

## REFERENCES

1. Seagate Annual Report. Thailand, 1998.
2. Cheetah 18 HGA Manufacturing Process. Thailand, 1998 (MP#81455211).
3. Preload SPC Procedure. Thailand, 1998 (PCA# PEM8145555)
4. Green Belt Training Package. Thailand ,1999 (The first edition).
5. Mikel J. Harry. The Nature of Six Sigma Quality. United States of America: Motorola University Press, 1997.
6. Mikel J. Harry and J.Ronald Lawson. Six Sigma Producibility Analysis and Process Characterization. United State of America: Motorola University Press, 1992.
7. Chen Gordon K. C., and McGarrah R. E. Productivity Management Text & Cases. United States of America: The Dryden Press, 1980.
8. Heizer J., and Render B. Production and Operations Management Strategic and Tactical Decisions. United States of America: Prentice-Hall International, 1996.
9. Niebel, B. W. Motion and Time Study. United States of America: Donnelley & Sons, 1993.
10. Salvendy G. Handbook of Industrial Engineering. United States of America: John Wiley & Sons, 1992.
11. Taniguchi T. IE for Productivity Facilitators I. Tokyo. Japan Productivity Center, 1990.
12. Capron, H.L. Computers Tools for an Information Age. New York: The Benjamim/ Cummings, 1990.
13. วิจิตร ตันทวิสุทธิ์. การศึกษาการทำงาน กรุงเทพมหานคร : จุฬาลงกรณ์มหาวิทยาลัย , 2524

## **APPENDICES**

**Appendix A****Table A.1** Raw data of contamination at Spot Cleaning Oper

Cell number	Particle/Unit	Cell number	Particle/Unit
1	0.6	9	0
1	0.2	9	0
1	0	9	0.2
1	0.6	9	0.2
1	0	10	0
1	0	10	0.4
1	0	10	0
1	0	10	0
1	0.2	10	0
1	0.2	10	0.4
7	0.2	10	0.4
7	0.2	10	0.2
7	0.2	10	0
7	0.6	10	0.2
7	0.4	5	0.6
7	0.4	5	1.4
7	0.6	5	1
7	1	5	0.6
7	0	5	0.4
7	1	5	0.2
2	0.4	5	0.8
2	0.8	5	0.2
2	0.4	5	1.6
2	0.2	5	0.6
2	0	11	0.2
2	0.2	11	0
2	0.2	11	0.4
2	0.6	11	0.4
2	0.6	11	0.4
2	0.4	11	0.4
3	0	11	0.2
3	0	11	0
3	0	11	0.4
3	0	11	0
3	0	13	0.4
3	0	13	0
3	0	13	0.6
3	0	13	0.8
3	0.2	13	0.2
3	0	13	0.6
9	0.2	13	0.2
9	0	13	0
9	0	13	0.2
9	0.6	13	0
9	0		
9	0		

Table A.2 Raw data of contamination at Autogrammer by Type, Cell and Shift.

Cell number	P/Unit	Type	Cell number	Particle/unit	Shift
1	1.30	SST-300	1	1.30	A
1	1.70	SST-300	1	1.70	A
1	1.40	SST-300	1	1.40	A
1	1.50	SST-300	1	1.50	A
1	1.80	SST-300	1	1.80	A
1	2.00	SST-300	1	2.00	B
1	0.40	SST-300	1	0.40	B
1	0.80	SST-300	1	0.80	B
1	1.30	SST-300	1	1.30	B
1	1.40	SST-300	1	1.40	B
1	0.40	TIN	1	0.40	A
1	0.90	TIN	1	0.90	A
1	0.50	TIN	1	0.50	A
1	0.60	TIN	1	0.60	A
1	1.20	TIN	1	1.20	A
7	1.10	SST-300	7	1.10	A
7	0.90	SST-300	7	0.90	A
7	0.90	SST-300	7	0.90	A
7	1.00	SST-300	7	1.00	A
7	0.60	SST-300	7	0.60	A
2	0.30	TIN	2	0.30	B
2	1.10	TIN	2	1.10	B
2	0.90	TIN	2	0.90	B
2	0.30	TIN	2	0.30	B
2	0.20	TIN	2	0.20	B
2	1.40	TIN	2	1.40	B
2	1.10	TIN	2	1.10	B
2	1.40	TIN	2	1.40	B
2	2.10	TIN	2	2.10	B
2	1.80	TIN	2	1.80	B
3	1.50	SST-300	3	1.50	B
3	0.50	SST-300	3	0.50	B
3	0.10	SST-300	3	0.10	B
3	1.10	SST-300	3	1.10	B
3	1.00	SST-300	3	1.00	B
4	2.10	SST-300	4	2.10	A
4	1.20	SST-300	4	1.20	A
4	1.10	SST-300	4	1.10	A
4	1.50	SST-300	4	1.50	A
4	1.00	SST-300	4	1.00	A

Table A.2 Raw data of contamination at Autogrammer by Type, Cell and Shift (Cont.)

