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APPENDICES

Appendix A Data of Preliminary Study

Table A.1 Results of jar test experimental performed by C-PAM with septic tank effluent

C-PAM Dosage mg/L	Turbidity, NTU					TCOD mg/L	SCOD mg/L	TCOD removal %	SCOD removal %
	1	2	3	Avg.	% Removal				
0	91.4	95.8	98.1	95.1	0.0	257.8	142.9	0.0	0.0
0.1	60.1	60.1	60.2	60.2	36.7	182.2	140.0	29.3	2.0
0.25	54.1	53.2	53.3	53.5	43.7	179.7	138.3	30.3	3.2
0.5	41.2	41.7	41.9	41.6	56.3	154.4	100.5	40.1	29.6
1	37.7	38.1	37.5	37.8	60.3	131.6	95.2	49.0	33.3
1.5	36.6	37.0	36.6	36.7	61.4	115.8	90.1	55.1	36.9
2	34.2	33.2	31.2	32.9	65.4	85.2	70.1	67.0	50.9
2.5	25.1	25.5	24.3	25.0	73.7	75.1	64.6	70.9	54.8
3	18.0	17.8	18.1	18.0	81.1	70.2	55.3	72.8	61.3
4	13.6	12.9	13.0	13.2	86.2	65.7	41.1	74.5	71.2
5	12.3	12.4	12.8	12.5	86.9	63.7	40.1	75.3	71.9
10	9.3	9.2	9.2	9.2	90.3	56.9	39.5	77.9	72.4

Table A.2 Results of jar test experimental performed by A-PAM with septic tank effluent

A-PAM Dosage mg/L	Turbidity, NTU					TCOD mg/L	SCOD mg/L	TCOD removal %	SCOD removal %
	1	2	3	Avg.	% Removal				
0	80.2	82.5	83.9	82.2	0.0	249.5	159.9	0.0	0.0
0.1	55.5	54.3	56.2	55.3	32.7	208.9	154.3	16.3	3.5
0.25	54.2	54.2	54.3	54.2	34.0	208.4	153.3	16.5	4.2
0.5	47.8	47.9	47.4	47.7	42.0	161.5	120.1	35.3	24.9
1	39.4	39.5	39.9	39.6	51.8	154.9	129.0	37.9	19.4
1.5	35.8	35.8	35.7	35.7	56.5	143.5	111.5	42.5	30.3
2	42.4	41.7	42.7	42.3	48.6	135.3	118.5	45.8	25.9
2.5	39.5	39.7	39.3	39.5	51.9	137.8	108.2	44.8	32.3
3	37.1	36.8	37.2	37.0	54.9	125.7	98.3	49.6	38.5
4	36.2	36.3	36.2	36.2	55.9	141.1	115.6	43.4	27.7
5	38.8	37.6	37.9	38.1	53.6	147.5	114.8	40.9	28.2
10	36.8	36.4	36.4	36.5	55.6	135.7	101.0	45.6	36.8

Table A.3 Results of jar test experimental performed by Non-PAM with septic tank effluent

Non-PAM Dosage mg/L	Turbidity, NTU					TCOD mg/L	SCOD mg/L	TCOD removal %	SCOD removal %
	1	2	3	Avg.	% Removal				
0	109.2	108.8	109.4	109.1	0.0	259.4	143.0	0.0	0.0
0.1	89.2	87.6	89.1	88.6	18.8	242.7	140.8	6.5	1.5
0.25	84.9	82.9	83.5	83.7	23.3	234.4	135.6	9.6	5.2
0.5	53.9	53.9	53.7	53.8	50.7	161.4	103.1	37.8	27.9
1	52.9	52.7	52.1	52.6	51.8	155.3	96.8	40.1	32.3
1.5	54.6	54.3	54.5	54.5	50.1	143.2	94.0	44.8	34.2
2	53.4	53.8	52.3	53.2	51.3	129.0	90.3	50.3	36.9
2.5	53.9	53.9	54.1	54.0	50.5	121.1	90.1	53.3	37.0
3	53.3	53.5	53.8	53.5	50.9	118.9	88.8	54.2	37.9
4	54.9	54.3	54.7	54.6	49.9	113.7	84.2	56.2	41.1
5	57.8	56.3	54.8	56.3	48.4	132.6	90.9	48.9	36.4
10	51.9	51.0	51.4	51.4	52.9	128.8	91.4	50.4	36.1

Table A.4 Results of jar test experimental performed by C-PAM with MLSS in MBR

C-PAM Dosage mg/L	Turbidity, NTU					TCOD mg/L	SCOD mg/L	TCOD removal %	SCOD removal %
	1	2	3	Avg.	% Removal				
0	103.0	102.0	102.0	102.3	0.0	180.0	152.6	0.0	0.0
0.1	69.5	69.5	69.6	69.5	32.1	152.8	119.2	15.1	21.9
0.25	61.5	61.7	61.6	61.6	39.8	129.1	101.8	28.3	33.3
0.5	30.6	30.3	30.4	30.4	70.3	96.1	62.8	46.6	58.8
1	28.6	28.7	28.5	28.6	72.1	94.8	62.3	47.3	59.2
1.5	23.3	21.1	23.4	22.6	77.9	74.2	50.6	58.8	66.9
2	17.9	17.4	18.6	17.9	82.4	67.4	46.4	62.5	69.6
2.5	17.2	17.0	17.5	17.2	83.2	64.5	42.1	64.2	72.4
3	15.1	15.8	15.4	15.4	84.9	57.7	36.2	67.9	76.2
4	14.4	14.2	14.3	14.3	86.0	56.1	33.7	68.9	77.9
5	13.4	13.6	13.1	13.4	86.9	45.5	34.8	74.7	77.2
10	8.83	8.54	8.87	8.8	91.4	42.6	24.4	76.3	84.0

