A. E. Leisy
Aroclor-WGK, Quality Control & Process Control Report

Using the "three sigma limits" on pre-October 1970 data, most of 1971 is "out of control". Both analysis and process variables are being thoroughly scrutinized. No significant changes have been found. The trend in April to the present (5/6) is downward (better stability). Unfortunately there are again no known changes.

DSW 329267

MONSANTO CHEMICAL COMPANY - CONTROL CHART

SHEET 1 OF 3

PRODUCT: Aroclor 1242

CODE

DEPT

PERIOD: 1 / 1 / 71 TO / /

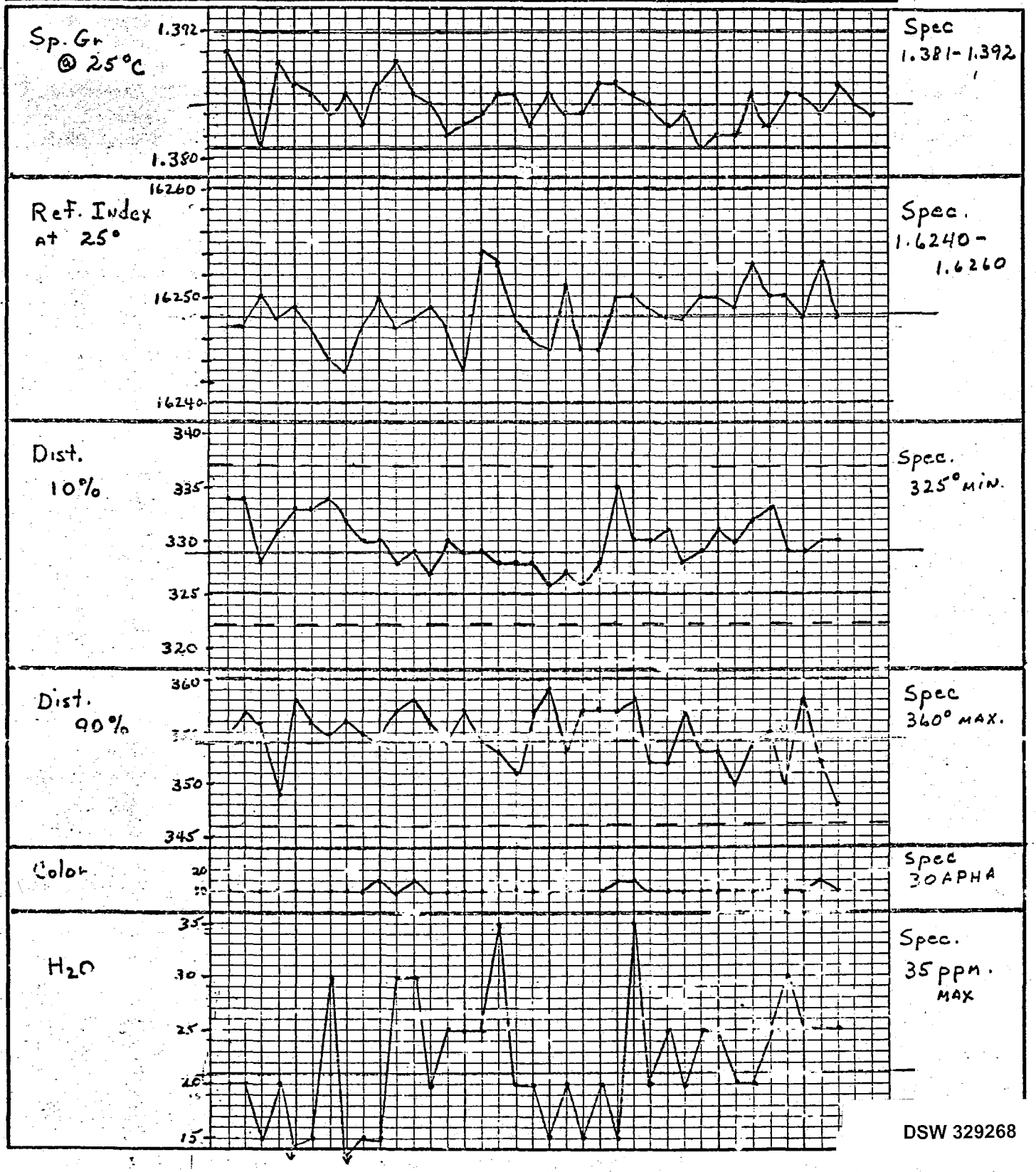
LEGEND: AVERAGE ● ● ● ● ● ● ● ● ● ● WARNING LIMIT SPECIFICATION

