Stan McCool
August 25, 1996

Gel Treatments - Well H-14, Nelson Lease, Savonburg, KS.

Two gel treatments were implemented in injection Well H-14, Nelson Lease, Savonburg, KS.
* A total of 245 bbl of gel solution was injected during both treatments.
* A summary of each treatment and the amounts of chemicals injected are given in Table 1.
* Volumes and concentrations of injected solutions are given in Table 2.
* Event logs are presented in Table 3 and 4.

* Additional data for Treatment # 1 are presented in figures.

- Figure 1-A Total flow rate (flow meter).
- Figure 1-B Polymer solution flow rate (tank strap).
- Figure 1-C Chromium solution flow rate (tank strap).
- Figure 1-D Wellhead pressure (gauge).
- Figure 1-E Viscosity and pH of injected solution (wellhead samples).
- Figure 1-F Temperature of injected solution (wellhead samples).

* Additional data for Treatment #2 are presented in figures.

- Figure 2-A Polymer solution flow rate (tank strap).
- Figure 2-B Chromium solution flow rate (tank strap).
- Figure 2-C Wellhead pressure (gauge).
- Figure 2-D Viscosity and pH of injected solution (wellhead samples).
- Figure 2-E Temperature of injected solution (wellhead samples).

Comments

1. Gel times of samples collected during Treatment #1 ranged between 1 and 5 days.
2. Gel times of samples collected during Treatment #2 ranged between 2 and 24 hours.
3. Polymer tank bulged and cracked when the 90 bbl batch of polymer was being prepared. The tank should not be loaded with more than 60 bbl until it is repaired.
4. The flow meter did not work during Treatment #2. The flow meter should be moved upstream of the chromium-solution inlet.
5. The two chemical pumps (TORP's and Russell's) should be re-packed and re-fitted with their proper heads.

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* Additional data for Treatment # 1 are presented in attached figures.
    - Total flow rate (flow meter).
    - Polymer solution flow rate (tank strap).
    - Chromium solution flow rate (tank strap).
    - Wellhead pressure (gauge).
    - Viscosity and pH of injected solution (wellhead sample).
    - Temperature of injected solution (wellhead sample).

* Additional data for Treatment #2 are presented in attached figures.
    - Polymer solution flow rate (tank strap).
    - Chromium solution flow rate (tank strap).
    - Wellhead pressure (gauge).
    - Viscosity and pH of injected solution (wellhead samples).
    - Temperature of injected solution (wellhead samples).

Table 1 : Injected Chemicals

Treatment #1
6/25/96 - 6/27/96
100 bbl of gel solution injected

Component	lbs injected	average conc (ppm)
Alcoflood 935 polyacrylamide	194	5500
sodium dichromate dihydrate	13.0	370
sodium thiosulfate	12.7	360
evaporative salt	167	4800
anhydrous calcium	95.2	2700
Chanute tap water		

Initial wellhead pressure = vacuum (55 bbl/day)
Final wellhead pressure = 50 psi (50 bbl/day)

Treatment #2
7/30/96 - 8/2/96
145 bbl of gel solution injected

Component	lbs injected	average conc (ppm)
Alcoflood 935 polyacrylamide	313	6200
sodium dichromate dihydrate	30.6	600
sodium thiosulfate	25.1	490
evaporative salt	239	4700
anhydrous calcium	147	2900
Chanute tap water		

Initial wellhead pressure = 40 psi (50 bbl/day)
Final wellhead pressure = 375 psi (100 bbl/day)

Table 2 : Injected Volumes and Concentrations

Volumes injected (bbl)			Concentration (ppm)				
Total volume	Polymer solution	Chrome solution	AF-935 polyacrylamide	sodium dichromate di-hydrate	sodium thiosulfate	Evap. Salt (NaCl)	Anhydrous calcium ($CaCl_2$)
Treatment #1							
2.0	2.0	0.0	5300	0	290	4800	2700
8.9	8.8	0.12	5200	190	290	4800	2700
7.4	7.3	0.092	5200	170	290	4700	2700
10.0	9.7	0.28	5100	390	280	4700	2600
17.6	17.0	0.60	5100	440	280	4600	2600
31.0	29.9	1.1	5700	450	420	4900	2800
24.6	23.9	0.66	5800	350	430	4900	2800
Treatment #2							
1.3	1.3	0	6100	0	500	4700	3000
30.3	29.7	0.62	6000	540	490	4700	2900
5.1	5.0	0.082	6000	430	490	4700	2900
2.4	2.4	0.046	6000	510	490	4700	2900
40.3	39.9	0.39	6000	580	490	4700	2900
28.1	27.8	0.28	6400	580	500	4700	2900
38.7	38.3	0.39	6400	720	500	4700	2900
3.1	3.1	0	6500	0	500	4800	2900