Cell number	P/Unit	Type	Cell number	Particle/unit	Shift
9	0.50	TIN	9	0.50	C
9	0.70	TIN	9	0.70	C
9	0.10	TIN	9	0.10	C
9	0.50	TIN	9	0.50	C
9	0.30	TIN	9	0.30	C
10	0.90	TIN	10	0.90	C
10	1.10	TIN	10	1.10	C
10	1.70	TIN	10	1.70	C
10	0.50	TIN	10	0.50	C
10	0.70	TIN	10	0.70	C
5	0.90	SST-300	5	0.90	C
5	0.90	SST-300	5	0.90	C
5	1.10	SST-300	5	1.10	C
5	0.70	SST-300	5	0.70	C
5	1.40	SST-300	5	1.40	C
11	2.40	TIN	11	2.00	C
11	2.00	TIN	11	1.90	C
11	1.90	TIN	11	1.90	C
11	1.90	TIN	11	1.50	C
11	1.50	SST-300	13	0.30	C
13	0.30	SST-300	13	0.80	C
13	0.80	SST-300	13	0.80	C
13	0.80	SST-300	13	1.40	C
13	1.40	SST-300	13	0.50	C

Table A.3 Raw data of contamination by varying Blower conditions

Blower-on	Blower-off	Change Location
1.6	2	0
1	1.2	0.4
1.4	0	0.2
1.8	0.4	0.4
0.8	0.2	0
0.6	0.4	0.4
0.8	0.2	1
1.8	0.8	0.6
3.8	0.6	0
0.6	0.6	0.6
1.4	0	0.6
0.4	0.2	0.6
0.8	2.2	0.6
2	0.8	0.4
1.4	1	0.4
1.4	1	1.2
0.8	0.8	0.2
1.4	0.6	0.8
2.4	0.8	0.6
0	0.6	0.2

Table A 4 Laminar DOE

StdOrder	RunOrder	CenterPt	Blocks	B-on&off	B-angle	Partition	Velocity	B/O&F&VE	PA&VE	B/o&f/an/ve	B/o&f/PA/ve	B an PA	B o&f/an	B ang PA Ve
1	6	1	1	-1	-1	-1	-1	1	1	-1	-1	1	1	1
2	26	1	1	1	-1	-1	-1	-1	1	1	1	1	1	-1
3	3	1	1	-1	1	-1	-1	1	1	1	-1	-1	-1	1
4	2	1	1	1	1	-1	-1	-1	1	-1	1	-1	1	1
5	20	1	1	-1	-1	1	-1	1	-1	-1	1	-1	1	1
6	23	1	1	1	-1	1	-1	-1	-1	-1	1	-1	1	1
7	21	1	1	-1	1	1	-1	1	-1	1	1	1	-1	1
8	27	1	1	1	1	1	-1	-1	-1	-1	-1	1	1	-1
9	29	1	1	-1	-1	-1	1	-1	-1	1	1	1	1	1
10	11	1	1	1	-1	-1	1	1	-1	-1	-1	1	-1	1
11	25	1	1	-1	1	-1	1	-1	-1	-1	1	-1	-1	1
12	7	1	1	1	1	-1	1	1	-1	1	-1	-1	-1	1
13	12	1	1	-1	-1	1	1	-1	1	1	-1	-1	-1	1
14	16	1	1	1	-1	1	1	1	1	-1	1	-1	-1	1
15	30	1	1	-1	1	1	1	-1	1	-1	-1	1	-1	1
16	1	1	1	1	1	1	1	1	1	1	1	1	1	1
17	8	1	1	-1	-1	-1	-1	1	1	-1	-1	1	1	1
18	9	1	1	1	-1	-1	-1	-1	1	1	1	1	-1	1
19	14	1	1	-1	1	-1	-1	1	1	1	-1	-1	-1	1
20	32	1	1	1	1	-1	-1	-1	-1	-1	1	-1	-1	1
21	4	1	1	-1	-1	1	-1	1	-1	-1	1	-1	1	1
22	5	1	1	1	-1	1	-1	-1	-1	1	-1	-1	-1	1
23	10	1	1	-1	1	1	-1	1	-1	1	1	1	-1	1
24	13	1	1	1	1	1	-1	-1	-1	-1	-1	1	1	1
25	15	1	1	-1	-1	-1	1	-1	-1	1	1	1	1	1
26	19	1	1	1	-1	-1	1	1	-1	-1	-1	1	-1	1
27	22	1	1	-1	1	-1	1	-1	-1	-1	1	-1	-1	1
28	28	1	1	1	1	-1	1	1	-1	1	-1	-1	1	1
29	31	1	1	-1	-1	1	1	-1	1	1	-1	-1	1	1
30	18	1	1	1	-1	1	1	1	1	-1	1	-1	-1	1
31	17	1	1	-1	1	1	1	-1	1	-1	-1	1	-1	1
32	24	1	1	1	1	1	1	1	1	1	1	1	1	1

