14.6	0	7.78
14.6	0	12.22
14.8	0	2.22
14.8	1.11	3.33
14.8	1.11	5.56
14.8	0	2.22
14.8	0	2.22
15	0	0
15	1.11	1.11
15	1.11	1.11
15	1.11	0
15	0	0
15.2	0	0
15.2	0	0
15.2	0	1.11

Area	%Splash	%Void
15.2	1.11	1.11
15.2	1.11	0
15.4	1.11	0
15.4	0	0
15.4	0	1.11
15.4	0	0
15.4	1.11	0
15.6	3.33	0
15.6	2.22	0
15.6	3.33	0
15.6	2.22	0
15.6	2.22	0
15.8	4.44	0
15.8	4.44	0
15.8	7.78	0
15.8	8.89	0
15.8	4.44	0
16	16.67	0
16	21.11	0
16	15.56	0
16	16.67	0
16	18.89	0

ตารางผลการทดลอง G R&R โดย MiniTAB

Part	Operator	Area of dry film opening (Sq.mm)	Part	Operator	Area of dry film opening (Sq.mm)
1	1	11.7783	1	1	11.7775
2	1	11.8471	2	1	11.8455
3	1	11.8553	3	1	11.8564
4	1	12.5978	4	1	12.5974
5	1	12.6063	5	1	12.6081
6	1	12.6348	6	1	12.6384
7	1	13.5149	7	1	13.5167
8	1	13.5427	8	1	13.5418
9	1	13.5515	9	1	13.5552
10	1	14.3277	10	1	14.3233
11	1	14.315	11	1	14.3142
12	1	14.3251	12	1	14.327
13	1	15.2441	13	1	15.2464
14	1	15.3274	14	1	15.3234
15	1	15.3442	15	1	15.3436
16	1	16.1095	16	1	16.1106
17	1	16.126	17	1	16.1251
18	1	16.1429	18	1	16.1461
19	1	17.0992	19	1	17.0987
20	1	17.1352	20	1	17.136
21	1	17.1455	21	1	17.1453
22	1	17.9372	22	1	17.9364
23	1	17.9359	23	1	17.9313
24	1	17.9557	24	1	17.9512
25	1	18.95	25	1	18.9514
26	1	18.9745	26	1	18.9792
27	1	19.0421	27	1	19.0472
28	1	19.8433	28	1	19.8443
29	1	19.8444	29	1	19.8408
30	1	19.9129	30	1	19.9118

Part	Operator	Area of dry film opening (Sq.mm)	Part	Operator	Area of dry film opening (Sq.mm)
1	2	11.7796	1	2	11.7804
2	2	11.8512	2	2	11.8490
3	2	11.8573	3	2	11.8610
4	2	12.5924	4	2	12.5956
5	2	12.6111	5	2	12.6075
6	2	12.6333	6	2	12.6339
7	2	13.5128	7	2	13.5115
8	2	13.5393	8	2	13.5430
9	2	13.5522	9	2	13.5523
10	2	14.3229	10	2	14.3240
11	2	14.3175	11	2	14.3193
12	2	14.3305	12	2	14.3288
13	2	15.2411	13	2	15.2454
14	2	15.3274	14	2	15.3264
15	2	15.3454	15	2	15.3406
16	2	16.1113	16	2	16.1071
17	2	16.1238	17	2	16.1230
18	2	16.1451	18	2	16.1434
19	2	17.1004	19	2	17.0953
20	2	17.1354	20	2	17.1391
21	2	17.1427	21	2	17.1481
22	2	17.9334	22	2	17.9365
23	2	17.9359	23	2	17.9361
24	2	17.9561	24	2	17.9556
25	2	18.9493	25	2	18.9476
26	2	18.9746	26	2	18.9766
27	2	19.0456	27	2	19.0460
28	2	19.8485	28	2	19.8449
29	2	19.8386	29	2	19.8404
30	2	19.9123	30	2	19.9141

