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APPENDICES

APPENDIX A

THE RESULTS OF EFFECTS OF PARAMETERS ON THE DOWNWIND GROUND-LEVEL CONCENTRATION FOR WIND DIRECTION OF 228 AZIMUTH

A.1 The case of unchanged boundary condition.

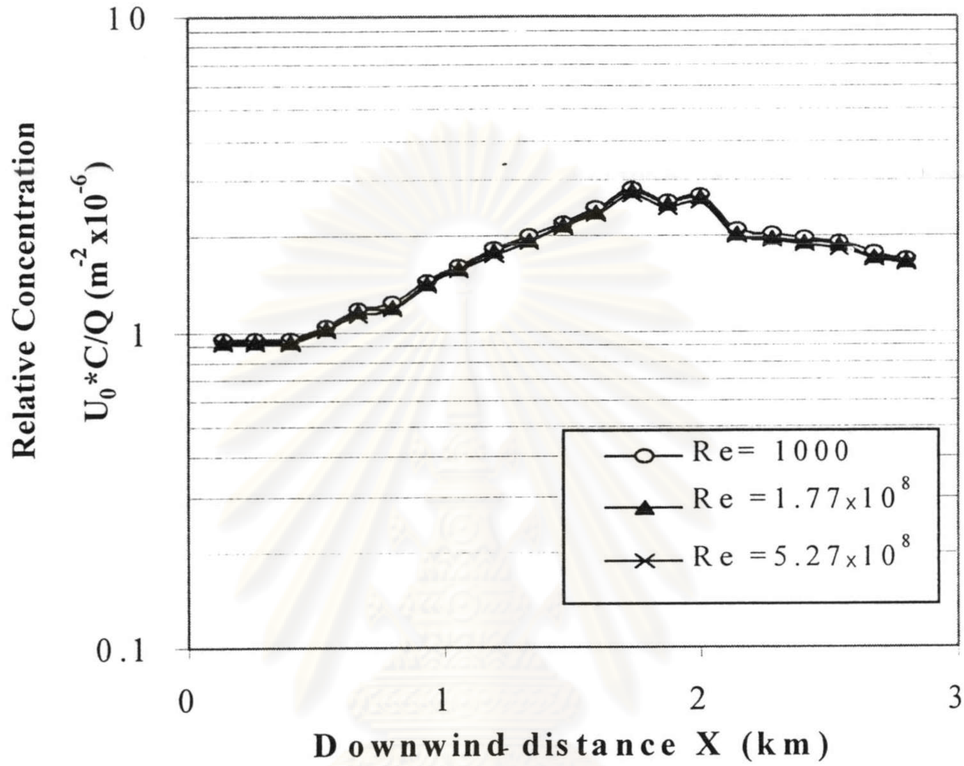


Figure A.1 Downwind ground-level concentration for wind direction of 228 deg. and various Reynold number with K_H=200 m^2/s, K_v=1 m^2/s, exponent of the power law=0.55

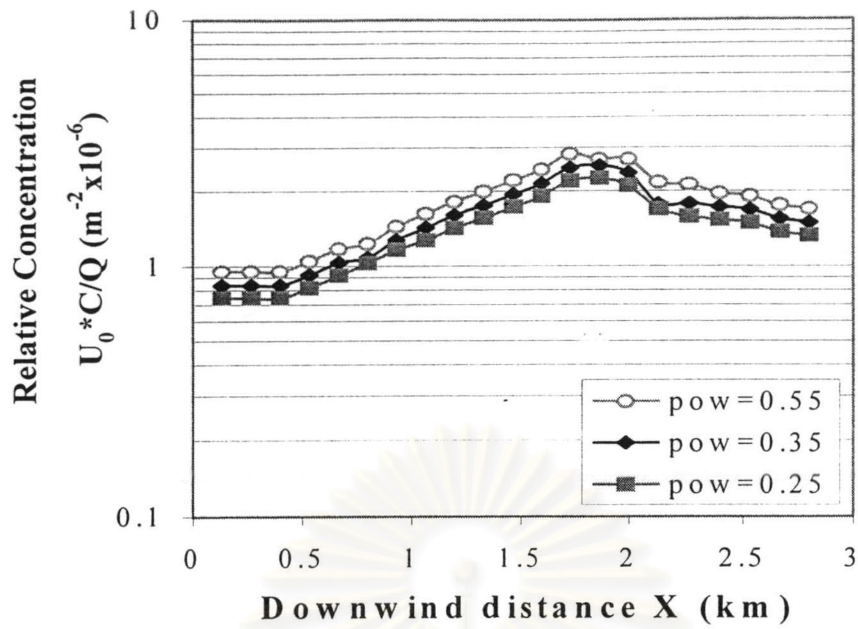


Figure A.2 Downwind ground-level concentrations of wind direction of 228 deg. and various exponents of the power law with Re=1000, K_H=200 m^2/s, K_v=1 m^2/s

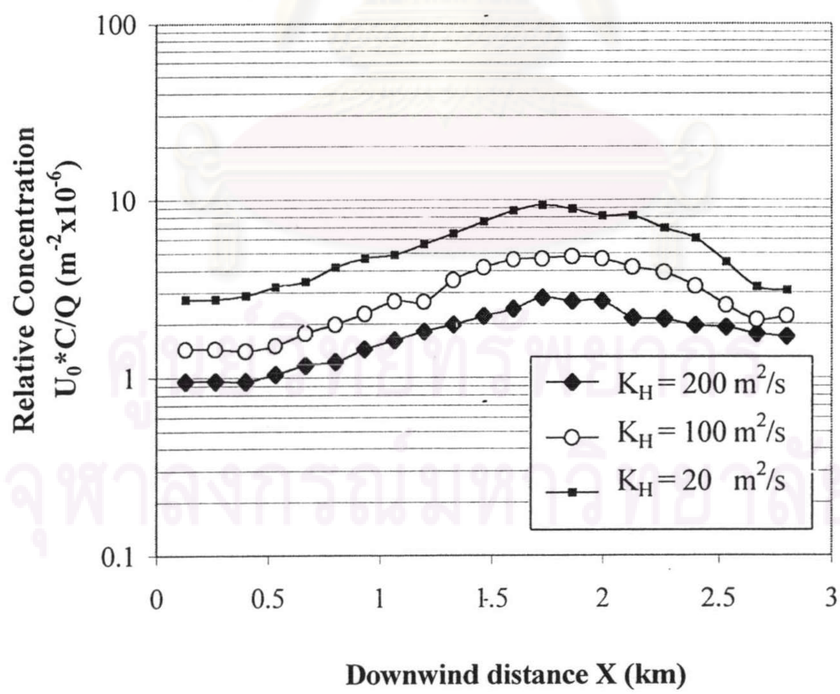


Figure A.3 Downwind ground-level concentration for wind direction of 192 deg and various horizontal dispersion coefficients with Re=1000, K_v=1 m^2/s, exponent of the power law=0.55.

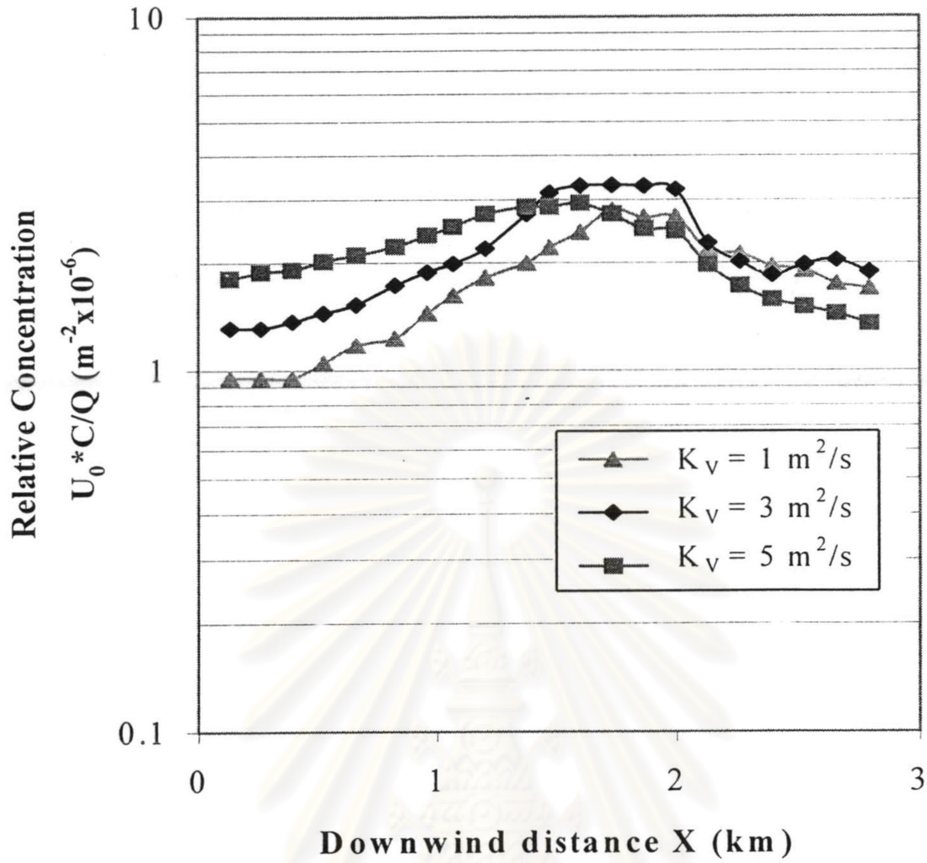


Figure A.4 Downwind ground-level concentration for wind direction of 228 deg. and various vertical dispersion coefficients with Re=1000, K_H=200 m^2/s, exponent of the power law=0.55.

A.2 The case of changed boundary condition.

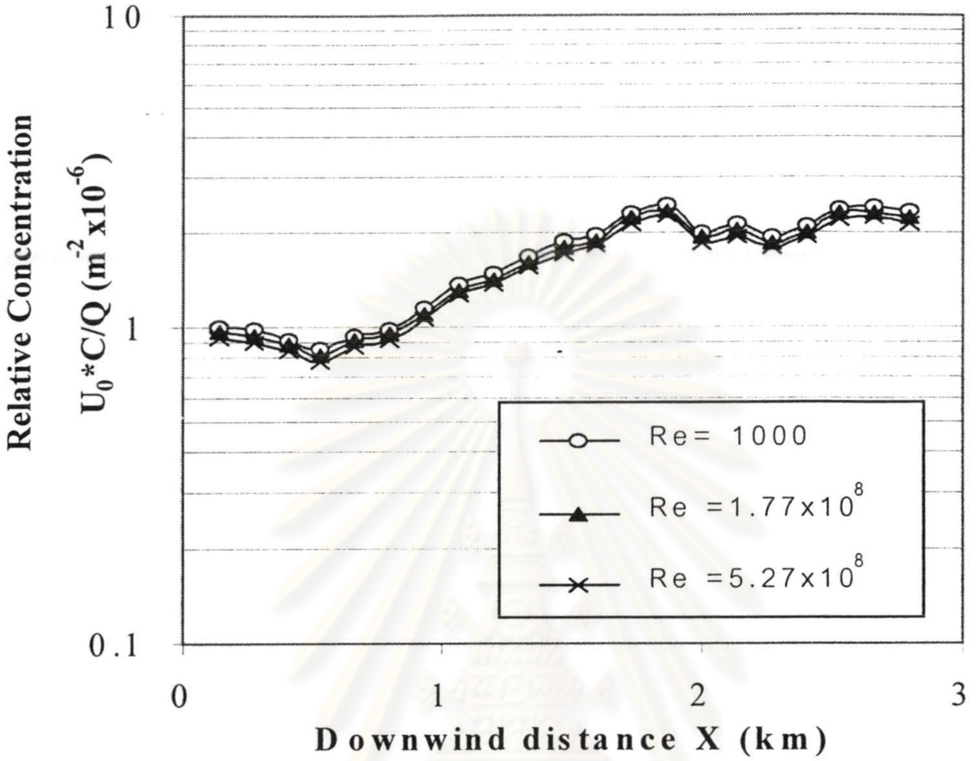


Figure A.5 Downwind ground-level concentration for wind direction of 228 deg. and various Reynold number with K_H=200, K_v=1, exponent of the power law=0.55 (Changed B.C.)

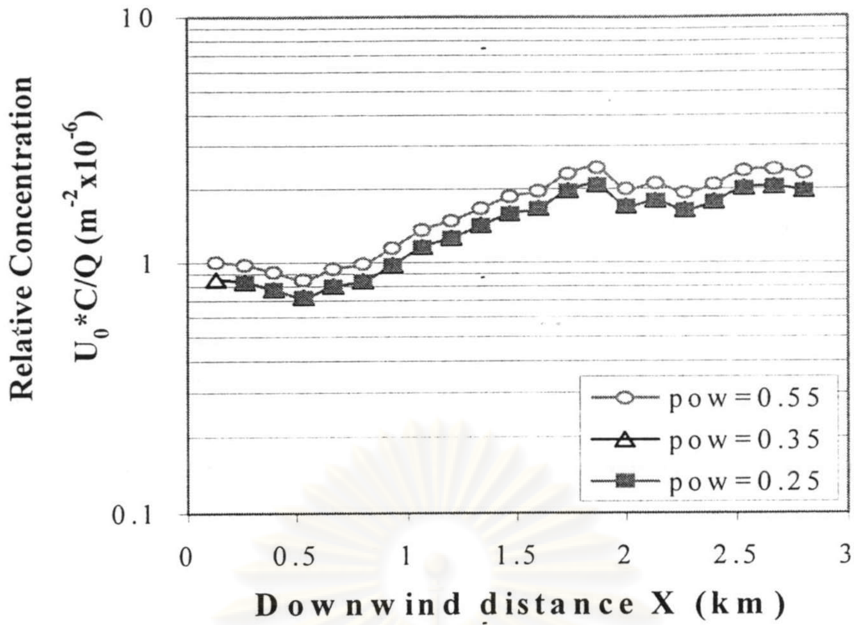


Figure A.6 Downwind ground-level concentrations of wind direction of 228 deg. and various exponents of the power law with Re=1000, K_H=200 m^2/s, K_v=1 m^2/s (Changed B.C.)

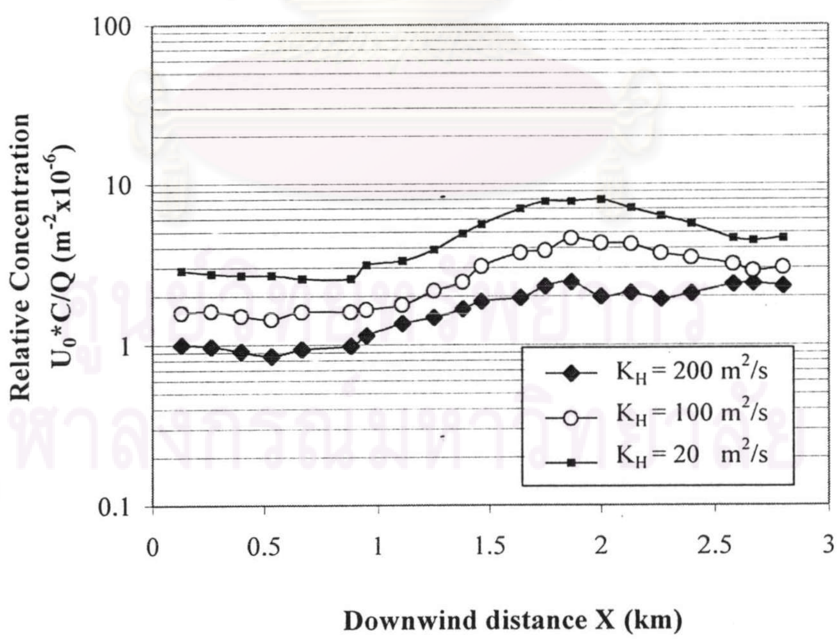


Figure A.7 Downwind ground-level concentration for wind direction of 192 deg and various horizontal dispersion coefficients with Re=1000, K_v=1 m^2/s, exponent of the power law=0.55. (Changed B.C.)