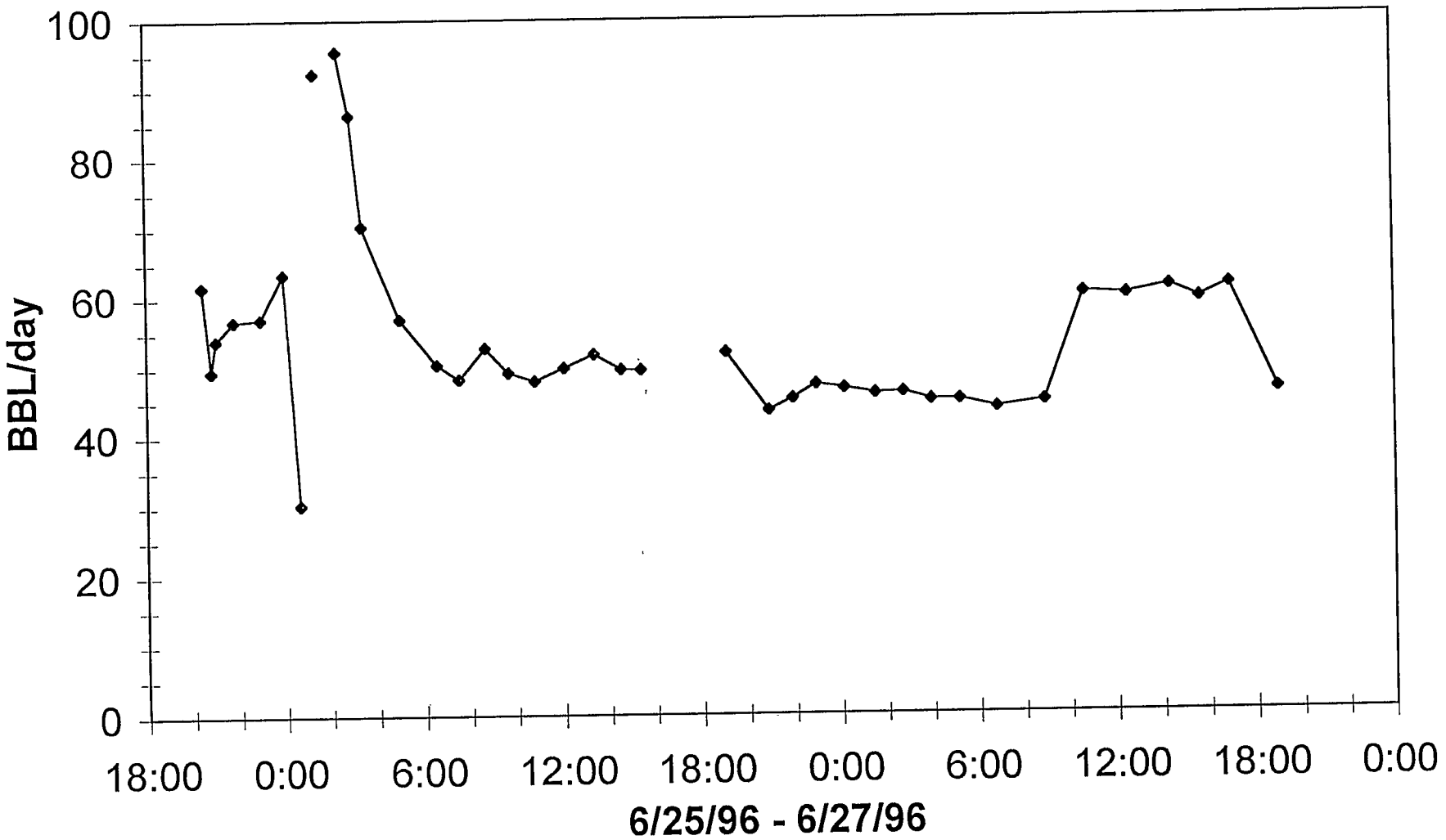
Table 3 : Treatment #1 - LOG

Date/Time	Event
6/25/96	
	Mixed polymer batch # 1. Mixed chromium batch # 1A.
8:10 pm	Start injection of polymer solution.
9:11 pm	Start injection of chromium solution (58% stroke).
6/26/96	
12:28 am - 12:58 am	Grease jackshaft. Change chrome-pump stroke to 70%.
1:43 am - 1:56 am	Shutdown. Changed oil in polymer pump
3:07 am	Changed chrome-pump stroke to 105%.
7:20 am	Mixed chromium batch # 1B.
3:45 pm	Stopped injection of polymer batch # 1.
	Mixed polymer batch # 2.
	Mixed chromium batch # 2A.
5:50 pm	Start injection of polymer batch # 2 and chromium batch # 2A.
6/27/96	
2:10 am	Mixed chromium batch #2B.
10:00 am	Positive wellhead pressure. Polymer pump rate increased.
10:35 am	Mixed chromium batch # 2C.
8:20 pm	Stopped injection.