ตารางผลการทดลองการคัดกรองปัจจัยด้วย 2 level factorial โดย MiniTAB

StdOrder	RunOrder	CenterPt	Blocks	Dwell time	Chem Press	Chem Conc	Chem Temp	Rinse Press	Rinse Temp	Area
1	1	1	1	36	20	0.7	27	20	21	14.3834
2	2	1	1	36	35	0.7	27	20	21	15.0391
3	3	1	1	36	20	1	27	20	21	14.9500
4	4	1	1	36	35	1	27	20	21	15.7639
5	5	1	1	36	20	0.7	32	20	21	14.1615
6	6	1	1	36	35	0.7	32	20	21	14.9881
7	7	1	1	36	20	1	32	20	21	15.1063
8	8	1	1	36	35	1	32	20	21	15.6521
9	9	1	1	36	20	0.7	27	35	21	14.3077
10	10	1	1	36	35	0.7	27	35	21	14.9585
11	11	1	1	36	20	1	27	35	21	14.9595
12	12	1	1	36	35	1	27	35	21	15.6861
13	13	1	1	36	20	0.7	32	35	21	14.3735
14	14	1	1	36	35	0.7	32	35	21	15.0335
15	15	1	1	36	20	1	32	35	21	15.0825
16	16	1	1	36	35	1	32	35	21	15.6853
17	17	1	1	36	20	0.7	27	20	25	14.3942
18	18	1	1	36	35	0.7	27	20	25	14.9764
19	19	1	1	36	20	1	27	20	25	15.0717
20	20	1	1	36	35	1	27	20	25	15.7656
21	21	1	1	36	20	0.7	32	20	25	14.2025
22	22	1	1	36	35	0.7	32	20	25	14.9796
23	23	1	1	36	20	1	32	20	25	14.9866
24	24	1	1	36	35	1	32	20	25	15.6395
25	25	1	1	36	20	0.7	27	35	25	14.3214
26	26	1	1	36	35	0.7	27	35	25	14.9186
27	27	1	1	36	20	1	27	35	25	15.0804
28	28	1	1	36	35	1	27	35	25	15.6614
29	29	1	1	36	20	0.7	32	35	25	14.2825
30	30	1	1	36	35	0.7	32	35	25	14.9685
31	31	1	1	36	20	1	32	35	25	15.1152
32	32	1	1	36	35	1	32	35	25	15.7509

StdOrder	RunOrder	CenterPt	Blocks	Dwell time	Chem Press	Chem Conc	Chem Temp	Rinse Press	Rinse Temp	Area
33	33	1	1	36	20	0.7	27	20	21	14.4264
34	34	1	1	36	35	0.7	27	20	21	14.9701
35	35	1	1	36	20	1	27	20	21	15.0065
36	36	1	1	36	35	1	27	20	21	15.6057
37	37	1	1	36	20	0.7	32	20	21	14.2191
38	38	1	1	36	35	0.7	32	20	21	15.0519
39	39	1	1	36	20	1	32	20	21	15.0060
40	40	1	1	36	35	1	32	20	21	15.5713
41	41	1	1	36	20	0.7	27	35	21	14.3919
42	42	1	1	36	35	0.7	27	35	21	14.9397
43	43	1	1	36	20	1	27	35	21	14.9695
44	44	1	1	36	35	1	27	35	21	15.6498
45	45	1	1	36	20	0.7	32	35	21	14.2669
46	46	1	1	36	35	0.7	32	35	21	14.9361
47	47	1	1	36	20	1	32	35	21	15.0080
48	48	1	1	36	35	1	32	35	21	15.6439
49	49	1	1	36	20	0.7	27	20	25	14.1223
50	50	1	1	36	35	0.7	27	20	25	15.0853
51	51	1	1	36	20	1	27	20	25	14.9961
52	52	1	1	36	35	1	27	20	25	15.6276
53	53	1	1	36	20	0.7	32	20	25	14.3488
54	54	1	1	36	35	0.7	32	20	25	15.0153
55	55	1	1	36	20	1	32	20	25	15.0087
56	56	1	1	36	35	1	32	20	25	15.5708
57	57	1	1	36	20	0.7	27	35	25	14.3899
58	58	1	1	36	35	0.7	27	35	25	15.0140
59	59	1	1	36	20	1	27	35	25	14.9992
60	60	1	1	36	35	1	27	35	25	15.7019
61	61	1	1	36	20	0.7	32	35	25	14.3207
62	62	1	1	36	35	0.7	32	35	25	15.1250
63	63	1	1	36	20	1	32	35	25	14.9888
64	64	1	1	36	35	1	32	35	25	15.6995
65	65	1	1	46	20	0.7	27	20	21	14.9295
66	66	1	1	46	35	0.7	27	20	21	15.5144