Tale A.5 Results of jar test experimental performed by A-PAM with MLSS in MBR tank

A-PAM Dosage mg/L	Turbidity, NTU					TCOD mg/L	SCOD mg/L	TCOD removal %	SCOD removal %
	1	2	3	Avg.	% Removal				
0	105.0	100.0	101.0	102.0	0.0	179.0	139.9	0.0	0.0
0.1	68.9	68.8	68.8	68.9	31.8	156.0	94.7	12.9	32.3
0.25	62.6	62.6	62.6	62.6	38.6	143.0	72.8	20.1	47.6
0.5	37.8	37.9	37.4	37.7	63.0	105.0	50.8	41.3	63.7
1	30.4	29.5	29.9	29.9	70.6	98.4	51.7	45.0	63.1
1.5	35.8	35.0	35.0	35.3	65.4	108.7	60.7	39.3	56.6
2	35.4	35.7	35.7	35.6	65.1	107.9	60.3	39.7	56.9
2.5	29.5	29.7	29.3	29.5	71.1	99.3	59.5	44.5	57.5
3	37.1	36.8	37.2	37.0	63.7	107.5	61.6	39.9	56.0
4	36.2	36.3	36.2	36.2	64.5	113.2	64.0	36.7	54.3
5	28.8	27.6	27.9	28.1	72.4	97.2	57.0	45.7	59.2
10	37.8	37.4	37.4	37.5	63.2	114.1	61.1	36.3	56.3

Table A.6 Results of jar test experimental performed by Non-PAM with MLSS in MBR

Non-PAM Dosage mg/L	Turbidity, NTU					TCOD mg/L	SCOD mg/L	TCOD removal %	SCOD removal %
	1	2	3	Avg.	% Removal				
0	99.2	98.8	99.4	99.1	0.0	185.5	142.2	0.0	0.0
0.1	80.4	80.4	80.4	80.4	18.9	158.8	75.8	14.4	46.7
0.25	68.3	68.4	68.3	68.3	31.1	165.8	100.3	10.6	29.5
0.5	36.1	36.8	36.7	36.5	63.2	103.5	50.1	44.2	64.8
1	35.2	34.9	35.0	35.0	64.7	104.8	54.7	43.5	61.6
1.5	34.9	35.2	35.0	35.0	64.7	108.1	54.3	41.7	61.8
2	31.2	30.8	30.6	30.9	68.9	97.3	57.2	47.5	59.8
2.5	35.3	35.9	34.8	35.3	64.4	102.3	59.6	44.9	58.1
3	30.6	30.3	30.7	30.5	69.2	108.9	51.8	41.3	63.6
4	32.3	32.5	32.9	32.6	67.2	96.5	48.9	48.0	65.6
5	35.8	36.0	35.3	35.7	64.0	108.1	54.3	41.7	61.8
10	26.9	26.4	26.5	26.6	73.2	100.2	51.8	46.0	63.6

Table A.7 Results of particle size distribution of supernatant fraction at different dosage of C-PAM

Particle size distribution of supernatant fraction at different dosage of C-PAM													
0 mg/L		0.1 mg/L		0.5 mg/L		1.5 mg/L		2.5 mg/L		5 mg/L		10 mg/L	
Particle size, nm	Intensity	Particle size, nm	Intensity	Particle size, nm	Intensity	Particle size, nm	Intensity	Particle size, nm	Intensity	Particle size, nm	Intensity	Particle size, nm	Intensity
0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00
216.45	2.54E+06	173.28	2.50E+06	125.53	2.13E+06	110.96	2.13E+06	95.20	2.70E+06	63.22	2.13E+06	51.91	2.09E+06
420.16	5.66E+06	285.39	4.63E+06	227.53	4.55E+06	208.06	4.67E+06	158.67	5.04E+06	119.79	4.88E+06	92.89	4.71E+06
611.14	8.03E+06	468.86	7.75E+06	376.60	7.75E+06	339.83	7.83E+06	259.16	8.07E+06	186.34	7.79E+06	139.34	7.54E+06
1005.83	9.92E+06	825.60	9.92E+06	643.36	9.92E+06	582.56	9.92E+06	428.41	9.92E+06	312.79	9.92E+06	237.69	9.92E+06
1566.04	8.16E+06	1304.66	7.95E+06	1027.81	7.95E+06	908.51	7.99E+06	655.83	8.24E+06	479.16	7.95E+06	377.02	7.70E+06
2062.59	5.74E+06	1783.71	5.20E+06	1451.49	4.84E+06	1289.95	4.84E+06	920.28	5.25E+06	638.88	5.20E+06	519.09	4.71E+06
3004.76	2.66E+06	2293.35	3.11E+06	1937.93	2.50E+06	1733.80	2.46E+06	1216.46	2.91E+06	911.73	2.21E+06	691.21	2.38E+06
4112.45	1.07E+06	2935.48	1.60E+06	2573.45	1.07E+06	2267.81	1.11E+06	1650.16	1.23E+06	1211.21	8.61E+05	948.02	8.61E+05
5538.44	3.69E+05	4168.79	4.92E+05	3562.03	3.28E+05	3169.39	3.28E+05	2332.43	3.69E+05	1570.58	3.28E+05	1273.13	2.87E+05
7270.00	1.43E-09	5820.00	1.43E-09	4480.00	1.43E-09	3960.00	1.43E-09	3020.00	1.43E-09	1900.00	1.43E-09	1560.00	1.43E-09