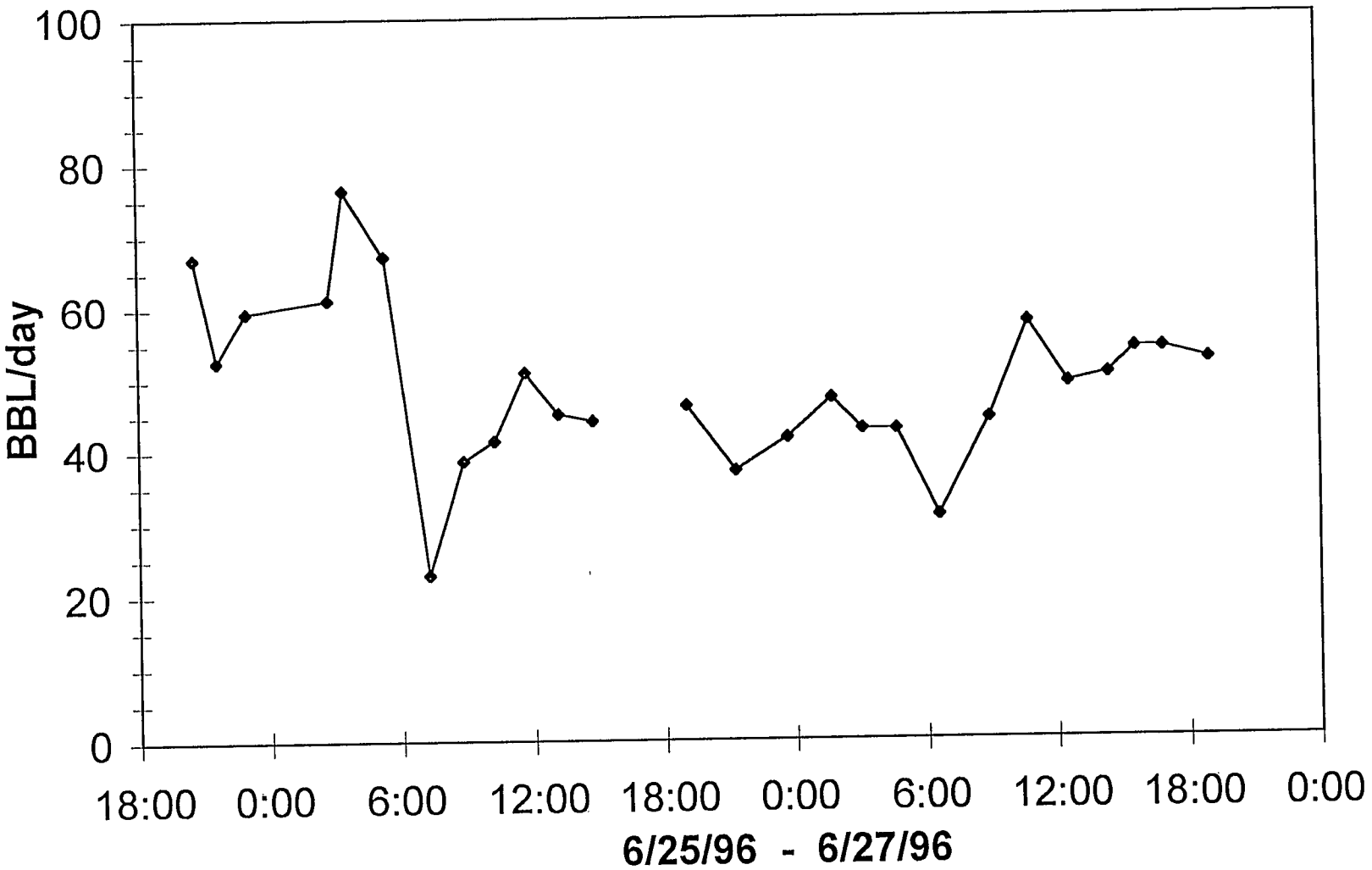
Table 4 : Treatment #2 - LOG

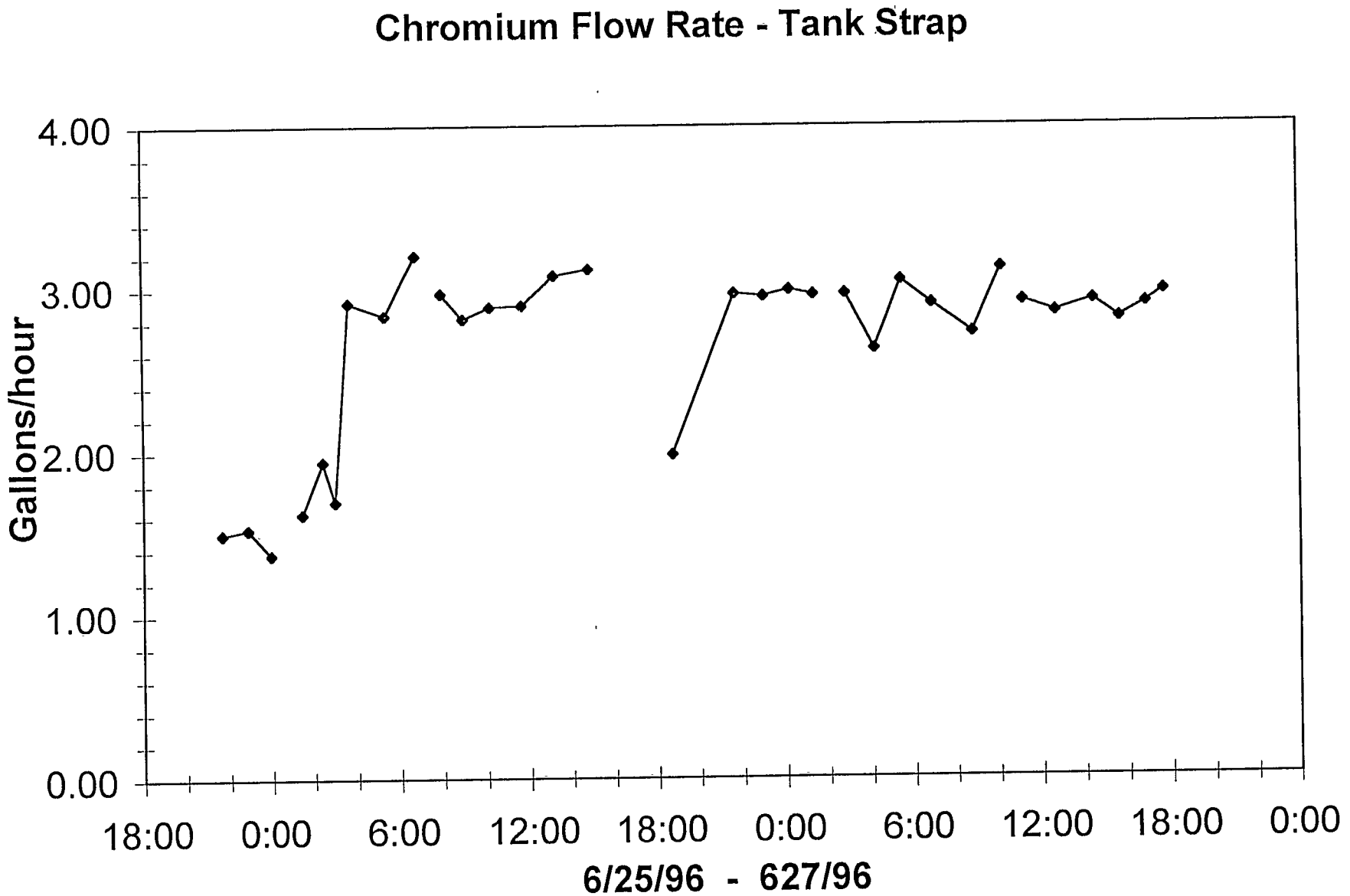
Date/Time	Event
7/30/96	
	Mixed polymer batch #3.
	Mixed chromium batch #3A.
3:10 pm	Start injection of polymer solution.
3:35 pm	Start injection of chromium solution.
7/31/96	
7:10 am	Mixed chromium batch # 3B.
8:45 am - 9:42 am	Shutdown. Cleaned polymer pump and flow meter.
10:45 am	Increased rate of polymer pump - 3rd piston starts working.
11:16 am - 11:47 am	Shutdown. Exchange sheaves on polymer pump.
12:20 pm	Mixed chromium batch #3C.
10:40 pm	Stopped chromium solution injection..
10:56 pm	Stopped polymer solution injection.
11:00 pm - 11:42 pm	Injected 42 gal of water.
8/1/96	
	Mixed polymer batch #4.
	Mixed chromium batch #4A.
9:57 am - 10:04 am	Opened valve - well sucked polymer solution (o.4 bbl).
10:04 am	Start injection of polymer batch # 4.
10:09 am	Start injection of chromium batch # 4A.
5:20 pm	Mixed chromium batch #4B.
8/2/96	
1:30 am	Shut-iin well H-15.
3:30 am	stopped injection of chromium solution.
4:00 am	Shut-in wells H-13, H-16 and H-22.
4:20 am	Stopped injection of polymer solution (2 bbl left in tank).
4:30 am - 5:00 am	Injected 43 gal of water.