DAY

MONTH

ANALYST

LOT NUMBER SERIES



DSW 329268

STLCOPCB4075976

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT

SHEET 3 OF 3

PRODUCT Aroclor 1242

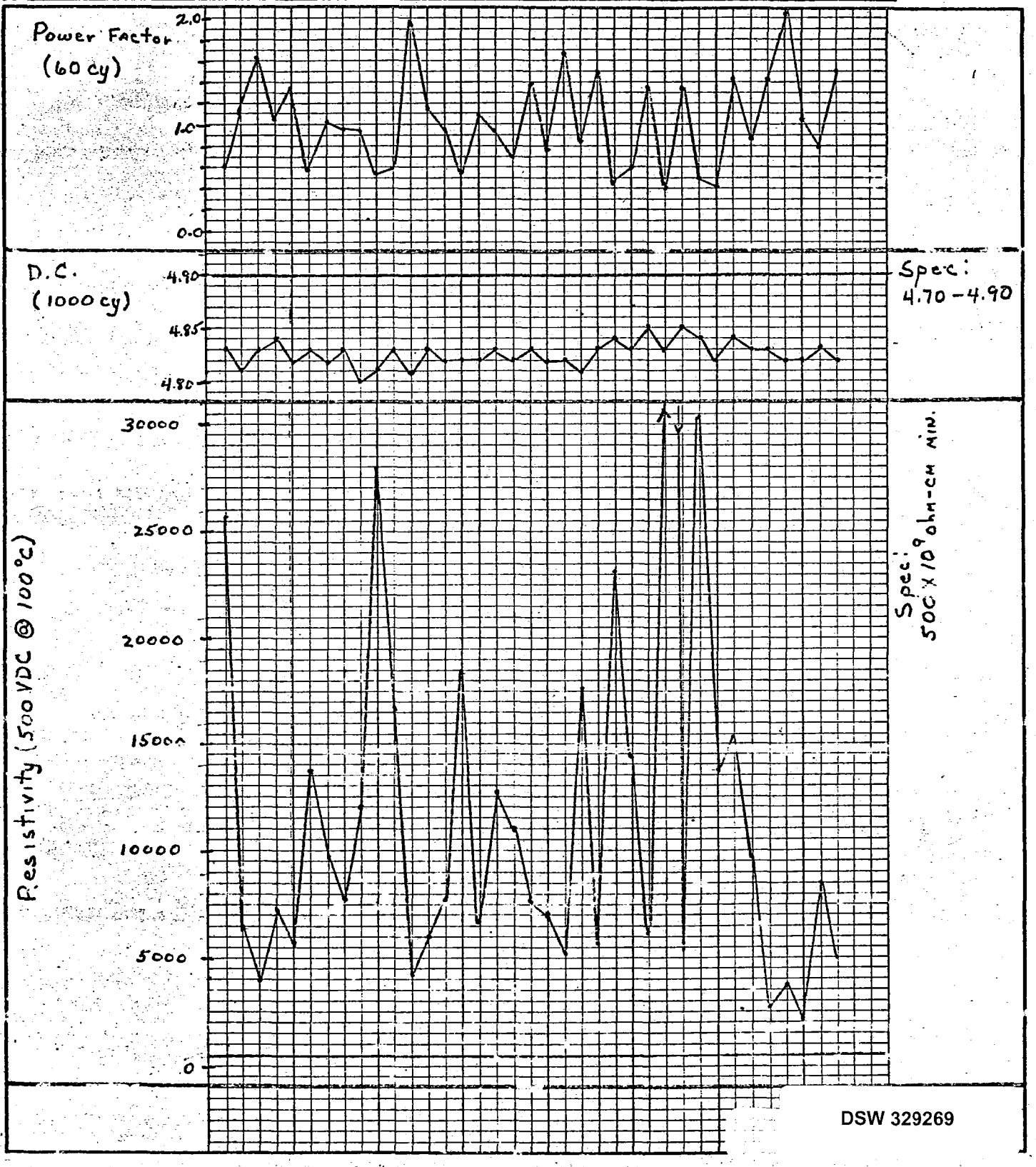
CODE

DEPT.

PERIOD 1, 1, 71 TO , ,

LEGEND:
AVERAGE
WARNING LIMIT
SPECIFICATION

DAY	
MONTH	
ANALYST	
LOT NUMBER SERIES	401 03 05 08 410 12 14 15 18 19 422 23 24 25 27 28 430 31 33 34 38 39 442 43 44 47 48 450 51 53 54 55 57 58 59 460 61



DSW 329269

STLCOPCB4075977

A. E. Leisy
Aroclor-WGK, Quality Control & Process Control Report

PROCESS CONTROL

Production and TSD selected the key process variables and their control limits. Most of these variables are logged daily; a few less frequently. Where no data is plotted indicates that the equipment was not in use, i.e., #2 & #3 batch chlorinators. The control limits are indicated by the heavier black lines. In a few cases control limits have not been set. On the last page equipment changes are noted for future reference.

During April, 608 key variable data points were logged. Eight were out of control. They were:

1) Low heat exchanger temperature on #4 chlorinator (batch) - The batch had apparently not been chlorinating long enough to reach full temperature. It did not occur again.

5) High temperature at the sparger on #5 chlorinator (batch) - The problem has not been defined. The chlorine flow rates have been temporarily reduced to compensate.

2) Long heatup time on #4 chlorinator - The heat exchanger louvres were not closing completely. This has been corrected.

OTHER COMMENTS

Still pot temperature will be added to the key variable list even though it is primarily a dependent variable.

Levels of contamination in biphenyl and chlorine are unknown at this time. (Other than Br_2 in Cl_2).