Appendix B Experimental Data of the in-line Flocculation MBR system

Table B.1 Daily data of Temperature, pH, DO at the first stage (Non-dosed)

Day	Temp			pH			DO		
	Influent	MBR	Permeate	Influent	MBR	Permeate	Influent	MBR	Permeate
1	26.0	26.0	24.6	7.9	6.2	5.5	0.2	6.3	6.2
4	24.8	22.8	23.9	8.0	5.7	6.8	0.2	6.2	6.1
8	27.1	27.5	26.8	8.5	6.4	6.3	0.5	6.3	5.4
12	26.7	26.9	27.0	8.0	6.5	6.3	0.1	6.9	5.9
22	24.5	24.7	24.6	7.4	5.9	4.7	0.3	6.7	6.9
25	23.3	23.7	23.9	7.6	5.3	5.2	0.3	6.3	5.7
27	24.2	24.5	24.8	6.1	6.1	4.8	0.2	6.2	5.8
29	24.4	24.2	24.3	7.9	5.6	5.2	0.5	6.9	5.7
34	21.7	21.7	21.4	7.9	6.6	6.5	-	-	-
39	21.9	21.6	21.9	8.2	6.5	6.3	-	-	-
41	22.8	22.4	23.0	7.8	5.9	5.8	-	-	-
44	24.1	24.2	24.4	7.4	6.8	6.5	-	-	-
46	22.9	22.3	22.8	8.8	5.9	5.9	-	-	-
56	21.3	21.7	22.2	8.4	6.4	6.1	0.1	7.4	5.4
58	20.0	19.6	20.1	8.3	6.9	6.3	0.2	7.3	5.9
60	14.2	16.9	17.6	8.4	7.6	7.6	0.4	6.1	6.4
65	18.8	18.5	25.0	8.3	7.8	7.7	0.8	6.3	4.4
70	19.8	19.1	19.3	8.5	7.0	6.5	0.6	7.9	7.1
71	18.8	18.4	18.4	8.3	6.1	5.8	0.7	8.1	6.3
73	25.0	18.3	18.1	8.3	6.9	6.7	0.4	6.8	5.6
76	17.2	16.9	17.5	8.8	7.5	7.3	0.2	8.3	7.2
80	21.5	21.0	25.0	8.1	5.8	6.0	0.2	7.7	5.7
85	21.5	20.8	21.9	8.0	4.8	5.4	0.1	7.8	5.8
87	20.9	20.4	20.9	7.9	5.4	5.6	0.7	8.2	4.4
90	22.3	22.4	22.9	8.2	7.3	7.4	0.2	7.4	4.7
92	23.2	22.8	23.2	7.8	8.0	7.9	0.1	7.6	4.4
94	23.6	24.0	24.1	8.0	7.7	7.7	0.2	7.0	4.1
97	22.6	21.6	22.2	8.1	6.8	6.9	0.1	7.8	4.0

Table B.1 Daily data of Temperature, pH, DO at the first stage (Non-dosed) (Con.)

