ICR Treatment Study Summary Report

Evaluation of Granular Activated Carbon
Using Pilot Scale Testing
for
Compliance with the Information Collection Rule

Conducted during the period March 3, 1998 to June 16, 1998

Prepared by:

Charlotte Smith & Associates, Inc.
PO Box 629
Orinda, California 94563
(925) 377-1891

June 4, 1999

For:

Little Road Water Treatment Plant, ICR # 315
Pasco County Utilities
8864 Government Drive
New Port Richie, Florida 34654
(727) 847-8145
(727) 847- 8112

Attachments:
1 diskette containing the *ICR Treatment Study Data Collection Spreadsheets & Report*
1 diskette containing the *ICR Treatment Study Summary Report Spreadsheets*

ICR Treatment Study Summary Report

Pasco County Utilities

Summary

According to the requirements of the Information Collection Rule, a pilot-scale GAC study was conducted at the Little Road Water Treatment Plant, in New Port Richie, Florida. The purpose of the study was to evaluate the reduction in disinfection by-product precursors and simulated disinfection by-products afforded by GAC filtration over time. In addition, the Utilities Laboratory conducted 2 weeks of TOC monitoring, from the influent and 10 minute and 20 minute EBCT effluent taps, before media was installed in the filters. The purpose of this preliminary study was to demonstrate that the pilot plant materials do not contribute organic carbon to the water.

Shortly after the first run began, sulfur oxidizing bacteria began to colonize the GAC media. This growth resulted in accumulation of biomass in the filters and early breakthrough of organic carbon. The organic carbon concentration in the 10 minute EBCT effluent reached 73% of the influent concentration after 192 hours. After consultation with the treatment study coordinator, the first run was terminated, and a design change made (ultraviolet light disinfection prior to the GAC filters).

The second run was initiated on March 3 and continued until June 16, 1998. Sixteen sets of samples including three duplicates were taken. The ultraviolet light, was oversized for the flow rate of the pilot plant, and found to be somewhat effective in inhibiting the growth of sulfur oxidizing bacteria. Microscopic analysis of the biofilm in the pilot plant revealed *Thiothrix* (a sulfur oxidizing bacteria) as well as algae and other bacteria. In the second run, organic carbon broke through (at the 70% level) at 529 hours or about 3 weeks, indicating that a complex situation existed which probably involved fluctuating levels of organic carbon in the source water, the nature of the organic carbon and the presence of microbes.

The pilot study demonstrated that GAC filtration is not viable without significant pretreatment. Future efforts of the County to control disinfection by-products should involve a treatablity study aimed at simultaneous control of sulfide and organic carbon. Alternative disinfection (i.e. chloramines) will likely lead to continued regulatory compliance in the short-term.

Background

The existing Little Road Water Treatment Plant, receives untreated groundwater from the West Coast Regional Water Supply Authority. At the plant the water is pumped to slat tray aerators for the removal of hydrogen sulfide. After the water cascades over the aerators, chlorine is added for disinfection, and caustic soda for corrosion control. The water is then held on site for storage and to ensure adequate distribution system pressure. A schematic of the Treatment Plant is shown as Figure 1.

The utility obtained to services of Charlotte Smith & Associates, Inc. to design, construct and supervise the operation of a pilot scale GAC filter plant for compliance with the Information Collection Rule. Utility staff collected samples, analyzed some of the parameters, and sent samples to Gannett Flemming Laboratories, which held a separate contract with the Utility.

Materials & Methods

Description of the Pilot Plant

The pilot plant was constructed of CPVC. CPVC was used rather than PVC due to the presence of hydrogen sulfide in the source water. The GAC pilot columns are 5.75 inch ID, and 8 feet high. All joints and connections are thermo-welded, threaded, or flanged with Teflon gaskets. No glue or solvents were employed in the construction of the pilot plant. Flow was controlled using a Kates™ flow control valve for precise control.

The pilot plant obtained water from the same inlet pipe which feeds water to the existing plant. Water in the existing plant is chlorinated before distribution to the consumers. Additionally, aeration is employed to off-gas hydrogen sulfide. The pilot columns do not employ aeration since this would enhance the growth of sulfide oxidizing bacteria such as *Beggiatoa, Thiothrix* and *Thiodendron*, in the pilot columns. This treatment scheme is appropriate since full scale use of GAC for this utility would incorporate alternative methods to aeration for hydrogen sulfide removal (such as oxidation with chlorine or ozone and granular media filtration) before GAC filtration. Discussions with USEPA led to the conclusion that the best location for the pilot plant was directly off of the raw water inlet tap.

A check valve was placed at the inlet tap. Sample taps were located at the inlet, after the 10 minute EBCT column and after the 20 minute EBCT column. Water flows through ¾ inch CPVC and valves which can be closed to allow for backwash. A by-pass valve between the two pilot columns to allow for independent backwashing of the columns. The valves have EPDM seals. Unions have EPDM o-rings and the water meters have teflon washers. The flow control valve is made of 316 stainless steel with teflon seals. Figure 2 illustrates the pilot plant design.

A Trojen Advantage 5™ ultraviolet light was installed for the second run in an effort to limit the inoculation of the GAC filters by microbes present in the source water. This unit has a rated dose of 22,000 uW•sec/cm^2.

Start-up and Operation

The plant operated without GAC for two weeks to demonstrate that the materials in the pilot plant do not contribute organic carbon to the process stream. The following Pilot Plant TOC data indicates that equivalent TOC values exist for the influent, 10 minute EBCT effluent, and 20 minute EBCT effluent:

PILOT PLANT TOC DATA

DATE:	10/27/97		10/28/97		10/29/97		10/30/97		10/31/97	
	Init.	Dup.	Init.	Dup.	Init.	Dup.	Init.	Dup.	Init.	Dup.
INFLUENT	3.7	3.5	3.7	3.5	3.6	3.5	3.6	3.6	3.6	3.5
10 MINUTE EBCT EFFLUENT	3.6	3.7	3.7	3.6	3.8	3.4	3.8	3.8	3.8	3.7
20 MINUTE EBCT EFFLUENT	3.7	3.5	3.6	3.6	4.0	3.9	3.6	3.6	3.8	3.8

Operating Conditions

The GAC depth has been calculated to achieve an empty bed contact time of 10 minutes and 20 minutes. Calgon Filtrasorb™, which is bituminous GAC was used as the media. This media is 8 by 16 US standard mesh. The plant was operated at 3 gpm/ft^2. Additional information is contained in the Treatment Study Spreadsheets.

Every day the full scale plant operators recorded the pressure at the influent and after both GAC columns. Due to the large size of the media, headloss did not significantly increase over the course of the study. The plant operators also recorded totalized flow, and recorded that the UV light was operating. Once a week they cleaned the bulb with Lime-a-way™, a household solvent designed to dissolve calcium and iron deposits.

Monitoring Plan

According to the requirements of the ICR, 16 samples were taken from each sample tap for the following parameters. Three duplicate samples from each tap were also taken.

INFLUENT	GAC EFFLUENT @ 10 MINUTE EBCT	GAC EFFLUENT @ 20 MINUTE EBCT
pH	pH	pH
alkalinity	alkalinity	alkalinity
turbidity	turbidity	turbidity
temperature	temperature	temperature
total hardness	total hardness	total hardness
calcium hardness	calcium hardness	calcium hardness
ammonia	ammonia[3]	ammonia[3]
bromide		
total organic carbon	total organic carbon	total organic carbon
UV-254	UV-254	UV-254
trihalomethanes[1]	trihalomethanes[1]	trihalomethanes[1]
haloacetic acids[2]	haloacetic acids[2]	haloacetic acids[2]
total organic halides	total organic halides	total organic halides
chlorine demand	chlorine demand	chlorine demand

From: Table 4-0 of the ICR Manual for Bench- and Pilot-Scale Treatment Studies (EPA 814-B-96-003).

Notes: [1] CHCl3, CHBrCl2, CHBr2Cl, CHBr3

[2] MCAA, DCAA, TCAA, MBAA, DBAA, BCAA, TBAA CDBAA, DCBAA

[3] if present in the influent

[4] SDS conditions

Sample analysis

Water samples were collected according to Standard Methods by Utility staff. The Utility's Laboratory analyzed the samples for TOC, UV-254, ammonia, total and calcium hardness, alkalinity, pH, turbidity and temperature. For the SDS studies, duplicate samples were spiked with chlorine to obtain target residual levels. Temperature was maintained by placing the samples in a calibrated incubator. The following table indicates the target SDS conditions:

TARGET SDS CONDITIONS

PARAMETER	VALUE
Chlorine residual	0.5 -1.5 mg/L
Temperature	23 -25 ^{o}C
Time	24 hours
pH	7.6 - 7.8

Gannett Flemming Laboratory conducted the analyses for bromide, TOX, THM4 and HAA6.

Quality Assurance/Quality Control

At the time this report was finalized the QC data was unavailable for inclusion. However, the same laboratories were utilized for ICR monitoring and the QC data which was requested by EPA on October 22, 1998 for the *ICR Treatment Study Summary Report Spreadsheets*, has been sent to EPA directly by the laboratories under separate cover using the ICR Laboratory Database. According to the County, during this study and the ICR monitoring, the laboratories fulfilled the quality control requirements of EPA including performance evaluation (PE) analyses. Available information was entered into the *ICR Treatment Study Summary Report Spreadsheets*, including the "Miscellaneous Information" which is also attached to the end of this report.

Results

Seasonal Variability

The following TOC data were provided to shows that there is no seasonal variability in the source water. These data were sent to the USEPA in the "Monitoring Plan" and it was agreed that analysis of seasonal variability was not required for this utility.

Month and Year	TOC (mg/L)
October 1996	3.5
November 1996	3.4
December 1996	3.2
January 1997	4.4
February 1997	3.4
March 1997	3.6
April 1997	3.6
May 1997	4.1
June 1997	4.0
July 1997	3.4
August 1997	3.4
September 1997	3.8

Full Scale Data

The full scale water quality for relevant parameters are shown below. These data were extracted from the 18 month ICR Water Utility Database which covers the period July 1997 to December 1998.

Full-Scale Influent Water Quality Data						
Item	**Units**	**Average**	**Std Dev**	**Min**	**Max**	**Count**
Temperature	C	25.9	0.2	25	26	18
pH	Unit	7.4	0.0	7	7	18
Turbidity	ntu	0.2	0.1	0	1	18
Alkalinity	mg/L as $CaCO_3$	225.5	12.3	191	255	18
Total Hardness	mg/L as $CaCO_3$	243.9	15.9	217	279	18
Calcium Hardness	mg/L as $CaCO_3$	218.6	15.4	194	254	18
TOC	mg/L	3.4	0.2	3	4	18
UV_{254}	1/cm	0.1	0.0	0	0	18
Bromide	µg/L	BMRL	BMRL	BMRL	BMRL	BMRL
TSUVA*	L/(mg*m)	4.0	0.3	3	5	18

Full-Scale Finished Water Quality Data						
Item	**Units**	**Average**	**Std Dev**	**Min**	**Max**	**Count**
Temperature	C	25.7	0.5	25	26	18
pH	unit	7.7	0.2	7	8	18
Turbidity	ntu	5.6	1.7	3	10	18
TOC	mg/L	3.4	0.4	3	5	18
UV_{254}	1/cm	0.1	0.0	0	0	18
DS-THM4	µg/L	66.8	32.1	28.9	162.7	20
DS-HAA6	µg/L	58.8	25.6	28.9	97.5	16

Pilot Study Run #1

Shortly after the first run started, sulfur oxidizing bacteria began to colonize the GAC media. This growth resulted in accumulation of biomass on the filters and a concomitant increase in organic carbon. The organic carbon concentration in the 10 minute EBCT effluent reached 73% of the influent concentration after 192 hours. After consultation with the treatment study coordinator, the first run was terminated, and a design change made (using ultraviolet light disinfection prior to the GAC filters). As agreed, the samples were not subjected to SDS conditions therefore, spreadsheets and graphs do not exist for the first run. The influent tap was moved in order to collect this sample after the UV filter, (to ensure a proper comparison of influent and effluent data).

