REFERENCES

Beni'tez, J. (1993), Process Engineering and Design for Air pollution Control, Prentice Hall, Englewood Cliffs, New Jersey.

Blakeburn, D. L. and Scamehorn, J. F. (1989), Surfactant-Enhanced Carbon Regeneration, Surfactant Based Seperation Processes, Marcel Dekker, New York.

Bhummasobhana, A and Scamehorn, J. F. in Separation Science and Technology, 31,629 (1996).

Cheremisinoff, N. P. (1993). Carbon Adsorption for Pollution Control, Prentice Hall, Englewood Cliffs, New Jersey.

Chudyk, W. A.and Snoeyink, V. L. (1984). Bioregeneration of Activated Carbon Saturated with Phenol, Environ. Sci. Technol., Vol. 18, No. 1, pp. 1-5.

Christian, S. D. and Scamehorn, J. F. (Eds.). Solubilization in Surfactant Aggregates, Marcel Dekker, New York (1995).

Lionos, P., Viriot, M. L., Zana, R. (1984). Study of the Solubilization of Aromatic Hydrocarbons by Aqueous micellar Solutions, J. Phys. Chem., Vol. 88, pp. 1098-1101.

Martin, R. J.and Ng, W. J. (1987). The Repeated Exhaustion and Chemical Regeneration of Activated Carbon, Wat.Res., Vol. 21, No. 8, pp. 961-965.

Noll, K. E., Gounaris, V. and Hou, W. S. (1992). Adsorption technology for air and water pollution control, Lewis Publishers, Inc., Michigan.

Raouf, Sh. And Erich, R. (1983). Microstructure and Thermal Analysis of Solid Surfaces, pp. 77-81,496.

Richard, I. Masel (1996), Principles of Adsorption and reaction Solid Surfaces, pp. 108-113, 803.

Roberts, B.L., Scamehorn, J. F.and Harwell, J. H. (1989), Use of Surfactant Enhanced Carbon Regeneration to Remove Volatile Organics from Spent Activated Carbon, New Directions in Sorption Technology, Buttersworth.

Rosen, M. J. (1989), Surfactants and Interfacial Phenomena, 2nd, John Wiley & sons, Inc., New York.

Scamehorn, J. F. (1979). Removal of Vinyl Chloride from Gaseous Streams by Adsorption on Activated Carbon, Ind. Eng. Chem. Process Des. Dev., Vol. 18, No. 2, pp. 208-217.

Sutikno, T.and Himmeistein, K. J. (1983), Desorption of Phenol from Activated Carbon by Solvent Regeneration, Ind. Eng. Chem. Fundam., Vol. 22, pp. 420-425.

Sutud na Ayoothaya, T and J. F. Scamehorn, M.S. Thesis, The Petroleum and Petrochemical College, (1996).

Wankat, P. C.and Partin, L. R. (1980), Process for Recovery of Solvent Vapors with Activated Carbon, Ind. Eng. Chem. Process Des. Dev., Vol. 19, pp. 446-451.

APPENDIX

TABLE A-1 Breakthrough curve for TCE adsorption on fresh carbon
System : Flow Rate of Air-TCE vapor = 1.227 L/min.
Activated Carbon = 25 g.

Time (min)	Concentration of TCE (ppm)
0	0.0
45	19.0
310	22.0
400	21.0
490	19.0
720	18.0
800	21.0
930	20.0
950	21.0
1000	20.0
1135	20.0
1180	45.0
1200	112.0
1240	298.0
1260	482.0
1270	611.0
1280	754.0
1310	956.0
1320	1022.0
1330	1025.0

TCE loading = 6.837 grams/25 grams of Activated Carbon
= 0.274 gram of TCE/gram of Activated Carbon

TABLE A-2 Breakthrough curve for TCE adsorption on fresh carbon
System : Flow Rate of Air-TCE vapor = 1.142 L/min.
Activated Carbon = 25 g.