Day	Temp			pH			DO		
	Influent	MBR	Permeate	Influent	MBR	Permeate	Influent	MBR	Permeate
101	24.2	24.5	25.0	7.9	8.0	7.9	0.0	7.4	3.4
106	20.7	20.1	20.5	7.4	7.4	7.5	0.1	7.5	4.5
108	19.4	18.6	18.8	7.5	8.1	8.1	0.1	7.6	4.5
111	15.9	15.8	16.0	7.6	8.4	8.3	0.2	7.4	6.2
113	17.5	18.4	19.0	8.2	8.1	8.1	0.5	7.4	7.0
115	19.6	19.8	20.5	7.6	8.1	8.1	0.1	8.4	5.0
118	24.8	24.6	24.9	7.9	5.0	5.1	0.1	6.8	4.3
120	26.1	26.2	26.6	7.9	4.7	4.7	0.0	6.5	3.5
122	26.5	26.7	27.1	7.7	7.0	6.8	0.0	6.1	3.5
125	26.7	25.0	26.7	7.7	4.8	5.1	0.0	6.0	3.3
127	26.6	25.9	26.1	7.7	6.2	6.6	0.0	6.8	4.1
129	22.3	20.2	19.8	7.7	7.8	7.6	0.0	8.5	5.1
132	19.8	20.3	20.9	7.9	4.9	4.9	0.1	7.4	4.2
136	24.6	23.2	23.4	6.4	6.4	6.4	0.0	6.8	3.8
139	24.1	24.0	24.3	7.1	7.1	7.1	0.0	6.4	3.7
142	22.4	21.6	22.0	7.8	6.8	6.7	0.0	7.1	4.1
144	23.3	22.8	23.2	7.8	8.2	8.1	0.1	6.8	3.9
147	24.9	25.0	24.9	7.8	8.0	7.9	0.1	7.1	4.0
156	24.0	23.2	23.8	7.9	8.0	7.8	0.1	6.8	4.0
160	25.3	25.1	25.1	8.0	8.4	8.4	0.1	7.6	4.0
170	24.4	24.9	24.9	7.5	7.2	7.2	0.0	6.0	3.0
172	25.0	25.2	25.2	7.8	7.8	7.4	0.1	5.5	3.3
179	25.6	27.0	26.9	7.5	7.3	7.1	0.1	6.5	3.3
186	26.0	27.1	27.0	7.7	7.6	7.0	0.0	6.7	3.5
189	27.0	27.4	27.2	7.5	7.3	7.2	0.1	6.4	3.9
198	28.2	28.2	27.7	7.5	7.4	6.8	0.1	6.6	4.1

Table B.2 Daily data of Temperature, pH, DO at the second stage (0.1 mg/L of C-PAM)

Day	Temp, C°			pH			DO, mg/L		
	Influent	MR	Permeate	Influent	MBR	Permeate	Influent	MBR	Permeate
203	28.0	28.1	27.5	7.4	7.3	7.1	0.1	6.6	4.0
207	27.0	27.0	27.2	7.3	7.1	7.0	0.2	6.2	3.7
209	27.6	27.3	27.3	7.3	7.2	7.0	0.1	6.1	4.1
213	28.0	27.2	27.3	7.3	7.7	7.6	0.0	7.3	4.0
215	26.2	27.9	28.0	8.2	6.4	6.5	0.1	6.2	4.8
217	26.7	25.6	25.6	7.8	5.8	5.8	0.1	7.0	6.3
220	27.5	27.5	27.9	7.3	7.9	7.9	0.0	6.7	3.6
222	28.1	28.2	28.4	7.5	7.9	7.8	0.0	6.6	3.3
224	28.8	28.7	28.7	7.7	7.2	7.2	0.0	6.4	3.4

Table B.3 Daily data of Temperature, pH, DO at the third stage (2 mg/L of C-PAM)

Day	Temp, C°			pH			DO, mg/L		
	Influent	MBR	Permeate	Influent	MBR	Permeate	Influent	MBR	Permeate
229	29.1	28.7	28.8	7.7	7.5	7.2	0.0	6.9	3.4
231	30.3	30.0	30.2	7.7	7.5	7.1	0.1	6.6	3.1
234	31.0	30.5	30.8	7.3	6.6	6.1	0.0	6.2	3.4
236	29.9	29.9	29.9	7.5	7.4	7.1	0.0	5.6	3.3
238	29.4	28.9	28.6	7.5	7.3	7.1	0.0	6.1	3.4

TableB.4 Daily data of Flux and TMP at the first stage (Non-dosed)

Day	Q, mL/min	TMP, cmHg	Flux, L/m^2.h	TMP, Kpa
59	31.0	2.5	12.9	3.3
60	30.0	5.0	12.5	6.7
61	28.0	18.0	11.7	24.0
62	24.0	26.0	10.0	34.7
66	27.0	1.5	11.3	2.0
67	23.0	21.0	9.6	28.0
68	40.0	0.0	16.7	0.0
69	30.0	2.5	12.5	3.3
70	27.0	10.0	11.3	13.3
71	22.0	34.0	9.2	45.3
72	37.0	0.0	15.4	0.0
73	28.0	0.0	11.7	0.0
74	36.0	0.0	15.0	0.0
75	28.0	5.0	11.7	6.7
76	27.0	22.0	11.3	29.3
77	26.0	26.0	10.8	34.7
78	37.0	0.0	15.4	0.0
79	33.0	6.5	13.8	8.7
80	30.0	12.0	12.5	16.0
81	29.0	21.0	12.1	28.0
82	40.0	0.0	16.7	0.0
83	27.0	2.5	11.3	3.3
84	32.0	7.5	13.4	10.0
85	25.0	24.0	10.4	32.0
86	40.0	0.0	16.7	0.0
87	33.0	3.0	13.8	4.0
88	29.0	6.0	12.1	8.0
89	33.0	10.0	13.8	13.3
90	28.0	21.0	11.7	28.0
91	40.0	0.0	16.7	0.0
92	32.0	5.0	13.4	6.7
93	30.0	7.5	12.5	10.0
94	34.0	13.0	14.2	17.3

TableB.4 Daily data of Flux and TMP at the first stage (Non-dosed) (Con.)