StdOrder	RunOrder	Bo&f/PA	WK	L	sition 3	&2&5&	ricle-10	Particle-10
1	6	1	36.7	66	48	31	29	4
2	26	-1	63.8	71	60.5	65.5	44	13
3	3	1	29.7	58.2	33.5	27.8	57	13
4	2	-1	55.7	70.7	68	49.5	20	3
5	20	-1	39.2	68.3	53	32.3	38	9
6	23	1	51.3	69.7	59	47.5	28	5
7	21	-1	49.8	74.7	63	43.3	33	8
8	27	1	47	67.3	58	41.5	4	1
9	29	1	73.2	117.3	115	52.3	1	0
10	11	-1	76.8	116.7	106.5	62	0	0
11	25	1	68	115.7	110.5	46.8	3	1
12	7	-1	72.2	116.3	118	49.3	4	2
13	12	-1	61.8	116.7	115.5	35	1	0
14	16	1	65.3	115.3	97.5	49.3	2	1
15	30	-1	61.2	112.7	109.5	37	1	0
16	1	1	74.7	115.7	106.5	58.8	1	0
17	8	1	37.5	60.3	65	23.8	9	1
18	9	-1	58.8	72.7	78	49.3	17	2
19	14	1	30.3	62.7	55	18	9	0
20	32	-1	46	67	69	34.5	17	4
21	4	-1	42.5	66.7	78	24.8	7	0
22	5	1	55.3	69.3	58	54	30	6
23	10	-1	33.5	65.7	51.5	24.5	68	16
24	13	1	67	61	70	65.5	1	0
25	15	1	58.2	115.3	109.5	32.5	1	0
26	19	-1	74.8	114	103.5	60.5	0	0
27	22	1	67.8	116.7	105.5	49	0	0
28	28	-1	72.8	116.3	111.5	53.5	0	0
29	31	-1	61.7	116	113.5	35.8	1	0
30	18	1	67	117.7	97.5	51.8	9	6
31	17	-1	57.5	122	110.5	31	0	0
32	24	1	71.2	119.7	101.5	56	9	9

## Appendix B

Table B.1 Raw data of mapping gramload by operation

Raw Flexure	Gimbal	FOS Bond	Coat/Tack	Unload Jit tool	Load IAT	Spot Clean
2.61	2.61	2.52	2.81	2.68	2.67	2.78
2.66	2.65	2.59	2.70	2.80	2.76	2.81
2.54	2.54	2.66	2.79	2.65	2.67	2.60
2.54	2.54	2.57	2.69	2.60	2.72	2.80
2.58	2.58	2.59	2.73	2.83	2.66	2.67
2.51	2.50	2.53	2.72	2.69	2.87	2.77
2.62	2.60	2.60	2.84	2.68	2.66	2.65
2.61	2.61	2.61	2.66	2.81	2.67	2.67
2.61	2.61	2.61	2.75	2.79	2.67	2.66
2.61	2.45	2.70	2.64	2.81	2.75	2.67
2.47	2.50	2.57	2.73	2.71	2.68	2.75
2.50	2.58	2.50	2.67	2.69	2.82	2.67
2.58	2.53	2.62	2.66	2.66	2.65	2.68
2.53	2.55	2.50	2.84	2.75	2.65	2.71
2.55	2.60	2.51	2.74	2.77	2.83	2.79
2.63	2.55	2.43	2.88	2.70	2.69	2.85
2.56	2.53	2.52	2.71	2.85	2.68	2.76
2.56	2.56	2.51	2.79	2.77	2.81	2.82
2.56	2.51	2.54	2.77	2.87	2.79	2.70
2.54	2.53	2.44	2.65	2.69	2.81	2.75
2.56	2.60	2.50	2.73	2.67	2.71	2.69
2.63	2.54	2.58	2.71	2.76	2.69	2.66
2.54	2.53	2.59	2.62	2.67	2.68	2.73
2.51	2.48	2.58	2.75	2.72	2.75	2.66
2.47	2.52	2.50	2.71	2.66	2.77	2.71
2.52	2.60	2.48	2.82	2.87	2.75	2.67
2.59	2.57	2.78	2.66	2.66	2.85	2.68
2.57	2.53	2.61	2.55	2.67	2.77	2.66
2.53	2.50	2.56	2.69	2.67	2.87	2.84
2.50	2.56	2.49	2.82	2.72	2.66	2.63
2.50	2.52	2.62	2.73	2.73	2.75	2.70
2.48	2.49	2.60	2.72	2.72	2.74	2.72
2.68	2.68	2.66	2.76	2.73	2.77	2.74
2.57	2.58	2.69	2.72	2.71	2.63	2.61
2.59	2.62	2.67	2.76	2.74	2.69	2.65
2.52	2.54	2.67	2.80	2.78	2.76	2.75
2.56	2.57	2.70	2.99	2.98	2.72	2.66
2.55	2.57	2.64	2.81	2.80	2.66	2.61
2.57	2.57	2.71	2.78	2.78	2.79	2.72
2.53	2.54	2.65	2.76	2.73	2.71	2.66
2.47	2.49	2.71	2.66	2.66	2.74	2.72
2.49	2.49	2.66	2.70	2.70	2.73	2.72
2.44	2.50	2.60	2.66	2.72	2.79	2.72
2.50	2.44	2.75	2.67	2.69	2.79	2.72



Table B.1 Raw data of mapping gramload by operation (Cont.)