Time (min)	Concentration of TCE (ppm)
0	0.0
45	18.0
75	25.0
120	16.0
190	21.0
310	18.0
430	20.0
610	19.0
670	21.0
720	19.0
1000	21.0
1060	18.0
1120	40.0
1135	112.0
1160	284.0
1200	411.0
1240	633.0
1270	852.0
1300	1012.0
1310	1020.0
1320	1022.0
1330	1021.0

TCE loading = 6.660 grams/ 25 grams of Activated C
= 0.26641 gram of TCE /gram of Activat

TABLE A-3 Breakthrough curve for TCE adsorption on fresh carbon
System : Flow Rate of Air-TCE vapor = 1.099 L/min.
Activated Carbon = 25 g.

Time (min)	Concentration of TCE (ppm)
0	0.0
120	19.0
190	17.0
310	21.0
880	21.0
930	20.0
985	22.0
1030	21.0
1120	22.0
1135	56.0
1160	89.0
1225	258.0
1250	456.0
1260	587.0
1280	789.0
1300	915.0
1310	998.0
1320	1012.0
1330	1019.0

TCE loading = 7.633 grams/ 25 grams of Activated Carbon
= 0.305 gram of TCE /gram of Activated Carbon

TABLE A-4 %TCE Recovery at SDS Concentration = 0.025 M
System Amount of Water-Flushing Volume = **500** Pore Volume

Time (min)	Cumulative Pore Volume	TCE Recovered (mg)	Cumulative of TCE Recovered	%TCE Recovery
0	0	0	0	0
52	66.67	487.0	487	7.31
104	133.34	340.0	827	12.42
156	200.01	278.0	1105	16.59
208	266.68	215.0	1320	19.82
260	333.35	168.0	1488	22.34
312	400.02	119.0	1607	24.13
364	466.69	115.0	1722	25.85
416	533.36	88.0	1810	27.18
468	600.03	80.0	1890	28.38
520	666.7	67.0	1957	29.38
572	733.37	67.0	2024	30.39
624	800.04	74.0	2098	31.50
676	866.71	62.0	2160	32.43
728	933.38	57.0	2217	33.29
780	1000.05	51.0	2268	34.05
832	1066.72	54.0	2322	34.86
884	1133.39	52.0	2374	35.64
936	1200.06	52.0	2426	36.42
988	1266.73	48.0	2474	37.15
1040	1333.4	46.0	2520	37.84
1092	1400.07	44.0	2564	38.50
1144	1466.74	42.0	2606	39.13
1196	1533.41	41.0	2647	39.74
1248	1600.08	41.0	2688	40.36
1300	1666.75	38.0	2726	40.93
1352	1733.42	37.0	2763	41.48
1404	1800.09	40.0	2803	42.09
1456	1866.76	36.0	2839	42.63
1508	1933.43	35.0	2874	43.15
1560	2000.1	28.0	2902	43.57
1612	2066.77	33.0	2935	44.07
1664	2133.44	27.0	2962	44.47

TABLE A-4 (Continued)

1716	2200.11	31.0	2993	44.94
1768	2266.78	64.0	3057	45.90
1820	2333.45	50.0	3107	46.65
1872	2400.12	34.0	3141	47.16
1924	2466.79	30.0	3171	47.61
1976	2533.46	30.0	3201	48.06
2028	2600.13	27.0	3228	48.47
2080	2666.8	26.0	3254	48.86
2132	2733.47	44.0	3298	49.52
2184	2800.14	37.0	3335	50.07
2236	2866.81	32.0	3367	50.55
2288	2933.48	37.0	3404	51.11
2340	3000.15	38.0	3442	51.68
2392	3066.82	44.0	3486	52.34
2444	3133.49	32.0	3518	52.82
2496	3200.16	28.0	3546	53.24
2548	3266.83	26.0	3572	53.63
2600	3333.5	23.0	3595	53.98
2652	3400.17	28.0	3623	54.40
2704	3466.84	24.0	3647	54.76
2756	3533.51	23.0	3670	55.10
2808	3600.18	21.0	3691	55.42
2860	3666.85	19.9	3710.9	55.72
2912	3733.52	21.7	3732.6	56.04
2964	3800.19	24.1	3756.7	56.40
3016	3866.86	19.4	3776.1	56.70
3068	3933.53	18.2	3794.3	56.97
3120	4000.2	18.2	3812.51	57.24
3172	4066.87	18.6	3831.07	57.52
3588	4600.23	14.0	3953.2	59.35
3640	4700	11.0	3964.2	59.52