Run #2

The second run was initiated on March 3 and terminated on June 16, 1998. Sixteen sets of samples (with three duplicates) were taken by the utility. Data from the pilot study were input to the Treatment Study Spreadsheets which are included with the submission of this report on diskette.

As seen in the following three tables, target SDS conditions were usually achieved. Temperature and time could be tightly controlled by the analyst by placing the SDS bottles in a calibrated incubator and quenching the reaction at a specified time.

INFLUENT WATER QUALITY	**Cl dose**	**Cl residual**	**Cl2 demand**	**SDS temp.**	**SDS pH**	**incubation time**
Mean	5.0	1.7	3.4	24.5	7.8	24
Standard Deviation	1.2	0.8	0.7	0.7	0.1	0.0
Count	16	15	15	15	15	15
Minimum	2.5	0.3	1.8	23.5	7.6	24
Maximum	7.3	3.2	4.4	25.7	8.0	24

10 Min Effluent WATER QUALITY	**Cl dose**	**Cl residual**	**Cl2 demand**	**SDS temp.**	**SDS pH**	**inclubation time**
Mean	4.1	1.7	2.7	24.4	7.8	24.0
Standard Deviation	1.4	0.5	0.9	0.9	0.1	0.0
Count	16	15	15	15	15	15
Minimum	1.4	1.1	0.8	22.5	7.6	24.0
Maximum	5.8	3.2	3.9	26.0	8.0	24.0

20 Min Effluent WATER QUALITY	Cl dose	Cl residual	Cl2 demand	SDS temp.	SDS pH	inclubation time
Mean	3.0	1.2	1.8	24.4	7.9	24.0
Standard Deviation	0.8	0.3	0.7	0.8	0.1	0.0
Count	16	15	15	15	15	15
Minimum	1.6	0.8	0.3	22.8	7.6	24.0
Maximum	4.0	1.8	2.6	25.9	8.1	24.0

The following three tables provide the results for the influent, 10 and 20 minute EBCT carbon columns. The graphic representations that follow illustrate the same data, and show the fluctuations in values throughout the study.

INFLUENT WATER QUALITY	TOC	pH	UV_{254}	SUVA	Bromide	SDS TOX	SDS THM4	SDS HAA5	SDS HAA6
Mean	3.3	7.48	0.139	4.2	0.0	337.6	76.2	87.6	90.4
Standard Deviation	0.3	0.1	0.013	0.5	0.0	30.5	25.4	31.5	31.7
Count	16	16	16	16	15	14	13	14	14
Minimum	2.9	7.34	0.123	3.2	0.0	255.0	24.9	34.0	36.6
Maximum	3.9	7.63	0.174	4.8	0.0	381.0	137.2	149.0	150.3

10 Min Effluent WATER QUALITY	TOC	pH	UV_{254}	SUVA	SDS TOX	SDS THM4	SDS HAA5	SDS HAA6
Mean	2.6	7.5	0.1	3.8	246.1	59.7	48.8	50.8
Standard Deviation	0.5	0.1	0.0	1.1	49.0	23.3	17.9	18.6
Count	16	15	16	16	12	13	14	14
Minimum	1.5	7.3	0.0	0.1	150.0	16.1	5.3	5.3
Maximum	3.7	7.6	0.1	4.8	313.0	87.4	74.6	78.9

20 Min Effluent WATER QUALITY	TOC	pH	UV_{254}	SUVA	SDS TOX	SDS THM4	SDS HAA5	SDS HAA6
Mean	2.1	7.5	0.1	4.0	126.1	50.0	23.1	28.9
Standard Deviation	0.5	0.1	0.0	1.9	62.9	19.8	14.3	12.3
Count	15	16	15	15	14	13	15	13
Minimum	1.0	7.3	0.0	0.1	0.0	10.2	0.0	4.4
Maximum	2.9	7.8	0.1	9.6	205.0	73.0	44.0	46.7

Ammonia & Bromide

Figures 3 & 4 show the ammonia and bromide levels at the samples taps during the study. Although there is some fluctuation in the ammonia concentration, it is unlikely that this variation contributed enough demand to explain the DBP results. Bromide concentrations were insignificant.

TOC

Figure 5 shows the TOC concentrations at the influent, and after 10 and 20 minute EBCT columns. Influent water TOC varied from 2.9 to 3.9 mg/L. Figure 6 shows the breakthrough of organic carbon during the run. In the second run, organic carbon broke through (at the 70% level) at 529 hours or about 3 weeks.

UV-254
A surrogate parameter for organic carbon is UV-254. The results of the influent, 10 and 20 minute EBCT effluents' UV-254 values are shown it Figure 7. Influent UV-254 values ranged from 0.123 to 0.174 cm^{-1}, and follow the same general pattern in terms of breakthrough as the TOC data.

SDS Conditions
Figure 8 shows the SDS chlorine dose and residual concentrations. Figures 9 and 10 show the SDS pH and temperature conditions. As depicted in these graphics, the target conditions were generally met. If target residual was not obtained, the test was repeated. If target conditions could not achieved the sample was not analyzed for disinfection by-products. This happened once during the study. Another set of DBP samples were also not sent for analysis. To compensate, an extra set of samples were collected and analyzed.

SDS-DBP
Figure 11 illustrates the TOX values produced from influent and effluent samples. Figures 12 and 13 show the SDS-THM4, and SDS-HAA6 results. The DBP graphics are consistent with the TOC and UV-254 data. As precursor (organic carbon) concentrations increased, DBP concentrations increased. For the most part, fluctuations in DBP levels are consistent with observed fluctuations in precursor concentrations. DBP concentrations reached a steady state in the second half of the study. It is unclear why the SDS-THM4 data has more variation (comparing influent and effluent data) than the other two SDS-DBP parameters.

THM Species
Figures 14, 15, and 16 show the individual THM species. As expected, chloroform is the predominant constituent.

HAA Species
Figures 17, 18, and 19 illustrate the individual HAA species. Trichloracetic acid and dichloracetic acid constitute the majority of the haloacetic acid formation.

Discussion and Conclusions

Early on in this study it was noted that filtration would require pretreatment to control the microbial population in the source water. Ultraviolet light was chosen as a disinfectant since it has been shown to be effective in a variety of groundwater applications, and it does not affect DBP formation. An article by Parrotta et. al (*JAWWA*, Feb. 1998, p71) cited multiple studies on the efficacy of UV for disinfecting various microbes. However these studies did not examine the efficacy of UV disinfection on filamentous organisms.

The ultraviolet light, which was oversized for the flow rate of the pilot plant, was somewhat effective in inhibiting the growth of sulfur oxidizing bacteria. There was a five-fold increase in filter run time to breakthrough, when compared to the pilot run without UV disinfection. However, microscopic analysis of the biofilm in the pilot plant after the study revealed *Thiothrix* (a sulfur oxidizing bacteria), algae and other bacteria.

Sulfur oxidizing bacteria are similar in morphology to filamentous iron oxidizing bacteria which are common in groundwaters throughout the country, the results of the pilot study show the need for a better understanding of appropriate applications of UV technology for disinfection, especially if a designation as a best available technology for groundwater systems is considered.

Since the natural organic matter in this groundwater was not characterized, it is impossible to say how much of the fluctuations in TOC and disinfection by-products, and early breakthrough are attributable to the nature of the organic matter and how much to microbial colonization of the media. Whether the bacteria coated the carbon grains, reducing the number of adsorption sites for the natural organic matter, or produced by-products that were preferentially adsorbed by the carbon, is speculative. The mechanism for breakthrough was beyond the scope of this study.

The goal of this study, which was to provide data to the EPA on removal of organic carbon and formation of disinfection by-products when GAC filtration is applied to a potable water supply, was accomplished. Additionally, in this case it became evident that GAC filtration can not be applied without pre-treatment to control the microbial population of the source water. According to the full-scale data, the utility should be able to meet the Stage I disinfection by-products regulation with no change to current operations. However, even a slight change in the regulation would require operational changes. Future studies to evaluate operational alternatives should consider the data contained in this report.