StdOrder	RunOrder	CenterPt	Blocks	Dwell time	Chem Press	Chem Conc	Chem Temp	Rinse Press	Rinse Temp	Area
67	67	1	1	46	20	1	27	20	21	15.7177
68	68	1	1	46	35	1	27	20	21	16.4925
69	69	1	1	46	20	0.7	32	20	21	14.9941
70	70	1	1	46	35	0.7	32	20	21	15.7526
71	71	1	1	46	20	1	32	20	21	15.7752
72	72	1	1	46	35	1	32	20	21	16.3067
73	73	1	1	46	20	0.7	27	35	21	14.9794
74	74	1	1	46	35	0.7	27	35	21	15.6189
75	75	1	1	46	20	1	27	35	21	15.7002
76	76	1	1	46	35	1	27	35	21	16.3766
77	77	1	1	46	20	0.7	32	35	21	15.0616
78	78	1	1	46	35	0.7	32	35	21	15.6461
79	79	1	1	46	20	1	32	35	21	15.7912
80	80	1	1	46	35	1	32	35	21	16.2783
81	81	1	1	46	20	0.7	27	20	25	14.9164
82	82	1	1	46	35	0.7	27	20	25	15.5959
83	83	1	1	46	20	1	27	20	25	15.7345
84	84	1	1	46	35	1	27	20	25	16.4491
85	85	1	1	46	20	0.7	32	20	25	14.9273
86	86	1	1	46	35	0.7	32	20	25	15.6431
87	87	1	1	46	20	1	32	20	25	15.6510
88	88	1	1	46	35	1	32	20	25	16.2648
89	89	1	1	46	20	0.7	27	35	25	14.9947
90	90	1	1	46	35	0.7	27	35	25	15.6263
91	91	1	1	46	20	1	27	35	25	15.6463
92	92	1	1	46	35	1	27	35	25	16.3631
93	93	1	1	46	20	0.7	32	35	25	14.9455
94	94	1	1	46	35	0.7	32	35	25	15.6165
95	95	1	1	46	20	1	32	35	25	15.7183
96	96	1	1	46	35	1	32	35	25	16.3783
97	97	1	1	46	20	0.7	27	20	21	14.9154
98	98	1	1	46	35	0.7	27	20	21	15.6214
99	99	1	1	46	20	1	27	20	21	15.5695
100	100	1	1	46	35	1	27	20	21	16.3926
101	101	1	1	46	20	0.7	32	20	21	14.9112

StdOrder	RunOrder	CenterPt	Blocks	Dwell time	Chem Press	Chem Conc	Chem Temp	Rinse Press	Rinse Temp	Area
102	102	1	1	46	35	0.7	32	20	21	15.6902
103	103	1	1	46	20	1	32	20	21	15.7673
104	104	1	1	46	35	1	32	20	21	16.4171
105	105	1	1	46	20	0.7	27	35	21	14.9312
106	106	1	1	46	35	0.7	27	35	21	15.6461
107	107	1	1	46	20	1	27	35	21	15.8217
108	108	1	1	46	35	1	27	35	21	16.4923
109	109	1	1	46	20	0.7	32	35	21	14.9776
110	110	1	1	46	35	0.7	32	35	21	15.5600
111	111	1	1	46	20	1	32	35	21	15.6096
112	112	1	1	46	35	1	32	35	21	16.4392
113	113	1	1	46	20	0.7	27	20	25	14.9964
114	114	1	1	46	35	0.7	27	20	25	15.8012
115	115	1	1	46	20	1	27	20	25	15.7450
116	116	1	1	46	35	1	27	20	25	16.5574
117	117	1	1	46	20	0.7	32	20	25	14.9688
118	118	1	1	46	35	0.7	32	20	25	15.5238
119	119	1	1	46	20	1	32	20	25	15.7433
120	120	1	1	46	35	1	32	20	25	16.4930
121	121	1	1	46	20	0.7	27	35	25	14.9340
122	122	1	1	46	35	0.7	27	35	25	15.7136
123	123	1	1	46	20	1	27	35	25	15.5410
124	124	1	1	46	35	1	27	35	25	16.3867
125	125	1	1	46	20	0.7	32	35	25	14.8469
126	126	1	1	46	35	0.7	32	35	25	15.6522
127	127	1	1	46	20	1	32	35	25	15.6735
128	128	1	1	46	35	1	32	35	25	16.3913

ตารางผลการทดลองด้วย General full factorial โดย MiniTAB

StdOrder	RunOrder	PtType	Blocks	Chemical concentration	Dwell time	Chemical pressure	Area
1	1	1	1	0.7	36	20	13.24
2	2	1	1	0.7	36	27.5	14.23
3	3	1	1	0.7	36	35	15.75
4	4	1	1	0.7	41	20	13.75
5	5	1	1	0.7	41	27.5	14.86
6	6	1	1	0.7	41	35	16.43
7	7	1	1	0.7	46	20	14.36
8	8	1	1	0.7	46	27.5	15.49
9	9	1	1	0.7	46	35	16.8
10	10	1	1	0.85	36	20	14.32
11	11	1	1	0.85	36	27.5	15.43
12	12	1	1	0.85	36	35	16.32
13	13	1	1	0.85	41	20	14.67
14	14	1	1	0.85	41	27.5	15.78
15	15	1	1	0.85	41	35	16.75
16	16	1	1	0.85	46	20	14.89
17	17	1	1	0.85	46	27.5	16.12
18	18	1	1	0.85	46	35	16.99
19	19	1	1	1	36	20	14.68
20	20	1	1	1	36	27.5	15.78
21	21	1	1	1	36	35	16.89
22	22	1	1	1	41	20	14.99
23	23	1	1	1	41	27.5	16.19
24	24	1	1	1	41	35	17.35
25	25	1	1	1	46	20	15.48
26	26	1	1	1	46	27.5	16.32
27	27	1	1	1	46	35	17.66
28	28	1	1	0.7	36	20	13.18
29	29	1	1	0.7	36	27.5	14.08
30	30	1	1	0.7	36	35	15.62