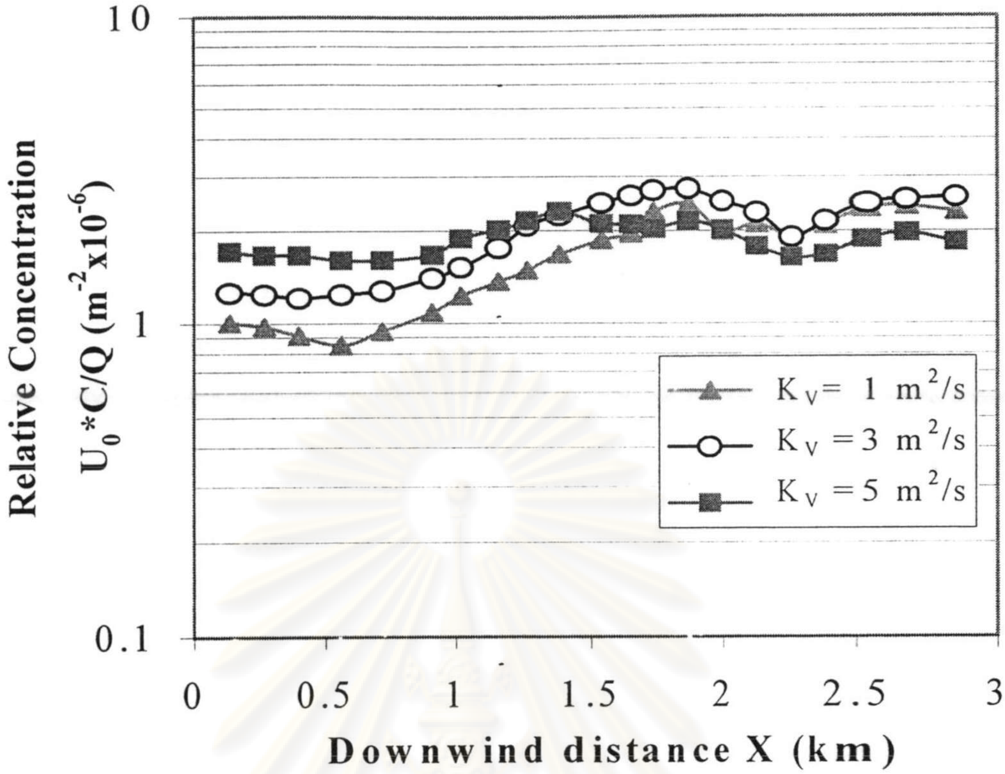


Figure A.8 Downwind ground-level concentration for wind direction of 228 deg. and various vertical dispersion coefficients with Re=1000, K_H=200 m^2/s, exponent of the power law=0.55. (Changed B.C.)

APPENDIX B

THE ESTIMATION OF EFFECTS USING YATES' METHOD

Instead of using the table of plus and minus signs to obtain the contrasts for the effect estimates and the sums of squares, a simple tabular algorithm devised by Yates' method, construct a table with the treatment combinations and the corresponding treatment totals recorded in standard order, which mean that each factor is introduced one at a time by combining it with all factor levels above it. Thus for a 2^2, the standard order is (1), *a, b, ab*, while for a 2^3 it is (1), *a, b, ab, c, ac, bc, abc.* Then follow this four-step procedure (Hines and Montgomery, 1990)

1. Label the adjacent column (1). Compute the entries in the top half of this column by adding the observation sin adjacent pairs. Compute the entries in the bottom half of this column by changing the sign of the first entry in each pair of the original observations and adding the adjacent pairs.

2. Label the adjacent column (2). Compute the column (2) using the entries in column (1). Follow the same procedure employed employed to generate column (1). Continue this process until k columns have been constructed. Column (k) contains the contrasts designated in the rows.

3. Calculate the sums of squares for the effects by squaring the entries in column k and dividing by 2^k for single replication.
4. Calculate the effect estimates by dividing the entries in column k by 2^{k-1} for single replication.

Accordingly, the estimated effect investigated in chapter 6 can be found easily as shown in Table E.1 to E. .

Table B.1 The estimated effect of the 2^5 factorial design using Yates' method at receptor P1

Treatment combination	Average Conc. (μg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
(1)	8.43	17.14	19.65	25.45	97.50	307.44	I	-	-
a	8.71	2.51	5.79	72.05	209.94	-37.48	A	-1.17	21.95
b	1.31	4.24	33.15	147.15	-1.19	-120.37	B	-3.76	226.39
ab	1.20	1.55	38.90	62.79	-36.29	-45.62	AB	-1.43	32.52
c	1.99	25.05	124.65	0.52	-24.52	-70.87	C	-2.21	78.49
ac	2.25	8.11	22.49	-1.71	-95.85	4.52	AC	0.14	0.32
bc	0.72	14.58	11.70	-32.14	-9.37	80,69	BC	2.52	101.73
abc	0.83	24.32	51.09	-4.15	-36.25	30.79	ABC	0.96	14.82
d	12.52	83.37	0.16	-17.32	-8.11	-37.75	D	-1.18	22.27
ad	12.53	41.28	0.36	-7.19	-62.76	25.77	AD	0.81	10.38
bd	6.43	18.44	-4.73	-56.48	7.96	27.24	BD	0.85	11.59
abd	1.68	4.05	3.03	-39.37	-3.43	50.38	ABD	1.57	39.67
cd	12.90	6.77	-29.38	-0.55	38.63	161.16	CD	5.04	405.83
acd	11.42	4.93	-2.76	-8.82	42.06	7.34	ACD	0.23	0.84
bcd	7.88	31.80	-1.16	-31.82	0.95	1.43	BCD	0.04	0.03
abcd	7.37	19.30	-2.99	-4.43	29.85	-23.56	ABCD	-0.74	8.67

Table B.1 (Cont.) The estimated effect of the 2^5 factorial design using Yates' method at receptor P1

Treatment combination	**Average Conc. (µg/m3)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**Treatment effect**	**Estimated effect $(5)/2^{k-1}$**	**Sum of squares**
e	41.68	0.28	-14.63	-13.86	46.60	112.44	E	3.51	197.55
ae	41.68	-0.12	-2.69	5.75	-84.35	-35.10	AE	-1.10	19.26
be	35.33	0.26	-16.94	-102.16	-2.22	-71.34	BE	-2.23	79.51
abe	5.95	0.10	9.75	39.40	28.00	-26.88	ABE	-0.84	11.29
ce	9.30	0.02	-42.09	0.19	10.13	-54.65	CE	-1.71	46.66
ace	9.14	-4.75	-14.39	7.76	17.11	-11.39	ACE	-0.36	2.03
bce	3.33	3.54	-26.87	-1.61	23.00	41.12	BCE	1.28	26.42
abce	0.72	-0.52	-12.50	-1.83	27.39	28.90	ABCE	0.90	13.05
de	2.76	0.00	-0.39	11.94	19.61	-130.96	DE	-4.09	267.96
ade	4.01	-29.38	-0.15	26.69	141.55	30.22	ADE	0.94	14.27
bde	3.67	-0.16	-4.77	27.69	7.57	6.98	BDE	0.22	0.76
abde	1.26	-2.60	-4.06	14.37	-0.22	4.39	ABDE	0.14	0.30
cde	16.46	1.26	-29.38	0.24	14.75	121.95	CDE	3.81	232.36
acde	15.34	-2.42	-2.44	0.71	-13.32	-7.79	ACDE	-0.24	0.95
bcde	10.59	-1.11	-3.67	26.94	0.47	-28.07	BCDE	-0.88	12.31
abcde	8.71	-1.87	-0.76	2.91	-24.03	-24.50	ABCDE	-0.77	9.38

Table B.2 The estimated effect of the 2^5 factorial design using Yates' method at receptor P2

Treatment combination	Average Conc. (μg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
(1)	0.55	1.12	2.04	3.32	10.15	30.49	I	-	-
a	0.57	0.92	1.27	6.83	20.35	-4.81	A	-0.15	0.36
b	0.44	0.74	4.39	12.45	-1.75	-5.66	B	-0.18	0.50
ab	0.48	0.54	2.44	7.89	-3.06	-3.64	AB	-0.11	0.21
c	0.34	2.17	8.18	0.12	0.13	-7.16	C	-0.22	0.80
ac	0.40	2.22	4.27	-1.87	-5.79	1.74	AC	0.05	0.05
bc	0.27	0.97	4.22	-1.79	-0.77	-0.17	BC	-0.01	0.00
abc	0.27	1.47	3.68	-1.27	-2.86	2.22	ABC	0.07	0.08
d	1.20	4.81	0.06	-0.41	-2.72	-1.04	D	-0.03	0.02
ad	0.97	3.37	0.06	0.54	-4.44	-1.47	AD	-0.05	0.03
bd	1.70	3.23	-1.42	-3.63	0.97	2.42	BD	0.08	0.09
abd	0.52	1.05	-0.45	-2.16	0.78	2.26	ABD	0.07	0.08
cd	0.51	3.00	-1.21	-0.04	0.45	2.18	CD	0.07	0.07
acd	0.46	1.22	-0.58	-0.73	-0.63	1.14	ACD	0.04	0.02
bcd	0.79	2.35	-0.88	-1.95	1.10	1.28	BCD	0.04	0.03
abcd	0.67	1.33	-0.40	-0.91	1.12	1.39	ABCD	0.04	0.03

Table B.2 (Cont.) The estimated effect of the 2^5 factorial design using Yates' method at receptor P2

Treatment combination	**Average Conc. (µg/m3)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**Treatment effect**	**Estimated effect $(5)/2^{k-1}$**	**Sum of squares**
e	2.41	0.02	-0.21	-0.77	3.52	10.20	E	0.32	1.62
ae	2.41	0.04	-0.20	-1.95	-4.56	-1.31	AE	-0.04	0.03
be	2.29	0.06	0.05	-3.90	-1.99	-5.92	BE	-0.19	0.55
abe	1.08	0.00	0.49	-0.54	0.52	-2.09	ABE	-0.07	0.07
ce	1.57	-0.23	-1.45	0.00	0.95	-1.72	CE	-0.05	0.05
ace	1.65	-1.18	-2.18	0.96	1.47	-0.19	ACE	-0.01	0.00
bce	0.85	-0.33	-1.14	0.30	1.22	-1.72	BCE	-0.05	0.05
abce	0.19	-0.12	-1.03	0.48	1.04	0.02	ABCE	0.00	0.00
de	1.52	0.00	0.01	0.01	-1.18	-8.07	DE	-0.25	1.02
ade	1.48	-1.21	-0.05	0.44	3.36	2.51	ADE	0.08	0.10
bde	1.02	0.08	-0.95	-0.73	0.96	0.52	BDE	0.02	0.00
abde	0.20	-0.66	0.21	0.11	0.18	-0.18	ABDE	-0.01	0.00
cde	1.24	-0.05	-1.21	-0.06	0.44	4.55	CDE	0.14	0.32
acde	1.11	-0.83	-0.74	1.16	0.84	-0.78	ACDE	-0.02	0.01
bcde	0.80	-0.13	-0.78	0.48	1.23	0.41	BCDE	0.01	0.00
abcde	0.53	-0.27	-0.13	0.64	0.17	-1.06	ABCDE	-0.03	0.02

Table B.3 The estimated effect of the 2^5 factorial design using Yates' method at receptor P3

Treatment combination	**conc (mg/m^3)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**Treatment effect**	**Estimated effect $(5)/2^{k-1}$**	**Sum of squares**
(1)	0.63	1.59	2.17	4.06	23.01	35.30	I	-	-
a	0.97	0.58	1.89	18.95	12.30	-13.25	A	-0.41	2.74
b	0.28	1.41	10.07	5.23	-8.90	29.81	B	0.93	13.88
ab	0.30	0.48	8.88	7.07	-4.35	-5.58	AB	-0.17	0.49
c	0.61	1.36	1.93	0.56	12.84	5.97	C	0.19	0.56
ac	0.80	8.70	3.30	-9.45	16.97	3.81	AC	0.12	0.23
bc	0.24	0.72	0.50	0.45	-1.65	3.82	BC	0.12	0.23
abc	0.24	8.16	6.57	-4.80	-3.93	7.65	ABC	0.24	0.91
d	0.72	1.35	0.36	-1.94	-1.47	16.73	D	0.52	4.37
ad	0.65	0.58	0.19	14.78	7.44	-15.25	AD	-0.48	3.64
bd	6.78	2.58	-4.93	-2.62	0.23	38.93	BD	1.22	23.68
abd	1.92	0.73	-4.53	19.59	3.58	-2.06	ABD	-0.06	0.07
cd	0.50	-4.14	0.25	-0.50	0.19	3.78	CD	0.12	0.22
acd	0.22	4.65	0.20	-1.15	3.63	-1.70	ACD	-0.05	0.05
bcd	4.30	-2.79	-2.72	-1.01	8.55	5.80	BCD	0.18	0.53
abcd	3.86	9.36	-2.07	-2.92	-0.90	10.39	ABCD	0.32	1.69

Table B.3 (Cont.) The estimated effect of the 2^5 factorial design using Yates' method at receptor P3

Treatment combinatio n	**conc (mg/m3)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**Treatment effect**	**Estimated effect $(5)/2^{k-1}$**	**Sum of squares**
e	0.67	0.34	-1.01	-0.28	14.89	-3.77	E	-0.12	0.22
ae	0.67	0.03	-0.93	-1.19	8.78	5.48	AE	0.17	0.47
be	0.17	0.19	7.34	1.37	-10.01	-1.46	BE	-0.05	0.03
abe	0.41	0.00	7.44	4.71	-4.31	-3.22	ABE	-0.10	0.16
ce	0.92	-0.07	-0.77	-0.17	16.72	7.56	CE	0.24	0.89
ace	1.65	-4.86	-1.85	0.40	16.63	2.83	ACE	0.09	0.13
bce	0.63	-4.08	4.65	2.44	-0.14	-4.92	BCE	-0.15	0.38
abce	0.10	-0.44	9.36	0.62	-2.85	-9.43	ABCE	-0.29	1.39
de	0.00	0.00	-0.31	0.09	-0.90	-6.11	DE	-0.19	0.58
ade	0.00	0.25	-0.19	0.10	3.34	5.71	ADE	0.18	0.51
bde	3.44	0.73	-4.79	-1.08	0.57	-0.10	BDE	0.00	0.00
abde	1.20	-0.53	3.64	4.71	-1.82	-2.71	ABDE	-0.08	0.11
cde	0.00	0.00	0.25	0.13	0.02	4.24	CDE	0.13	0.28
acde	0.00	-2.24	-1.25	8.43	5.79	-2.39	ACDE	-0.07	0.09
bcde	5.49	0.00	-2.24	-1.50	8.30	5.77	BCDE	0.18	0.52
abcde	3.87	-1.62	-1.62	0.62	2.12	-6.18	ABCDE	-0.19	0.60

Table B.4 The estimated effect of the 2^5 factorial design using Yates' method at receptor P4

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
(1)	2.02	4.47	5.14	7.20	7.34	33.28	I	-	-
a	2.44	0.67	2.06	0.14	25.94	-2.52	A	-0.06	0.10
b	0.32	1.75	0.14	24.96	0.52	-16.21	AB	-0.11	1.65
ab	0.36	0.32	0.00	0.98	-3.04	-4.18	ABC	0.11	0.27
c	0.81	0.00	18.75	0.61	-5.08	-16.73	ABCD	-0.05	4.37
ac	0.94	0.14	6.22	-0.09	-11.13	-0.15	ABCDE	-0.04	0.00
bc	0.14	0.00	0.98	-2.90	-0.58	3.94	ABCE	0.06	0.24
abc	0.17	0.00	0.00	-0.14	-3.60	2.40	ABD	0.24	0.09
d	0.00	13.07	0.46	-5.22	-3.22	-31.05	ABDE	0.01	15.06
ad	0.00	5.67	0.16	0.14	-13.51	2.06	ABE	-0.08	0.07
bd	0.12	5.46	-0.09	-12.11	-0.21	18.45	AC	0.00	5.32
abd	0.02	0.75	0.00	0.98	0.06	6.69	ACD	0.04	0.70
cd	0.00	0.00	-2.68	-0.48	2.22	14.49	ACDE	0.00	3.28
acd	0.00	0.98	-0.23	-0.09	1.72	0.62	ACE	0.02	0.01
bcd	0.00	0.00	-0.14	-3.46	0.37	-6.18	AD	0.08	0.60
abcd	0.00	0.00	0.00	-0.14	2.03	-1.93	ADE	0.12	0.06

Table B.4 (Cont.) The estimated effect of the 2^5 factorial design using Yates' method at receptor P4

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
e	6.54	0.42	-3.79	-3.08	-7.06	18.59	AE	-0.09	5.40
ae	6.54	0.04	-1.43	-0.14	-23.98	-3.56	B	-0.19	0.20
be	4.17	0.13	0.14	-12.53	-0.70	-6.05	BC	0.21	0.57
abe	1.50	0.03	0.00	-0.98	2.76	-3.03	BCD	-0.19	0.14
ce	2.59	0.00	-7.40	-0.30	5.36	-10.29	BCDE	-0.01	4.11
ace	2.87	-0.09	-4.71	0.09	13.09	0.26	BCE	0.05	0.00
bce	0.63	0.00	0.98	-0.08	3.37	1.35	BD	0.58	0.03
abce	0.12	0.00	0.00	0.14	3.32	1.66	BDE	0.27	0.04
de	0.00	0.00	-0.38	2.36	2.94	-16.92	BE	-0.13	4.47
ade	0.00	-2.68	-0.10	-0.14	11.55	3.46	C	-0.52	0.19
bde	0.56	0.28	-0.09	2.70	0.39	7.72	CD	0.58	0.93
abde	0.42	-0.51	0.00	-0.98	0.23	-0.05	CDE	0.45	0.00
cde	0.00	0.00	-2.68	0.28	-2.50	8.61	CE	-0.32	1.16
acde	0.00	-0.14	-0.79	0.09	-3.67	-0.17	D	-0.97	0.00
bcde	0.00	0.00	-0.14	1.89	-0.19	-1.17	DE	-0.53	0.02
abcde	0.00	0.00	0.00	0.14	-1.75	-1.56	E	-0.51	0.04