LITTLE ROAD WATER TREATMENT FACILITY
FULL SCALE SCHEMATIC DIAGRAM
PASCO COUNTY UTILITIES

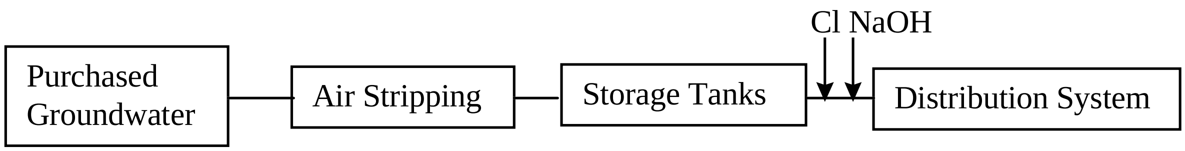


Figure 1

PASCO COUNTY UTILITIES
LITTLE ROAD WATER TREATMENT FACILITY
PILOT PLANT SCHEMATIC DIAGRAM

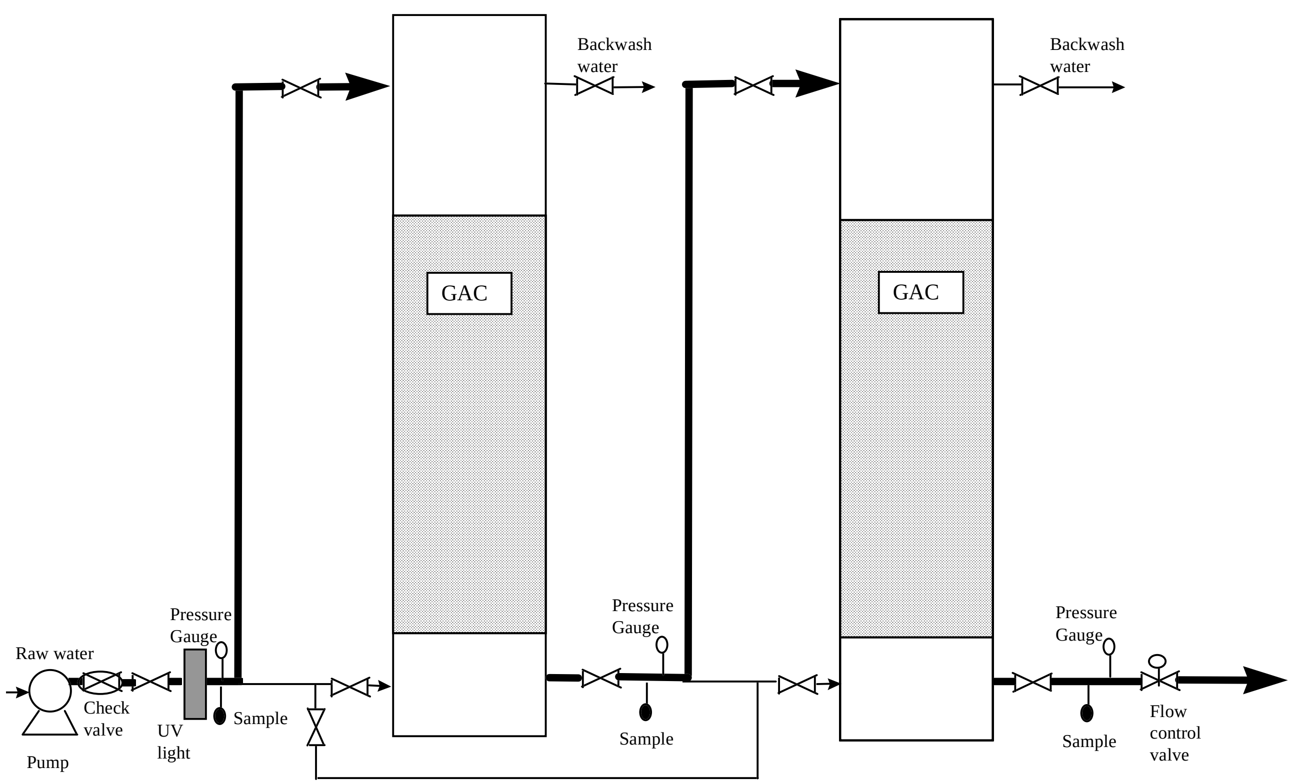


Figure 2

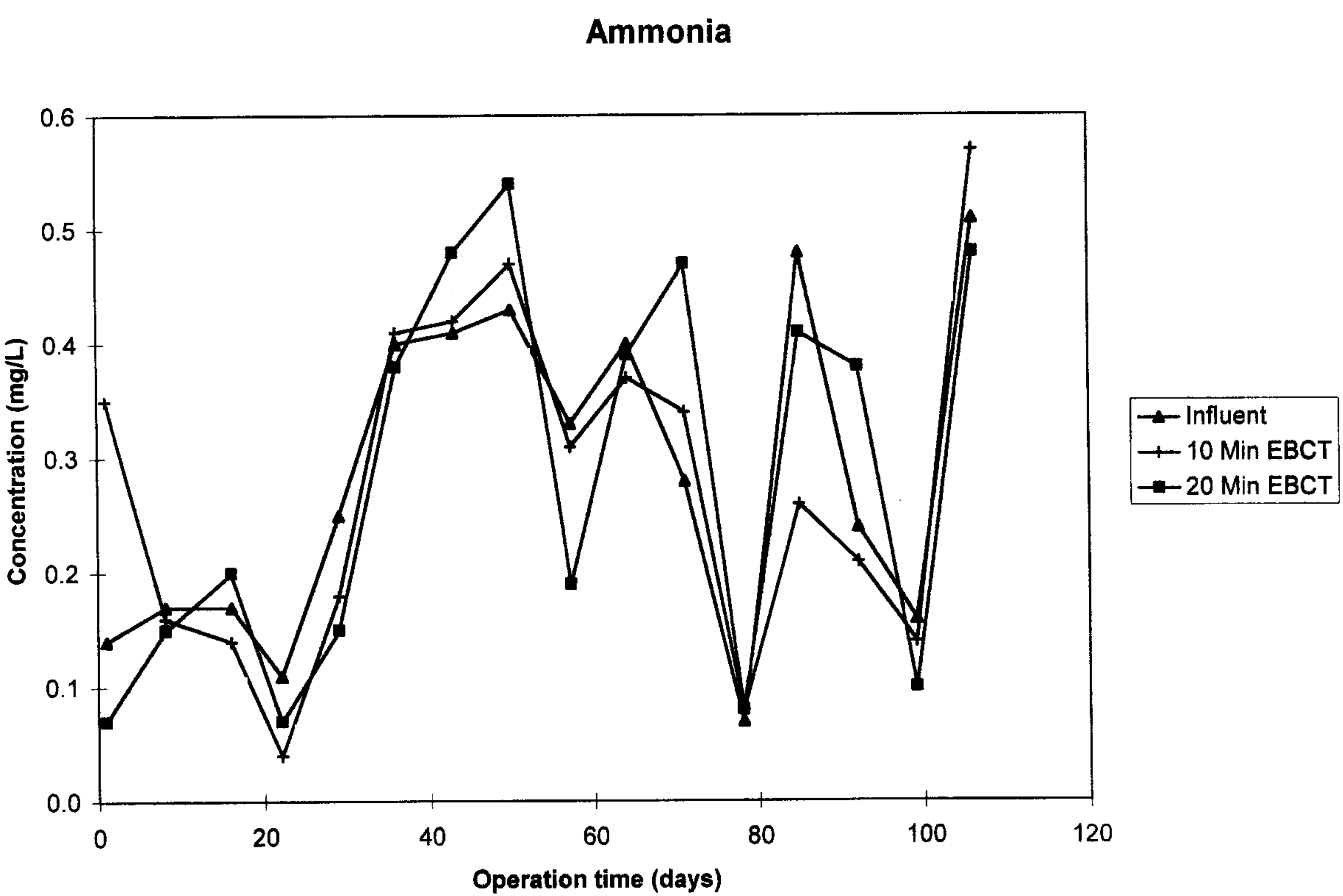

Ammonia
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Concentration (mg/L)
0
20
40
60
80
100
120
Operation time (days)
Influent
10 Min EBCT
20 Min EBCT

Figure 3

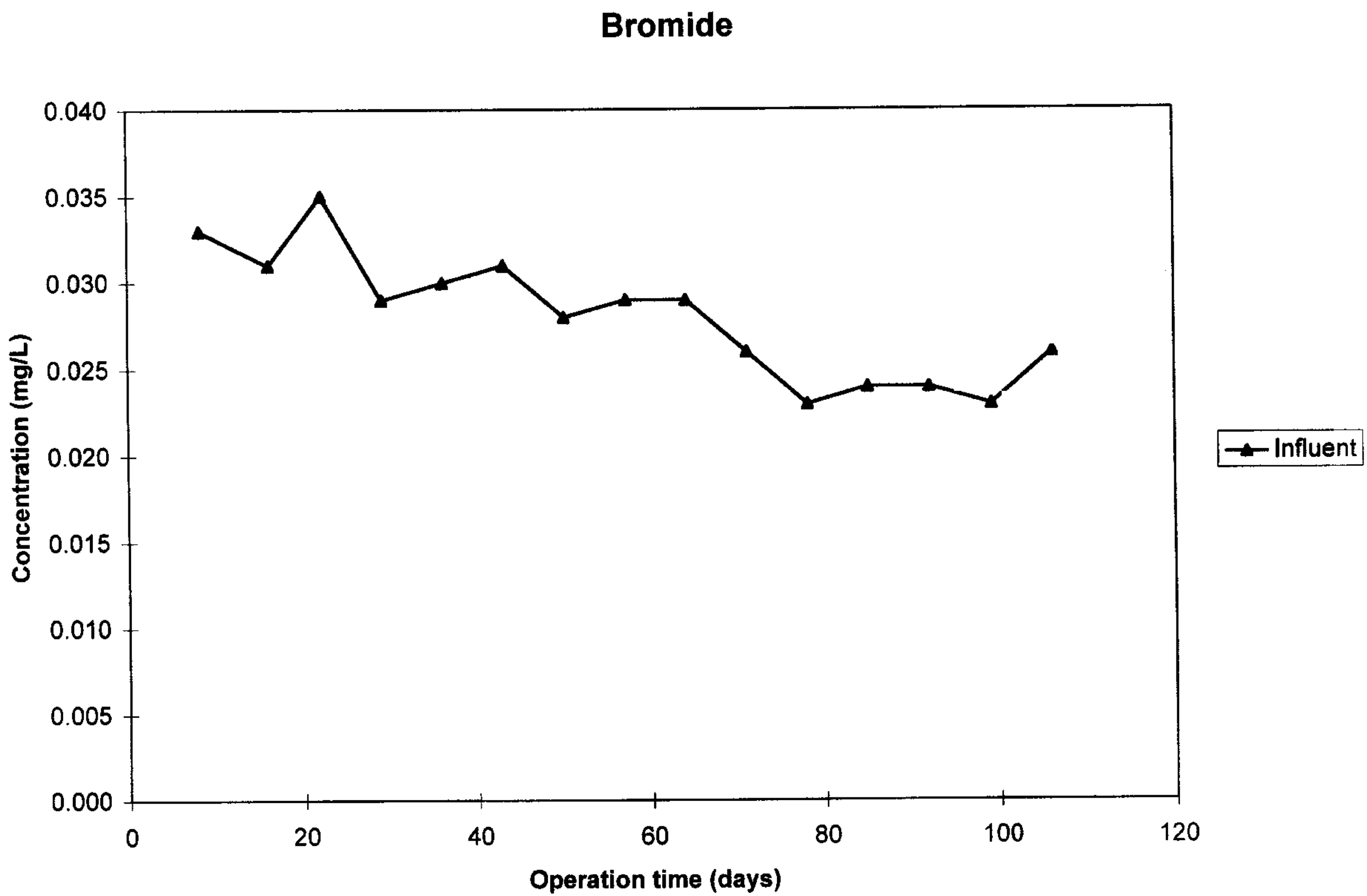

Bromide
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Concentration (mg/L)
0
20
40
60
80
100
120
Operation time (days)
Influent

Figure 4

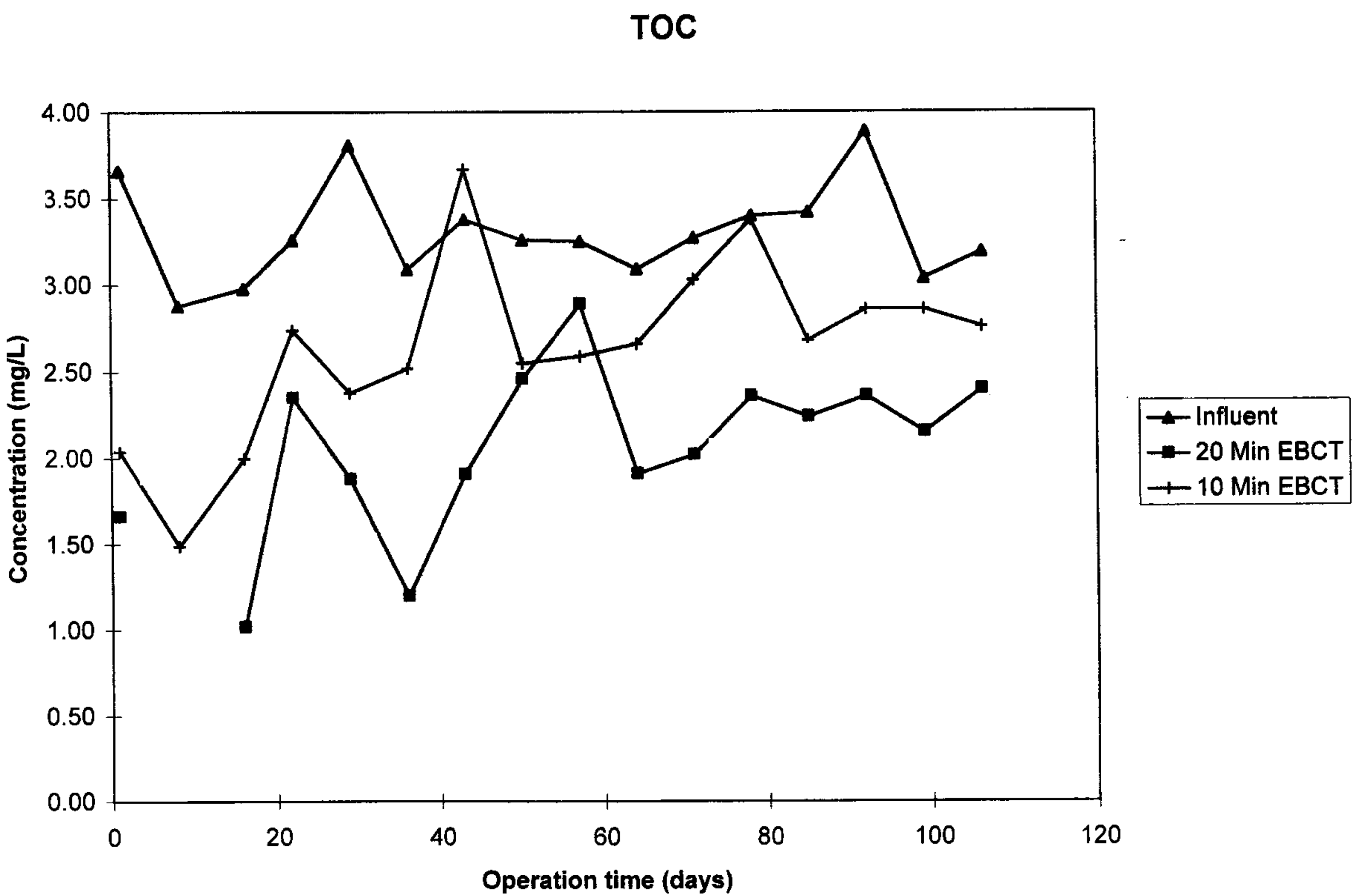

TOC
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Concentration (mg/L)
0
20
40
60
80
100
120
Operation time (days)
Influent
20 Min EBCT
10 Min EBCT