Raw Flexure	Gimbal	FOS Bond	Coat/Tack	Unload Jit tool	Load IAT	Spot Clean
2.58	2.52	2.60	2.81	2.80	2.76	2.67
2.48	2.69	2.60	2.72	2.72	2.79	2.73
2.48	2.52	2.88	2.75	2.77	2.85	2.79
2.52	2.51	2.70	2.75	2.79	2.85	2.72
2.52	2.52	2.55	2.62	2.68	2.88	2.85
2.46	2.54	2.64	2.68	2.68	2.71	2.63
2.47	2.50	2.60	2.76	2.75	2.75	2.67
2.52	2.50	2.55	2.72	2.72	2.73	2.69
2.50	2.52	2.47	2.77	2.75	2.60	2.59
2.53	2.54	2.55	2.59	2.59	2.63	2.58
2.52	2.55	2.82	2.86	2.86	2.84	2.81
2.65	2.53	2.69	2.75	2.75	2.76	2.70
2.54	2.66	2.68	2.75	2.75	2.84	2.72
2.47	2.56	2.64	2.73	2.73	2.74	2.70
2.50	2.49	2.55	2.77	2.76	2.73	2.66
2.53	2.51	2.56	2.71	2.71	2.71	2.68

Table B.2 Raw data of Gramload DOE

SidOrder	RunOrder	CenterPt	Blocks	FOS EPOXY	TACK TAIL	FOS VENDOR	FOS EPOXY*VENDOR	TACK TAIL*FOS VENDOR	PRELOAD
1	4	1	1	-1	-1	-1	1	-1	2.68
2	5	1	1	-1	-1	-1	1	-1	2.81
3	9	1	1	-1	-1	-1	1	-1	2.81
4	13	1	1	-1	-1	-1	1	-1	2.66
5	16	1	1	-1	-1	-1	1	-1	2.68
6	24	1	1	-1	-1	-1	1	-1	2.75
7	25	1	1	-1	-1	-1	1	-1	2.74
8	29	1	1	-1	-1	-1	1	-1	2.74
9	35	1	1	-1	-1	-1	1	-1	2.71
10	36	1	1	-1	-1	-1	1	-1	2.75
11	44	1	1	-1	-1	-1	1	-1	2.72
12	45	1	1	-1	-1	-1	1	-1	2.66
13	49	1	1	-1	-1	-1	1	-1	2.72
14	53	1	1	-1	-1	-1	1	-1	2.69
15	56	1	1	-1	-1	-1	1	-1	2.71
16	127	1	1	-1	-1	-1	1	-1	2.66
17	128	1	1	-1	-1	-1	1	-1	2.67
18	138	1	1	-1	-1	-1	1	-1	2.66
19	146	1	1	-1	-1	-1	1	-1	2.68
20	151	1	1	-1	-1	-1	1	-1	2.67
21	167	1	1	-1	-1	-1	1	-1	2.68
22	168	1	1	-1	-1	-1	1	-1	2.73
23	178	1	1	-1	-1	-1	1	-1	2.71
24	186	1	1	-1	-1	-1	1	-1	2.73
25	191	1	1	-1	-1	-1	1	-1	2.66
26	207	1	1	-1	-1	-1	1	-1	2.68
27	208	1	1	-1	-1	-1	1	-1	2.66
28	218	1	1	-1	-1	-1	1	-1	2.65
29	226	1	1	-1	-1	-1	1	-1	2.67
30	231	1	1	-1	-1	-1	1	-1	2.67
31	247	1	1	-1	-1	-1	1	-1	2.65
32	248	1	1	-1	-1	-1	1	-1	2.67
33	258	1	1	-1	-1	-1	1	-1	2.68
34	266	1	1	-1	-1	-1	1	-1	2.71
35	271	1	1	-1	-1	-1	1	-1	2.68
36	287	1	1	-1	-1	-1	1	-1	2.65
37	288	1	1	-1	-1	-1	1	-1	2.7
38	298	1	1	-1	-1	-1	1	-1	2.67
39	306	1	1	-1	-1	-1	1	-1	2.66
40	311	1	1	-1	-1	-1	1	-1	2.68
81	62	1	1	-1	1	-1	1	1	2.77
82	63	1	1	-1	1	-1	1	1	2.71
83	64	1	1	-1	1	-1	1	1	2.65
84	70	1	1	-1	1	-1	1	1	2.67
85	79	1	1	-1	1	-1	1	1	2.76
86	82	1	1	-1	1	-1	1	1	2.74
87	83	1	1	-1	1	-1	1	1	2.72
88	84	1	1	-1	1	-1	1	1	2.73
89	90	1	1	-1	1	-1	1	1	2.7
90	99	1	1	-1	1	-1	1	1	2.72
91	102	1	1	-1	1	-1	1	1	2.69
92	103	1	1	-1	1	-1	1	1	2.73
93	104	1	1	-1	1	-1	1	1	2.7

Table B.2 Raw data of Gramload DOE (Cont.)