Table B.5 The estimated effect of the 2^5 factorial design using Yates' method at receptor P5

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
(1)	0.24	0.70	1.06	1.72	1.72	4.81	I	-	-
a	0.47	0.36	0.66	0.00	3.09	1.25	A	0.04	0.02
b	0.17	0.46	0.00	2.60	0.35	-1.07	B	-0.03	0.02
ab	0.19	0.20	0.00	0.49	0.90	-0.15	AB	0.00	0.00
c	0.19	0.00	1.35	0.35	-0.60	-1.00	C	-0.03	0.02
ac	0.27	0.00	1.25	0.00	-0.47	0.23	AC	0.01	0.00
bc	0.09	0.00	0.49	0.90	-0.27	-0.22	BC	-0.01	0.00
abc	0.11	0.00	0.00	0.00	0.12	-0.76	ABC	-0.02	0.01
d	0.00	0.84	0.25	-0.60	-0.40	-3.83	D	-0.12	0.23
ad	0.00	0.51	0.10	0.00	-0.59	-1.25	AD	-0.04	0.02
bd	0.00	0.82	0.00	-0.72	-0.16	1.57	BD	0.05	0.04
abd	0.00	0.43	0.00	0.25	0.39	-0.25	ABD	-0.01	0.00
cd	0.00	0.24	0.51	-0.27	0.09	0.02	CD	0.00	0.00
acd	0.00	0.25	0.39	0.00	-0.31	-0.23	ACD	-0.01	0.00
bcd	0.00	0.00	0.00	0.12	0.14	-0.28	BCD	-0.01	0.00
abcd	0.00	0.00	0.00	0.00	-0.90	0.76	ABCD	0.02	0.01

Table B.5 (Cont.) The estimated effect of the 2^5 factorial design using Yates' method at receptor P5

Treatment combination	**conc (mg/m3)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**Treatment effect**	**Estimated effect $(5)/2^{k-1}$**	**Sum of squares**
e	0.42	0.23	-0.34	-0.40	-1.72	1.36	E	0.04	0.03
ae	0.42	0.02	-0.25	0.00	-2.11	0.54	AE	0.02	0.00
be	0.00	0.08	0.00	-0.10	-0.35	0.13	BE	0.00	0.00
abe	0.51	0.01	0.00	-0.49	-0.90	0.40	ABE	0.01	0.00
ce	0.22	0.00	-0.33	-0.16	0.60	-0.19	CE	-0.01	0.00
ace	0.60	0.00	-0.39	0.00	0.97	0.54	ACE	0.02	0.00
bce	0.35	0.00	0.25	0.39	-0.12	-0.44	BCE	-0.01	0.00
abce	0.08	0.00	0.00	0.00	-0.12	-1.03	ABCE	-0.03	0.02
de	0.24	0.00	-0.21	0.09	0.40	-0.38	DE	-0.01	0.00
ade	0.00	0.51	-0.07	0.00	-0.39	-0.54	ADE	-0.02	0.00
bde	0.13	0.39	0.00	-0.06	0.16	0.37	BDE	0.01	0.00
abde	0.12	0.00	0.00	-0.25	-0.39	0.00	ABDE	0.00	0.00
cde	0.00	0.00	0.51	0.14	-0.09	-0.79	CDE	-0.02	0.01
acde	0.00	0.00	-0.39	0.00	-0.19	-0.54	ACDE	-0.02	0.00
bcde	0.00	0.00	0.00	-0.90	-0.14	-0.10	BCDE	0.00	0.00
abcde	0.00	0.00	0.00	0.00	0.90	1.03	ABCDE	0.03	0.02

Table B.6 The estimated effect of the 2^5 factorial design using Yates' method at receptor P6

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
(1)	0.00	0.00	0.07	0.16	11.03	32.74	I	-	-
a	0.00	0.06	0.09	10.87	21.71	-3.63	A	-0.11	0.21
b	0.03	0.00	6.16	0.17	-3.09	21.93	B	0.69	7.52
ab	0.03	0.09	4.72	21.55	-0.54	-5.47	AB	-0.17	0.47
c	0.00	3.17	0.03	0.01	1.99	-1.90	C	-0.06	0.06
ac	0.00	2.99	0.13	-3.10	19.94	1.56	AC	0.05	0.04
bc	0.04	1.34	11.06	-0.01	-0.61	2.10	BC	0.07	0.07
abc	0.04	3.37	10.49	-0.53	-4.86	5.06	ABC	0.16	0.40
d	1.69	-0.02	0.00	0.14	-1.42	32.10	D	1.00	16.10
ad	1.47	0.05	0.01	1.85	-0.48	-3.63	AD	-0.11	0.21
bd	2.46	-0.01	-2.14	0.21	1.19	21.22	BD	0.66	7.04
abd	0.53	0.14	-0.95	19.73	0.37	-5.44	ABD	-0.17	0.46
cd	0.72	0.73	0.06	0.00	2.23	-2.14	CD	-0.07	0.07
acd	0.63	10.34	-0.07	-0.61	-0.13	1.06	ACD	0.03	0.02
bcd	1.65	0.36	-0.32	-0.01	2.80	1.88	BCD	0.06	0.06
abcd	1.72	10.12	-0.20	-4.85	2.26	5.32	ABCD	0.17	0.44

Table B.6 (Cont.) The estimated effect of the 2^5 factorial design using Yates' method at receptor P6

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
e	0.00	0.00	0.06	0.02	10.72	11.25	E	0.35	1.98
ae	0.00	0.00	0.08	-1.44	21.89	2.00	AE	0.06	0.06
be	0.00	0.00	-0.18	0.09	-3.11	17.79	BE	0.56	4.94
abe	0.06	0.00	2.03	-0.97	-1.04	-3.72	ABE	-0.12	0.22
ce	0.00	-0.22	0.06	0.00	1.71	0.54	CE	0.02	0.00
ace	0.00	-1.92	0.14	1.19	19.38	0.03	ACE	0.00	0.00
bce	0.11	-1.02	9.90	0.71	-0.59	-2.93	BCE	-0.09	0.13
abce	0.03	0.07	9.68	0.51	-4.30	-0.92	ABCE	-0.03	0.01
de	0.00	0.00	0.00	0.02	-1.46	11.17	DE	0.35	1.95
ade	1.19	0.06	0.00	2.21	-1.05	2.06	ADE	0.06	0.07
bde	6.16	0.00	-1.70	0.09	1.19	17.68	BDE	0.55	4.88
abde	4.18	-0.08	1.09	-0.22	-0.20	-3.71	ABDE	-0.12	0.21
cde	0.00	1.19	0.06	0.01	2.18	0.40	CDE	0.01	0.00
acde	0.44	-1.97	-0.08	2.79	-0.31	-1.39	ACDE	-0.04	0.03
bcde	5.42	0.44	-3.16	-0.13	2.79	-2.49	BCDE	-0.08	0.10
abcde	4.70	-0.72	-1.15	2.01	2.14	-0.65	ABCDE	-0.02	0.01

Table B.7 The estimated effect of the 2^5 factorial design using Yates' method at receptor P7

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
(1)	0.17	0.33	0.43	0.79	0.79	2.58	I	-	-
a	0.15	0.11	0.36	0.00	1.79	-0.10	A	0.00	0.00
b	0.05	0.29	0.00	1.76	-0.01	-0.81	B	-0.03	0.01
ab	0.06	0.07	0.00	0.03	-0.09	0.06	AB	0.00	0.00
c	0.14	0.00	0.76	-0.01	-0.43	0.14	C	0.00	0.00
ac	0.15	0.00	1.00	0.00	-0.37	-0.22	AC	-0.01	0.00
bc	0.03	0.00	0.03	-0.11	0.02	-0.72	BC	-0.02	0.01
abc	0.04	0.00	0.00	0.03	0.04	-0.21	ABC	-0.01	0.00
d	0.00	0.31	-0.02	-0.43	-0.08	-2.53	D	-0.08	0.10
ad	0.00	0.45	0.01	0.00	0.22	0.15	AD	0.00	0.00
bd	0.00	0.78	0.00	-0.40	0.03	0.86	BD	0.03	0.01
abd	0.00	0.23	0.00	0.03	-0.25	0.00	ABD	0.00	0.00
cd	0.00	0.00	0.09	0.02	0.00	-0.94	CD	-0.03	0.01
acd	0.00	0.03	-0.20	0.00	-0.72	0.17	ACD	0.01	0.00
bcd	0.00	0.00	0.03	0.01	-0.03	0.67	BCD	0.02	0.01
abcd	0.00	0.00	0.00	0.03	-0.19	0.16	ABCD	0.01	0.00

Table B.7 (Cont.) The estimated effect of the 2^5 factorial design using Yates' method at receptor P7

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
e	0.15	-0.02	-0.22	-0.08	-0.79	1.00	E	0.03	0.02
ae	0.15	0.00	-0.22	0.00	-1.74	-0.08	AE	0.00	0.00
be	0.18	0.01	0.00	0.24	0.01	0.06	BE	0.00	0.00
abe	0.27	0.00	0.00	-0.03	0.14	0.02	ABE	0.00	0.00
ce	0.42	0.00	0.15	0.03	0.43	0.29	CE	0.01	0.00
ace	0.36	0.00	-0.55	0.00	0.43	-0.28	ACE	-0.01	0.00
bce	0.18	0.00	0.03	-0.23	-0.01	-0.69	BCE	-0.02	0.01
abce	0.05	0.00	0.00	-0.03	0.01	-0.16	ABCE	0.00	0.00
de	0.00	0.00	0.02	0.00	0.08	-0.19	DE	-0.01	0.01
ade	0.00	0.09	0.00	0.00	-0.27	0.13	ADE	0.00	0.00
bde	0.00	-0.06	0.00	-0.70	-0.03	-0.01	BDE	0.00	0.00
abde	0.03	-0.14	0.00	-0.03	0.20	0.03	ABDE	0.00	0.00
cde	0.00	0.00	0.09	-0.03	0.00	-0.34	CDE	-0.01	0.00
acde	0.00	0.03	-0.07	0.00	0.67	0.23	ACDE	0.01	0.00
bcde	0.00	0.00	0.03	-0.16	0.03	0.67	BCDE	0.02	0.01
abcde	0.00	0.00	0.00	-0.03	0.13	0.11	ABCDE	0.00	0.00

Table B.8 The estimated effect of the 2^5 factorial design using Yates' method at receptor P8

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
(1)	0.00	0.00	0.01	0.03	0.03	0.48	I	-	-
a	0.00	0.01	0.02	0.00	0.45	0.01	A	0.00	0.00
b	0.01	0.00	0.00	0.45	0.00	0.06	B	0.00	0.00
ab	0.01	0.02	0.00	0.00	0.01	-0.02	AB	0.00	0.00
c	0.00	0.00	0.19	0.00	0.03	0.08	C	0.00	0.00
ac	0.00	0.00	0.26	0.00	0.02	-0.02	AC	0.00	0.00
bc	0.01	0.00	0.00	0.01	0.00	-0.06	BC	0.00	0.00
abc	0.01	0.00	0.00	0.00	-0.02	-0.09	ABC	0.00	0.00
d	0.00	0.07	0.00	0.03	0.01	-0.48	D	-0.02	0.00
ad	0.00	0.12	0.00	0.00	0.07	-0.01	AD	0.00	0.00
bd	0.00	0.14	0.00	0.02	0.00	-0.06	BD	0.00	0.00
abd	0.00	0.12	0.00	0.00	-0.02	0.04	ABD	0.00	0.00
cd	0.00	0.00	0.04	0.00	0.00	-0.08	CD	0.00	0.00
acd	0.00	0.00	-0.02	0.00	-0.07	0.02	ACD	0.00	0.00
bcd	0.00	0.00	0.00	-0.02	0.00	0.06	BCD	0.00	0.00
abcd	0.00	0.00	0.00	0.00	-0.09	0.09	ABCD	0.00	0.00

Table B.8 (Cont.) The estimated effect of the 2^5 factorial design using Yates' method at receptor P8

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
e	0.04	0.00	0.02	0.01	-0.03	0.42	E	0.01	0.00
ae	0.04	0.00	0.02	0.00	-0.45	0.01	AE	0.00	0.00
be	0.04	0.00	0.00	0.07	0.00	-0.01	BE	0.00	0.00
abe	0.08	0.00	0.00	0.00	-0.01	-0.02	ABE	0.00	0.00
ce	0.06	0.00	0.05	0.00	-0.03	0.07	CE	0.00	0.00
ace	0.08	0.00	-0.02	0.00	-0.02	-0.02	ACE	0.00	0.00
bce	0.08	0.00	0.00	-0.02	0.02	-0.07	BCE	0.00	0.00
abce	0.04	0.00	0.00	0.00	0.02	-0.09	ABCE	0.00	0.00
de	0.00	0.00	0.00	0.00	-0.01	-0.42	DE	-0.01	0.00
ade	0.00	0.04	0.00	0.00	-0.07	-0.01	ADE	0.00	0.00
bde	0.00	0.02	0.00	-0.07	0.00	0.01	BDE	0.00	0.00
abde	0.00	-0.04	0.00	0.00	0.02	0.00	ABDE	0.00	0.00
cde	0.00	0.00	0.04	0.00	0.00	-0.07	CDE	0.00	0.00
acde	0.00	0.00	-0.06	0.00	0.07	0.02	ACDE	0.00	0.00
bcde	0.00	0.00	0.00	-0.09	0.00	0.07	BCDE	0.00	0.00
abcde	0.00	0.00	0.00	0.00	0.09	0.09	ABCDE	0.00	0.00

Table B.9 The estimated effect of the 2^5 factorial design using Yates' method at receptor P9

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
(1)	0.00	0.00	0.01	0.03	0.03	0.48	I	-	-
a	0.00	0.01	0.02	0.00	0.45	0.01	A	0.00	0.00
b	0.01	0.00	0.00	0.45	0.00	0.06	B	0.00	0.00
ab	0.01	0.02	0.00	0.00	0.01	-0.02	AB	0.00	0.00
c	0.00	0.00	0.19	0.00	0.03	0.08	C	0.00	0.00
ac	0.00	0.00	0.26	0.00	0.02	-0.02	AC	0.00	0.00
bc	0.01	0.00	0.00	0.01	0.00	-0.06	BC	0.00	0.00
abc	0.01	0.00	0.00	0.00	-0.02	-0.09	ABC	0.00	0.00
d	0.00	0.07	0.00	0.03	0.01	-0.48	D	-0.02	0.00
ad	0.00	0.12	0.00	0.00	0.07	-0.01	AD	0.00	0.00
bd	0.00	0.14	0.00	0.02	0.00	-0.06	BD	0.00	0.00
abd	0.00	0.12	0.00	0.00	-0.02	0.04	ABD	0.00	0.00
cd	0.00	0.00	0.04	0.00	0.00	-0.08	CD	0.00	0.00
acd	0.00	0.00	-0.02	0.00	-0.07	0.02	ACD	0.00	0.00
bcd	0.00	0.00	0.00	-0.02	0.00	0.06	BCD	0.00	0.00
abcd	0.00	0.00	0.00	0.00	-0.09	0.09	ABCD	0.00	0.00

Table B.9 (Cont.) The estimated effect of the 2^5 factorial design using Yates' method at receptor P9

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
e	0.04	0.00	0.02	0.01	-0.03	0.42	E	0.01	0.00
ae	0.04	0.00	0.02	0.00	-0.45	0.01	AE	0.00	0.00
be	0.04	0.00	0.00	0.07	0.00	-0.01	BE	0.00	0.00
abe	0.08	0.00	0.00	0.00	-0.01	-0.02	ABE	0.00	0.00
ce	0.06	0.00	0.05	0.00	-0.03	0.07	CE	0.00	0.00
ace	0.08	0.00	-0.02	0.00	-0.02	-0.02	ACE	0.00	0.00
bce	0.08	0.00	0.00	-0.02	0.02	-0.07	BCE	0.00	0.00
abce	0.04	0.00	0.00	0.00	0.02	-0.09	ABCE	0.00	0.00
de	0.00	0.00	0.00	0.00	-0.01	-0.42	DE	-0.01	0.00
ade	0.00	0.04	0.00	0.00	-0.07	-0.01	ADE	0.00	0.00
bde	0.00	0.02	0.00	-0.07	0.00	0.01	BDE	0.00	0.00
abde	0.00	-0.04	0.00	0.00	0.02	0.00	ABDE	0.00	0.00
cde	0.00	0.00	0.04	0.00	0.00	-0.07	CDE	0.00	0.00
acde	0.00	0.00	-0.06	0.00	0.07	0.02	ACDE	0.00	0.00
bcde	0.00	0.00	0.00	-0.09	0.00	0.07	BCDE	0.00	0.00
abcde	0.00	0.00	0.00	0.00	0.09	0.09	ABCDE	0.00	0.00