Figure 5

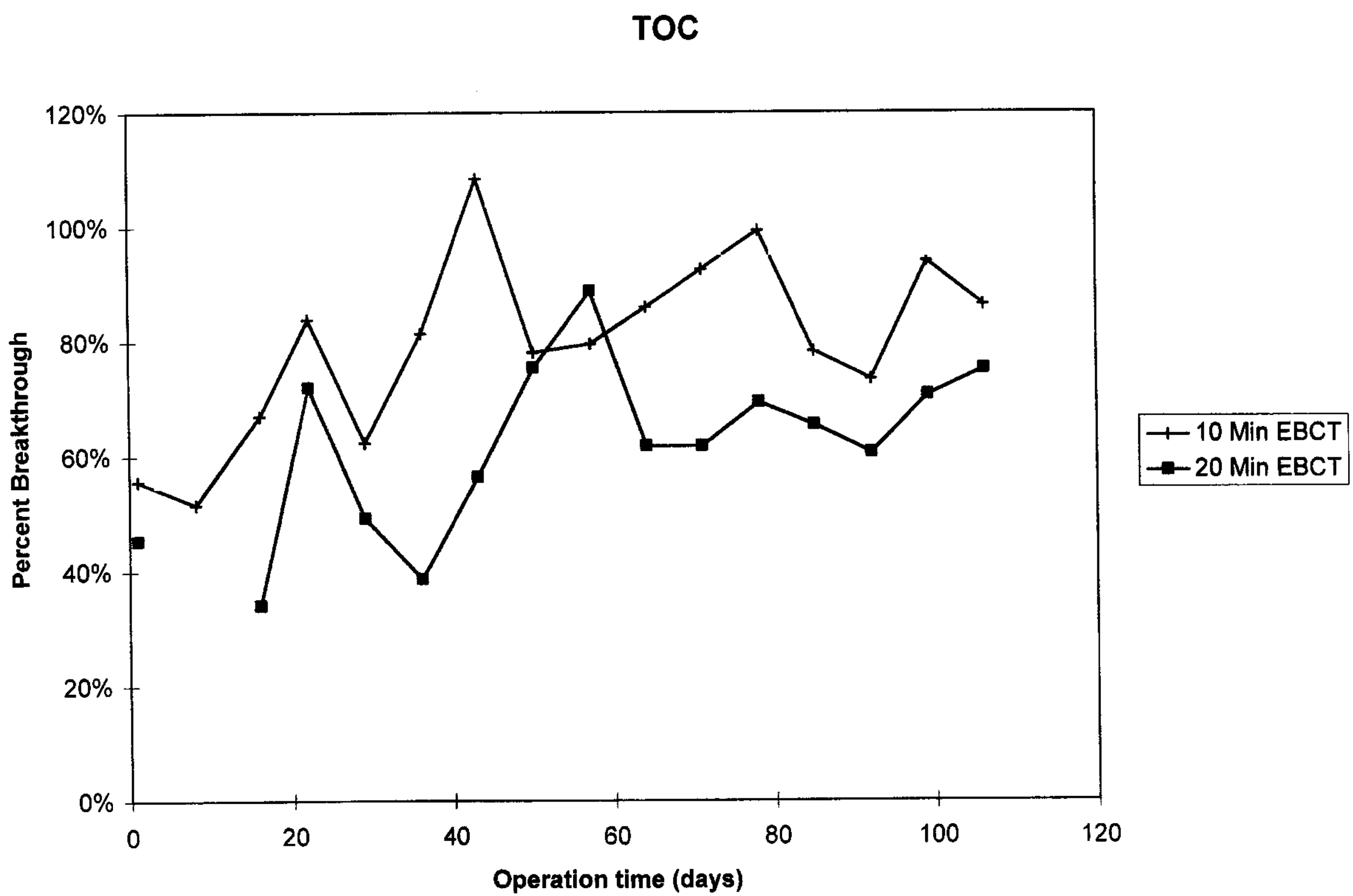

TOC
120%
100%
80%
60%
40%
20%
0%
Percent Breakthrough
0
20
40
60
80
100
120
Operation time (days)
10 Min EBCT
20 Min EBCT

Figure 6

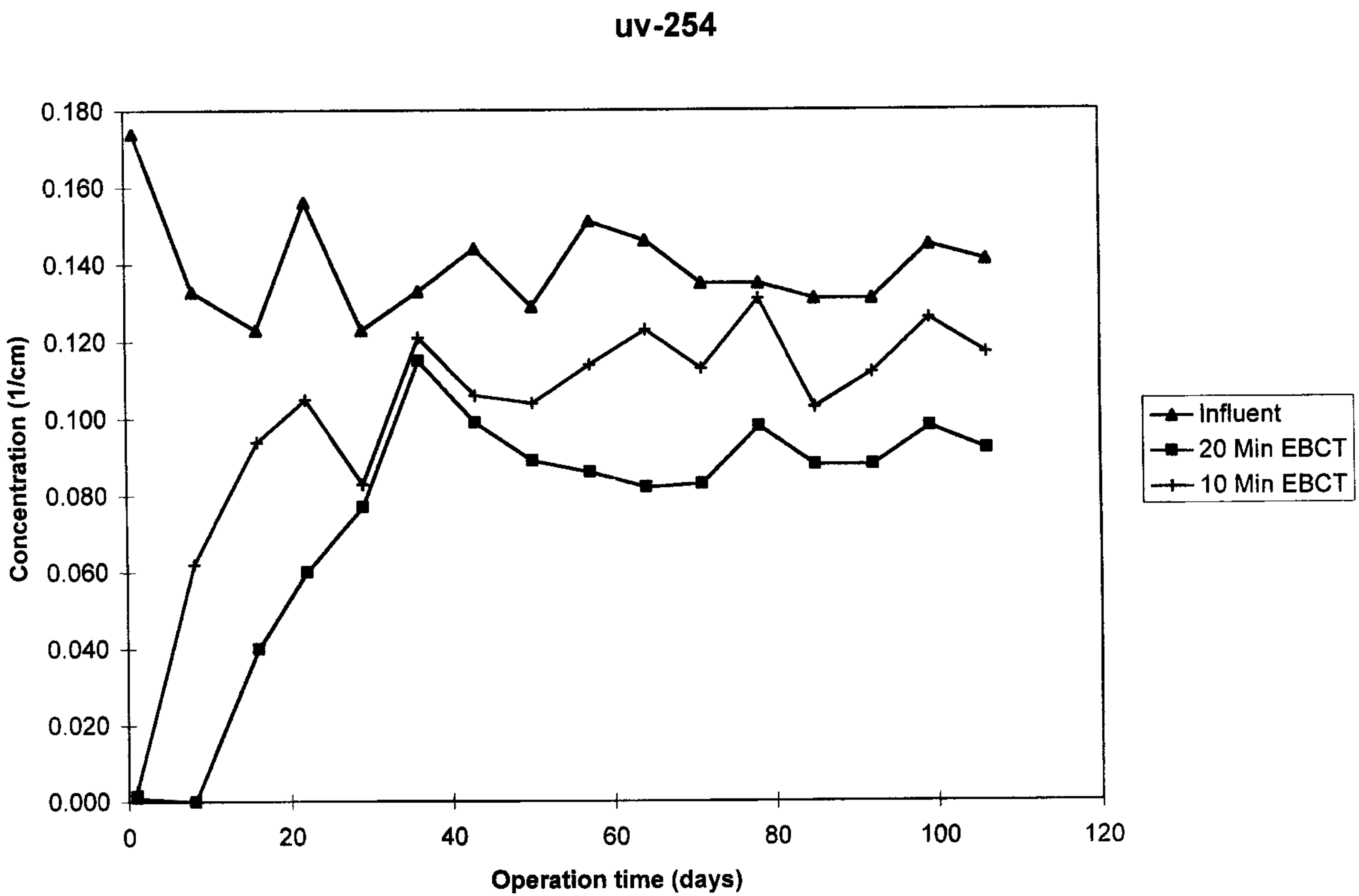

uv-254
0.180
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
Concentration (1/cm)
0
20
40
60
80
100
120
Operation time (days)
Influent
20 Min EBCT
10 Min EBCT

Figure 7

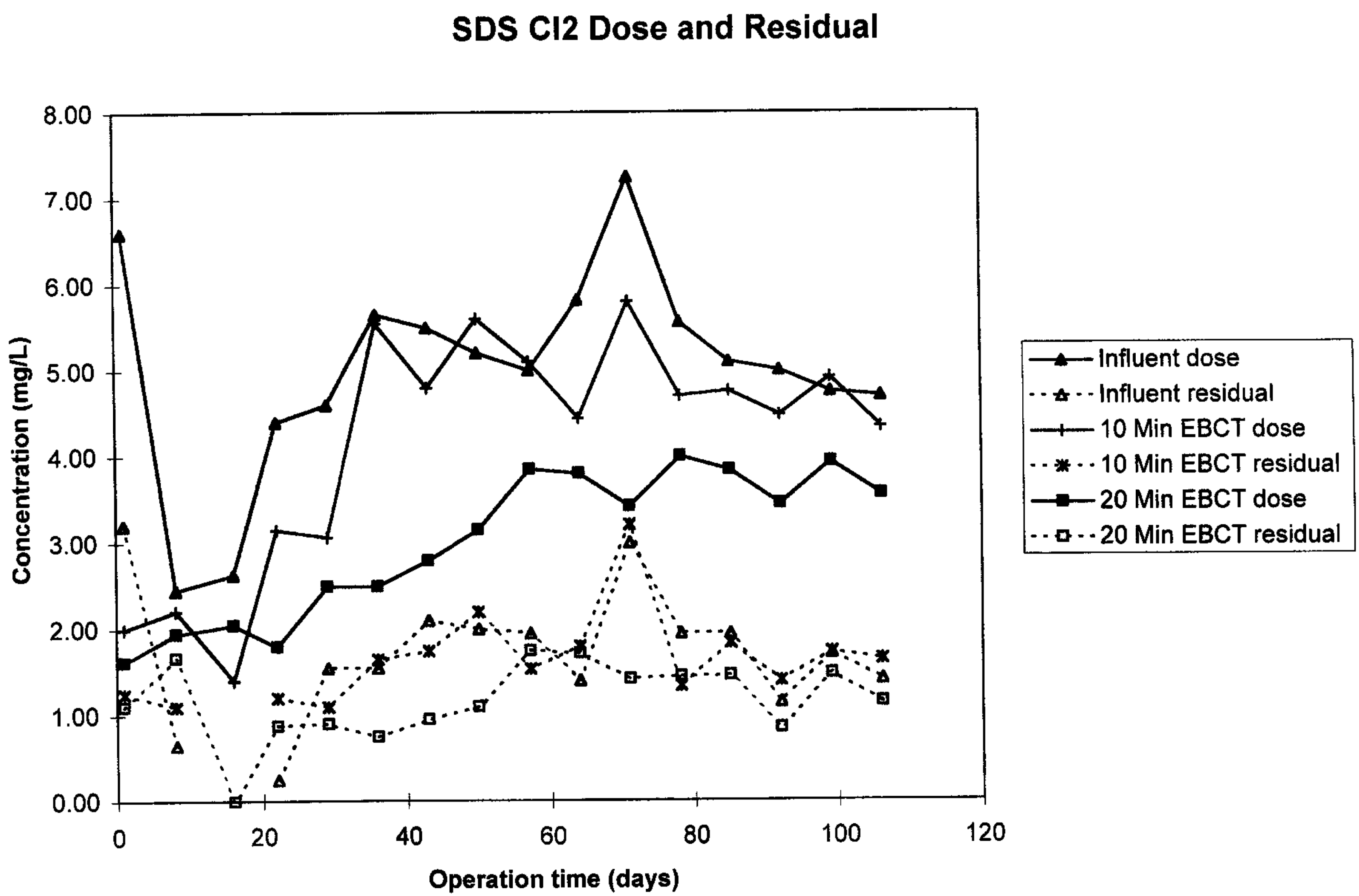

SDS Cl2 Dose and Residual
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Concentration (mg/L)
0
20
40
60
80
100
120
Operation time (days)
Influent dose
Influent residual
10 Min EBCT dose
10 Min EBCT residual
20 Min EBCT dose
20 Min EBCT residual