TABLE A-5 %TCE Recovery at SDS Concentration = 0.025 M
System Amount of Water-Flushing Volume = **500** Pore Volume

Time (min)	Cumulative Pore Volume	TCE Recovered (mg)	Cumulative of TCE Recovered	%TCE Recovery
0	0	0	0	0
52	66.67	513.0	487	7.31199392
104	133.34	340.0	827	12.4168767
156	200.01	278.0	1105	16.5908692
208	266.68	215.0	1320	19.8189568
260	333.35	168.0	1488	22.3413695
312	400.02	119.0	1607	24.1280785
364	466.69	115.0	1722	25.85473
416	533.36	88.0	1810	27.1759938
468	600.03	80.0	1890	28.3771427
520	666.7	67.0	1957	29.3831049
572	733.37	67.0	2024	30.3890671
624	800.04	74.0	2098	31.5001299
676	866.71	62.0	2160	32.4310203
728	933.38	57.0	2217	33.2868389
780	1000.05	51.0	2268	34.0525713
832	1066.72	54.0	2322	34.8633468
884	1133.39	52.0	2374	35.6440936
936	1200.06	52.0	2426	36.4248404
988	1266.73	48.0	2474	37.1455297
1040	1333.4	46.0	2520	37.8361903
1092	1400.07	44.0	2564	38.4968222
1144	1466.74	42.0	2606	39.1274254
1196	1533.41	41.0	2647	39.7430142
1248	1600.08	41.0	2688	40.358603
1300	1666.75	38.0	2726	40.9291487
1352	1733.42	37.0	2763	41.4846801
1404	1800.09	40.0	2803	42.0852545
1456	1866.76	36.0	2839	42.6257716
1508	1933.43	35.0	2874	43.1512742
1560	2000.1	28.0	2902	43.5716763
1612	2066.77	33.0	2935	44.0671502
1664	2133.44	27.0	2962	44.472538

TABLE A-5(Continued)

1716	2200.11	31.0	2993	44.9379832
1768	2266.78	64.0	3057	45.8989023
1820	2333.45	50.0	3107	46.6496204
1872	2400.12	34.0	3141	47.1601086
1924	2466.79	30.0	3171	47.6105395
1976	2533.46	30.0	3201	48.0609703
2028	2600.13	27.0	3228	48.4663581
2080	2666.8	26.0	3254	48.8567315
2132	2733.47	44.0	3298	49.5173634
2184	2800.14	37.0	3335	50.0728947
2236	2866.81	32.0	3367	50.5533543
2288	2933.48	37.0	3404	51.1088856
2340	3000.15	38.0	3442	51.6794314
2392	3066.82	44.0	3486	52.3400633
2444	3133.49	32.0	3518	52.8205228
2496	3200.16	28.0	3546	53.2409249
2548	3266.83	26.0	3572	53.6312983
2600	3333.5	23.0	3595	53.9766286
2652	3400.17	28.0	3623	54.3970308
2704	3466.84	24.0	3647	54.7573754
2756	3533.51	23.0	3670	55.1027057
2808	3600.18	21.0	3691	55.4180073
2860	3666.85	19.9	3710.9	55.7167931
2912	3733.52	21.7	3732.6	56.0426048
2964	3800.19	24.1	3756.7	56.4044509
3016	3866.86	19.4	3776.1	56.6957295
3068	3933.53	18.2	3794.3	56.9689908
3120	4000.2	18.2	3812.51	57.2424024
3172	4066.87	18.6	3831.07	57.5210689
3224	4133.54	17.3	3848.41	57.7814179
3276	4200.21	17.2	3865.62	58.0398151
3328	4266.88	16.6	3882.2	58.2887532
3380	4333.55	15.0	3897.2	58.5139686
3640	4700.00	11.0	3964.2	59.5199308