Ferric chloride concentration is recorded as a percent by weight of the finished crude 1142 in #9 chlorinator, not as a percent of biphenyl. Proper sampling the crude appears to be difficult. It is not likely that the actual $FeCl_3$ concentration varies as widely as analysis indicates.

RM McCutchan

R. M. McCutchan

Attachments

DSW 329270

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK | SHEET 1 OF

1 BATCH CHLORINATOR

TEMPERATURES (°C) - after start-up period

LEGEND: AVERAGE · · ·

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK | SHEET 2 OF

#2 BATCH CHLORINATOR

TEMPERATURES (°C) - after start-up period

LEGEND: AVERAGE ● ● ● ● ● ● ● ● ● ● | WARNING LIMIT ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ | SPECIFICATION ▬▬▬▬▬▬▬▬▬▬

PRODUCT AROCLOR

CODE 811.00 | DEPT. 246

PERIOD ' ' TO ' '

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
MONTH APRIL 71																														
ANALYST																														
LOT NUMBER SERIES		Down	Down	Down	Down	Down															Down			Down				Down		

SPARGER (panel indicator below strip chart)

HEAT EXCH. OUTLET (panel strip chart)

PUMP DISCHARGE (PT. #4 on 12-PT. RECOR.)

BODY (PT. #3 on 2-PT. RECOR.)

190 180 170 160 150 140

DSW 329272

12 J 12

STLCOPCB4075980

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK | SHEET 3 OF

#3 BATCH CHLORINATOR

TEMPERATURES (°C) - after start-up period

LEGEND: AVERAGE ● ● ● ● ● ● ● ● ● ● | WARNING LIMIT ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬ | SPECIFICATION ▬▬▬▬▬▬▬▬

PRODUCT: AROCLOR

CODE: 811.00 | DEPT: 246

PERIOD: / / TO / /

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
MONTH APRIL 71																														
ANALYST																														
LOT NUMBER SERIES	DOWN	Down	Down	Down	DOWN	↑																↓	Down		Down	↑		↓		Down

SPARGER (panel indicator below strip chart)

HEAT EXCH. OUTLET (panel strip chart)

PUMP DISCHARGE (PT. #6 ON 12-PT. RECOR.)