Day	Q, mL/min	TMP, cmHg	Flux, L/m^2.h	TMP, Kpa
105	34.0	0.0	14.2	0.0
106	32.0	0.0	13.4	0.0
107	34.0	0.0	14.2	0.0
108	32.0	0.0	13.4	0.0
109	40.0	0.0	16.7	0.0
110	34.0	0.0	14.2	0.0
111	33.0	0.0	13.8	0.0
112	30.0	0.0	12.5	0.0
114	33.0	0.0	13.8	0.0
115	36.0	5.0	15.0	6.7
116	40.0	5.0	16.7	6.7
117	40.0	7.5	16.7	10.0
118	40.0	10.0	16.7	13.3
119	40.0	10.0	16.7	13.3
120	40.0	10.0	16.7	13.3
121	40.0	10.0	16.7	13.3
122	35.0	10.0	14.6	13.3
123	36.0	11.0	15.0	14.7
124	37.0	10.0	15.4	13.3
125	36.0	11.0	15.0	14.7
126	35.0	14.0	14.6	18.7
127	36.0	14.0	15.0	18.7
128	40.0	0.0	16.7	0.0
129	35.0	2.5	14.6	3.3
130	40.0	0.0	16.7	0.0
131	40.0	0.0	16.7	0.0
132	38.0	2.5	15.9	3.3
133	40.0	7.5	16.7	10.0
134	35.0	15.0	14.6	20.0
135	40.0	21.0	16.7	28.0
136	40.0	21.0	16.7	28.0
137	37.0	21.0	15.4	28.0
138	27.0	27.0	11.3	36.0
139	40.0	2.5	16.7	3.3

Table B.4 Daily data of Flux and TMP at the first stage (Non-dosed) (Con.)

Day	Q, mL/min	TMP, cmHg	Flux, L/m^2.h	TMP, Kpa
141	40.0	5.0	16.7	6.7
142	40.0	7.5	16.7	10.0
143	39.0	7.5	16.3	10.0
144	36.0	15.0	15.0	20.0
145	31.0	28.0	12.9	37.3
146	40.0	0.0	16.7	0.0
147	40.0	5.0	16.7	6.7
148	39.0	6.0	16.3	8.0
149	40.0	7.5	16.7	10.0
150	35.0	10.0	14.6	13.3
151	40.0	14.0	16.7	18.7
152	38.0	17.0	15.9	22.7
153	36.0	19.0	15.0	25.3
154	35.0	28.0	14.6	37.3
155	38.0	0.0	15.9	0.0
156	36.0	2.5	15.0	3.3
157	38.0	5.0	15.9	6.7
158	35.0	6.0	14.6	8.0
159	40.0	9.0	16.7	12.0
160	37.0	12.0	15.4	16.0
161	33.0	16.0	13.8	21.3
162	27.0	24.0	11.3	32.0
163	40.0	0.0	16.7	0.0
164	35.0	2.5	14.6	3.3
165	35.0	5.0	14.6	6.7
166	35.0	10.0	14.6	13.3
167	35.0	12.0	14.6	16.0
168	33.0	20.0	13.8	26.7
169	40.0	0.0	16.7	0.0
170	39.0	2.5	16.3	3.3
171	38.0	4.0	15.9	5.3
172	37.0	7.0	15.4	9.3
173	33.0	16.0	13.8	21.3
174	30.0	22.0	12.5	29.3

Table B.4 Daily data of Flux and TMP at the first stage (Non-dosed) (Con.)

Day	Q, mL/min	TMP, cmHg	Flux, L/m^2.h	TMP, Kpa
176	38.0	2.0	15.9	2.7
177	37.0	2.5	15.4	3.3
178	40.0	5.0	16.7	6.7
179	38.0	8.0	15.9	10.7
181	37.0	12.0	15.4	16.0
182	30.0	18.0	12.5	24.0
183	38.0	2.0	15.9	2.7
184	36.0	4.0	15.0	5.3
185	38.0	10.0	15.9	13.3
186	36.0	14.0	15.0	18.7
187	30.0	20.0	12.5	26.7
188	40.0	0.0	16.7	0.0
189	37.0	2.0	15.4	2.7
190	35.0	4.0	14.6	5.3
191	33.0	7.5	13.8	10.0
192	33.0	14.0	13.8	18.7
193	30.0	16.0	12.5	21.3
194	31.0	22.0	12.9	29.3
200	40.0	7.5	16.7	10.0
201	35.0	10.0	14.6	13.3

Table B.5 Daily data of Flux and TMP at the second stage (0.1 mg/L of C-PAM)

Day	Q, mL/min	TMP, cmHg	Flux, $L/m^2.h$	TMP, Kpa
202	40.0	0.0	16.7	0.0
203	38.0	2.0	15.9	2.7
204	37.0	2.0	15.4	2.7
205	37.0	3.0	15.4	4.0
206	36.0	3.0	15.0	4.0
207	37.0	4.0	15.4	5.3
208	40.0	4.0	16.7	5.3
209	40.0	4.0	16.7	5.3
210	40.0	3.0	16.7	4.0
211	43.0	6.0	17.9	8.0
212	40.0	6.0	16.7	8.0
213	40.0	5.0	16.7	6.7
214	40.0	9.0	16.7	12.0
215	40.0	8.0	16.7	10.7
216	40.0	7.0	16.7	9.3
217	40.0	7.0	16.7	9.3
218	40.0	7.0	16.7	9.3
219	38.0	8.0	15.9	10.7
220	38.0	9.5	15.9	12.7
221	36.0	14.0	15.0	18.7
222	33.0	20.0	13.8	26.7
223	35.0	32.0	14.6	42.7
226	0.0	0.0	0.0	0.0