StdOrder	RunOrder	CenterPt	Blocks	FOS EPOXY	TACK TAIL	FOS VENDOR	FOS EPOXY*VENDOR	TACK TAIL*FOS VENDOR	PRELOAD
94	110	1	1	-1	1	-1	1	1	2.72
95	119	1	1	-1	1	-1	1	1	2.68
96	123	1	1	-1	1	-1	1	1	2.68
97	124	1	1	-1	1	-1	1	1	2.67
98	129	1	1	-1	1	-1	1	1	2.65
99	142	1	1	-1	1	-1	1	1	2.65
100	158	1	1	-1	1	-1	1	1	2.64
101	163	1	1	-1	1	-1	1	1	2.66
102	164	1	1	-1	1	-1	1	1	2.72
103	169	1	1	-1	1	-1	1	1	2.67
104	182	1	1	-1	1	-1	1	1	2.72
105	198	1	1	-1	1	-1	1	1	2.66
106	203	1	1	-1	1	-1	1	1	2.64
107	204	1	1	-1	1	-1	1	1	2.62
108	209	1	1	-1	1	-1	1	1	2.65
109	222	1	1	-1	1	-1	1	1	2.7
110	238	1	1	-1	1	-1	1	1	2.65
111	243	1	1	-1	1	-1	1	1	2.67
112	244	1	1	-1	1	-1	1	1	2.67
113	249	1	1	-1	1	-1	1	1	2.61
114	262	1	1	-1	1	-1	1	1	2.67
115	278	1	1	-1	1	-1	1	1	2.69
116	283	1	1	-1	1	-1	1	1	2.65
117	284	1	1	-1	1	-1	1	1	2.71
118	289	1	1	-1	1	-1	1	1	2.63
119	302	1	1	-1	1	-1	1	1	2.7
120	318	1	1	-1	1	-1	1	1	2.67
161	1	1	1	-1	-1	1	-1	1	2.72
162	6	1	1	-1	-1	1	-1	1	2.67
163	11	1	1	-1	-1	1	-1	1	2.73
164	14	1	1	1	-1	1	-1	1	2.7
165	18	1	1	-1	-1	1	-1	1	2.69
166	21	1	1	-1	-1	1	-1	1	2.72
167	26	1	1	-1	-1	1	-1	1	2.72
168	31	1	1	-1	-1	1	-1	1	2.72
169	34	1	1	-1	-1	1	-1	1	2.66
170	38	1	1	-1	-1	1	-1	1	2.67
171	41	1	1	-1	-1	1	-1	1	2.63
172	46	1	1	-1	-1	1	-1	1	2.61
173	51	1	1	-1	-1	1	-1	1	2.63
174	54	1	1	-1	-1	1	-1	1	2.65
175	58	1	1	-1	-1	1	-1	1	2.64
176	122	1	1	-1	-1	1	-1	1	2.65
177	132	1	1	-1	-1	1	-1	1	2.68
178	140	1	1	-1	-1	1	-1	1	2.67
179	148	1	1	-1	-1	1	-1	1	2.63
180	153	1	1	-1	-1	1	-1	1	2.66
181	162	1	1	-1	-1	1	-1	1	2.71
182	172	1	1	-1	-1	1	-1	1	2.74
183	180	1	1	-1	-1	1	-1	1	2.69
184	188	1	1	-1	-1	1	-1	1	2.64
185	193	1	1	-1	-1	1	-1	1	2.67
186	202	1	1	-1	-1	1	-1	1	2.61

Table B.2 Raw data of Gramload DOE (Cont.)

StdOrder	RunOrder	CenterPt	Blocks	FOS EPOXY	TACK TAIL	FOS VENDOR	FOS EPOXY*VENDOR	TACK TAIL*FOS VENDOR	PRELOAD
187	212	1	1	-1	-1	1	-1	1	2.68
188	220	1	1	-1	-1	1	-1	1	2.63
189	228	1	1	-1	-1	1	-1	1	2.67
190	233	1	1	-1	-1	1	-1	1	2.69
191	242	1	1	-1	-1	1	-1	1	2.67
192	252	1	1	-1	-1	1	-1	1	2.63
193	260	1	1	-1	-1	1	-1	1	2.65
194	268	1	1	-1	-1	1	-1	1	2.65
195	273	1	1	-1	-1	1	-1	1	2.68
196	282	1	1	-1	-1	1	-1	1	2.69
197	292	1	1	-1	-1	1	-1	1	2.71
198	300	1	1	-1	-1	1	-1	1	2.7
199	308	1	1	-1	-1	1	-1	1	2.67
200	313	1	1	-1	-1	1	-1	1	2.81
241	66	1	1	-1	1	1	-1	-1	2.66
242	68	1	1	-1	1	1	-1	-1	2.78
243	69	1	1	-1	1	1	-1	-1	2.67
244	71	1	1	-1	1	1	-1	-1	2.71
245	72	1	1	-1	1	1	-1	-1	2.74
246	86	1	1	-1	1	1	-1	-1	2.68
247	88	1	1	-1	1	1	-1	-1	2.72
248	89	1	1	-1	1	1	-1	-1	2.65
249	91	1	1	-1	1	1	-1	-1	2.68
250	92	1	1	-1	1	1	-1	-1	2.7
251	106	1	1	-1	1	1	-1	-1	2.6
252	108	1	1	-1	1	1	-1	-1	2.63
253	109	1	1	-1	1	1	-1	-1	2.65
254	111	1	1	-1	1	1	-1	-1	2.66
255	112	1	1	-1	1	1	-1	-1	2.63
256	131	1	1	-1	1	1	-1	-1	2.66
257	134	1	1	-1	1	1	-1	-1	2.64
258	135	1	1	-1	1	1	-1	-1	2.66
259	143	1	1	-1	1	1	-1	-1	2.71
260	144	1	1	-1	1	1	-1	-1	2.64
261	171	1	1	-1	1	1	-1	-1	2.65
262	174	1	1	-1	1	1	-1	-1	2.68
263	175	1	1	-1	1	1	-1	-1	2.67
264	183	1	1	-1	1	1	-1	-1	2.65
265	184	1	1	-1	1	1	-1	-1	2.61
266	211	1	1	-1	1	1	-1	-1	2.62
267	214	1	1	-1	1	1	-1	-1	2.63
268	215	1	1	-1	1	1	-1	-1	2.59
269	223	1	1	-1	1	1	-1	-1	2.63
270	224	1	1	-1	1	1	-1	-1	2.7
271	251	1	1	-1	1	1	-1	-1	2.67
272	254	1	1	-1	1	1	-1	-1	2.68
273	255	1	1	-1	1	1	-1	-1	2.67
274	263	1	1	-1	1	1	-1	-1	2.65
275	264	1	1	-1	1	1	-1	-1	2.64
276	291	1	1	-1	1	1	-1	-1	2.74
277	294	1	1	-1	1	1	-1	-1	2.67
278	295	1	1	-1	1	1	-1	-1	2.67
279	303	1	1	-1	1	1	-1	-1	2.67