BODY (PT. #5 ON 12-PT. RECOR.)

190 180 170 160 150 140

DSW 329273

4 of 4 OK

STLCOPCB4075981

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK | SHEET 4 OF

#4 BATCH CHLORINATOR

TEMPERATURES (°C) - after start-up period

LEGEND: AVERAGE ● ● ● ● ● ● ● ● ● ● WARNING LIMIT ▭ ▭ ▭ ▭ ▭ ▭ ▭ ▭ SPECIFICATION

PRODUCT AROCLOR

CODE 811.00 | DEPT. 246

PERIOD ' ' TO ' '

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
MONTH APRIL 71																															
ANALYST			Dawd	Dawd			Dawd			Dawd	Dawd	Dawd	Dawd					Dawd	Dawd	Dawd	Dawd			Dawd	Dawd	Dawd	Dawd				
LOT NUMBER SERIES																															

SPARGER (panel indicator below strip chart)

HEAT EXCH. OUTLET (panel strip chart)

PUMP DISCHARGE (PT. #8 ON 12-PT. RECOR.)

BODY (PT. #7 ON 12-PT. RECOR.)

190 180 170 160 150 140

<= 120

DSW 329274

55 of 56

OK

STLCOPCB4075982

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK | SHEET 5 OF

TYPE: #5 BATCH CHLORINATOR

TEMPERATURES (°C) - after start-up period

LEGEND: AVERAGE ● ● ● ● ● ● ● ● ● ● | WARNING LIMIT ▭ ▭ ▭ ▭ ▭ ▭ ▭ ▭ | SPECIFICATION

PRODUCT: AROCLOR

CODE: 811.00 | DEPT: 246

PERIOD: / / TO / /

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
MONTH APRIL 71																															
ANALYST																															
LOT NUMBER SERIES			DOWN	DOWN			DOWN	DOWN		DOWN	DOWN	DOWN	DOWN								DOWN	DOWN	DOWN	DOWN			DOWN	DOWN	DOWN	DOWN			

SPARGER (panel indicator below strip chart)

HEAT EXCH. OUTLET (panel strip chart)

PUMP DISCHARGE (PT. #10 ON 12-PT. RECOR.)

BODY (PT. #9 ON 2-PT. RECOR.)

190 180 170 160 150 140

43 of 49 OK

DSW 329275

STLCOPCB4075983

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK | SHEET 6 OF

TYPE

#6 CONTINUOUS CHLORINATOR
TEMPERATURES (°C) - after start-up period

LEGEND:
AVERAGE
WARNING LIMIT
SPECIFICATION

PRODUCT AROCLORS
CODE 811.00 | DEPT. 246
PERIOD / / TO / /

DAY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

MONTH APRIL '71

ANALYST

LOT NUMBER SERIES

SPARGER
Pt. #2 on 24-pt. Recor.

HEAT EXCH. OUTLET
Pt. #2 on 24-pt. Indicator

BODY
Pt. #3 on 24-pt. Recor.

190
180
170
160
150
140

DSW 329276

STLCOPCB4075984

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK | SHEET 7 OF

T

7 CONTINUOUS CHLORINATOR

TEMPERATURES (°C) - after start-up period

LEGEND: AVERAGE ● ● ● ● ● ● ● ● ● ● | WARNING LIMIT ▭ ▭ ▭ ▭ ▭ ▭ ▭ ▭ ▭ ▭ | SPECIFICATION

PRODUCT AROCLORS

CODE 811.00 | DEPT. 246

PERIOD / / TO / /

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
MONTH APRIL '71																														
ANALYST																														
LOT NUMBER SERIES																														

SPARGER
Pt. #4 on 24-pt. Recor.