Table B.6 Daily data of Flux and TMP at the third stage (2 mg/L of C-PAM)

Day	Q, mL/min	TMP, cmHg	Flux, $L/m^2.h$	TMP, Kpa
227	20.0	23.0	8.3	0.0
228	39.0	6.0	16.3	2.0
229	38.0	10.0	15.9	2.0
230	28.0	20.0	11.7	3.0
231	30.0	28.0	12.5	3.0
233	40.0	4.0	16.7	5.3
235	40.0	5.0	16.7	6.7
236	40.0	7.0	16.7	9.3
237	40.0	8.0	16.7	10.7
238	40.0	8.0	16.7	10.7
239	39.0	8.0	16.3	11.3
240	39.0	10.0	16.3	13.3
241	39.0	9.0	16.3	12.0
242	39.0	9.0	16.3	12.0
243	40.0	9.0	16.7	12.0
244	40.0	10.0	16.7	13.3
245	39.0	10.0	16.3	13.3

Table B.7 Raw data of MLSS, MLVSS, and COD at the first stage (non-dosed)

Day	MLSS, mg/L	MLVSS, mg/L	COD Influent, mg/L	COD Permeate, mg/L	% TCOD removal	% SCOD removal
1	3750	1400	293	18	94	91
4	4820	3920	115	13	89	85
8	4300	3880	191	21	89	83
12	3600	-	190	22	88	83
22	2680	2680	131	22	83	70
25	2670	2490	118	18	85	68
27	2520	1720	118	29	75	63
29	2311	2200	79	24	69	40
34	1688	1537	100	51	49	41
39	1733	1700	152	76	49	15
41	1813	1680	111	65	42	19
44	1400	1060	86	55	37	20
46	1733	2460	177	77	57	33
56	2200	2020	130	61	53	31
58	1800	2200	279	82	71	-
60	2080	1800	128	74	42	-
65	1943	1620	157	79	34	24
70	1800	1640	160	100	37	45
71	1800	1710	111	51	54	14
73	1733	1660	121	92	24	38
76	1760	1620	172	91	47	29
80	1720	1400	128	87	37	34
85	2200	2040	136	18	87	78
87	2213	2400	157	26	83	61
90	2560	2702	131	18	86	74
92	2470	2210	148	8	95	89
94	2302	2240	184	25	86	72
97	2493	2309	105	21	80	70

Table B.7 Raw data of MLSS, MLVSS, and COD at the first stage (non-dosed) (Con.)

Day	MLSS, mg/L	MLVSS, mg/L	COD Influent, mg/L	COD Permeate, mg/L	% TCOD removal	% SCOD removal
101	2560	2380	156	24	85	63
106	2380	2140	110	21	81	71
108	2153	2640	44	12	73	54
111	2387	2080	29	4	86	56
113	2467	2340	39	4	89	63
115	2499	2380	38	7	82	76
118	2227	2080	105	22	79	72
120	2280	-	106	28	74	64
122	2400	1700	108	21	81	72
125	2573	2440	123	24	81	76
127	2947	2780	130	24	82	70
129	-	-	164	29	82	59
132	3880	3133	231	18	92	88
136	4200	3347	132	24	82	69
139	5253	3939	159	22	86	76
142	4867	3990	265	25	91	73
144	4713	3535	133	21	84	75
147	5653	4660	179	33	82	50
156	5587	-	151	8	95	90
160	5467	4560	140	15	89	77
170	5693	-	157	25	84	76
172	5760	4596	170	20	88	81
179	5507	4440	141	15	89	77
186	6680	5240	226	9	96	85
189	5440	4320	214	23	89	82
198	5321	4214	178	22	88	73
Average					**74.6**	**59.2**
SD.					**19.2**	**26.4**

Table B.8 Raw data of MLSS, MLVSS, and COD at the second stage (0.1 mg/L of C-PAM)

Day	MLSS, mg/L	MLVSS, mg/L	COD Influent, mg/L	COD Permeate, mg/L	% TCOD removal	% SCOD removal
203	5173	4358	120	11	91	87
207	4320	3960	81	8	91	75
209	4200	3980	185	7	96	85
213	4387	3732	77	3	96	91
215	4280	3660	237	22	91	76
217	4573	4240	178	26	85	73
220	4800		149	12	92	78
222	5160	4180	204	11	95	83
224	5027	4060	232	13	94	87
Average					**92.3**	**81.6**
SD.					**3.4**	**6.3**

Table B.9 Raw data of MLSS, MLVSS, and COD at the third stage (2 mg/L of C-PAM)