Table B.2 Raw data of Gramload DOE (Cont.)

StdOrder	RunOrder	CenterPt	Blocks	FOS EPOXY	TACK TAIL	FOS VENDOR	FOS EPOXY*VENDOR	TACK TAIL*FOS VENDOR	PRELOAD
280	304	1	1	-1	1	1	-1	-1	2.68
41	2	1	1	1	-1	-1	-1	1	2.93
42	3	1	1	1	-1	-1	-1	1	2.88
43	10	1	1	1	-1	-1	-1	1	2.9
44	17	1	1	1	-1	-1	-1	1	2.92
45	19	1	1	1	-1	-1	-1	1	2.82
46	22	1	1	1	-1	-1	-1	1	3.14
47	23	1	1	1	-1	-1	-1	1	3.2
48	30	1	1	1	-1	-1	-1	1	3.08
49	37	1	1	1	-1	-1	-1	1	3.1
50	39	1	1	1	-1	-1	-1	1	3.06
51	42	1	1	1	-1	-1	-1	1	3.13
52	43	1	1	1	-1	-1	-1	1	2.89
53	50	1	1	1	-1	-1	-1	1	2.89
54	57	1	1	1	-1	-1	-1	1	2.99
55	59	1	1	1	-1	-1	-1	1	2.92
56	125	1	1	1	-1	-1	-1	1	3.02
57	126	1	1	1	-1	-1	-1	1	3.06
58	139	1	1	1	-1	-1	-1	1	3.09
59	152	1	1	1	-1	-1	-1	1	2.99
60	154	1	1	1	-1	-1	-1	1	3.09
61	165	1	1	1	-1	-1	-1	1	3.12
62	166	1	1	1	-1	-1	-1	1	3.11
63	179	1	1	1	-1	-1	-1	1	3.01
64	192	1	1	1	-1	-1	-1	1	3.08
65	194	1	1	1	-1	-1	-1	1	2.9
66	205	1	1	1	-1	-1	-1	1	3.01
67	206	1	1	1	-1	-1	-1	1	3.03
68	219	1	1	1	-1	-1	-1	1	2.98
69	232	1	1	1	-1	-1	-1	1	3.04
70	234	1	1	1	-1	-1	-1	1	3.06
71	245	1	1	1	-1	-1	-1	1	3.1
72	246	1	1	1	-1	-1	-1	1	3.09
73	259	1	1	1	-1	-1	-1	1	3.06
74	272	1	1	1	-1	-1	-1	1	3.04
75	274	1	1	1	-1	-1	-1	1	3.01
76	285	1	1	1	-1	-1	-1	1	2.97
77	286	1	1	1	-1	-1	-1	1	2.85
78	299	1	1	1	-1	-1	-1	1	3.03
79	312	1	1	1	-1	-1	-1	1	2.82
80	314	1	1	1	-1	-1	-1	1	2.9
121	73	1	1	1	1	-1	-1	-1	2.87
122	74	1	1	1	1	-1	-1	-1	2.87
123	75	1	1	1	1	-1	-1	-1	2.92
124	76	1	1	1	1	-1	-1	-1	2.86
125	78	1	1	1	1	-1	-1	-1	2.83
126	93	1	1	1	1	-1	-1	-1	3.12
127	94	1	1	1	1	-1	-1	-1	3.17
128	95	1	1	1	1	-1	-1	-1	3.12
129	96	1	1	1	1	-1	-1	-1	3.14
130	98	1	1	1	1	-1	-1	-1	3.12
131	113	1	1	1	1	-1	-1	-1	2.88
132	114	1	1	1	1	-1	-1	-1	2.85

Table B.2 Raw data of Gramload DOE (Cont.)