Table B.10 The estimated effect of the 2^5 factorial design using Yates' method at receptor P10

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
(1)	0.02	0.06	0.24	0.41	0.41	5.60	I	-	-
a	0.03	0.18	0.17	0.00	5.20	-0.29	A	-0.01	0.00
b	0.09	0.07	0.00	5.20	0.04	-1.09	B	-0.03	0.02
ab	0.09	0.10	0.00	0.00	-0.32	-0.48	AB	-0.01	0.00
c	0.03	0.00	3.58	0.04	0.15	-2.02	C	-0.06	0.06
ac	0.04	0.00	1.62	0.00	-1.25	-0.09	AC	0.00	0.00
bc	0.05	0.00	0.00	-0.32	-0.01	-0.34	BC	-0.01	0.00
abc	0.05	0.00	0.00	0.00	-0.47	-0.02	ABC	0.00	0.00
d	0.00	2.04	0.02	0.15	-0.07	-5.60	D	-0.18	0.49
ad	0.00	1.54	0.02	0.00	-1.95	0.29	AD	0.01	0.00
bd	0.00	1.18	0.00	-1.25	0.01	1.09	BD	0.03	0.02
abd	0.00	0.44	0.00	0.00	-0.10	0.93	ABD	0.03	0.01
cd	0.00	0.00	-0.22	-0.01	-0.09	2.02	CD	0.06	0.06
acd	0.00	0.00	-0.10	0.00	-0.25	0.09	ACD	0.00	0.00
bcd	0.00	0.00	0.00	-0.47	0.00	0.34	BCD	0.01	0.00
abcd	0.00	0.00	0.00	0.00	-0.02	0.02	ABCD	0.00	0.00

Table B.10 (Cont.) The estimated effect of the 2^5 factorial design using Yates' method at receptor P10

Treatment combination	conc (mg/m3)	(1)	(2)	(3)	(4)	(5)	Treatment effect	Estimated effect $(5)/2^{k-1}$	Sum of squares
e	1.02	0.01	0.12	-0.07	-0.41	4.79	E	0.15	0.36
ae	1.02	0.01	0.03	0.00	-5.20	-0.36	AE	-0.01	0.00
be	0.88	0.02	0.00	-1.95	-0.04	-1.40	BE	-0.04	0.03
abe	0.66	0.01	0.00	0.00	0.32	-0.46	ABE	-0.01	0.00
ce	0.56	0.00	-0.50	0.01	-0.15	-1.88	CE	-0.06	0.06
ace	0.63	0.00	-0.75	0.00	1.25	-0.11	ACE	0.00	0.00
bce	0.31	0.00	0.00	-0.10	0.47	-0.24	BCE	-0.01	0.00
abce	0.13	0.00	0.00	0.00	0.47	-0.02	ABCE	0.00	0.00
de	0.00	0.00	0.00	-0.09	0.07	-4.79	DE	-0.15	0.36
ade	0.00	-0.22	-0.01	0.00	1.95	0.36	ADE	0.01	0.00
bde	0.00	0.07	0.00	-0.25	-0.01	1.40	BDE	0.04	0.03
abde	0.00	-0.17	0.00	0.00	0.10	0.00	ABDE	0.00	0.00
cde	0.00	0.00	-0.22	0.00	0.09	1.88	CDE	0.06	0.06
acde	0.00	0.00	-0.24	0.00	0.25	0.11	ACDE	0.00	0.00
bcde	0.00	0.00	0.00	-0.02	0.00	0.16	BCDE	0.00	0.00
abcde	0.00	0.00	0.00	0.00	0.02	0.02	ABCDE	0.00	0.00

APPENDIX C

THE ESTIMATION OF THE TREATMENT EFFECTS ON NORMAL PROBABILITY PAPER AND THE EFFECT OF FACTORS ON PREDICTED 45-MIN. AVERAGE CONCENTRATION AT REMAINING RECEPTOR POINTS

C.1 The estimation of the treatment effects on normal probability paper of remaining receptors

Table C.1 Ordered effect on the predicted 45-min. average concentration at receptor point P1 for the 2^5 factorial design

Order(q)	P_q	Treatment effect	Estimated effect
1	0.01613	DE	-4.0923
2	0.04839	B	-3.7615
3	0.08065	BE	-2.2292
4	0.11290	C	-2.2148
5	0.14516	CE	-1.7077
6	0.17742	AB	-1.4257
7	0.20968	D	-1.1797
8	0.24194	A	-1.1712
9	0.27419	AE	-1.0970
10	0.30645	BCDE	-0.8772
11	0.33871	ABE	-0.8400
12	0.37097	ABCDE	-0.7655
13	0.40323	ABCD	-0.7363
14	0.43548	ACE	-0.3560
15	0.46774	ACDE	-0.2434
16	0.50000	BCD	0.0447
17	0.53226	ABDE	0.1372
18	0.56452	AC	0.1413
19	0.59677	BDE	0.2181
20	0.62903	ACD	0.2295
21	0.66129	AD	0.8054
22	0.69355	BD	0.8511
23	0.72581	ABCE	0.9032
24	0.75806	ADE	0.9444
25	0.79032	ABC	0.9623
26	0.82258	BCE	1.2849
27	0.85484	ABD	1.5745
28	0.88710	BC	2.5215
29	0.91935	CDE	3.5138
30	0.95161	E	3.8109
31	0.98387	CD	5.0363

Table C.2 Ordered effect on the predicted 45-min. average concentration at receptor point P2 for the 2^5 factorial design

Order(q)	Pq	Treatment effect	Estimated effect
1	0.01613	DE	-0.2523
2	0.04839	C	-0.2238
3	0.08065	BE	-0.1851
4	0.11290	B	-0.1767
5	0.14516	A	-0.1504
6	0.17742	AB	-0.1136
7	0.20968	ABE	-0.0652
8	0.24194	CE	-0.0539
9	0.27419	BCE	-0.0538
10	0.30645	AD	-0.0459
11	0.33871	AE	-0.0410
12	0.37097	ABCDE	-0.0332
13	0.40323	D	-0.0326
14	0.43548	ACDE	-0.0244
15	0.46774	ACE	-0.0059
16	0.50000	ABDE	-0.0055
17	0.53226	BC	-0.0054
18	0.56452	ABCE	0.0007
19	0.59677	BCDE	0.0127
20	0.62903	BDE	0.0163
21	0.66129	ACD	0.0357
22	0.69355	BCD	0.0400
23	0.72581	ABCD	0.0435
24	0.75806	AC	0.0545
25	0.79032	CD	0.0682
26	0.82258	ABC	0.0693
27	0.85484	ABD	0.0705
28	0.88710	BD	0.0755
29	0.91935	ADE	0.0783
30	0.95161	CDE	0.1421
31	0.98387	E	0.3187

Table C.3 Ordered effect on the predicted 45-min. average concentration at receptor point P8 for the 2^5 factorial design

Order(q)	Pq	Treatment effect	Estimated effect
1	0.01613	D	-0.0152
2	0.04839	DE	-0.0132
3	0.08065	ABCE	-0.0029
4	0.11290	ABC	-0.0028
5	0.14516	CD	-0.0025
6	0.17742	BCE	-0.0022
7	0.20968	CDE	-0.0022
8	0.24194	BC	-0.0020
9	0.27419	BD	-0.0018
10	0.30645	ACE	-0.0008
11	0.33871	AB	-0.0007
12	0.37097	ABE	-0.0006
13	0.40323	AC	-0.0006
14	0.43548	ADE	-0.0005
15	0.46774	AD	-0.0004
16	0.50000	BE	-0.0002
17	0.53226	ABDE	0.0000
18	0.56452	BDE	0.0002
19	0.59677	A	0.0004
20	0.62903	AE	0.0005
21	0.66129	ACD	0.0006
22	0.69355	ACDE	0.0008
23	0.72581	ABD	0.0013
24	0.75806	B	0.0018
25	0.79032	BCD	0.0020
26	0.82258	CE	0.0022
27	0.85484	BCDE	0.0023
28	0.88710	C	0.0025
29	0.91935	ABCD	0.0028
30	0.95161	ABCDE	0.0029
31	0.98387	E	0.0132

Table C.4 Ordered effect on the predicted 45-min. average concentration at receptor point P10 for the 2^5 factorial design

Order(q)	Pq	Treatment effect	Estimated effect
1	0.01613	D	-1.4206
2	0.04839	DE	-1.2586
3	0.08065	C	-0.9479
4	0.11290	CE	-0.7586
5	0.14516	B	-0.5407
6	0.17742	BE	-0.5337
7	0.20968	AB	-0.2401
8	0.24194	BCD	-0.2376
9	0.27419	ABE	-0.1913
10	0.30645	BCDE	-0.1893
11	0.33871	A	-0.1779
12	0.37097	AE	-0.1762
13	0.40323	ABCDE	-0.1199
14	0.43548	ABCD	-0.0908
15	0.46774	ACDE	-0.0187
16	0.50000	ABDE	0.0015
17	0.53226	AC	0.0100
18	0.56452	ACE	0.0115
19	0.59677	ACD	0.0230
20	0.62903	ABCE	0.0893
21	0.66129	AD	0.1024
22	0.69355	ABC	0.1459
23	0.72581	BCE	0.1821
24	0.75806	ADE	0.2021
25	0.79032	BC	0.2209
26	0.82258	ABD	0.3975
27	0.85484	BDE	0.4745
28	0.88710	BD	0.6068
29	0.91935	CDE	0.8152
30	0.95161	CD	0.9099
31	0.98387	E	1.2007

Table C.5 Ordered effect on the predicted 45-min. average concentration at receptor point P11 for the 2^5 factorial design

Order(q)	Pq	Treatment effect	Estimated effect
1	0.01613	D	-0.1978
2	0.04839	DE	-0.1543
3	0.08065	C	-0.0747
4	0.11290	CE	-0.0638
5	0.14516	BE	-0.0444
6	0.17742	ABE	-0.0211
7	0.20968	AB	-0.0200
8	0.24194	AE	-0.0145
9	0.27419	A	-0.0110
10	0.30645	B	-0.0071
11	0.33871	BCDE	-0.0062
12	0.37097	BC	-0.0058
13	0.40323	ABC	-0.0049
14	0.43548	AC	-0.0048
15	0.46774	ACE	-0.0045
16	0.50000	ABCE	-0.0038
17	0.53226	ABDE	0.0000
18	0.56452	BCE	0.0008
19	0.59677	ABCDE	0.0038
20	0.62903	ACDE	0.0045
21	0.66129	ACD	0.0048
22	0.69355	ABCD	0.0049
23	0.72581	BCD	0.0058
24	0.75806	BD	0.0071
25	0.79032	AD	0.0110
26	0.82258	ADE	0.0145
27	0.85484	ABD	0.0412
28	0.88710	BDE	0.0444
29	0.91935	CDE	0.0638
30	0.95161	CD	0.0747
31	0.98387	E	0.1543

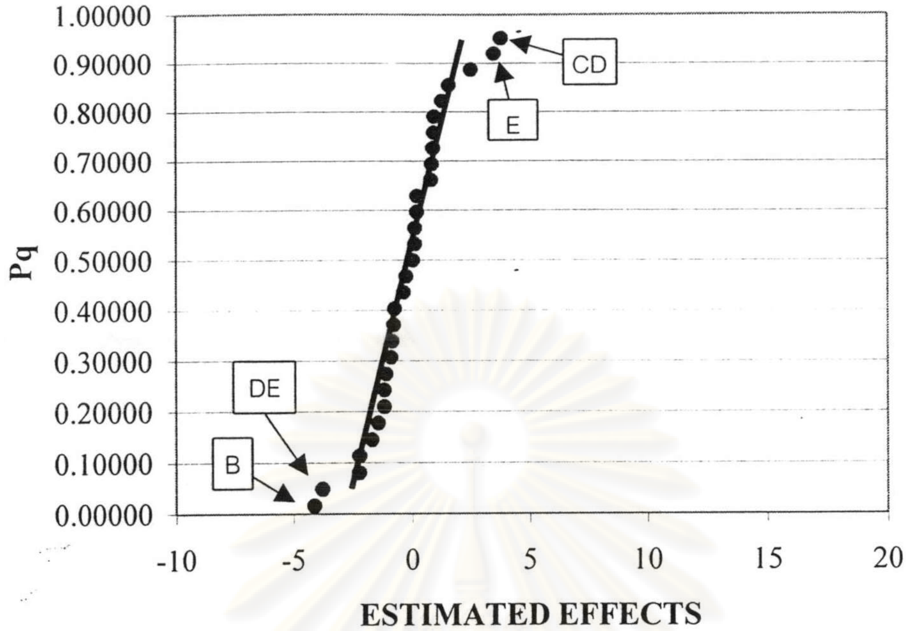


Figure C.1 The plot of the ordered effects on the predicted 45-min. average concentration at P1 on normal probability paper in the case of the 2^5 factorial design

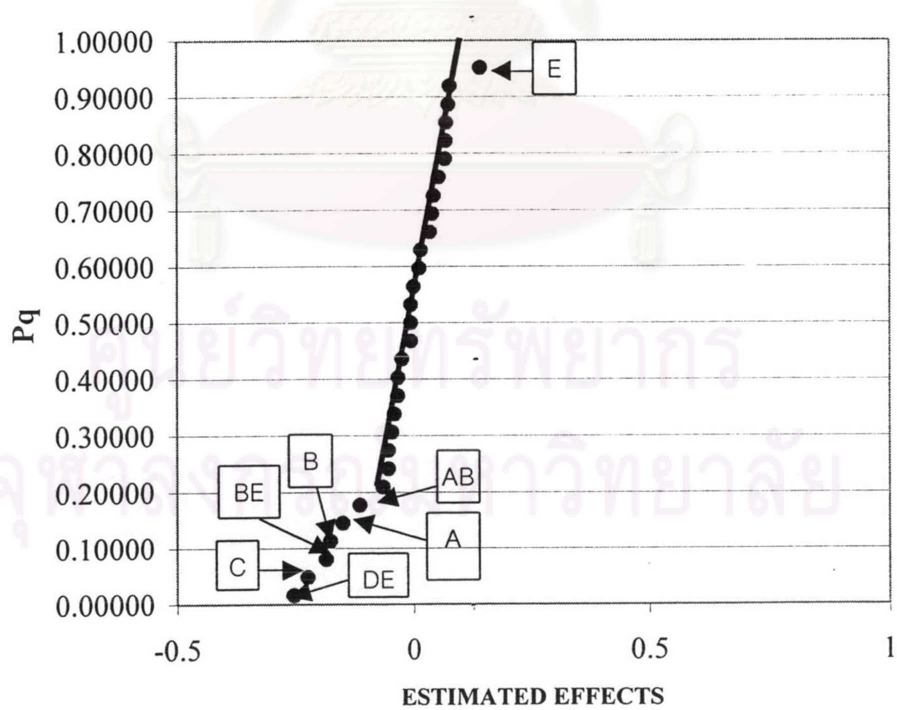


Figure C.2 The plot of the ordered effects on the predicted 45-min. average concentration at P2 on normal probability paper in the case of the 2^5 factorial design

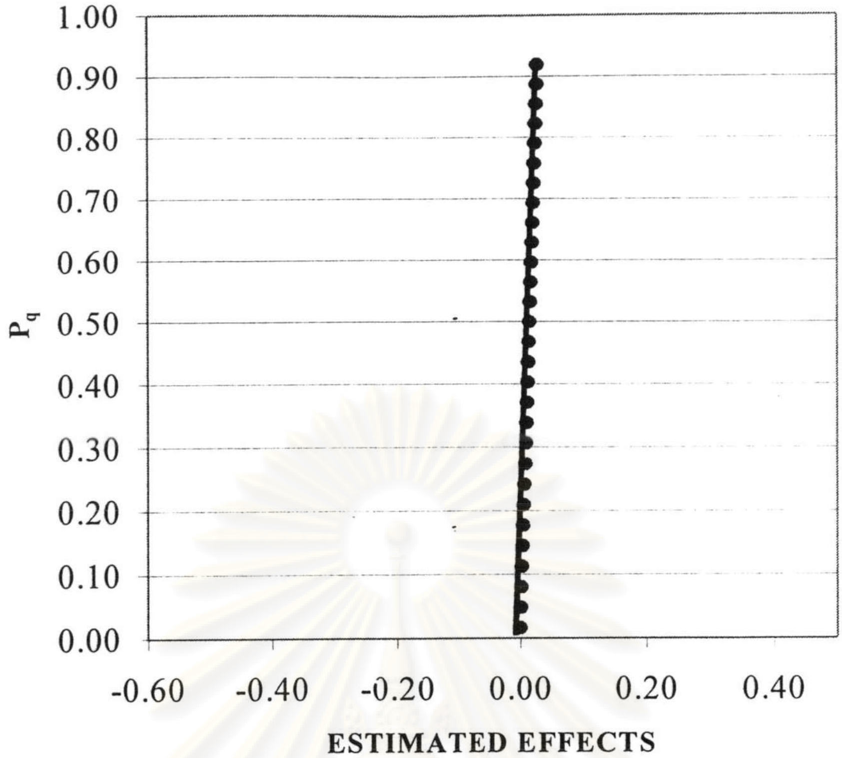


Figure C.3 The plot of the ordered effects on the predicted 45-min. average concentration at P8 on normal probability paper in the case of the 2^5 factorial design