Total Injection Rate - Flow Meter

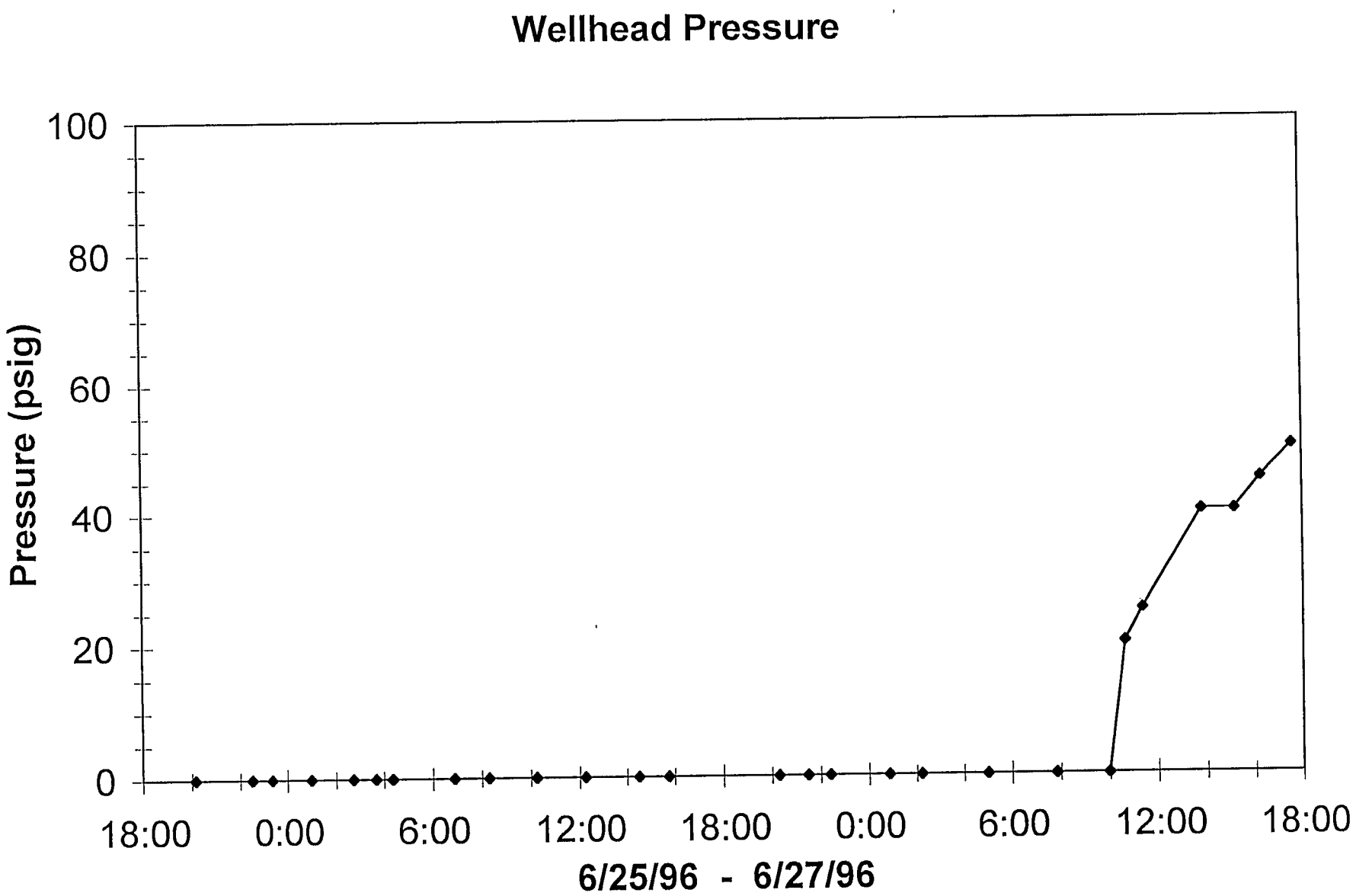


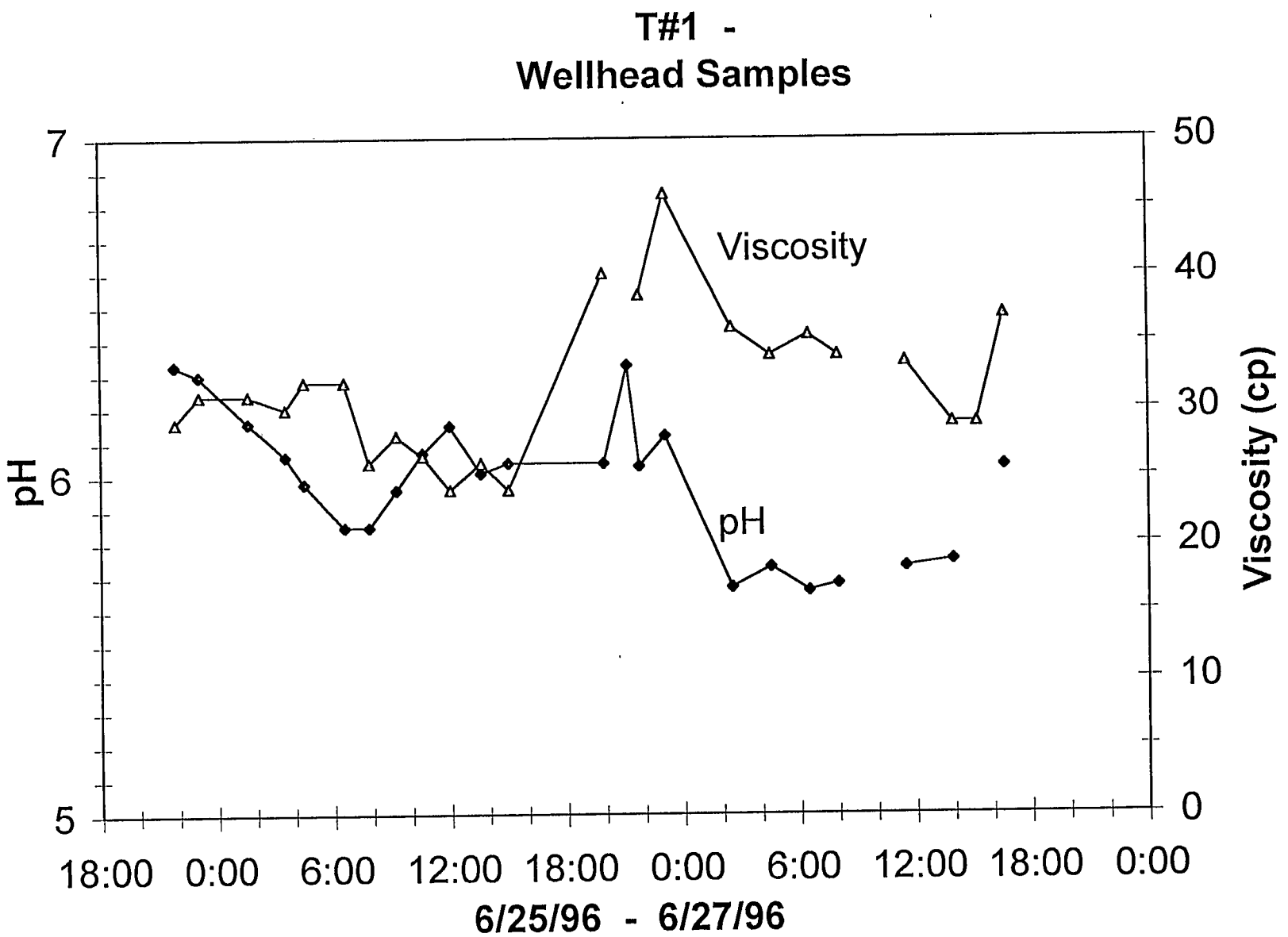
Polymer Flow Rate - Tank Strap



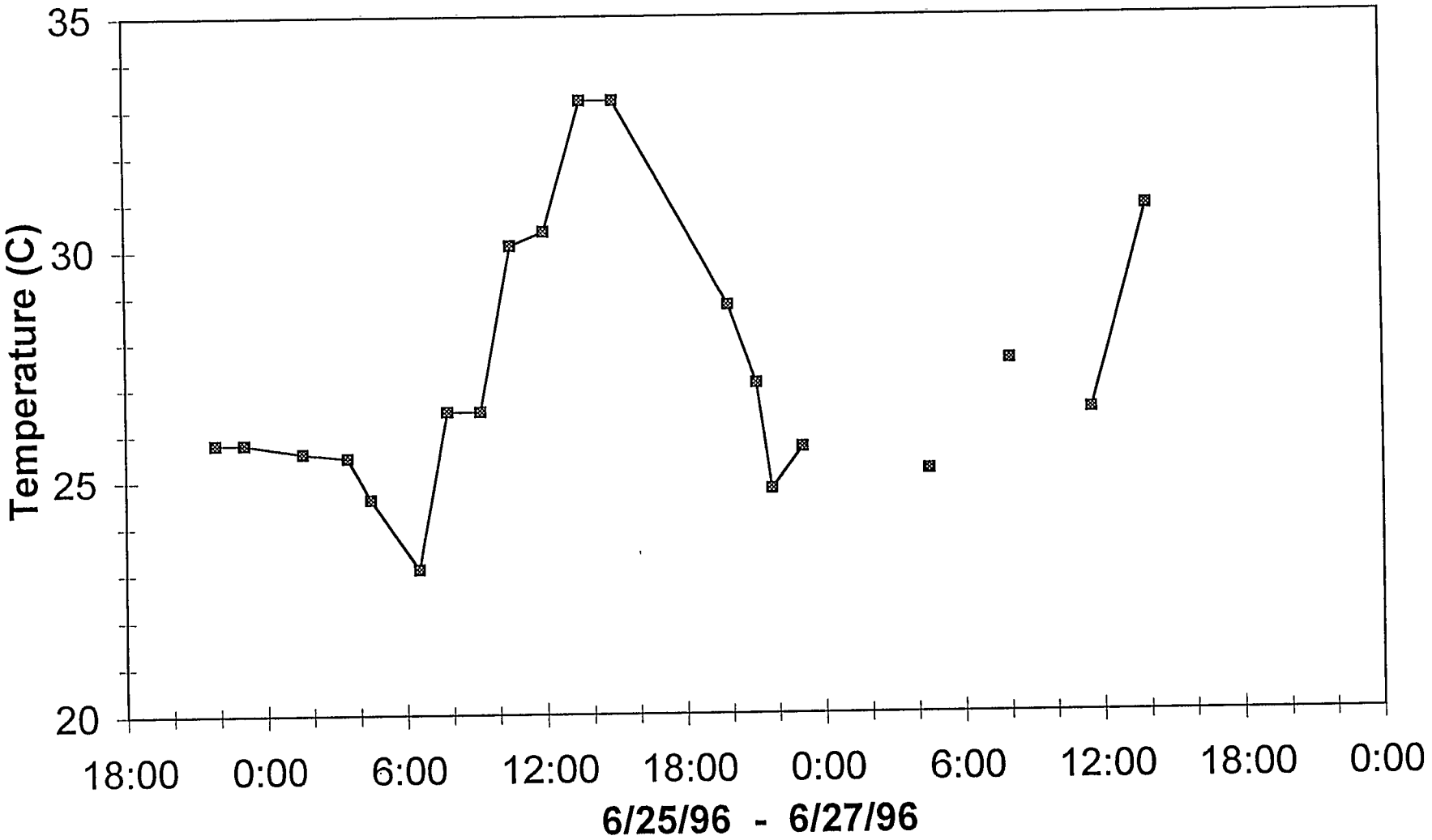

Chromium Flow Rate - Tank Strap