StdOrder	RunOrder	CenterPt	Blocks	FOS EPOXY	TACK TAIL	FOS VENDOR	FOS EPOXY*VENDOR	TACK TAIL*FOS VENDOR	PRELOAD
133	115	1	1	1	1	-1	-1	-1	2.81
134	116	1	1	1	1	-1	-1	-1	2.86
135	118	1	1	1	1	-1	-1	-1	2.81
136	145	1	1	1	1	-1	-1	-1	3.12
137	147	1	1	1	1	-1	-1	-1	3.08
138	149	1	1	1	1	-1	-1	-1	3.11
139	155	1	1	1	1	-1	-1	-1	3.12
140	157	1	1	1	1	-1	-1	-1	3.12
141	185	1	1	1	1	-1	-1	-1	3.14
142	187	1	1	1	1	-1	-1	-1	3.04
143	189	1	1	1	1	-1	-1	-1	2.9
144	195	1	1	1	1	-1	-1	-1	2.94
145	197	1	1	1	1	-1	-1	-1	2.98
146	225	1	1	1	1	-1	-1	-1	3.08
147	227	1	1	1	1	-1	-1	-1	3.1
148	229	1	1	1	1	-1	-1	-1	2.98
149	235	1	1	1	1	-1	-1	-1	3.11
150	237	1	1	1	1	-1	-1	-1	3.08
151	265	1	1	1	1	-1	-1	-1	2.98
152	267	1	1	1	1	-1	-1	-1	3.08
153	269	1	1	1	1	-1	-1	-1	2.95
154	275	1	1	1	1	-1	-1	-1	3.11
155	277	1	1	1	1	-1	-1	-1	2.94
156	305	1	1	1	1	-1	-1	-1	3.06
157	307	1	1	1	1	-1	-1	-1	2.98
158	309	1	1	1	1	-1	-1	-1	3.05
159	315	1	1	1	1	-1	-1	-1	2.92
160	317	1	1	1	1	-1	-1	-1	2.91
201	7	1	1	1	-1	1	1	-1	2.83
202	8	1	1	1	-1	1	1	-1	2.81
203	12	1	1	1	-1	1	1	-1	2.8
204	15	1	1	1	-1	1	1	-1	2.74
205	20	1	1	1	-1	1	1	-1	2.8
206	27	1	1	1	-1	1	1	-1	2.89
207	28	1	1	1	-1	1	1	-1	2.97
208	32	1	1	1	-1	1	1	-1	2.86
209	35	1	1	1	-1	1	1	-1	2.95
210	40	1	1	1	-1	1	1	-1	2.89
211	47	1	1	1	-1	1	1	-1	2.77
212	48	1	1	1	-1	1	1	-1	2.79
213	52	1	1	1	-1	1	1	-1	2.78
214	55	1	1	1	-1	1	1	-1	2.88
215	60	1	1	1	-1	1	1	-1	2.78
216	136	1	1	1	-1	1	1	-1	2.98
217	137	1	1	1	-1	1	1	-1	3.08
218	141	1	1	1	-1	1	1	-1	3.04
219	150	1	1	1	-1	1	1	-1	3.03
220	160	1	1	1	-1	1	1	-1	3.09
221	176	1	1	1	-1	1	1	-1	2.93
222	177	1	1	1	-1	1	1	-1	3.15
223	181	1	1	1	-1	1	1	-1	2.82
224	190	1	1	1	-1	1	1	-1	3.12
225	200	1	1	1	-1	1	1	-1	2.89







## Appendix C

Table C.1 Chcetah18 Line loading WW.14 ( Before improvement)

Model	Cell	Sat		Sun		Mon		Tue	
		Target	Act	Target	Act	Target	Act	Target	Act
CHEETAH18 (HEAD WAY)	A23=1	10,000	10,453	10,000	10,500	10,000	10,575	10,000	10,580
	A24=2	10,000	10,470	10,000	10,523	10,000	10,340	10,000	10,470
	A32=3	10,000	10,498			10,000	10,426	10,000	10,397
	A33=4	10,000	10,461			10,000	10,116	10,000	10,462
	A34=5	10,000	10,527	10,000	10,282	10,000	10,421	10,000	10,319
	A42=6	10,000	10,724	10,000	10,748	10,000	10,198	10,000	10,480
	A53=7	10,000	9,716	10,000	9,848	10,000	9,726	10,000	9,338
	A43=8	10,000	9,793			10,000	10,476	10,000	9,869
	B33=9	10,000	10,239	10,000	10,174	10,000	9,826	10,000	9,584
	A44=10	10,000	10,774	10,000	10,660	10,000	10,746	10,000	10,720
	B34=11	10,000	10,094	10,000	10,099	10,000	10,105	10,000	9,895
	A22=12	10,000	10,732	10,000	10,622	10,000	10,883	10,000	10,898
	B24=13	10,000	9,206	10,000	9,469	10,000	9,741	10,000	9,915
	B25=14	10,000	10,225	10,000	10,208	10,000	10,317	10,000	10,501
	A55=15	10,000	9,184	10,000	9,575	10,000	9,614	10,000	9,761
	B23=16	10,000	9,750	10,000	9,844	10,000	9,040	10,000	9,164
	B52=17	10,000	9,667	10,000	10,069	10,000	8,577	10,000	8,831
	B53=18	10,000	9,004	10,000	9,366	10,000	9,205	10,000	9,582
	SUM All		180,000	181,517	150,000	151,987	180,000	180,332	180,000
OUTPUT		129,996	131,092	108,330	109,765	129,996	130,236	129,996	130,549
Model	Cell	Wed		Thu		Fri		WTD	
		Target	Act	Target	Act	Target	Act	Target	Act
CHEETAH18 (HEAD WAY)	A23=1	10,000	10,528	10,000	10,520	10,000	10,628	70,000	73,784
	A24=2	10,000	10,515	10,000	10,440	10,000	10,421	70,000	73,179
	A32=3	10,000	10,525	10,000	10,327	10,000	10,538	60,000	62,711
	A33=4	10,000	10,510	10,000	10,410	10,000	10,152	60,000	62,111
	A34=5	10,000	10,193	10,000	10,065	10,000	10,278	70,000	72,085
	A42=6	10,000	10,539	10,000	10,503	10,000	10,605	70,000	73,797
	A53=7	10,000	9,696	10,000	9,864	10,000	10,337	70,000	68,525
	A43=8	10,000	10,450	10,000	10,365	10,000	10,438	60,000	61,391
	B33=9	10,000	9,450	10,000	9,497	10,000	9,839	70,000	68,609
	A44=10	10,000	9,845	10,000	9,540	10,000	9,915	70,000	72,200
	B34=11	10,000	10,160	10,000	9,233	10,000	10,043	70,000	69,629
	A22=12	10,000	10,909	10,000	10,871	10,000	10,691	70,000	75,606
	B24=13	10,000	10,250	10,000	10,240	10,000	10,138	70,000	68,959
	B25=14	10,000	9,893	10,000	10,094	10,000	10,523	70,000	71,761
	A55=15	10,000	10,126	10,000	9,922	10,000	10,117	70,000	68,299
	B23=16	10,000	9,739	10,000	9,664	10,000	9,094	70,000	66,295
	B52=17	10,000	9,211	10,000	8,951	10,000	9,701	70,000	65,007
	B53=18	10,000	9,586	10,000	10,321	10,000	10,295	70,000	67,359
	SUM All		180,000	182,125	180,000	180,827	180,000	183,753	1,230,000
OUTPUT		129,996	131,531	129,996	130,593	129,996	132,706	888,306	896,472