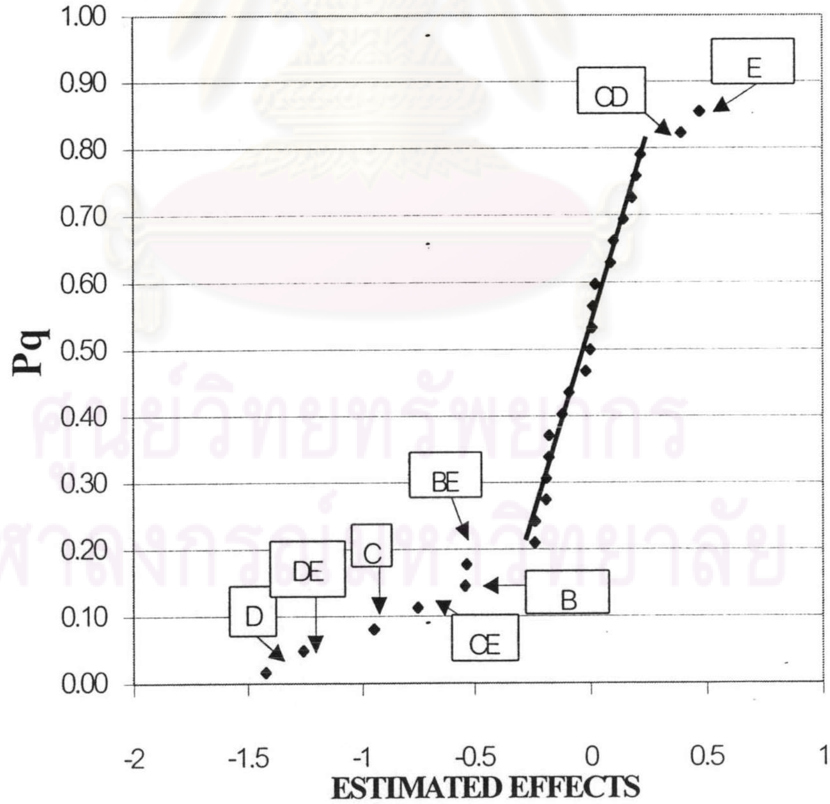


Figure C.4 The plot of the ordered effects on the predicted 45-min. average concentration at P10 on normal probability paper in the case of the 2^5 factorial design

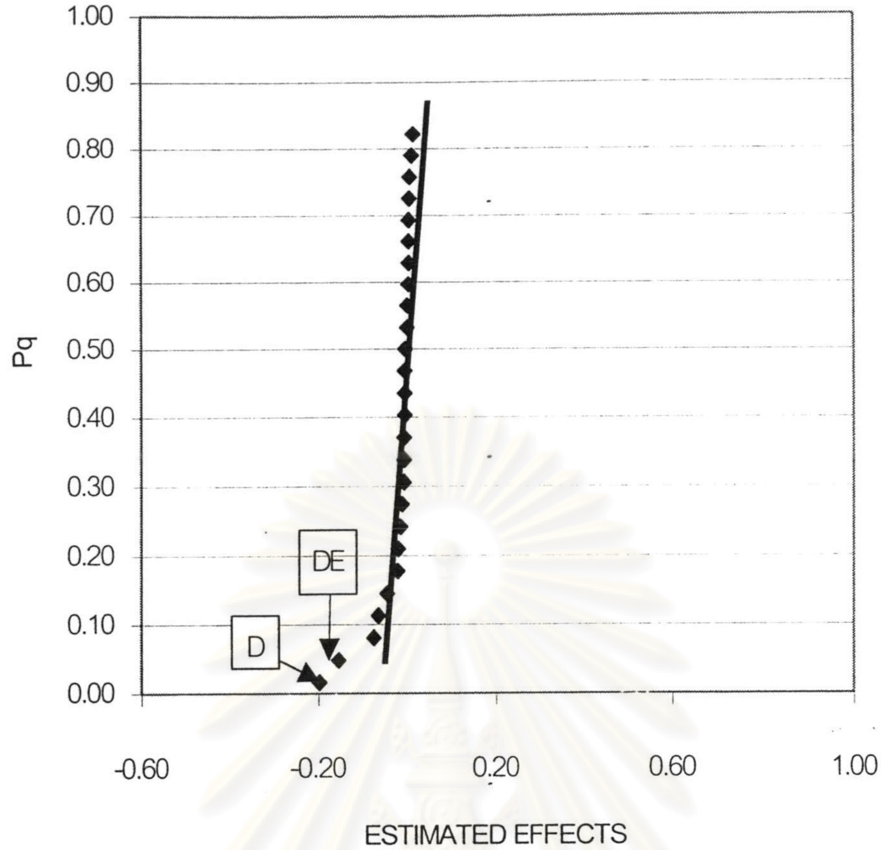


Figure C.5 The plot of the ordered effects on the predicted 45-min. average concentration at P11 on normal probability paper in the case of the 2^5 factorial design

C.2 The effect of factors

C.2.1. The effect of K_H

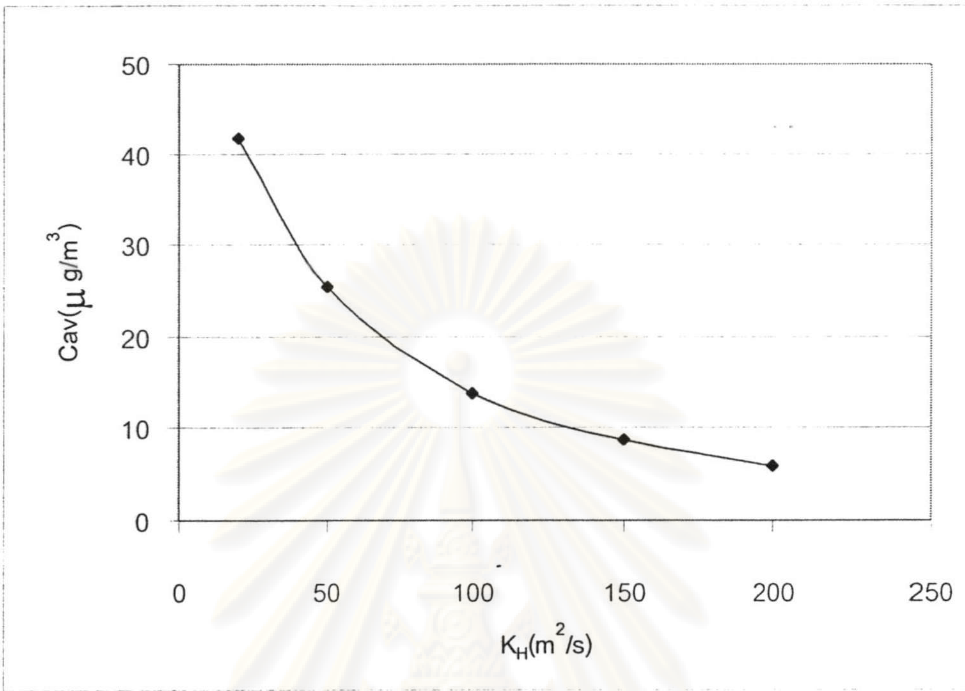


Figure C.6 Effect of horizontal dispersion coefficient (K_H) on predicted average concentration in 45 min at P1

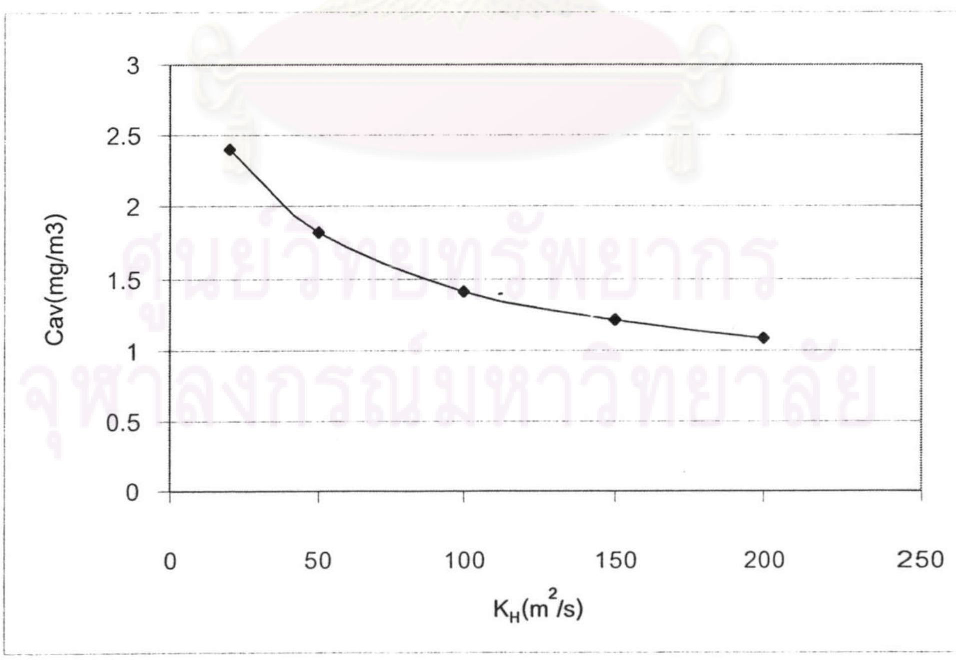


Figure C.7 Effect of horizontal dispersion coefficient (K_H) on predicted average concentration in 45 min at P2

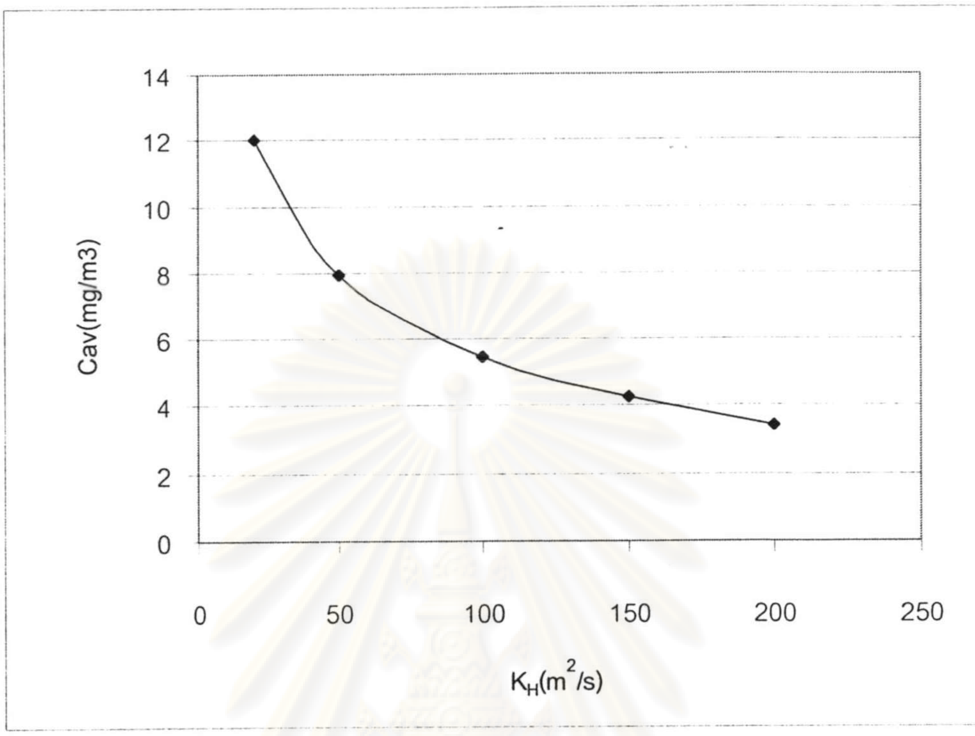


Figure C.8 Effect of horizontal dispersion coefficient (K_H) on predicted average concentration in 45 min at P10

C.2.2. Interactive effect of horizontal dispersion coefficient (K_H) and wind speed

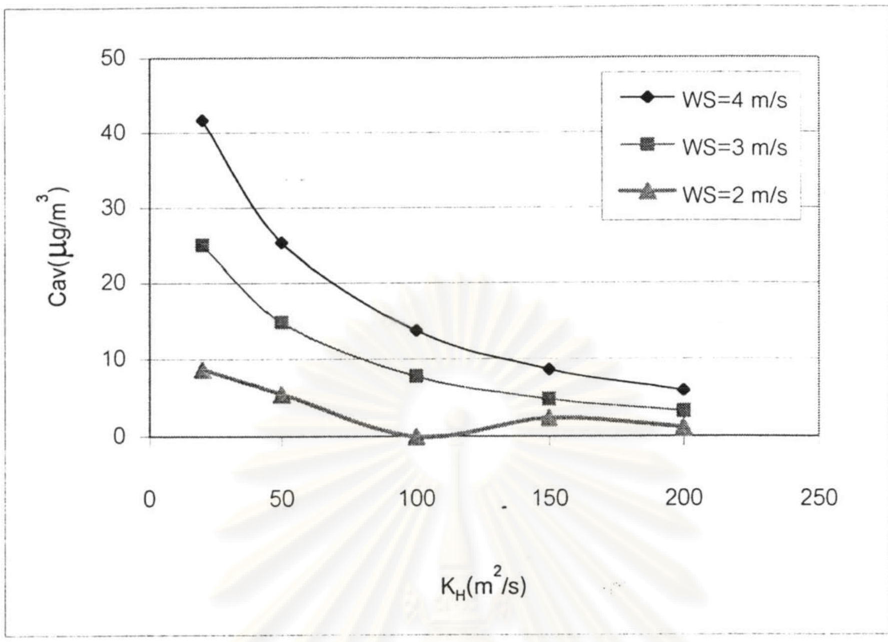


Figure C.9 Effect of K_H on predicted average concentration in 45 min at P1 at various wind speeds

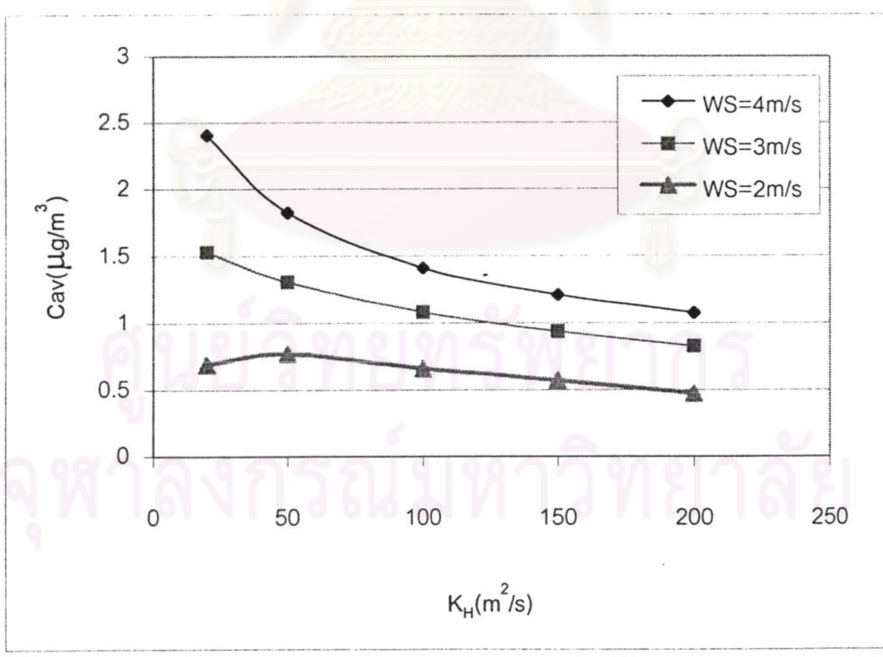


Figure C.10 Effect of K_H on predicted average concentration in 45 min at P2 in various wind speeds