4.00
3.00
2.00
1.00
0.00
Gallons/hour
18:00
0:00
6:00
12:00
18:00
0:00
6:00
12:00
18:00
0:00
6/25/96 - 627/96

Press

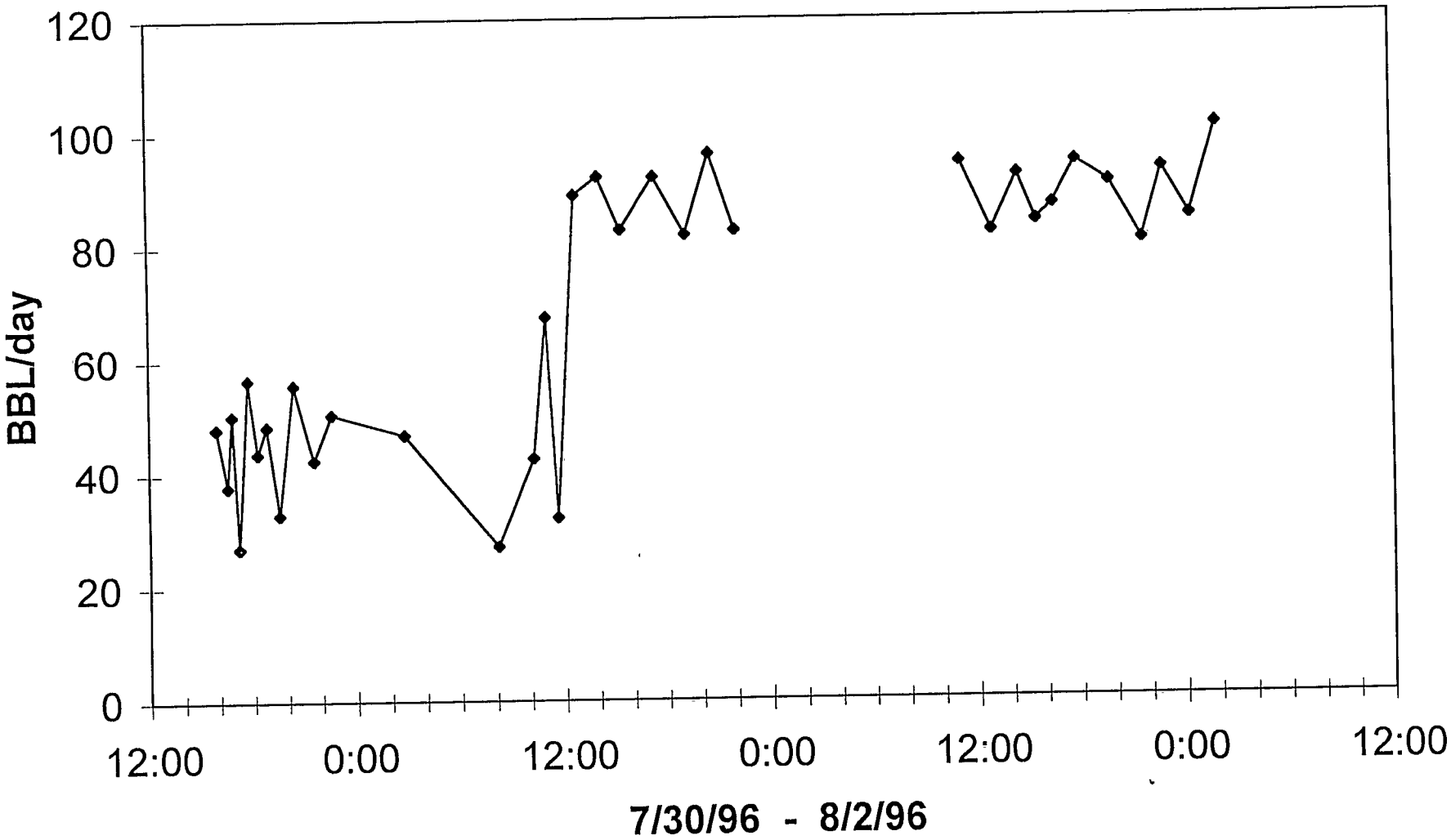

Wellhead Pressure
Pressure (psig)
100
80
60
40
20
0
18:00
0:00
6:00
12:00
18:00
0:00
6:00
12:00
18:00
6/25/96 - 6/27/96


T#1 -
Wellhead Samples
7
6
5
pH
50
40
30
20
10
0
Viscosity (cp)
Viscosity
pH
18:00
0:00
6:00
12:00
18:00
0:00
6:00
12:00
18:00
0:00
6/25/96 - 6/27/96