Figure 8

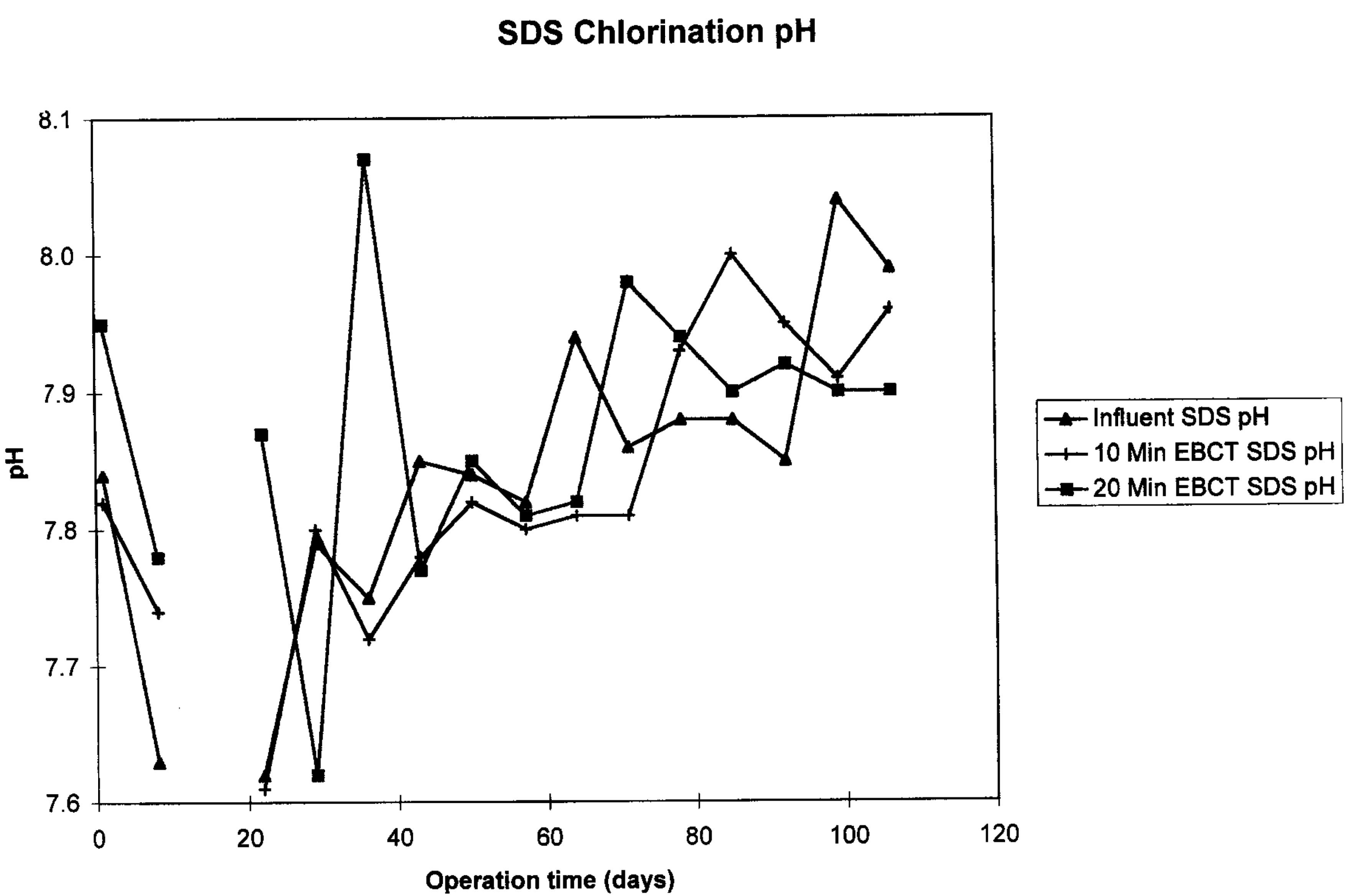

SDS Chlorination pH
8.1
8.0
7.9
7.8
7.7
7.6
pH
0
20
40
60
80
100
120
Operation time (days)
Influent SDS pH
10 Min EBCT SDS pH
20 Min EBCT SDS pH

Figure 9

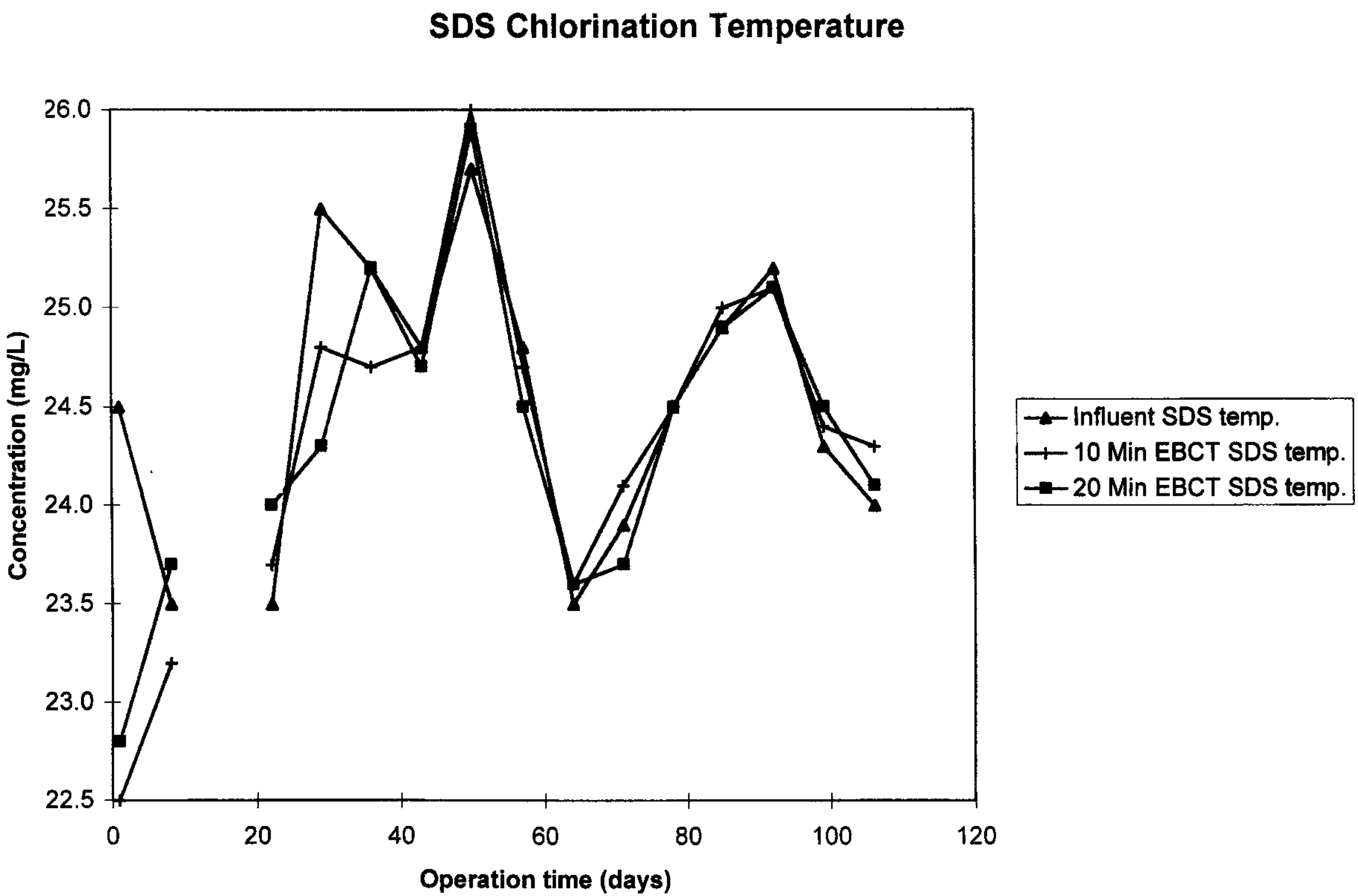

SDS Chlorination Temperature
Concentration (mg/L)
26.0
25.5
25.0
24.5
24.0
23.5
23.0
22.5
0
20
40
60
80
100
120
Operation time (days)
Influent SDS temp.
10 Min EBCT SDS temp.
20 Min EBCT SDS temp.

Figure 10

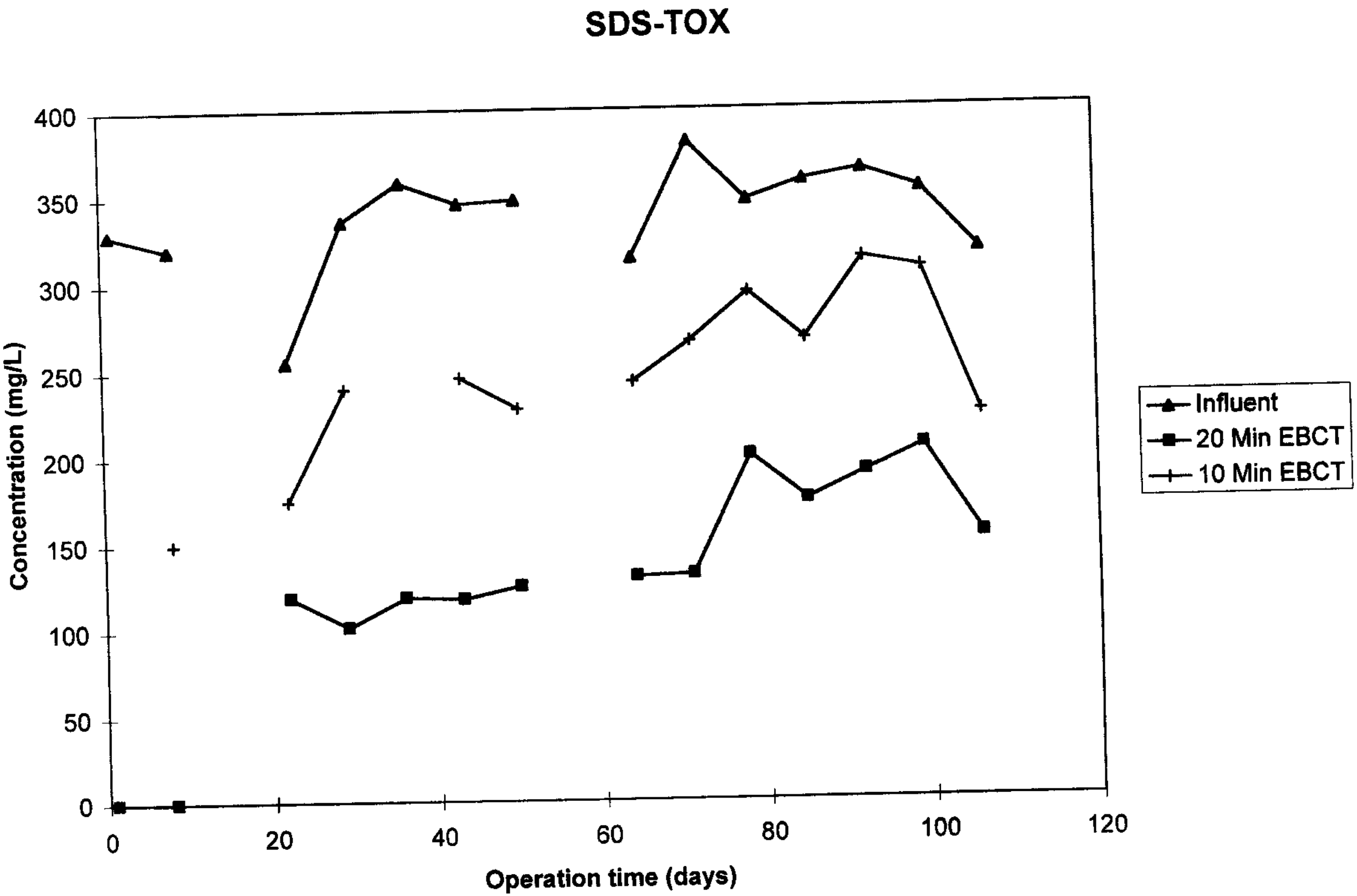

SDS-TOX
Concentration (mg/L)
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120
Operation time (days)
Influent
20 Min EBCT
10 Min EBCT