Day	MLSS, mg/L	MLVSS, mg/L	COD Influent, mg/L	COD Permeate, mg/L	% TCOD removal	% SCOD removal
229	4467	3760	185	12	93	85
231	4947	4280	209	10	95	88
234	4147	3733	247	13	95	90
236	5733	4800	214	12	94	85
238	4800	4000	258	8	97	90
Average					**94.9**	**87.6**
SD.					**1.3**	**2.7**

Table B.10 Data of Nitrogen compound at the first stage (non-dosed)

Day	Influent, mg/L					Permeate, mg/L					
	TKN	NH_4-N	NO_2-N	NO_3-N	TN	TKN	Org-N	NH_4-N	NO_2-N	NO_3-N	TN
115	100.1	2.3	N/D	1.8	101.9	10.3	-	0.0	N/D	47.8	58.1
118	929.9	33.6	1.1	0.7	931.7	1.9	N/D	2.5	0.5	258.7	261.1
120	865.5	88.2	N/D	6.6	872.2	2.3	N/D	15.6	0.3	290.2	292.9
122	673.6	69.1	N/D	4.8	678.4	0.5	N/D	0.8	0.2	260.3	261.0
125	710.6	76.6	0.1	10.5	721.2	0.4	N/D	40.4	0.4	384.4	385.2
127	852.3	121.3	N/D	7.4	859.7	0.5	N/D	2.3	0.2	428.4	429.1
129	117.0	26.4	N/D	4.8	121.8	N/D	N/D	0.1	0.2	179.2	179.4
132	829.6	117.9	N/D	11.7	841.2	1.0	N/D	7.8	1.5	348.2	350.6
136	1577.2	50.7	N/D	4.0	1581.2	1.8	1.6	0.2	0.3	407.4	409.5
139	666.4	92.7	N/D	12.0	678.4	1.0	0.9	0.1	0.7	453.3	455.0
142	751.2	90.7	N/D	11.2	762.4	1.1	1.0	0.1	0.9	397.4	399.4
144	722.1	87.9	N/D	10.7	732.8	0.9	0.3	0.6	0.5	426.1	427.6
147	639.9	88.3	N/D	6.9	646.8	1.0	0.6	0.4	0.4	439.4	440.9
156	686.4	90.7	N/D	12.0	698.4	0.9	0.6	0.3	0.5	430.2	431.6
160	717.0	91.7	N/D	12.2	729.2	1.0	0.5	0.5	1.5	406.7	409.1
170	698.3	89.8	N/D	11.8	710.1	0.9	0.7	0.3	0.4	398.5	399.9
172	691.0	88.8	N/D	12.6	703.6	1.0	0.2	0.8	0.6	399.5	401.1
179	751.8	88.3	N/D	12.5	764.4	1.3	1.2	0.1	0.4	408.7	410.4
186	700.1	62.2	N/D	10.2	710.2	0.8	0.7	0.1	0.2	289.9	290.8
189	709.1	68.5	N/D	13.6	722.7	1.1	1.0	0.1	0.6	312.4	314.1
198	505.4	43.6	N/D	1.7	507.1	0.7	0.6	0.1	N/D	254.0	254.6

Table B.11 Data of Nitrogen compound at the second stage (0.1 mg/L of C-PAM)

Day	Influent, mg/L					Permeate, mg/L					
	TKN	NH_4-N	NO_2-N	NO_3-N	TN	TKN	Org-N	NH_4-N	NO_2-N	NO_3-N	TN
203	472.9	25.9	N/D	1.5	474.4	0.5	0.5	0.0	N/D	190.5	191.0
207	278.6	19.7	N/D	3.3	281.9	0.6	0.6	0.0	0.2	85.2	86.0
209	403.7	31.9	N/D	3.5	407.2	1.1	1.1	0.0	0.1	117.1	118.3
213	467.1	25.9	N/D	2.4	469.4	0.3	0.3	0.0	N/D	107.3	107.6
215	442.1	48.4	N/D	12.1	454.2	0.4	0.4	0.0	0.6	208.1	209.2
217	524.2	58.2	N/D	10.6	534.7	2.2	N/D	2.4	0.3	280.2	282.8
220	578.9	46.3	N/D	8.7	587.5	0.6	0.5	0.1	0.4	282.7	283.7
222	605.7	54.6	0.1	11.0	616.8	0.4	0.2	0.2	0.3	299.9	300.6
224	595.2	52.9	N/D	9.1	604.3	0.7	0.6	0.1	0.3	291.7	292.8

Table B.12 Data of Nitrogen compound at the third stage (2 mg/L of C-PAM)

Day	Influent, mg/L					Permeate, mg/L					
	TKN	NH_4-N	NO_2-N	NO_3-N	TN	TKN	Org-N	NH_4-N	NO_2-N	NO_3-N	TN
229	650.5	54.6	N/D	17.5	668.0	5.6	5.5	0.1	20.2	263.0	288.8
231	1761.8	73.7	N/D	4.2	1766.0	5.9	5.8	0.2	3.3	309.8	319.0
236	1687.7	52.1	N/D	N/D	1687.7	0.3	0.1	0.2	2.2	286.0	288.5
238	1792.8	91.2	0.4	16.9	1810.0	1.9	1.8	0.2	0.8	352.4	355.1
241		47.9	N/D	N/D	778.2			0.3	0.2	168.8	168.9
243		41.7	N/D	6.0	628.7			0.3	0.3	182.7	183.0