HEAT EXCH. OUTLET
Pt. #4 on 24-pt. Indicator

BODY
Pt. #5 on 24-pt. Recor.

190
180
170
160
150
140

DSW 329277

STLCOPCB4075985

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK | SHEET 2 OF

8 CONTINUOUS CHLORINATOR
TEMPERATURES (°C) - after start-up period

LEGEND: AVERAGE ● ● ● ● ● ● ● ● ● ● | WARNING LIMIT ▭ ▭ ▭ ▭ ▭ ▭ ▭ ▭ ▭ ▭ | SPECIFICATION

PRODUCT AROCLORS

CODE 811.00 | DEPT. 246

PERIOD / / TO / /

DAY	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
MONTH	APRIL '71
ANALYST	
LOT NUMBER SERIES	

SPARGER
Pt. #6 on 24-pt. Recor.

HEAT EXCH. OUTLET
Pt. #6 on 24-pt. Indicator

BODY
Pt. #7 on 24-pt. Recor.

190
180
170
160
150
140

DSW 329278

STLCOPCB4075986

WGK 9 MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK SHEET 9 OF

TYPE

9 CONTINUOUS CHLORINATOR TEMPERATURES (°C) - after start-up period.

LEGEND:
AVERAGE
WARNING LIMIT
SPECIFICATION

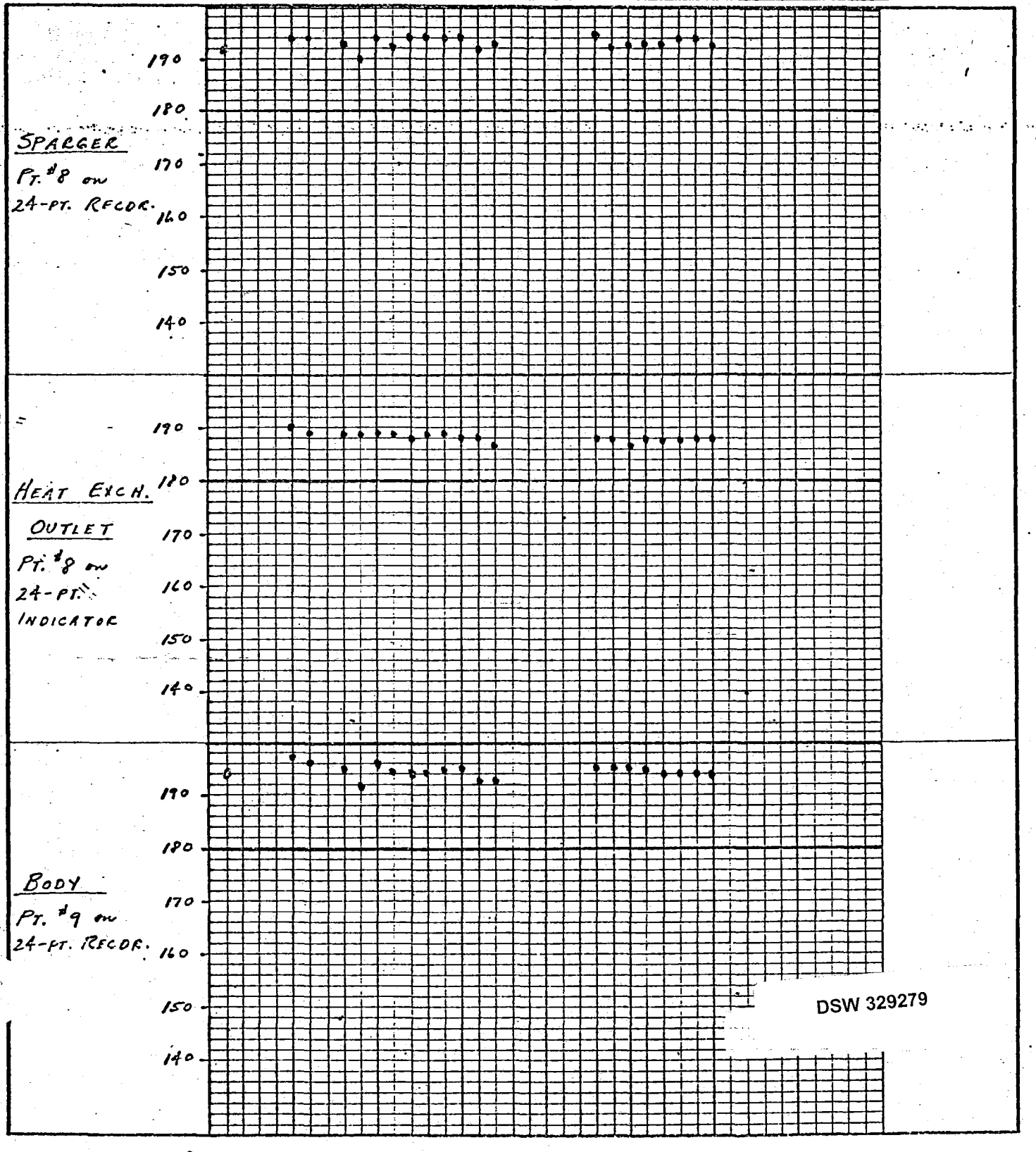
PRODUCT AROCLORS
CODE 811.00 DEPT. 246
PERIOD / / TO / /