Table C.2 Cheetah18 Line loading WW.14 ( After improvement)

Model	Cell	Sat		Sun		Mon		Tue	
		Target	Act	Target	Act	Target	Act	Target	Act
CHEETAH18	A23=1	10,900	10,988			10,900	11,230	10,900	11,150
	A24=2	10,900	11,408			10,900	11,278	10,900	11,057
	A32=3	10,900	10,905			10,900	10,965	10,900	11,018
	A33=4	10,900	11,497			10,900	11,220	10,900	11,314
	A34=5	10,900	11,482			10,900	10,777	10,900	10,685
	A42=6	10,900	11,456			10,900	10,383	10,900	10,328
	A43=8	10,900	11,251			10,900	11,339	10,900	11,347
	A22=12	10,900	11,255			10,900	11,260	10,900	11,336
	B24=13	10,900	11,421			10,900	11,404	10,900	11,398
	B25=14	10,900	11,383			10,900	11,187	10,900	11,381
	B23=16	10,900	10,727			10,900	11,153	10,900	10,788
	Sum All	119,900	123,773	0	0	119,900	122,196	119,900	121,802
	Output	86,592	89,389	0	0	86,592	88,250	86,592	87,965
	Model	Cell	Wed		Thu		Fri		WTD
Target			Act	Target	Act	Target	Act	Target	Act
CHEETAH18	A23=1	10,900	11,300	10,900	11,400	10,900	10,695	65,400	66,763
	A24=2	10,900	11,387	10,900	11,301	10,900	10,731	65,400	67,162
	A32=3	10,900	11,208	10,900	11,293	10,900	10,620	65,400	66,009
	A33=4	10,900	11,387	10,900	11,418	10,900	10,959	65,400	67,795
	A34=5	10,900	10,661	7,267	6,854	10,900	9,336	61,767	59,795
	A42=6	10,900	11,068	10,900	11,498	10,900	11,019	65,400	65,752
	A43=8	10,900	11,311	10,900	11,343	10,900	10,493	65,400	67,084
	A22=12	10,900	11,444	10,900	11,450	10,900	10,930	65,400	67,675
	B24=13	10,900	11,487	10,900	11,473	10,900	10,612	65,400	67,795
	B25=14	10,900	11,496	10,900	11,528	10,900	10,714	65,400	67,689
	B23=16	10,900	10,891	10,900	11,059	10,900	10,407	65,400	65,025
	Sum All	119,900	123,640	116,267	120,617	119,900	116,516	715,767	728,544
	Output	86,592	89,293	83,968	87,110	86,592	84,148	516,927	526,154

## VITA



Kong Bhumaret was born on July 9, 1972 in Bangkok, Thailand. He obtained his Bachelor's Degree in Industrial Engineering from Sirinbhorn International Institute of Technology, Thammasat University in 1995 academic year. He continued his graduate in Engineering Management at the Regional Center for Manufacturing System Engineering at Chulalongkorn University in 1997.

He has been working with Seagate Technology Thailand as a Product Engineer since 1996. He is responsible for Process improvement including Manufacturing line capacity improvement, Non-value added reduction and Mechanical Yield improvement as a primary. Cheetah 18 product is one of his products that he has been closely involved as beginning to its completion.