Table B.13 Result of Nitrogen removal efficiency at the first stage (Non-dosed)

Day	**% Removal**		
	TKN	**NH_4-N**	**TN**
115	89.7	99.7	43.0
118	99.8	92.6	72.0
120	99.7	82.3	66.4
122	99.9	98.9	61.5
125	99.9	47.2	46.6
127	99.9	98.1	50.1
129	100.0	99.7	-47.3
132	99.9	93.4	58.3
136	99.9	99.7	74.1
139	99.8	99.9	32.9
142	99.9	99.9	47.6
144	99.9	99.9	41.7
147	99.8	99.9	31.8
156	99.9	99.9	38.2
160	99.9	99.9	43.9
170	99.9	99.9	43.7
172	99.9	99.9	43.0
179	99.8	99.9	46.3
186	99.9	99.8	59.1
189	99.8	99.8	56.5
198	99.9	99.8	49.8
Average	**99.4**	**95.7**	**45.7**
SD.	**2.2**	**11.9**	**24.3**

Table B.14 Result of Nitrogen removal efficiency at the second stage (0.1 mg/L of C-PAM)

Day	% Removal		
	TKN	NH_4-N	TN
203	99.9	99.8	59.7
207	99.8	100.0	69.5
209	99.7	99.8	70.9
213	99.9	99.9	77.1
215	99.9	100.0	53.9
217	99.6	95.8	47.1
220	99.9	99.8	51.7
222	99.9	99.9	51.3
224	99.9	99.8	51.6
Average	**99.8**	**99.4**	**59.2**
SD.	**0.1**	**1.3**	**10.7**

Table B.15 Result of Nitrogen removal efficiency at the third stage (2 mg/L of C-PAM)

Day	% Removal		
	TKN	NH_4-N	TN
229	99.1	99.9	56.8
231	99.7	99.8	81.9
236	100.0	99.7	82.9
238	99.9	99.8	80.4
241	100.0	99.5	78.3
243	100.0	99.3	70.9
Average	**99.8**	**99.2**	**75.2**
SD.	**0.3**	**1.1**	**10.0**

Appendix C Data of EPS

Table C.1 Results of total EPS at the first stage (Non-dosed)

Day	MLVSS, mg/L	EPS_p, mg/L	EPS_C, mg/L	EPS_p, mg/gVSS	EPS_C, mg/gVSS
1	2380	156.3	55.9	65.7	23.5
2	2140	111.3	30.4	52.0	14.2
3	2640	87.8	50.7	33.3	19.2
4	2080	85.2	58.6	41.0	28.2
5	2380	78.6	47.2	33.0	19.8
6	3133	125.2	56.6	40.0	18.1
7	3737	228.6	80.0	61.2	21.4
8	3347	163.6	33.6	48.9	10.0
9	3939	254.4	95.0	64.6	24.1
10	3990	270.2	89.2	67.7	22.4
11	3535	113.6	124.1	32.1	35.1
12	4660	232.8	117.8	50.0	25.3
13	4560	214	116.2	46.9	25.5
14	4560	220.2	103.2	48.3	22.6
15	4596	229.4	102.6	49.9	22.3
16	4440	215.2	93.1	48.5	21.0
17	5240	226.3	105.6	43.2	20.2
18	4320	179.8	103.9	41.6	24.1
19	4214	231.7	127	55.0	30.1
Average				**48.6**	**22.5**
SD.				**10.8**	**5.5**

Table C.2 Results of total EPS at the second stage (0.1 mg/L of C-PAM)

Day	**MLVSS, mg/L**	**EPS_p, mg/L**	**EPS_C, mg/L**	**EPS_p, mg/gVSS**	**EPS_C, mg/gVSS**
1	4358	164.4	72.9	37.7	16.7
2	3960	114	66.5	28.8	16.8
3	3980	95	56.4	23.9	14.2
4	3732	77.5	45.6	20.8	12.2
5	3660	84.8	49.8	23.2	13.6
6	4240	115.9	51.2	27.3	12.1
7	3880	123.2	83.8	31.8	21.6
8	4180	158.2	102.6	37.8	24.5
9	4060	114.4	74.2	28.2	18.3
Average				**28.8**	**16.7**
SD.				**6.5**	**4.3**

Table C.3 Results of total EPS at the third stage (2 mg/L of C-PAM)

Day	**MLVSS, mg/L**	**EPS_p, mg/L**	**EPS_C, mg/L**	**EPS_p, mg/gVSS**	**EPS_C, mg/gVSS**
1	3760	91.7	54.3	24.4	14.4
2	4280	99.8	75.3	23.3	17.6
3	3733	68.6	48.5	18.4	13.0
4	4800	97.1	56.7	20.2	11.8
5	4000	109.8	62.6	27.5	15.7
Average				**22.8**	**14.5**
SD.				**3.6**	**2.3**

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