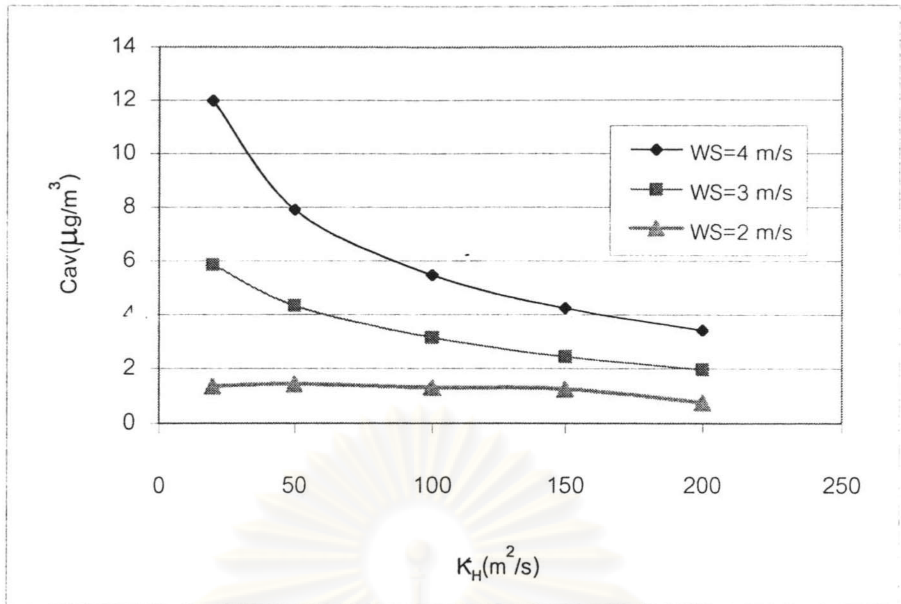


Figure C.11 Effect of K_H on predicted average concentration in 45 min at P11 at various wind speeds

C.2.3. Interactive effect of wind direction and wind speed

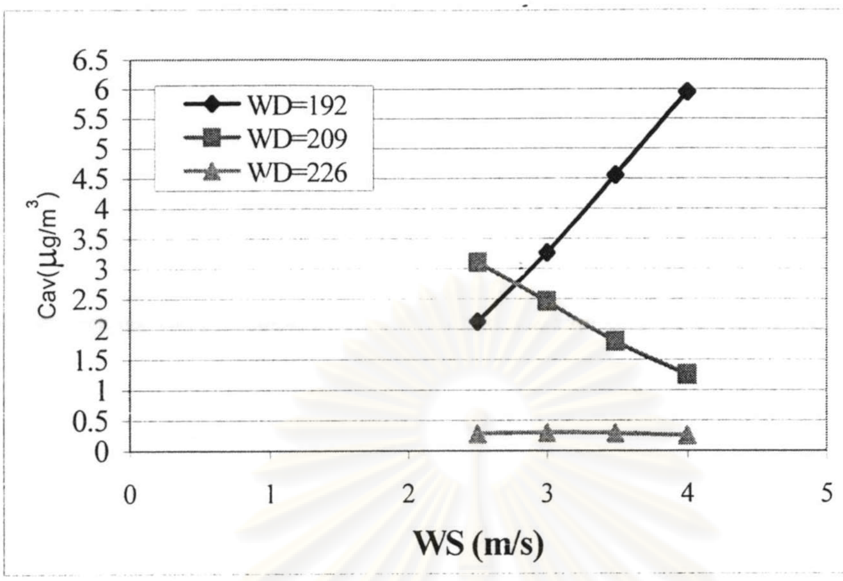


Figure C.12 Effect of WD on predicted average concentration in 45 min at P1 at various wind directions

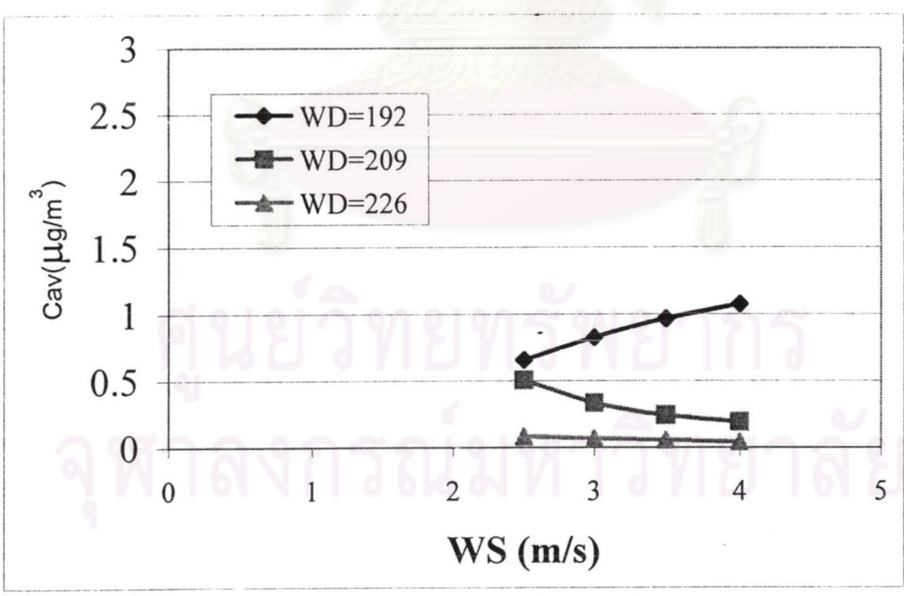


Figure C.13 Effect of WD on predicted average concentration in 45 min at P2 at various wind directions

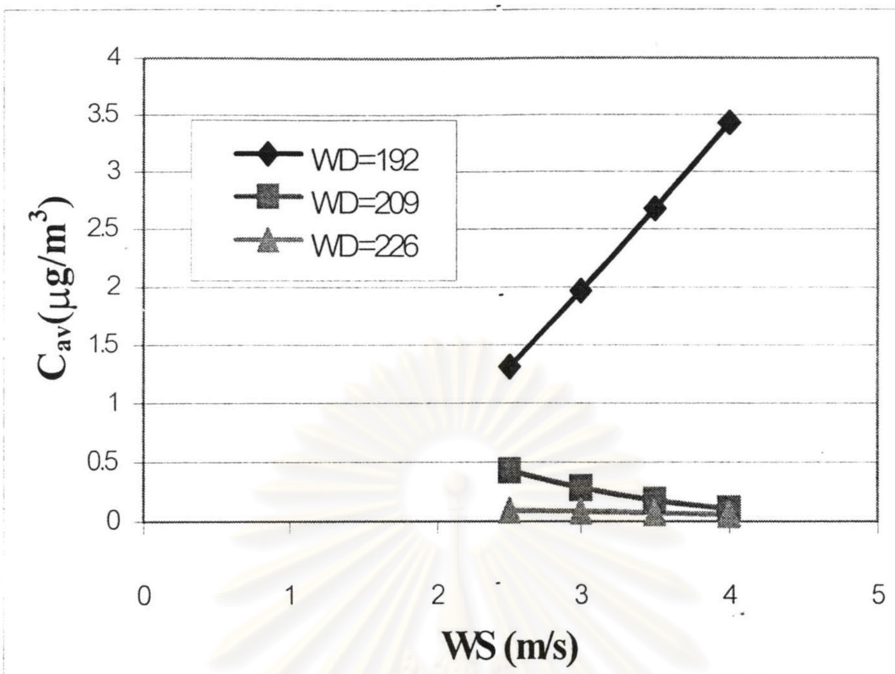


Figure C.14 Effect of WD on average concentration in 45 min at P10 at various wind directions

C.3 The Analysis of variance (ANOVA)

The ANOVA method is the other alternative for estimation of the effects of the factors. For this method, sum of square, degree of freedom, mean squares and F_0 are necessary in order to analyze with F distribution (Montgomery, 1984). The examples of analysis of variance of the 2^4 design at receptor P3 can be obtained as shown in Table C.6

TableC.6 Analysis of variance of the 2^4 design for effect of factor on the predicted 45-min. average concentration at receptor P3

Effect	Sum of Squares	Degree of Freedom	Mean Squares	F_0
A	2.74	1	2.74	1.32
B	13.88	1	13.88	6.70*
D	4.37	1	4.37	2.11*
E	1.79	1	1.79	0.86
AB	0.49	1	0.49	0.23
AD	3.64	1	3.64	1.76*
AE	0.32	1	0.32	0.16
BD	23.68	1	23.68	11.43*
BE	0.27	1	0.27	0.13
DE	2.66	1	2.66	1.28
Error	*10.359*	5	2.07	1.00
Total	64.201	15		

Since the varied significance of the system, α, will change the significant effects, we focused on the situation with the differently significance, say, at $\alpha = 0.05$ and 0.25, as follows:

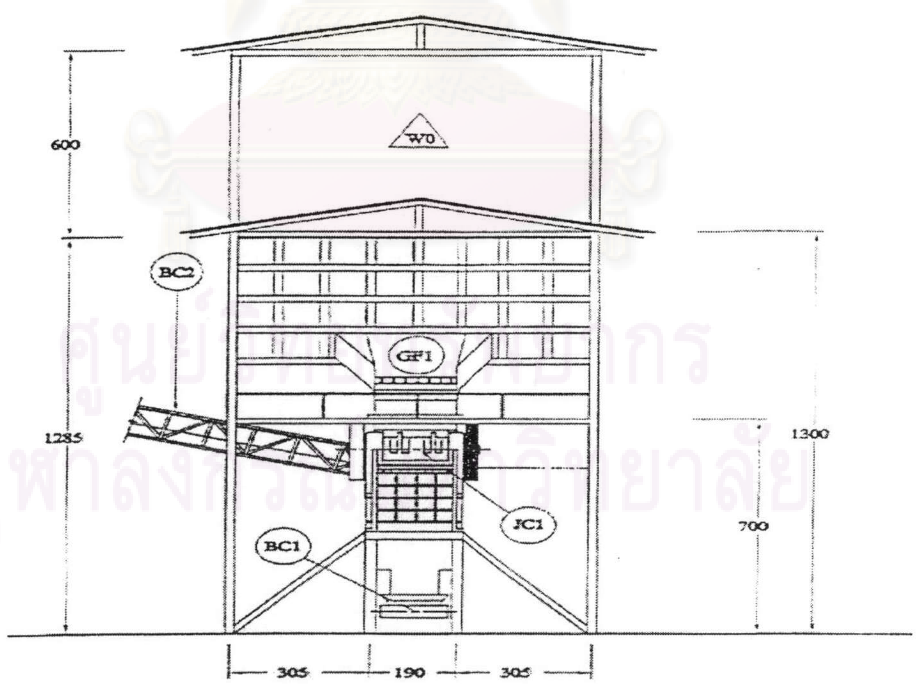
For $F_{0.05, 1, 5} = 6.61$, the significant effects are B, and BD interaction, say horizontal dispersion coefficient and interaction between horizontal dispersion coefficient and wind direction.

For $F_{0.25, 1, 5} = 1.69$, the significant effects are B, D, AD, and BD interaction, say horizontal dispersion coefficient, wind direction, interaction between the exponent of the power law and wind direction and interaction between horizontal dispersion coefficient and wind direction.

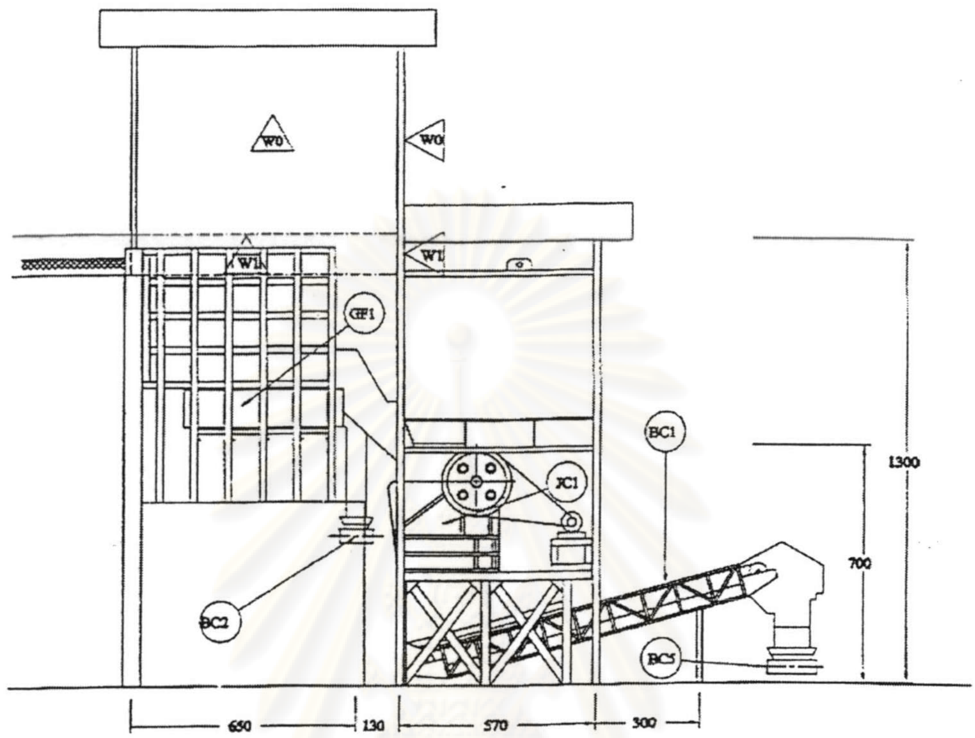
APPENDIX D

THE DIMENSIONS OF SURVEYED TYPICAL STONE PROCESSING CLOSED AREA

Figures D.1 (a) and (b) illustrates the dimensions of surveyed typical stone-processing closed area (Meechumna, P., et al., 1999) that the main crushing process occurs. The approximated dimension of this closed area is 16.5 m. x 8.0 m, therefore, the rectangular area is 132 m^2. In this study, for stack height or release height, it is assumed to be about 10 meter above ground, which is about a half length of average height of crushing plant in general (20 m). Besides, the height of stockpile, where the final stone products are dumped, is about 10 meter.



Figures D.1 (a) the dimensions of front view of representative stone processing plant



Figures D.1 (b) the dimensions of sidet view of representative stone processing plant

APPENDIX E

CALCULATION OF EMISSION RATE

E.1 Emission Factor of Stone Processing Operations

Emission factors provided by U.S. EPA. for filterable PM and PM_{10} emissions from crushed stone processing operations are presented in Tables E 1.1. This emission factor is employed to calculate PM_{10} emission rate in this study. However, the U.S.EPA Ap-42 document has not been concluded and indicated emission factors in some cases. Consequently, present study used some of the developed emission factors for Saburi stone processing provided by Meechumna, P. et al. as shown in Table E 1.2.

Table E.1.1 Emission factors for crushed stone processing operations[a] (kg/ton)

Source [b]	Total Particulate Matter	EMISSION FACTOR RATING	Total PM-10 [c]	EMISSION FACTOR RATING
Screening (SCC 3-05-020-02,-03)	— [d]		0.0076 [e]	C
Screening (controlled) (SCC 3-05-020-02-03)	— [d]		0.00042 [e]	C
Primary crushing (SCC 3-05-020-01)	0.00035[f]	E	ND [g]	
Secondary crushing (SCC 3-05-020-02)	ND		ND [g]	
Tertiary crushing (SCC 3-05-020-03)	— [d]		0.0012 [h]	C
Primary crushing (controlled) (SCC 3-05-020-01)	ND		ND [g]	
Secondary crushing (controlled) (SCC 3-05-020-02)	ND		ND [g]	
Tertiary crushing (controlled) (SCC 3-05-020-03)	— [d]		0.00029 [h]	C
Fines crushing j (SCC 3-05-020-05)	— [d]		0.0075	E
Fines crushing (controlled)j (SCC 3-05-020-05)	— [d]		0.0010	E
Fines screening j (SCC 3-05-020-21)	— [d]		0.036	E
Fines screening (controlled)j (SCC 3-05-020-21)	— [d]		0.0011	E
Conveyor transfer point k (SCC 3-05-020-06)	— [d]		0.00072	D
Conveyor transfer point (controlled)k (SCC 3-05-020-06)	— [d]		2.4×10^{-5}	D
Wet drilling: unfragmented stone m (SCC 3-05-020-10)	ND		4.0×10^{-5}	E

Table E.1.1 Emission factors for crushed stone processing operations[a] (kg/ton) (Cont.)

Source [b]	Total Particulate Matter	EMISSION FACTOR RATING	Total PM-10 [c]	EMISSION FACTOR RATING
Truck unloading: fragmented stone m (SCC 3-05-020-31)	ND	-	8.0×10^{-6}	E
Truck loading—conveyor: crushed stone n (SCC 3-05-020-32)	ND	-	5.0×10^{-5}	E

[a] Emission factors represent uncontrolled emissions unless noted. Emission factors in kg/Mg of material throughput, SCC = Source Classification Code. ND = no data.