StdOrder	RunOrder	PtType	Blocks	Chemical concentration	Dwell time	Chemical pressure	Area
31	31	1	1	0.7	41	20	13.67
32	32	1	1	0.7	41	27.5	14.67
33	33	1	1	0.7	41	35	16.32
34	34	1	1	0.7	46	20	14.53
35	35	1	1	0.7	46	27.5	15.56
36	36	1	1	0.7	46	35	16.86
37	37	1	1	0.85	36	20	14.57
38	38	1	1	0.85	36	27.5	15.31
39	39	1	1	0.85	36	35	16.78
40	40	1	1	0.85	41	20	14.73
41	41	1	1	0.85	41	27.5	15.89
42	42	1	1	0.85	41	35	16.77
43	43	1	1	0.85	46	20	14.98
44	44	1	1	0.85	46	27.5	16
45	45	1	1	0.85	46	35	16.78
46	46	1	1	1	36	20	14.58
47	47	1	1	1	36	27.5	15.54
48	48	1	1	1	36	35	16.75
49	49	1	1	1	41	20	14.89
50	50	1	1	1	41	27.5	16.32
51	51	1	1	1	41	35	17.14
52	52	1	1	1	46	20	15.34
53	53	1	1	1	46	27.5	16.42
54	54	1	1	1	46	35	17.56

ตารางผลการทดลอง Regression เพื่อหาสมการพยากรณ์ โดย MiniTAB

Chemical concentration	Dwell time	Chemical pressure	Area	Con * Press	Dwell * Con
0.7	36	20	13.24	14.00	25.2
0.7	36	27.5	14.23	19.25	25.2
0.7	36	35	15.75	24.50	25.2
0.7	41	20	13.75	14.00	28.7
0.7	41	27.5	14.86	19.25	28.7
0.7	41	35	16.43	24.50	28.7
0.7	46	20	14.36	14.00	32.2
0.7	46	27.5	15.49	19.25	32.2
0.7	46	35	16.8	24.50	32.2
0.85	36	20	14.32	17.00	30.6
0.85	36	27.5	15.43	23.38	30.6
0.85	36	35	16.32	29.75	30.6
0.85	41	20	14.67	17.00	34.85
0.85	41	27.5	15.78	23.38	34.85
0.85	41	35	16.75	29.75	34.85
0.85	46	20	14.89	17.00	39.1
0.85	46	27.5	16.12	23.38	39.1
0.85	46	35	16.99	29.75	39.1
1	36	20	14.68	20.00	36
1	36	27.5	15.78	27.50	36
1	36	35	16.89	35.00	36
1	41	20	14.99	20.00	41
1	41	27.5	16.19	27.50	41
1	41	35	17.35	35.00	41
1	46	20	15.48	20.00	46
1	46	27.5	16.32	27.50	46
1	46	35	17.66	35.00	46

Chemical concentration	Dwell time	Chemical pressure	Area	Con * Press	Dwell * Con
0.7	36	20	13.18	14.00	25.2
0.7	36	27.5	14.08	19.25	25.2
0.7	36	35	15.62	24.50	25.2
0.7	41	20	13.67	14.00	28.7
0.7	41	27.5	14.67	19.25	28.7
0.7	41	35	16.32	24.50	28.7
0.7	46	20	14.53	14.00	32.2
0.7	46	27.5	15.56	19.25	32.2
0.7	46	35	16.86	24.50	32.2
0.85	36	20	14.57	17.00	30.6
0.85	36	27.5	15.31	23.38	30.6
0.85	36	35	16.78	29.75	30.6
0.85	41	20	14.73	17.00	34.85
0.85	41	27.5	15.89	23.38	34.85
0.85	41	35	16.77	29.75	34.85
0.85	46	20	14.98	17.00	39.1
0.85	46	27.5	16	23.38	39.1
0.85	46	35	16.78	29.75	39.1
1	36	20	14.58	20.00	36
1	36	27.5	15.54	27.50	36
1	36	35	16.75	35.00	36
1	41	20	14.89	20.00	41
1	41	27.5	16.32	27.50	41
1	41	35	17.14	35.00	41
1	46	20	15.34	20.00	46
1	46	27.5	16.42	27.50	46
1	46	35	17.56	35.00	46