TABLE A-6 Breakthrough curve for TCE adsorption on regenerated carbon

System : Flow Rate of Air-TCE vapor = 1.201 L/min.
Activated Carbon = 25 g.

Time (min)	run # 1of without rinsing water (ppm)
0	0.0
45	42.0
75	51.0
120	41.0
190	47.0
310	49.0
400	114.0
430	278.0
490	355.0
550	412.0
610	476.0
670	554.0
720	715.0
760	846.0
800	922.0
880	1018.0
910	1022.0
930	1024.0
950	1017.0
970	1022.0
985	1021.0

TCE loading =3.389grams/25 grams of Activated Carbon
= 0.136 gram of TCE/gram of Activated Carbon

TABLE A-7 Breakthrough curve for TCE adsorption on regenerated carbon

System : Flow Rate of Air-TCE vapor = 1.198 L/min
Activated Carbon = 25 g.

Time (min)	run # 2of without rinsing water (ppm)
0	0.0
45	53.0
75	47.0
120	51.0
190	42.0
310	43.0
400	45.0
430	53.0
490	54.0
550	78.0
610	112.0
670	254.0
720	411.0
760	521.0
800	622.0
880	788.0
910	857.0
930	910.0
950	954.0
970	1011.0
985	1019.0
1000	1022.0
1010	1021.0

TCE loading = 3.716 grams/25 grams of Activated Carbon
= 0.149 gram of TCE/gram of Activated Carbon

TABLE A-8 Breakthrough curve for TCE adsorption on regenerated carbon

System : Flow Rate of Air-TCE vapor = 1.208 L/min.
Activated Carbon = 25 g.

Time (min)	run # 1of with 500 pore volume rinsing water (ppm)
0	0.0
45	54.0
75	49.0
120	46.0
190	58.0
310	189.0
400	312.0
430	374.0
490	453.0
550	512.0
610	588.0
670	785.0
720	945.0
760	1011.0
800	1018.0
880	1020.0
910	1022.0
930	1021.0
950	1023.0
970	1022.0
985	1020.0

TCE loading = 3.612 grams/25 grams of Activated Carbon
= 0.145 gram of TCE/gram of Activated Carbon

TABLE A-9 Breakthrough curve for TCE adsorption on regenerated carbon

System : Flow Rate of Air-TCE vapor = 1.216 L/min
Activated Carbon = 25 g.

Time (min)	run # 2 of with 500 pore volume rinsing water (ppm)
0	0.0
45	48.0
75	51.0
120	47.0
190	53.0
310	48.0
400	77.0
430	89.0
490	154.0
550	198.0
610	254.0
670	412.0
720	486.0
760	578.0
800	622.0
880	802.0
910	895.0
930	936.0
950	1012.0
970	1018.0
985	1021.0
1000	1020.0

TCE loading =3.512 grams/25 grams of Activated Carbon
= 0.141 gram of TCE/gram of Activated Carbon

CIRRICULUM VITAE

Name : Ms. Rachada Pokhun

Birth date : May 4 , 1971

Nationality : Thai

University Education :

1989-1992 Bachelor of Science in Material Science ,
Faculty of Science,
Chiangmai University.

Working Experience :

1992-1993 Mechanical Engineer
Canon Company Ltd.

1993-1995 Scientist
Electricity Generating Authority of Thailand .