[b] Controlled sources (with wet suppression) are those that are part of the processing plant that employs current wet

suppression technology similar to the study group. The moisture content of the study group without wet suppression systems operating (uncontrolled) ranged from 0.21 to 1.3 percent and the same facilities operating wet suppression systems (controlled) ranged from 0.55 to 2.88 percent. Due to carry over or the small amount of moisture required, it has been shown that each source, with the exception of crushers, does not need to employ direct water sprays. Although the moisture content was the only variable measured, other process features may have as much influence on emissions from a given source. Visual observations from each source under normal operating conditions are probably the best indicator of which emission factor is most appropriate. Plants that employ sub-standard control measures as indicated by visual observations should use the uncontrolled factor with an appropriate control efficiency that best reflects the effectiveness of the controls employed.

[c] Although total suspended particulate (TSP) is not a measurable property from a process, some states may require estimates of TSP emissions. No data are available to make these estimates. However, relative ratios in AP-42 Sections 13.2.2 and 13.2.4 indicate that TSP emission factors may be estimated by multiplying PM-10 by 2.1.

[d] Emission factors for total particulate are not presented pending a re-evaluation of the EPA Method 201a test data and/or results of emission testing. This re-evaluation is expected to be completed by July 1995.

[e] References 9, 11, 15-16.

[f] Reference 1.

[g] No data available, but emission factors for PM-10 emission factors for tertiary crushing can be used as an upper limit for primary or secondary crushing.

[h] References 10-11, 15-16.

[j] Reference 12.

[k] References 13-14.

Table E.1.2 Emission factors of PM_{10} for crushed stone processing operations[a] (kg/ton) used in the present study.

Source [b]	PM_{10} (kg/ton)
Truck Unloaded	0.0008***
Primary Crushing	0.00017
Secondary Crushing	0.000045
Tertiary Crushing	0.0012***
Screening	0.0076***
Fine Screening	0.036***
Conveyor Transfer	0.00072***
Truck Loading	0.00005***
Total	0.05275

** It is noted that conveyor transfers are about 10 points in a stone crushing plant.

*** US EPA's Emission Factor

E.2 Calculation of PM_{10} emissions from stone processing operations

The PM_{10} emission rate from stone crushing plants can be estimated by the following correlation.

$$\text{Emission Rate (kg/hr)} = \text{Emission Factor} \times \text{Plant Capacity} \qquad \text{(B.2.1)}$$

An Example:

The total capacity of Silapanai plant is 140 ton/hr, the emission factors of PM_{10} for crushed stone processing operations (kg/ton) is 0.05275 kg/ton, thus, the approximated emission rate of Silapanai plant is:

Calculations:

$$\begin{aligned}
\text{Emission Rate} &= 0.05275 \text{ (kg / ton)} \times 140 \text{ (ton / hr)} \\
&= 7.39 \text{ kg / hr} \\
&= 2.05 \text{ g / s}
\end{aligned}$$

Table E.2.1 PM_{10} emissions from stone crushing plants for uncontrolled emissions

No.	Plant	Capacity (ton/hr)	PM_{10} Emission Rate (kg/hr)
1	Silapanai	140	7.39
2	Kaewrtanadee1	180	9.50
3	Kaewrtanadee2	180	9.50
4	Rong Mo Hin Pong Taywin	290	15.30
5	Sila Sin Sap 2	430	22.68
6	S. Sila Thong Saraburi 1	320	16.88
7	S. Sila Thong Saraburi 2	230	12.13
8	Saraburi Benjapon	180	9.50
9	Silacharoenkit	180	9.50
10	Sila Boonsupa	180	9.50
11	Sila Mas	290	15.30
12	Sila A. Ratanachai 2	180	9.50
13	Dow Na Pra Laan	150	7.91
14	Na Pra Laan	430	22.68
15	Pornpit Sila 1	430	22.68
16	Saraburi Bhubha Thai	180	9.50
17	Sila Thepnorasingha	290	15.30
18	Sila Permpoon	160	8.44
19	Sila Srivilai	180	9.50
20	Boon Thai Sila	150	7.91
21	Siripatana	500	26.38
22	Sin Chai	450	23.74
23	Pra Bath	580	30.60
24	Cement Thai	250	13.19
25	Sila Lertchit 3	150	7.91

26	Krai Sin	600	31.65
27	Mekrarat	430	22.68
28	Silathip Saraburi	60	3.17
29	Silachai	330	17.41
30	Sila Maharat	180	9.50
31	Tanaworapong	150	7.91
32	Niyomchai	180	9.50
33	Sahasilapuempoon	150	7.91
34	Sila Sai Cret	440	23.21
35	Sila Sumpan	430	22.68
36	Sila Thaworn	150	7.91
37	Sahakanookchot	360	18.99
38	Saha Udomsila	180	9.50
39	Pitaksin	430	22.68
40	Sila Koong Kao Keaw	430	22.68
41	Surin Aomya Chemical 1	180	9.50
42	Palitapan Hin Klet Thai2	320	16.88
43	Sila Tawee Srap	300	15.83
44	Saraburi Chemical Line	130	6.86
45	Sila Chaicharoen	300	15.83
46	Saraburi Cement1	300	15.83
47	Sanont	150	7.91
48	Sahapongnarapan	180	9.50

APPENDIX F

THE PREDICTED 1-HR.-AVERAGED CONCENTRATION AT REMAINING RECEPTOR POINTS IN SARABURI PROVINCE

F.1 The predicted 1-hr-averaged concentration

F.1.1. The change in wind direction and wind speed

Table F.1 Change in the predicted average PM_{10} concentration by the change in wind speed (WS) at P5 and P6 Receptor at various wind direction

WS \ WD	predicted average conc.(mg/m^3) at P5			predicted average conc.(mg/m^3) at P6		
	29	45	59	29	45	59
0.25	1.604342	3.037957	5.389127	1.604342	3.037957	5.389127
0.5	0.810269	2.219377	5.961899	0.810269	2.219377	5.961899
1	0.220032	1.202679	6.342111	0.220032	1.202679	6.342111
2	-0.253084	0.561296	6.500072	-0.253084	0.561296	6.500072

Table F.2 Change in the predicted average PM_{10} concentration by the change in wind speed (WS) at P7 and P8 Receptor at various wind direction

WS \ WD	predicted average conc.(mg/m^3) at P7			predicted average conc.(mg/m^3) at P8		
	29	45	59	29	45	59
0.25	19.35341	28.57962	39.49763	211.147	51.69254	210.7814
0.5	9.29119	19.39385	34.65521	207.7812	45.72725	209.7516
1	2.008827	9.453198	27.43212	194.269	34.12991	203.8732
2	-0.404431	2.828718	18.62849	162.9093	16.91695	188.2247

Table F.3 Change in the predicted average PM_{10} concentration by the change in wind speed (WS) at P9 and P10 Receptor at various wind direction

WS \ WD	predicted average conc.(mg/m^3) at P9			predicted average conc.(mg/m^3) at P10		
	29	45	59	29	45	59
0.25	6.856673	7.925282	2.619256	143.616	134.8484	126.1837
0.5	7.655869	9.80824	1.285477	149.2939	132.9801	116.6723
1	7.641534	11.32893	0.285993	154.7569	124.9729	95.82884
2	5.335332	14.79746	0.000000	154.2648	101.6647	54.9431

F.1.2. The change in wind direction and vertical dispersion coefficient

Table F.4 Change in the predicted average PM_{10} concentration by the change in vertical dispersion coefficient (K_V) at P5 and P6 Receptor at various wind direction

K_V \ WD	predicted average conc.(mg/m^3) at P5			predicted average conc.(mg/m^3) at P6		
	29	45	59	29	45	59
1	0.220032	1.202679	6.342111	2.229043	7.181197	11.61343
2	0.068571	0.415194	2.687812	1.76137	5.363262	8.264803
3	0.024879	0.19944	1.531451	1.446445	4.244914	6.337355
4	0.008094	0.113741	1.009119	1.22372	3.496583	5.096818
5	0.000734	0.072522	0.725005	1.058548	2.962338	4.236495
10	-0.00518	0.018917	0.252728	0.622049	1.637912	2.205945

Table F.5 Change in the predicted average PM_{10} concentration by the change in vertical dispersion coefficient (K_V) at P7 and P8 Receptor at various wind direction

K_V \ WD	predicted average conc.(mg/m^3) at P7			predicted average conc.(mg/m^3) at P8		
	29	45	59	29	45	59
1	2.008827	9.453198	34.65521	194.269	203.0977	203.8732
2	0.560761	2.791895	9.297266	130.4142	134.9883	134.8038
3	0.232506	1.234001	4.645807	99.30982	102.2743	102.0257
4	0.121311	0.663169	2.779186	80.69172	82.82757	82.58696
5	0.074433	0.399841	1.844797	68.17467	69.82094	69.62081
10	0.024956	0.071469	0.486157	39.07314	39.78438	39.68703

Table F.6 Change in the predicted average PM_{10} concentration by the change in vertical dispersion coefficient (K_V) at P9 and P10 Receptor at various wind direction

K_V \ WD	predicted average conc.(mg/m^3) at P9			predicted average conc.(mg/m^3) at P10		
	29	45	59	29	45	59
1	7.641534	1.447872	0.285993	154.7569	124.9729	116.6723
2	2.809	0.278759	0.008011	100.4747	81.1557	62.90891
3	1.467887	0.069794	0.000000	73.29111	59.09305	46.05088
4	0.903696	0.009562	0.000000	57.13844	46.02646	35.98603
5	0.611267	0.000000	0.000000	46.53648	37.45806	29.36235
10	0.165095	0.000000	0.000000	23.32917	18.78841	14.86316

F.1.3. The change in wind direction and K_H

Table F.7 Change in the predicted average PM_{10} concentration by the change in horizontal dispersion coefficient (K_H) at P1 and P2 Receptor at various wind direction

K_H \ WD	predicted average conc.(mg/m^3) at P1			predicted average conc.(mg/m^3) at P2		
	29	45	59	29	45	59
200	66.29642	73.79155	76.47897	146.9094	179.352	208.2947
150	74.78999	85.23592	88.07523	133.854	175.8395	213.7646
100	86.01508	101.778	103.5547	103.308	160.3612	213.3533
50	102.0369	129.03	122.5059	31.45498	115.0212	198.4104
20	116.2644	156.3963	127.5232	-58.4346	51.36544	175.2249

Table F.8 Change in the predicted average PM_{10} concentration by the change in horizontal dispersion coefficient (K_H) at P3 and P4 Receptor at various wind direction

K_H \ WD	predicted average conc.(mg/m^3) at P3			predicted average conc.(mg/m^3) at P4		
	29	45	59	29	45	59
200	125.3451	106.8416	91.67097	101.6529	100.4367	50.2775
150	144.657	118.079	98.52383	117.6301	115.8744	58.0027
100	170.081	128.1119	103.3981	139.7308	137.0263	68.49305
50	207.2766	127.805	101.4345	173.0243	168.3149	83.35285
20	247.9273	108.5394	92.27667	203.2671	196.4976	95.20235

Table F.9 Change in the predicted average PM_{10} concentration by the change in horizontal dispersion coefficient (K_H) at P5 and P6 Receptor at various wind direction

77 WD / K_H	predicted average conc.(mg/m^3) at P5			predicted average conc.(mg/m^3) at P6		
	29	45	59	29	45	59
200	0.810269	2.219377	5.961899	4.018224	7.674025	10.24807
150	0.501680	1.650316	5.916128	3.98549	9.043624	12.74558
100	0.137111	0.829804	5.367393	3.523025	10.7234	16.52328
50	0.000000	0.000000	3.400309	2.280376	12.33462	23.07298
20	0.000000	0.000000	0.569098	1.224215	12.09831	30.67488

Table F.10 Change in the predicted average PM10 concentration by the change in horizontal dispersion coefficient (K_H) at P7 and P8 Receptor at various wind direction

WD / K_H	predicted average conc.(mg/m^3) at P7			predicted average conc.(mg/m^3) at P8		
	29	45	59	29	45	59
200	9.291190	19.39385	34.65521	210.6757	210.6757	104.8758
150	4.735701	12.90323	28.02697	118.3785	118.3785	117.9573
100	1.120879	5.582347	18.59319	134.8921	269.7841	134.7973
50	0.304707	3.326706	6.532690	156.3166	312.6331	157.4019
20	0.000000	0.409655	0.000000	172.024	344.048	175.6298

Table F.11 Change in the predicted average PM10 concentration by the change in horizontal dispersion coefficient (K_H) at P9 and P10 Receptor at various wind direction

K_H \ WD	predicted average conc.(mg/m^3) at P9			predicted average conc.(mg/m^3) at P10		
	29	45	59	29	45	59
200	3.114925	6.22985	0.642739	74.64695	66.49003	58.33615
150	1.013217	2.026433	0.292872	85.6541	73.64555	61.8937
100	0.278606	0.557212	0.007941	100.4805	81.1488	62.9114
50	0.000000	0.000000	0.000000	121.9555	85.62545	54.55515
20	0.188200	0.376401	0.000000	140.9913	81.16055	36.63605

F.1.4. The change in wind speed and K_H

Table F.12 Change in the predicted average PM_{10} concentration by the change in horizontal dispersion coefficient (K_H) at P1 and P2 Receptor at various wind speed

	predicted average conc.(mg/m^3) at P1			predicted average conc.(mg/m^3) at P2		
WS / K_H	0.5	1.0	2.0	0.5	1.0	2.0
200	66.29642	64.30875	61.21004	146.9094	89.46323	8.941266
150	74.78999	72.01998	68.07192	133.854	64.8297	0.000000
100	86.01508	82.00673	76.62085	103.308	20.69967	0.000000
50	102.0369	95.69941	87.50715	31.45498	0.000000	0.000000
20	116.2644	106.9118	95.33459	0.000000	0.000000	0.000000

Table F.13 Change in the predicted average PM_{10} concentration by the change in horizontal dispersion coefficient (K_H) at P9 and P10 Receptor at various wind speed

	predicted average conc.(mg/m^3) at P9			predicted average conc.(mg/m^3) at P10		
WS / K_H	0.5	1.0	2.0	0.5	1.0	2.0
200	125.3451	143.8285	188.2658	28.16293	22.18581	12.89378
150	144.657	169.9204	235.7769	28.11276	20.37175	10.12398
100	170.081	209.6522	316.0997	25.78661	16.00511	5.913006
50	207.2766	283.4669	473.2129	16.79387	6.328321	0.304382
20	247.9273	374.2978	656.0281	2.864383	0.000000	0.000000

Table F.14 Change in the predicted average PM_{10} concentration by the change in horizontal dispersion coefficient (K_H) at P5 and P6 Receptor at various wind speed

WS / K_H	predicted average conc.(mg/m³) at P5			predicted average conc.(mg/m³) at P6		
	0.5	1.0	2.0	0.5	1.0	2.0
200	0.810269	0.220032	0.000000	4.018224	2.229043	0.744465
150	0.50168	0.000000	0.000000	3.98549	1.911637	0.543591
100	0.137111	0.000000	0.000000	3.523025	1.408121	0.374516
50	0.000000	0.000000	0.000000	2.280376	0.81946	0.281212
20	0.000000	0.000000	0.767527	1.224215	0.492958	0.000000

Table F.15 Change in the predicted average PM_{10} concentration by the change in horizontal dispersion coefficient (K_H) at P7 and P8 Receptor at various wind speed

WS / K_H	predicted average conc.(mg/m³) at P7			predicted average conc.(mg/m³) at P8		
	0.5	1.0	2.0	0.5	1.0	2.0
200	9.29119	2.008827	0.000000	39.73559	23.35218	1.707552
150	4.735701	0.347657	0.000000	34.67822	15.62981	0.000000
100	1.120879	0.000000	0.000000	24.23313	2.959862	0.000000
50	0.304707	0.000000	0.000000	2.840947	0.000000	0.000000
20	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Table F.16 Change in the predicted average PM_{10} concentration by the change in horizontal dispersion coefficient (K_H) at P9 and P10 Receptor at various wind speed

WS / K_H	predicted average conc.(mg/m³) at P9			predicted average conc.(mg/m³) at P10		
	0.5	1.0	2.0	0.5	1.0	2.0
200	3.868968	2.510173	1.710987	149.2939	154.7569	154.2648
150	3.903873	2.532399	1.955905	171.3082	177.8377	175.155
100	3.769468	2.598081	2.574968	200.9609	209.3216	202.4707
50	3.441771	3.058951	4.725664	243.911	255.5094	240.2028
20	3.54153	4.329167	9.074125	281.9825	296.5442	271.7198