DAY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

MONTH APRIL 71

ANALYST

LOT NUMBER SERIES



DSW 329279

STLCOPCB4075987

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK | SHEET 10 OF

TEST: STILL LEVELS (%)

LEGEND: AVERAGE ● ● ● ● ● ● ● ● ● ● | WARNING LIMIT ▭ ▭ ▭ ▭ ▭ ▭ ▭ ▭ | SPECIFICATION ▬▬▬▬▬▬▬▬

PRODUCT: AROCLOR | CODE: 811.00 | DEPT: 246 | PERIOD: / / TO / /

DAY: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

MONTH: APRIL 71

ANALYST

LOT NUMBER SERIES

#1 Circular Recorder

#2 Circular Recorder

#3 Panel Indicator

23 ± 23

#4 Panel Indicator

20 ± 20

70 60 50 40 30

DSW 329280

STLCOPCB4075988

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK SHEET 11 OF

TYPE: STILL PRESSURES (mm Hg)

LEGEND: AVERAGE ● ● ● ● ● ● ● ● ● ● WARNING LIMIT ▫ ▫ ▫ ▫ ▫ ▫ ▫ ▫ ▫ ▫ SPECIFICATION

PRODUCT AROCLOR

CODE 1111.00 DEPT. 246

PERIOD ' ' TO ' '

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
MONTH APRIL 71																															
ANALYST																															
LOT NUMBER SERIES																															