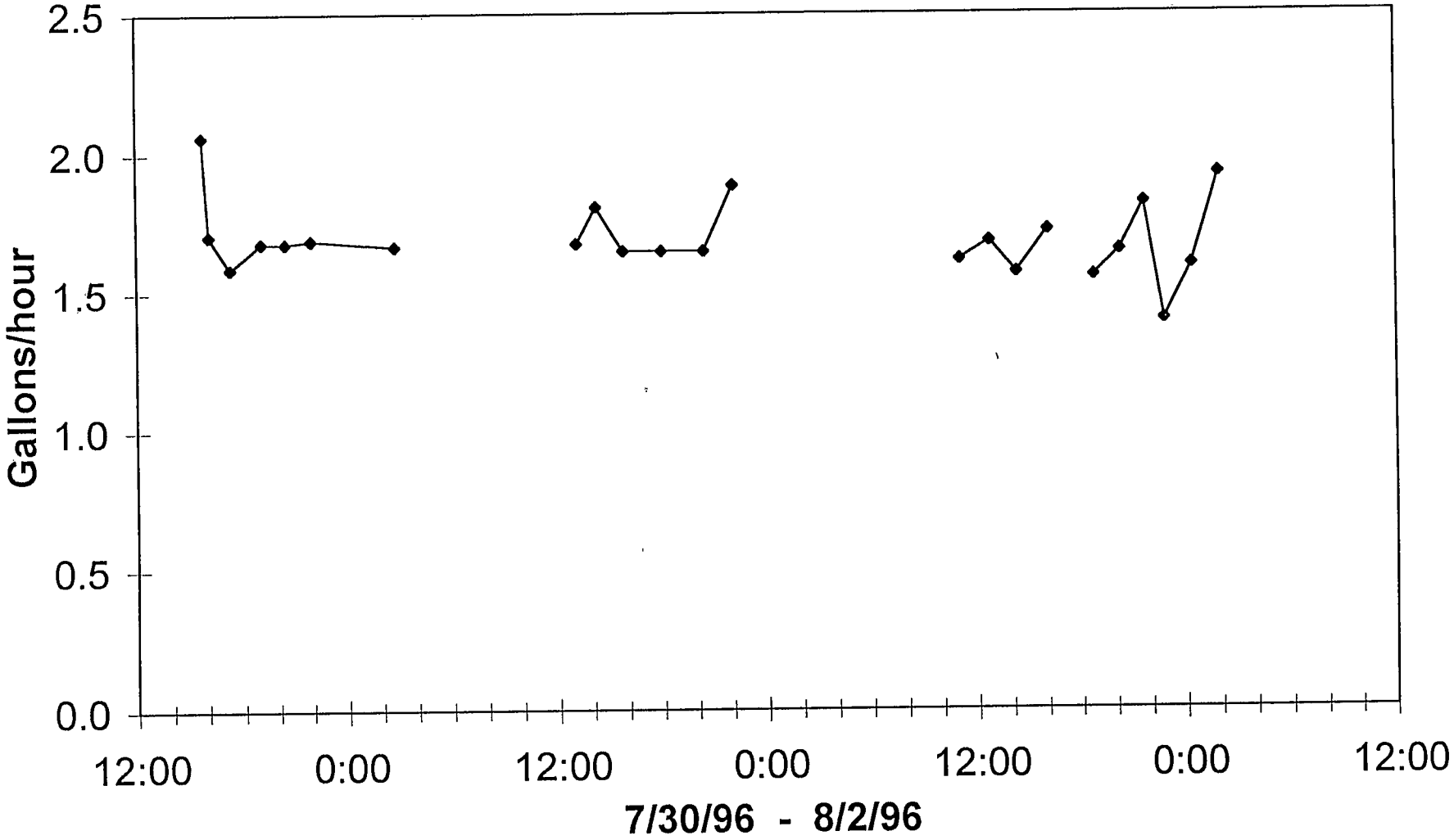
T#1 - Temperature of Injected Solution

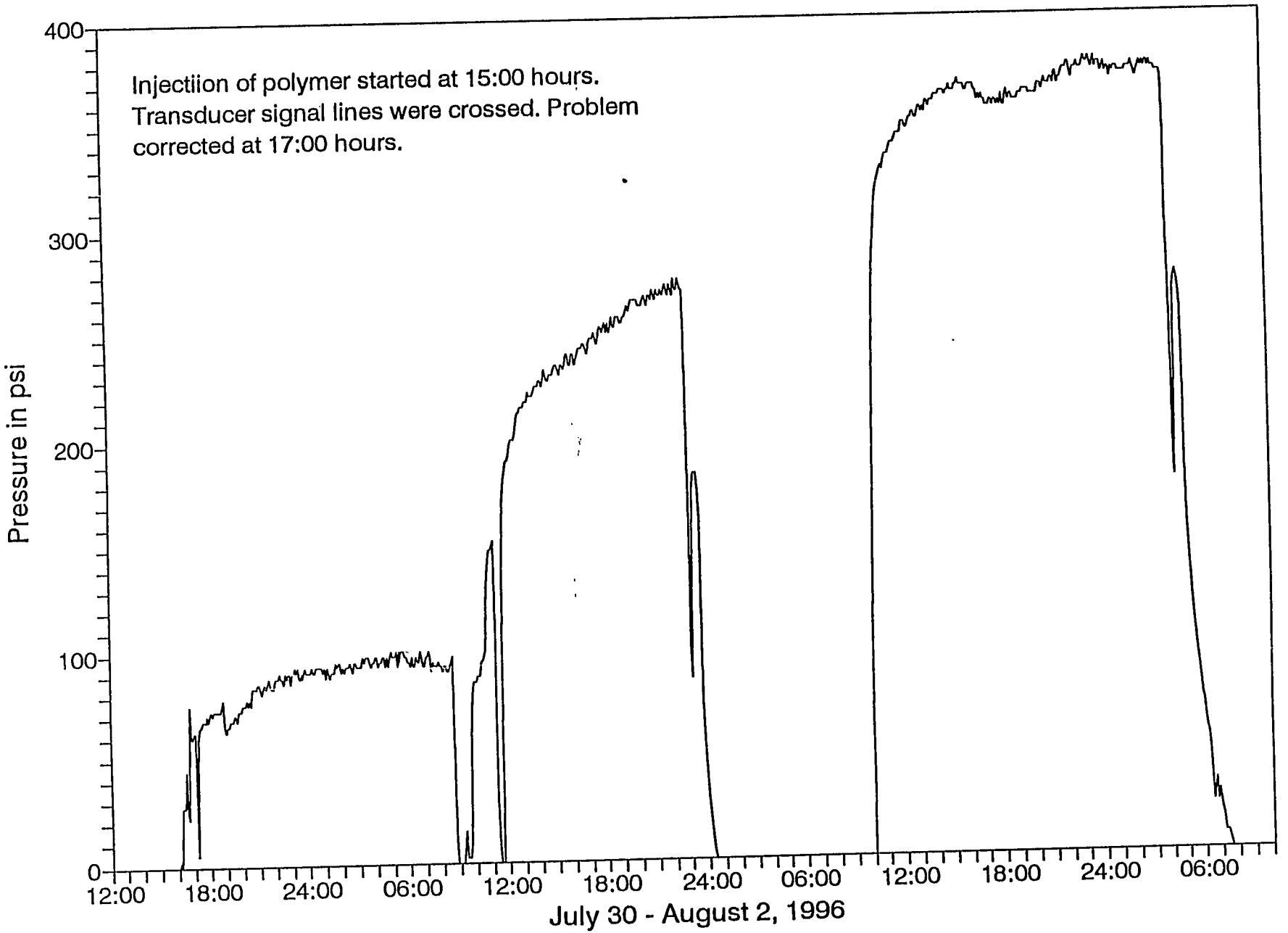


Polymer Flow Rate - Tank Strap

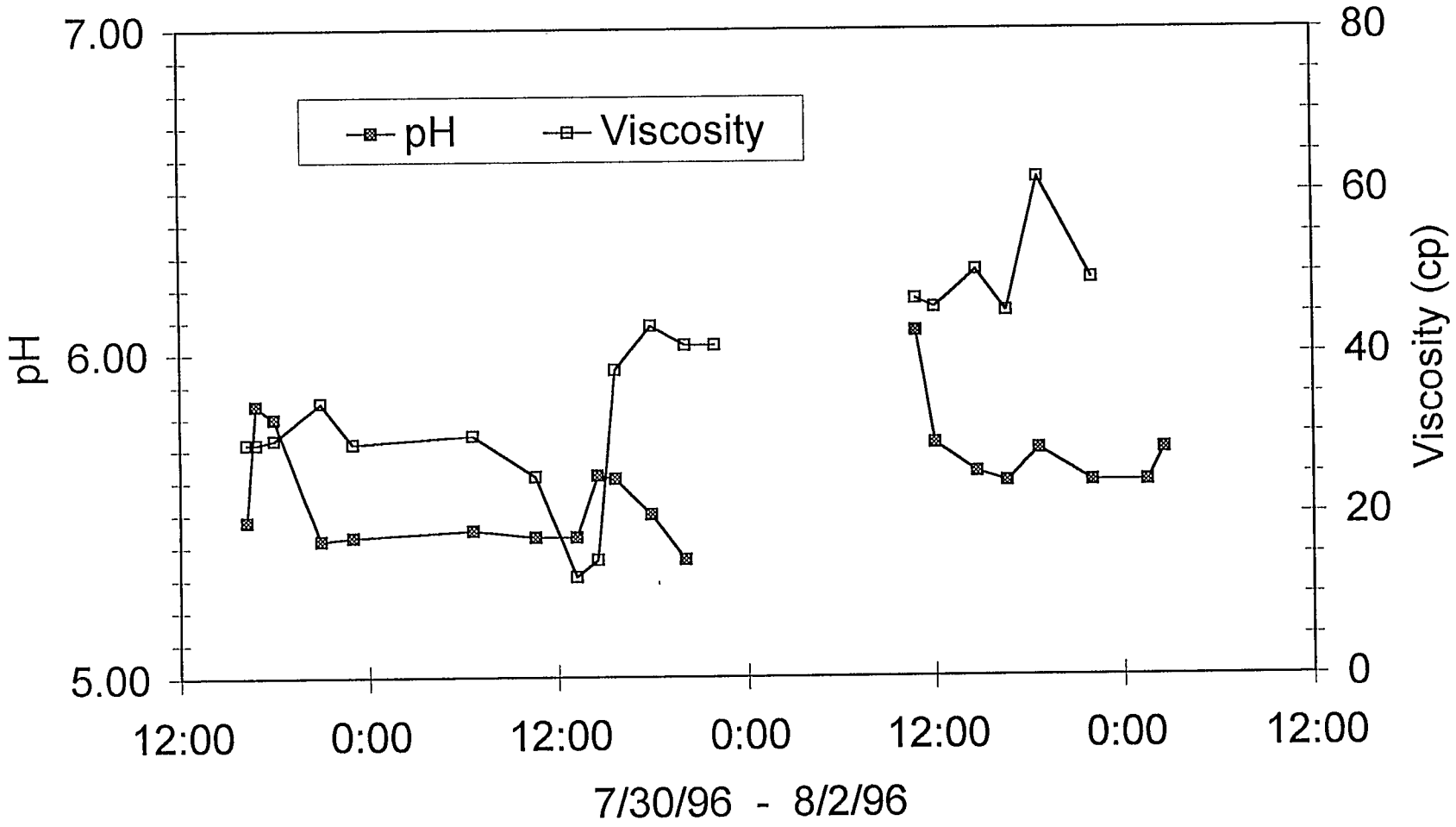


Chormium Flow Rate - Tank Strap




Injectiion of polymer started at 15:00 hours.
Transducer signal lines were crossed. Problem
corrected at 17:00 hours.
Pressure in psi
400
300
200
100
0
12:00
18:00
24:00
06:00
12:00
18:00
24:00
06:00
12:00
18:00
24:00
06:00
July 30 - August 2, 1996

Samples of Injected Gelant



Gelant Temperature