F.1.5. The change in wind speed and K_V

Table F.17 Change in the predicted average PM_{10} concentration by the change in vertical dispersion coefficient (K_V) at P5 and P6 Receptor at various wind speed

	predicted average conc.(mg/m³) at P5			predicted average conc.(mg/m³) at P6		
WS / K_V	0.5	1	2	0.5	1	2
1	0.810269	0.220032	0.000000	4.018224	2.229043	0.744465
2	0.321583	0.068571	0.000000	2.987742	1.76137	0.704127
3	0.172485	0.024879	0.000000	2.351267	1.446445	0.63475
4	0.107457	0.008094	0.000000	1.926576	1.22372	0.570738
5	0.07335	0.000734	0.000000	1.62269	1.058548	0.515929
10	0.021471	0.000000	0.000000	0.874686	0.622049	0.344693

Table F.18 Change in the predicted average PM_{10} concentration by the change in vertical dispersion coefficient (K_V) at P7 and P8 Receptor at various wind speed

	predicted average conc.(mg/m³) at P7			predicted average conc.(mg/m³) at P8		
WS / K_V	0.5	1	2	0.5	1	2
1	9.29119	2.008827	0.000000	207.7812	194.269	162.9093
2	2.860428	0.560761	0.000000	275.5015	130.4142	115.3176
3	1.310903	0.232506	0.037881	104.3695	99.30982	89.61573
4	0.728054	0.121311	0.077024	84.52105	80.69172	73.61332
5	0.452557	0.074433	0.089522	71.25792	68.17467	62.65079
10	0.093263	0.024956	0.083013	40.5646	39.07314	36.56041

Table F.19 Change in the predicted average PM_{10} concentration by the change in vertical dispersion coefficient (K_V) at P9 and P10 Receptor at various wind speed

WD / K_V	predicted average conc.(mg/m^3) at P9			predicted average conc.(mg/m^3) at P10		
	0.5	1	2	0.5	1	2
1	7.655869	7.641534	5.335332	149.2939	154.7569	154.2648
2	6.232425	2.809	1.654937	95.62855	100.4747	104.6607
3	1.750636	1.467887	0.716201	69.33548	73.29111	77.58277
4	1.140967	0.903696	0.347415	53.88475	57.13844	60.97462
5	0.811171	0.611267	0.174675	43.81582	46.53648	49.87849
10	0.269388	0.165095	0.000000	21.90182	23.32917	25.20531

APPENDIX G

THE METEOROLOGICAL DATA OF STUDY AREA DURING JANUARY-MARCH, 2000

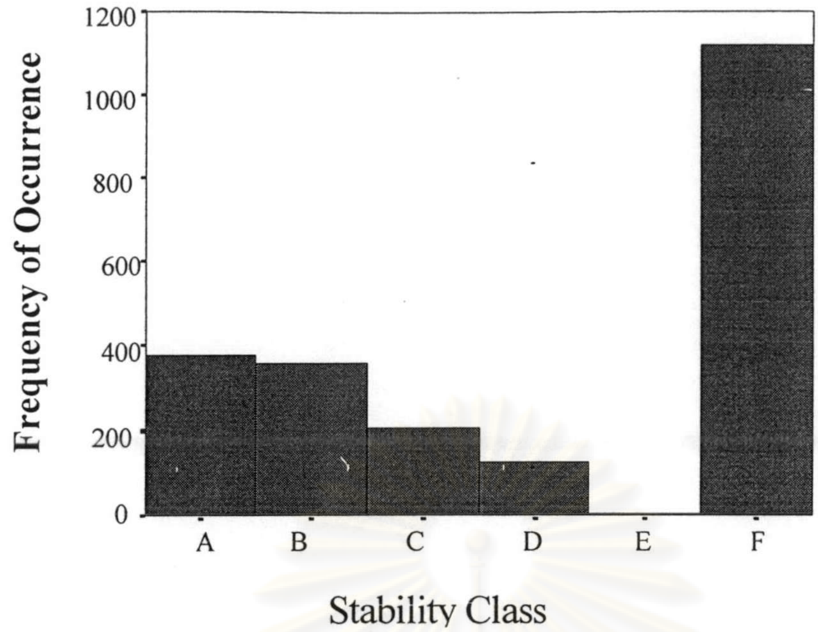


Figure G.1 Atmospheric stability class of Saraburi area during January-March, 2000 (source: Thailand Meteorological Department, Bankok)

Table G.1 The mixing height data of Bangkok during January-March, 2000

Date \ Time	Mixing Height (Meter)				
	07.00	**10.00**	**13.00**	**16.00**	**19.00**
01/01/00	1000	1400	1750	1900	1250
02/01/00	700	1100	1450	1600	900
03/01/00	800	800	2050	1800	800
04/01/00	900	1350	1650	1750	1100
05/01/00	1450	1700	2200	2000	1500
06/01/00	100	700	1350	1350	600
07/01/00	950	950	1700	1600	750
08/01/00	400	400	1000	900	400
09/01/00	550	550	1600	1600	600
10/01/00	450	450	1300	1300	500
11/01/00	1000	1000	1550	1700	900
12/01/00	400	400	1400	1400	300
13/01/00	700	700	1050	750	250
14/01/00	800	800	1400	1200	550

Date \ Time	Mixing Height (Meter)				
	07.00	**10.00**	**13.00**	**16.00**	**19.00**
15/01/00	700	700	1200	1150	500
16/01/00	1200	1200	1950	1800	1100
17/01/00	100	100	1100	1100	550
18/01/00	950	950	1150	1100	450
19/01/00	600	600	900	1200	500
20/01/00	650	650	1200	1550	1050
21/01/00	650	650	1400	1650	1000
22/01/00	1000	1150	1950	2200	1500
23/01/00	1150	1450	2100	2100	1500
24/01/00	300	350	2350	2400	700
25/01/00	700	700	1350	1350	1050
26/01/00	750	750	1500	1500	900
27/01/00	250	250	950	1200	550
28/01/00	300	300	950	1250	550
29/01/00	400	400	1650	1800	1100
30/01/00	750	750	1450	1350	1050
31/01/00	1000	1000	1600	1650	1200
01/02/00	400	400	800	1150	500
02/02/00	750	750	1700	1800	1250
03/02/00	300	400	1700	1750	1500
04/02/00	----------------**NO TEMP DATA**------------------------				
05/02/00	200	450	1850	1750	550
06/02/00	250	400	1900	2150	500
07/02/00	350	350	1550	1700	550
08/02/00	----------------**NO TEMP DATA**------------------------				
09/02/00	350	600	2200	2350	750
10/02/00	600	950	1700	1550	900
11/02/00	300	300	2300	1800	550
12/02/00	850	850	1350	1300	600
13/02/00	550	550	1200	1200	600
14/02/00	400	400	1250	1100	500

Date \ Time	Mixing Height (Meter) 07.00	10.00	13.00	16.00	19.00
15/02/00	750	750	900	950	400
16/02/00	900	900	1400	1750	900
17/02/00	1000	1100	1250	1600	700
18/02/00	900	900	1350	1400	600
19/02/00	1100	1100	1700	1450	750
20/02/00	550	550	1200	1100	700
21/02/00	750	750	1300	1500	600
22/02/00	1100	1100	1300	1350	850
23/02/00	850	850	1200	1200	650
24/02/00	700	700	1250	1350	550
25/02/00	70	750	1150	1400	800
26/02/00	----------------NO TEMP DATA--------------------------				
27/02/00	600	600	1100	1500	1100
28/02/00	700	1250	2250	2150	1050
29/02/00	1350	1350	1900	-	150
01/03/00	-	-	650	600	100
02/03/00	750	750	700	1000	700
03/03/00	800	1000	1350	1250	800
04/03/00	800	800	1400	1250	500
05/03/00	750	750	1400	1150	700
06/03/00	600	600	1150	850	600
07/03/00	550	550	1050	1050	450
08/03/00	800	800	900	900	600
09/03/00	1000	1000	1400	1450	850
10/03/00	950	950	1450	1400	600
11/03/00	900	900	1350	1450	500
12/03/00	550	750	1450	1850	750
13/03/00	700	700	1500	1800	1100
14/03/00	350	550	1700	2100	600
15/03/00	800	850	1500	1450	700
16/03/00	550	1350	2000	1900	850

Date \ Time	Mixing Height (Meter)				
	07.00	**10.00**	**13.00**	**16.00**	**19.00**
17/03/00	900	1100	1350	1400	900
18/03/00	1450	1450	2400	2400	1050
19/03/00	900	900	1500	1550	700
20/03/00	---------------NO TEMP DATA-------------------------				
21/03/00	800	1000	1250	1150	650
22/03/00	850	850	1200	1100	600
23/03/00	900	900	1350	1400	650
24/03/00	-	-	-	450	150
25/03/00	450	450	1450	1700	1300
26/03/00	700	700	1350	1200	800
27/03/00	450	450	1300	1200	500
28/03/00	800	1300	2100	1100	500
29/03/00	50	50	250	650	50
30/03/00	900	900	1350	950	550
31/03/00	850	850	1750	1800	600
Averaged mixing height	694	781	1448	1457	729

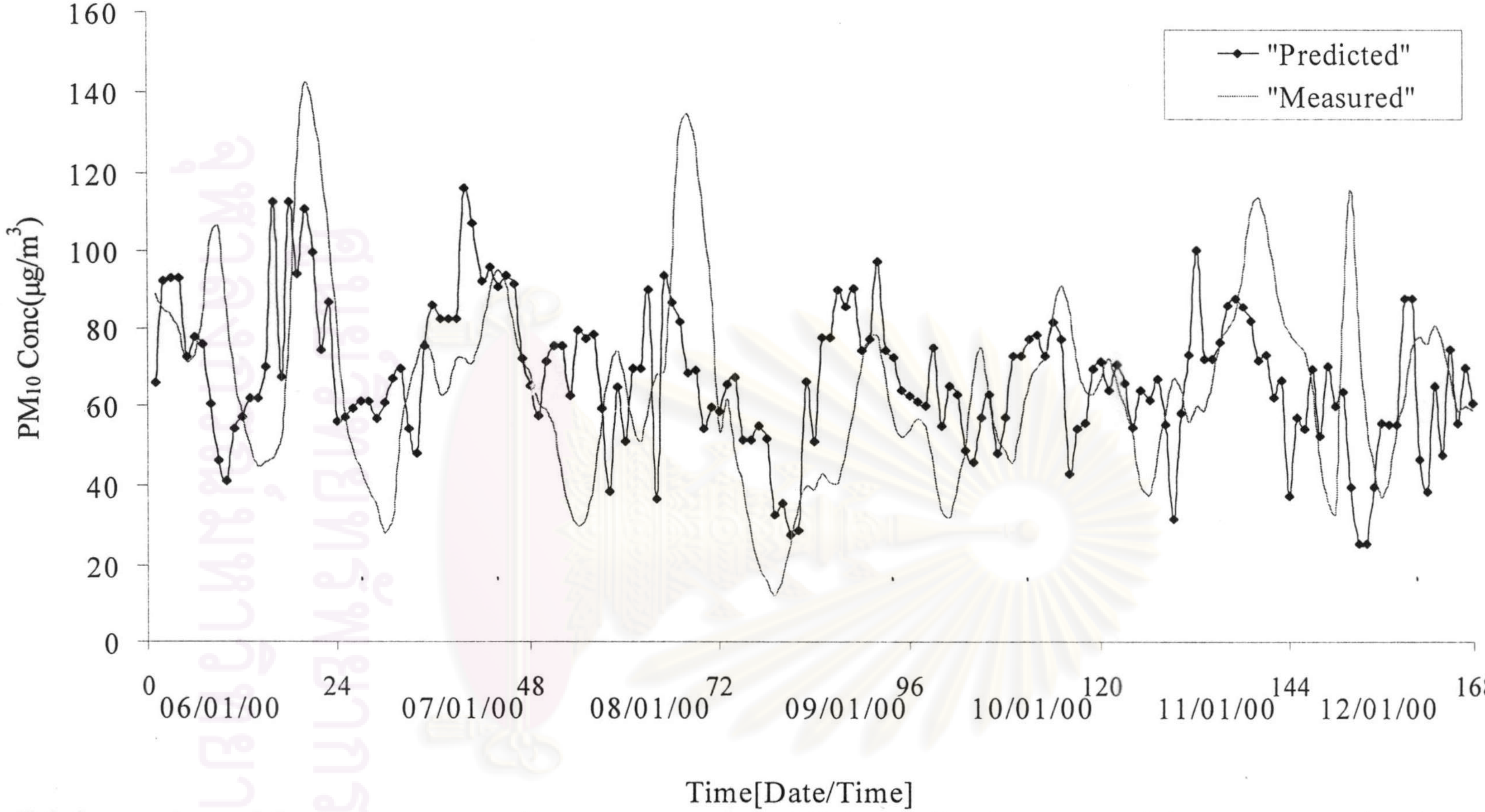


Figure G.2 Comparison of the 1-hr average ambient concentration of PM_{10} predicted by the model at the receptor height of 10 meter above the ground with itscounterpart concentration measured at the monitoring station in Na Pra Laan area during January 6-12,2000

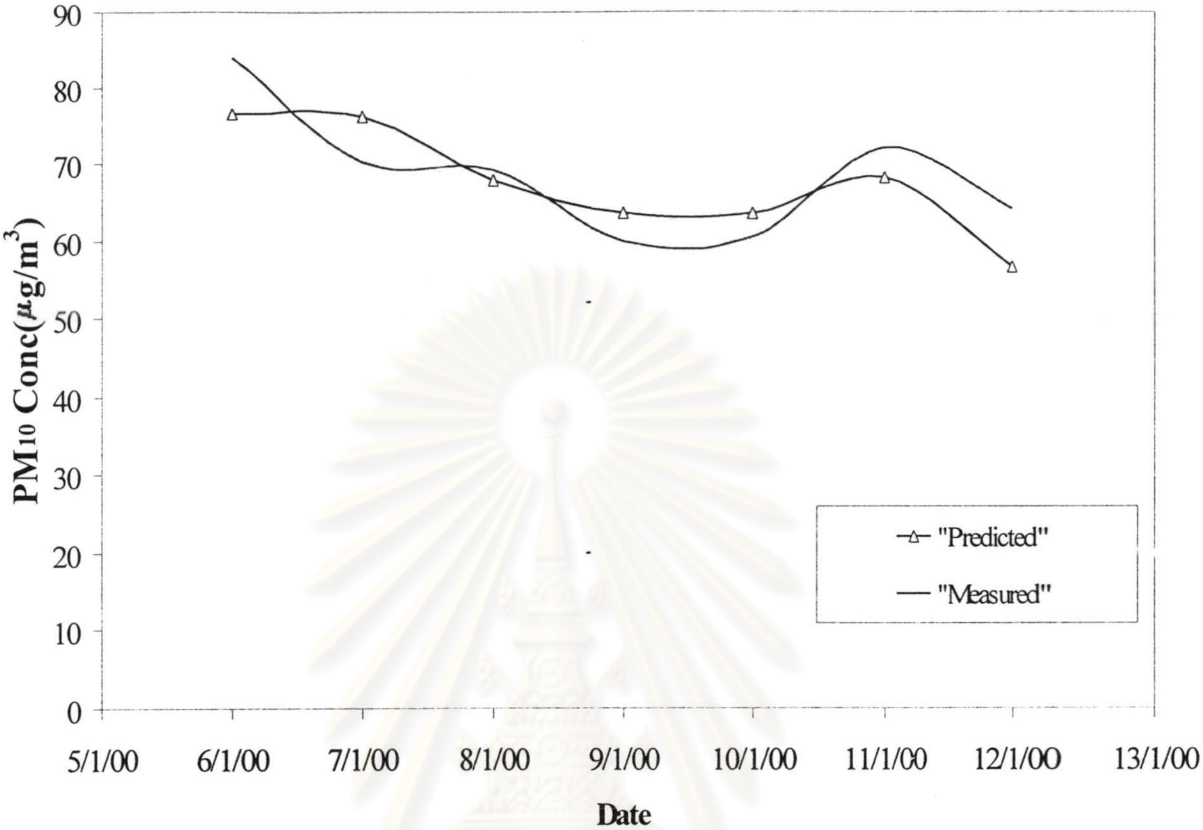


Figure G.3 Comparison of the 24-hr-average ambient concentration of PM_{10} predicted by the model at the receptor height of 10 meter above the ground with its counterpart concentration measured at the monitoring station in Na Pra Laan area during January 6-12,2000

VITA

Ms.Pairin Vijitjaroenmuang, the first child of Mr. Pairoj and Mrs. Chinsumol Vijitjaroenmuang, was born on April 9, 1975 in Bangkok. She attended Triamudom Sueksa School in Bangkok and graduated in 1993. In April 1997, she received her Bachelor Degree of Engineering in Chemical Engineer from Faculty of Engineering, Chulalongkorn University. From 1997 to 1999, she had worked for Petrothai Co., Ltd. in position of Technical support In June 1999, she gained admission to the Graduate School of Chulalongkorn University and awarded the degree of Master of Engineering in Chemical Engineering in 2002.