Figure 11

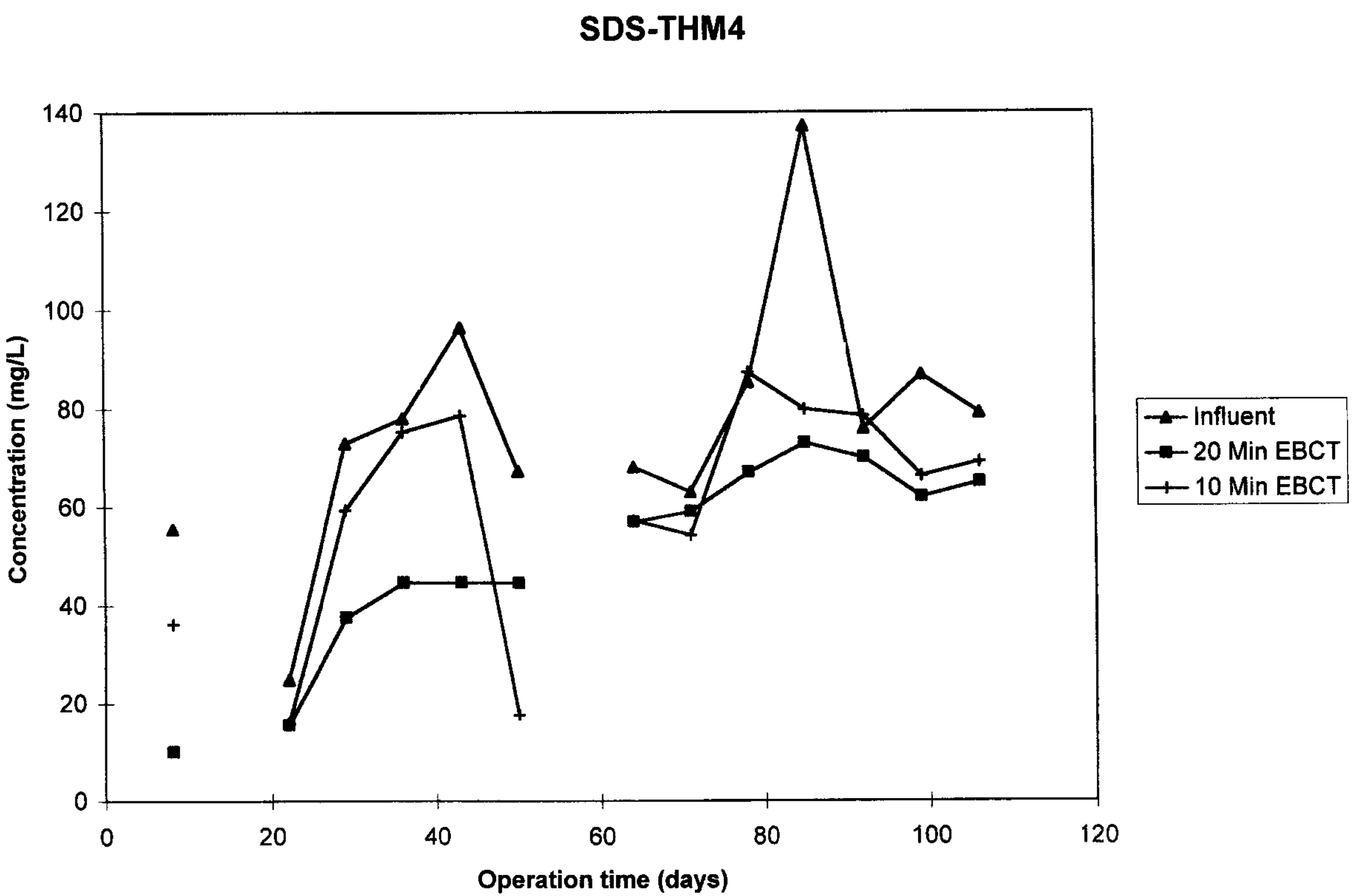

SDS-THM4
140
120
100
80
60
40
20
0
Concentration (mg/L)
0
20
40
60
80
100
120
Operation time (days)
Influent
20 Min EBCT
10 Min EBCT

Figure 12

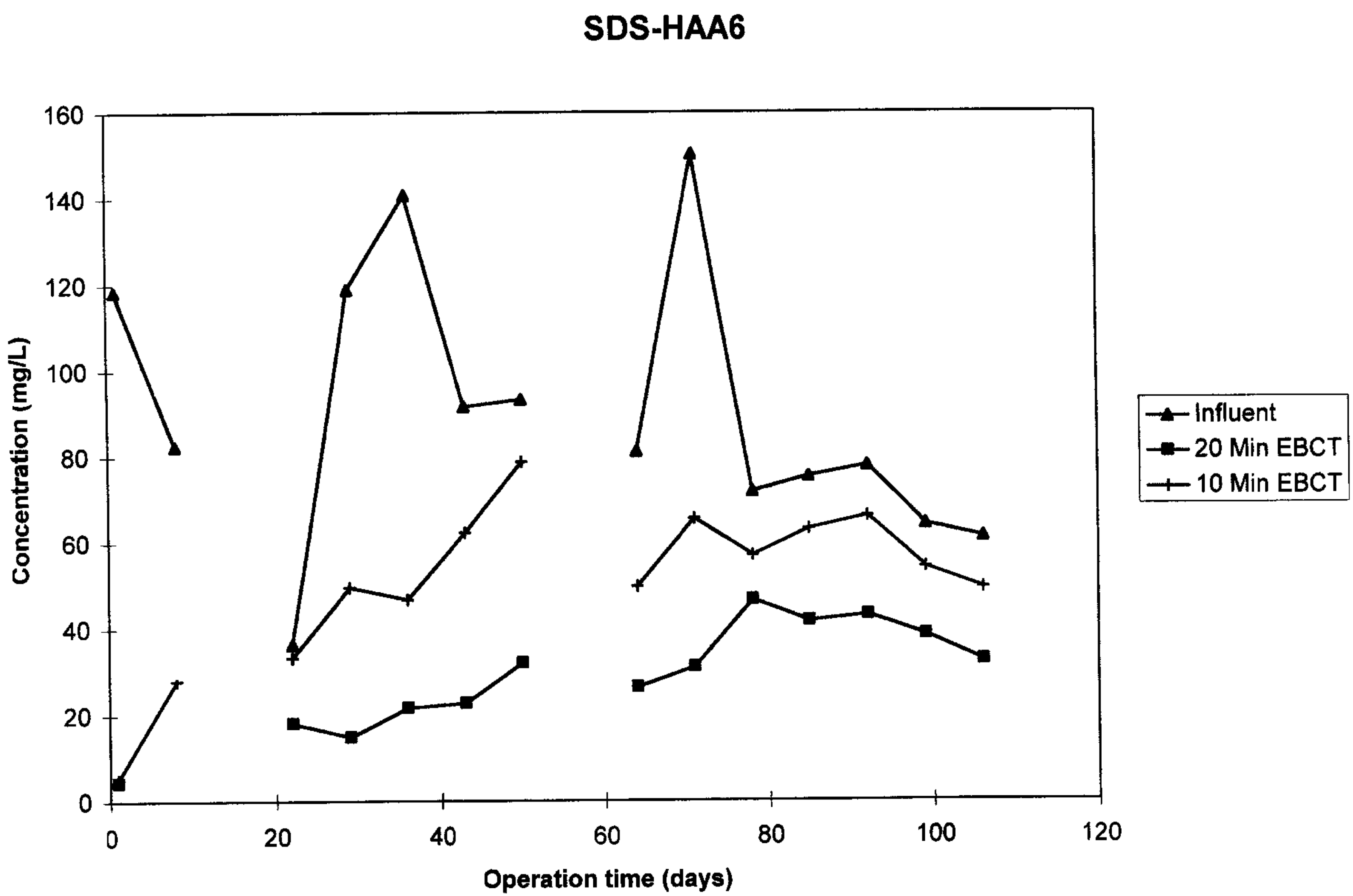

SDS-HAA6
160
140
120
100
80
60
40
20
0
Concentration (mg/L)
0
20
40
60
80
100
120
Operation time (days)
Influent
20 Min EBCT
10 Min EBCT