#1 Circular Recorder

#2 Circular Recorder

#3 Panel Indicator

21 of 21

#4 Panel Indicator

18 of 18

DSW 329281

STLCOPCB4075989

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK | SHEET 12 OF

OFF-GAS TEMPERATURE AND BLOW TANK AIR

LEGEND: AVERAGE ● ● ● ● ● ● ● ● ● ● WARNING LIMIT ▭ ▭ ▭ ▭ ▭ ▭ ▭ ▭ SPECIFICATION

PRODUCT: AROCLORS

CODE: 811.00 | DEPT: 246

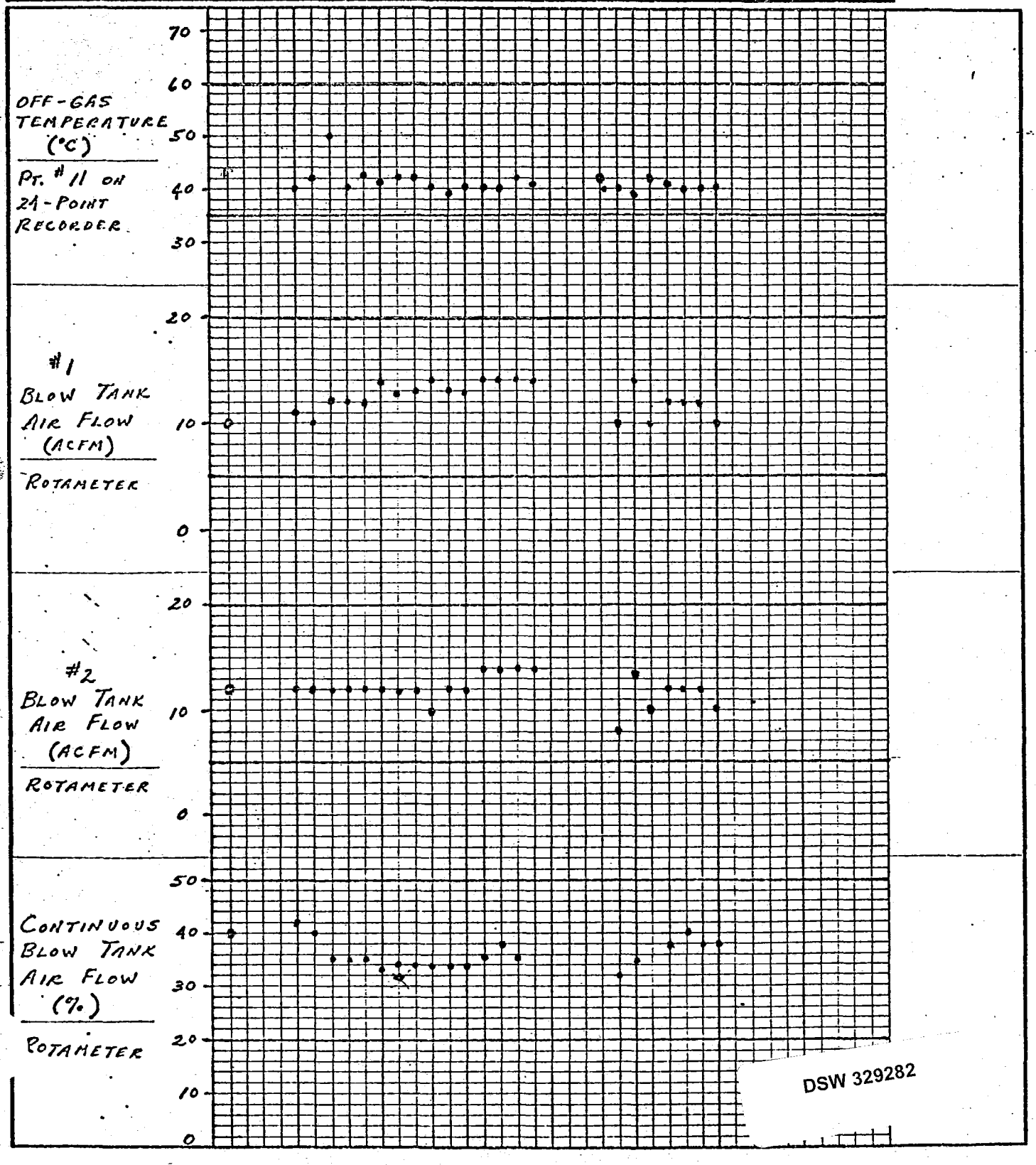
PERIOD / / TO / /

DAY: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

MONTH: APRIL 71

ANALYST

LOT NUMBER SERIES: DOWN DOWN DOWN



DSW 329282

STLCOPCB4075990

