

Exercise 5

BNR Troubleshooting

Attached is a plant data sheet for a BNR plant using a modified A²/O process similar to the schematic shown in Transparency 98. The plant has effluent limits of 5 mg/L TN and 2 mg/L ammonia. The plant has automatic DO control in the first aerobic zone. It also has automatic methanol feed to the second anoxic zone based on feedback from a nitrate probe in the second aerobic zone. This data set indicates that the plant is achieving excellent nitrogen removal. The monthly average effluent total nitrogen of 4.4 mg/L meets the discharge permit limit of 5.0 mg/L. The monthly average effluent ammonia of 0.8 mg/L meets the discharge permit limit of 2.0 mg/L. There are, however, some days when minor problems occurred. Process adjustments during these times could have improved performance.

Can you identify three problems indicated by the data and recommend actions to improve performance?

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Data Sheet

Nitrogen Removal Training Program

Day	Plant Flow (MGD)	Influent BOD ₅ (mg/L)	Influent TKN (mg/L)	MLSS in First Anoxic Zone (mg/L)	MLSS in First Aerobic Zone (mg/L)	Dissolved Oxygen in First Aerobic Zone (mg/L)	NO ₂ ⁻ and NO ₃ ⁻ - N in First Aerobic Zone (mg/L)	Final Effluent NH ₄ ⁺ - N (mg/L)	Final Effluent TKN (mg/L)	Final Effluent NO ₂ ⁻ and NO ₃ ⁻ - N (mg/L)	Final Effluent TN (mg/L)
1	6.1	202	22.2	2,450	2,660	2.0	4.0	0.8	1.4	3.1	4.5
2	6.2	211	21.1	2,630	2,870	1.9	3.5	0.7	1.2	2.5	3.7
3	6.2	230	25.3	1,100	2,670	1.6	6.8	0.9	1.5	5.9	7.4
4	6.3	214	25.7	1,300	2,700	1.5	7.1	0.9	1.5	6.1	7.6
5	6.2	196	25.5	2,490	2,730	2.0	4.1	1.1	1.6	3.1	4.7
6	6.1	209	23.0	2,440	2,670	1.9	3.8	0.9	1.3	2.8	4.1
7	6.2	213	24.5	2,570	2,810	2.2	4.0	0.8	1.3	2.9	4.2
8	6.6	221	23.2	2,530	2,760	1.9	3.9	0.6	1.2	2.9	4.1
9	6.4	232	23.2	2,610	2,830	1.9	3.3	0.7	1.2	2.4	3.6
10	6.3	244	26.8	2,660	2,890	1.8	3.2	0.8	1.3	2.1	3.4
11	6.4	240	27.6	2,620	2,850	2.1	3.1	0.6	1.0	2.0	3.0
12	6.4	239	27.5	2,620	2,860	1.8	3.4	0.8	1.4	2.4	3.8
13	6.5	235	26.8	2,590	2,820	1.6	3.9	0.9	1.5	3.0	4.5
14	6.2	241	29.6	2,630	2,860	1.4	2.8	1.3	1.9	1.8	3.7
15	6.1	222	24.2	2,480	2,710	1.4	3.1	1.4	1.8	2.1	3.9
16	6.2	234	24.1	2,560	2,780	1.4	3.3	1.3	1.8	2.3	4.1
17	6.3	244	26.1	2,470	2,710	2.1	3.7	0.8	1.3	2.6	3.9
18	7.4	220	27.1	2,550	2,790	4.1	3.9	0.5	1.1	3.5	4.6
19	9.9	155	16.7	2,630	2,860	5.2	4.8	0.4	1.3	4.5	5.8
20	8.5	165	21.0	2,680	2,910	4.7	4.9	0.5	1.2	4.5	5.7
21	6.2	220	28.7	2,690	2,930	1.9	3.8	0.7	1.2	2.9	4.1
22	6.3	234	26.7	2,620	2,870	1.9	4.1	0.8	1.3	3.1	4.4
23	6.2	249	26.6	2,520	2,760	1.9	2.9	0.8	1.3	1.9	3.2
24	6.4	224	26.4	2,380	2,600	2.0	3.6	0.8	1.4	2.6	4.0
25	6.5	202	20.4	2,480	2,720	1.8	4.1	0.9	1.4	3.0	4.4
26	6.2	198	19.4	2,540	2,780	1.9	3.3	0.7	1.2	2.3	3.5
27	6.1	194	19.3	2,330	2,550	1.8	4.2	0.9	1.3	3.2	4.5
28	6.1	206	20.2	2,410	2,640	2.0	4.1	0.8	1.3	3.2	4.5
29	6.1	197	21.0	2,480	2,700	1.9	4.1	0.6	1.1	3.1	4.2
30	6.2	216	24.1	2,520	2,750	1.9	3.5	0.9	1.3	2.5	3.8
31	6.2	208	20.6	2,560	2,800	2.0	4.1	0.6	1.0	3.1	4.1
AVG.	6.5	217	24.0	2460	2770	2.1	3.9	0.8	1.3	3.0	4.4