Figure 13

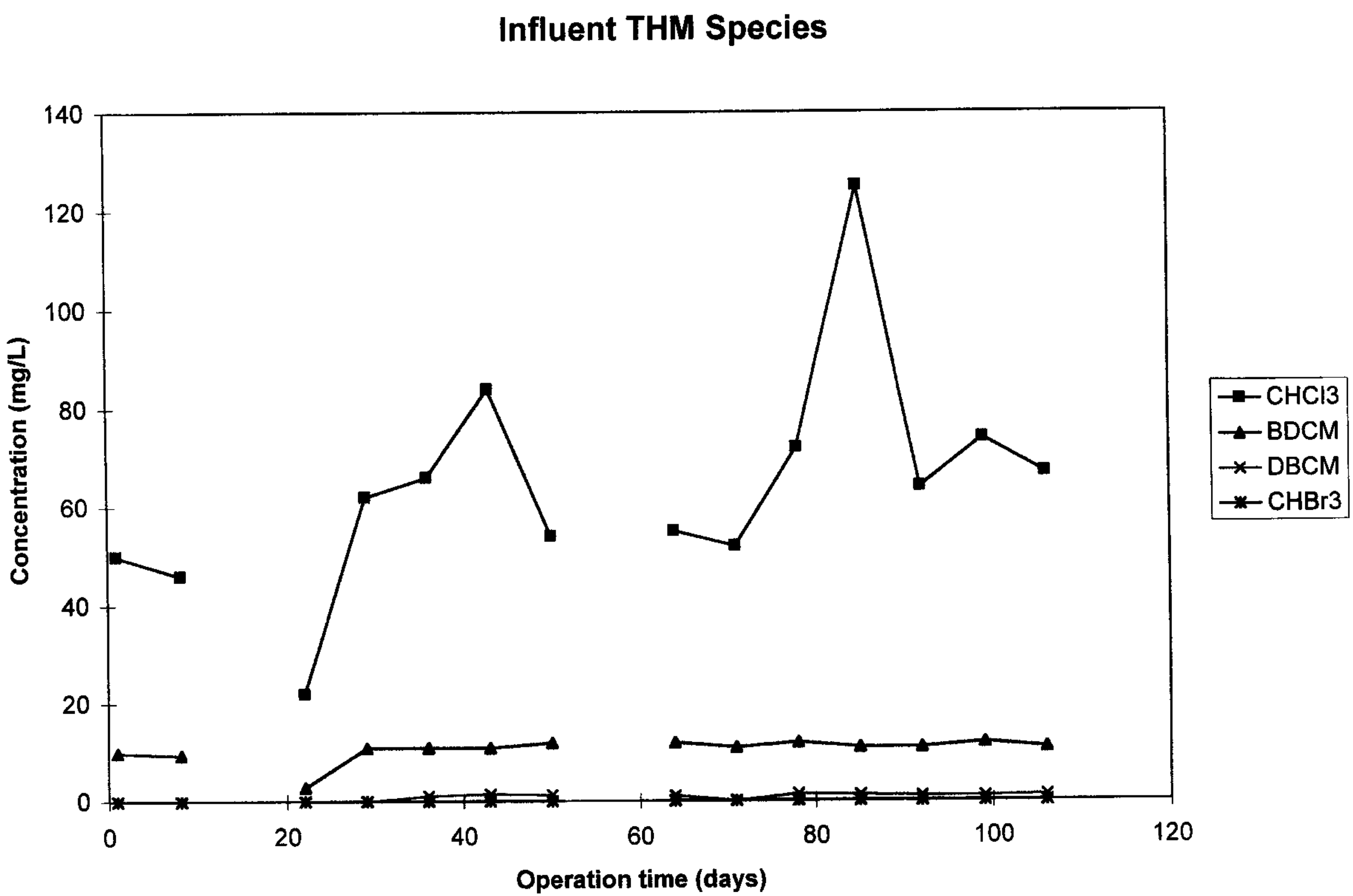

Influent THM Species
140
120
100
80
60
40
20
0
Concentration (mg/L)
0
20
40
60
80
100
120
Operation time (days)
CHCl3
BDCM
DBCM
CHBr3

Figure 14

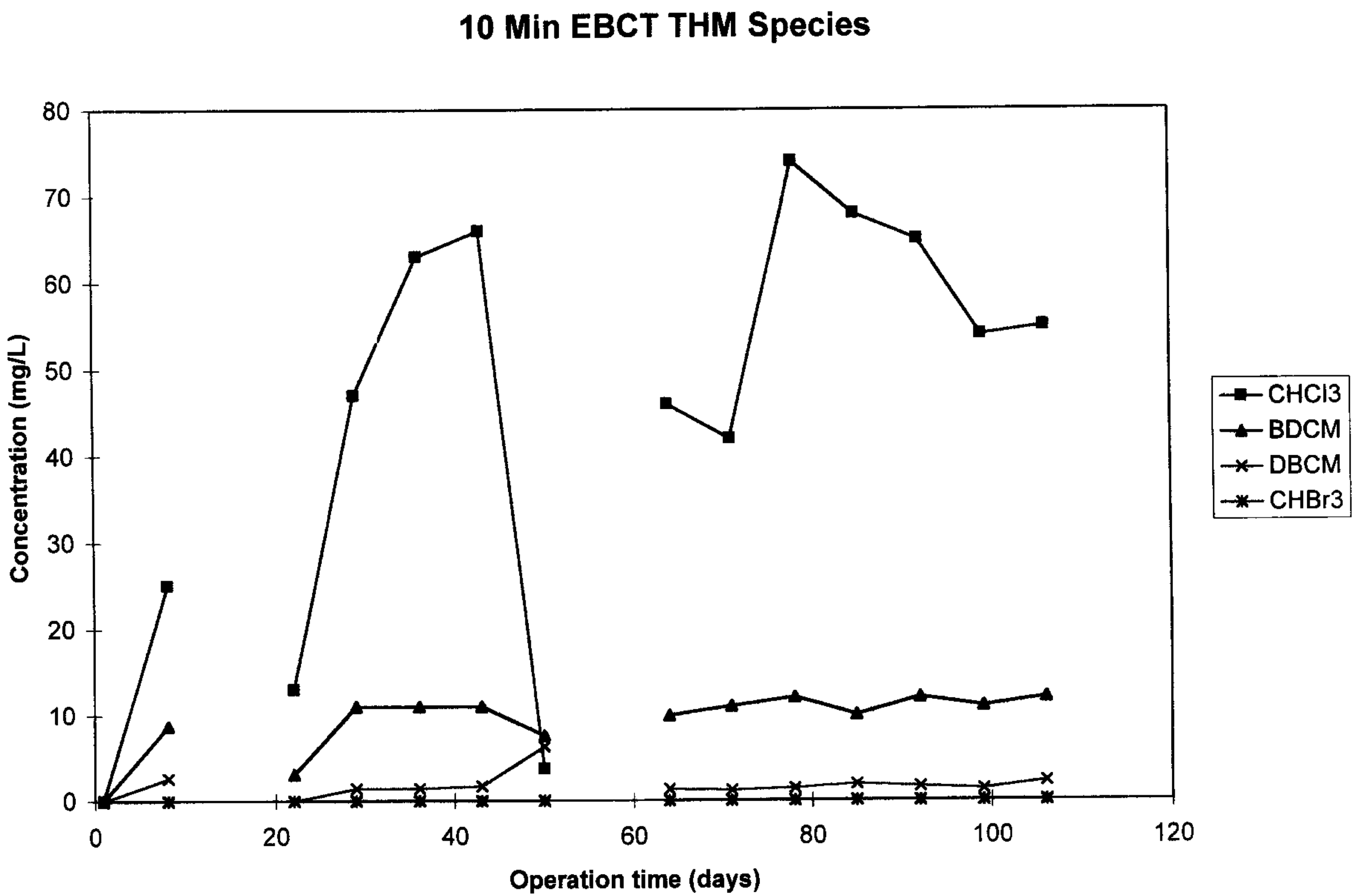

10 Min EBCT THM Species
Concentration (mg/L)
Operation time (days)
CHCl3
BDCM
DBCM
CHBr3
0
10
20
30
40
50
60
70
80
0
20
40
60
80
100
120

Figure 15

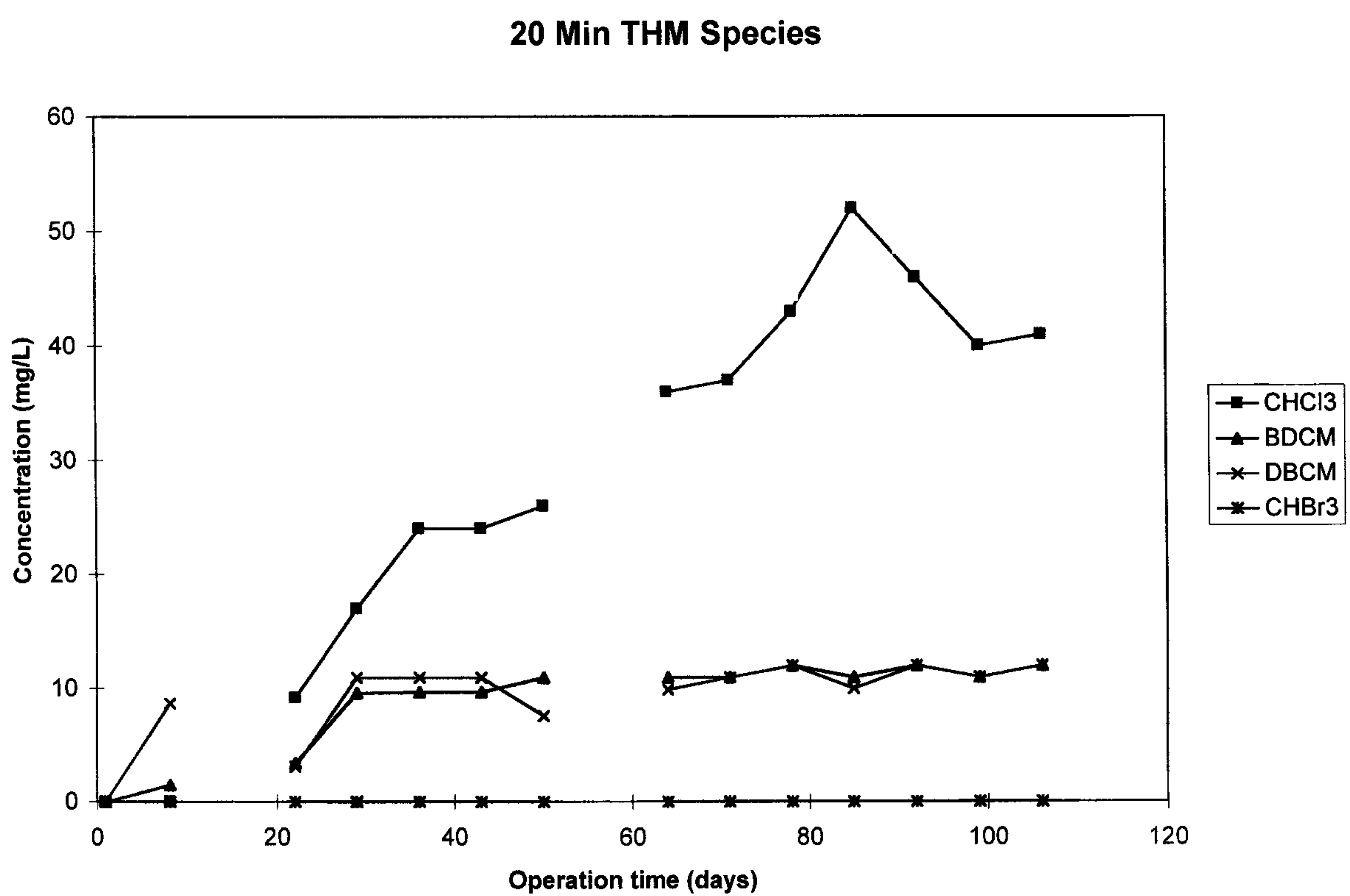

20 Min THM Species
60
50
40
30
20
10
0
Concentration (mg/L)
0
20
40
60
80
100
120
Operation time (days)
CHCl3
BDCM
DBCM
CHBr3

Figure 16

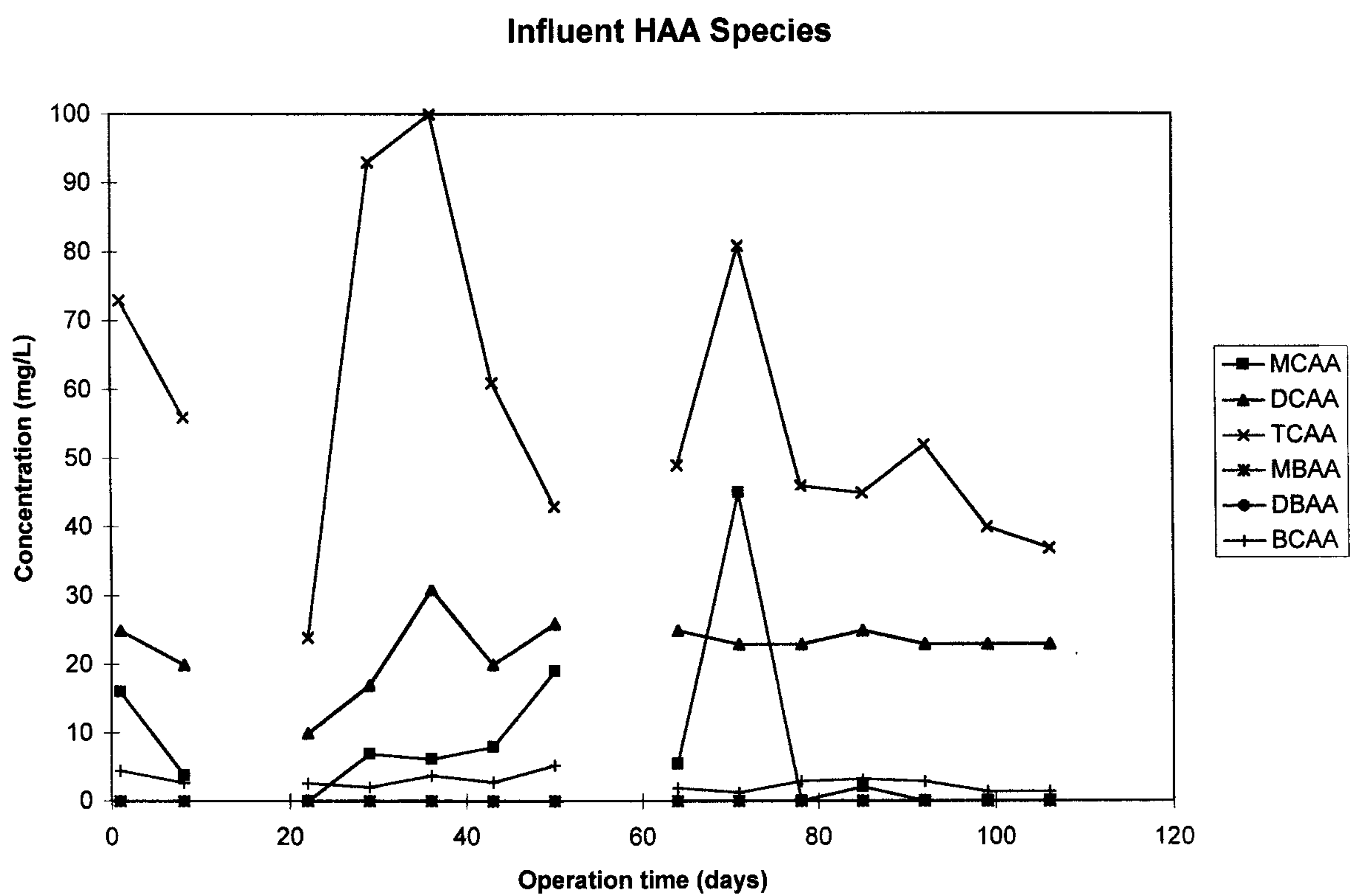
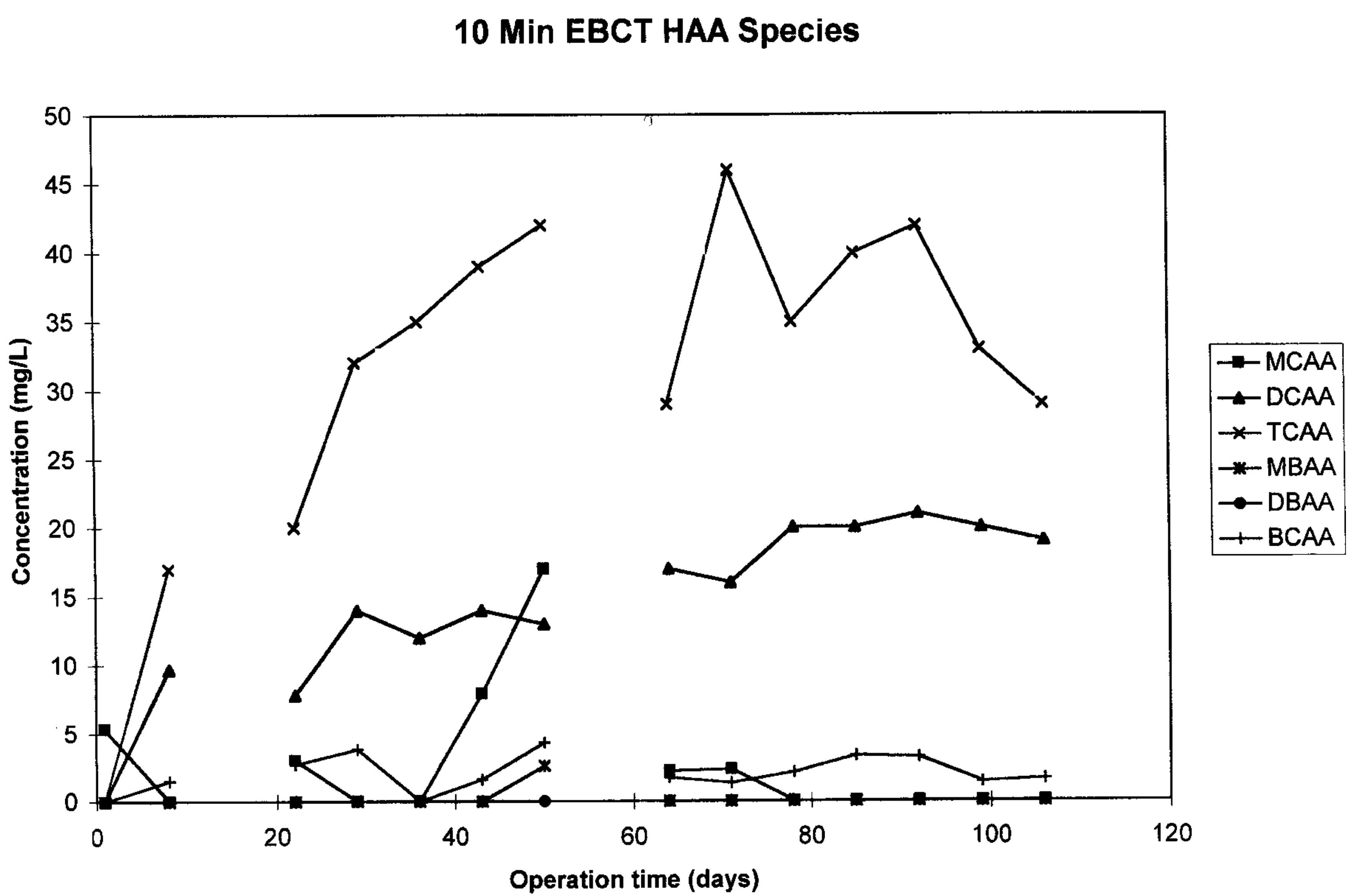

Influent HAA Species
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
Operation time (days)
MCAA
DCAA
TCAA
MBAA
DBAA
BCAA

Figure 17



10 Min EBCT HAA Species
Concentration (mg/L)
50
45
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Operation time (days)
MCAA
DCAA
TCAA
MBAA
DBAA
BCAA

Figure 18

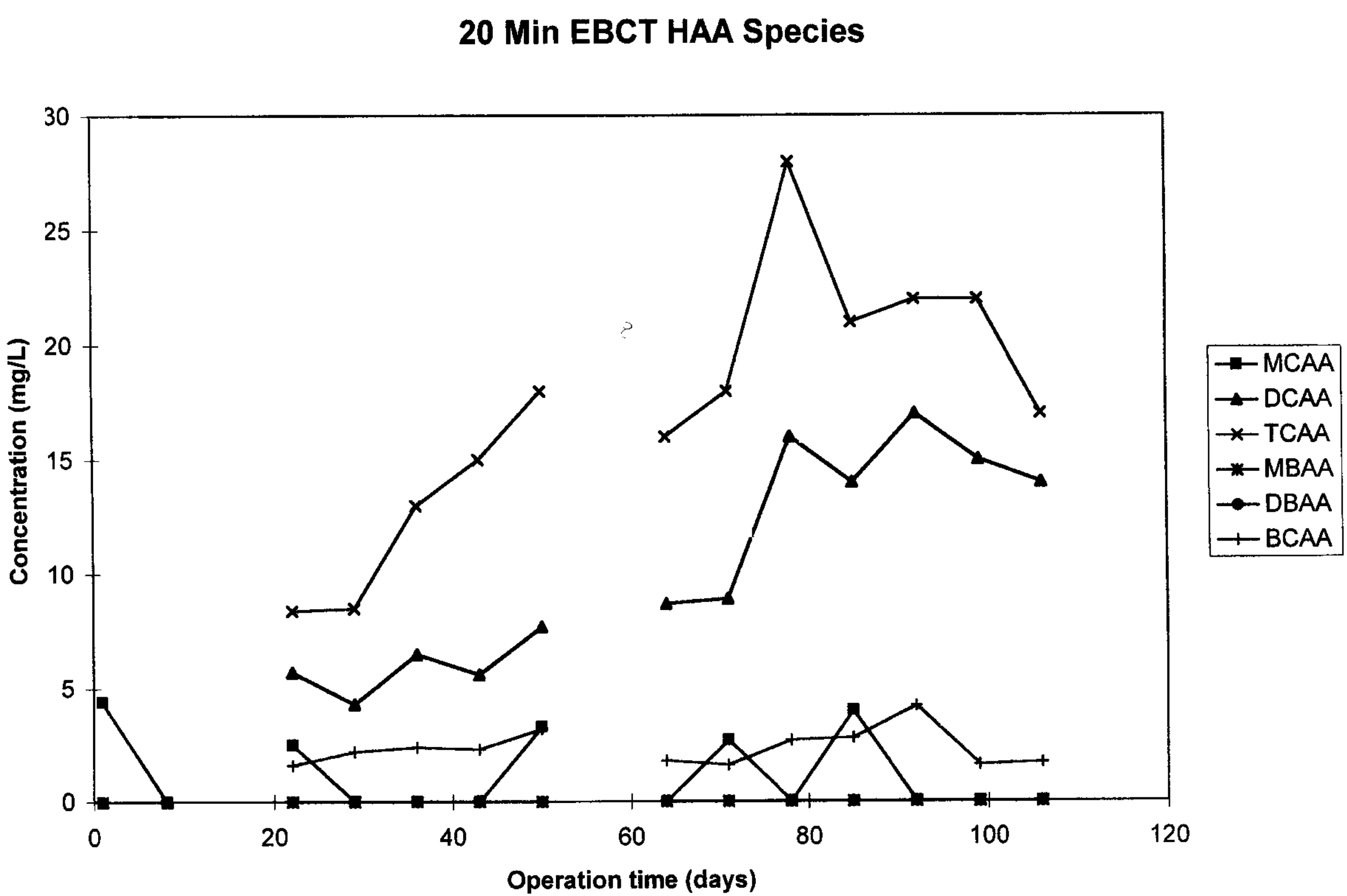

20 Min EBCT HAA Species
Concentration (mg/L)
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Operation time (days)
MCAA
DCAA
TCAA
MBAA
DBAA
BCAA

Figure 19

Miscellaneous Information

PWSID	FL6511361
Plant ICR #	315

Full-Scale Plant Information

Item	Result	
Primary Disinfectant	none	(Pri Disinf, Free Cl2, Chloramines, Chlorine Dioxide, Ozone)
Residual Disinfectant	Free Cl2	(Sec Disinf, Free Cl2, Chloramines, Chlorine Dioxide)
Source Type	groundwater	(River/Stream, Lake, Reservoir, Aquifer)
Source Name		

Laboratory Information

Item	ICR ID or Abbrev	Lab Name	Lab Type	Lab City	Lab State
Lab #1	ICRFL004	Pasco Cnty Environmental Lab	Utility	New Port Richey	FL
Lab #2	ICRPA006	Gannett Flemming	Commercial	Camp Hill	PA
Lab #3					
Lab #4					

(Commercial, Consultant, State, University, Utility)

Batch Sampling Dates for Quarterly Bench-Scale Testing

Item	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Sample Collection Date				

1998 Flow and Population Information

Source	Flow (mgd)	Population Served
Total Population Served		106686
Surface Water		0
Ground Water	9,022	9,022
Purchased Finished Water		0
Total	9,022	