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT WGK | SHEET 13 OF

TO: SPECIFIC GRAVITY OF FORWARD FLOW, AROCLOR 1242 FROM ABSORBER

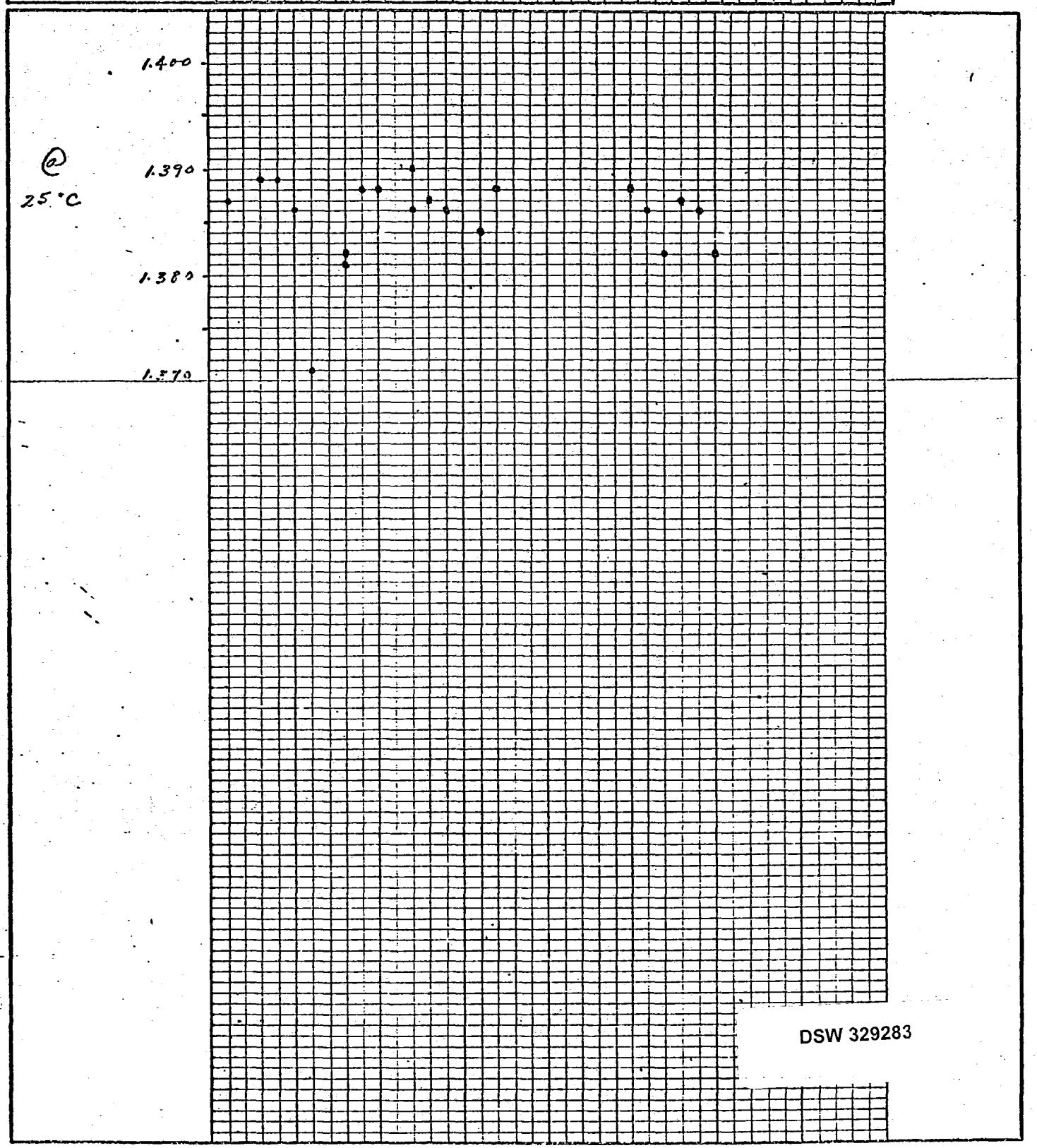
LEGEND: AVERAGE ● ● ● ● ● ● ● ● ● ● WARNING LIMIT ▭ ▭ ▭ ▭ ▭ ▭ ▭ ▭ SPECIFICATION ▬

PRODUCT: AROCLOR

CODE: 811.00 | DEPT: 246

PERIOD: / / TO / /

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
MONTH APRIL 71																														
ANALYST																														
LOT NUMBER SERIES						LOW DENSITY												DRAIN	"	"	"	"								



DSW 329283

STLCOPCB4075991

MONSANTO CHEMICAL COMPANY - CONTROL CHART

SHEET 14 OF

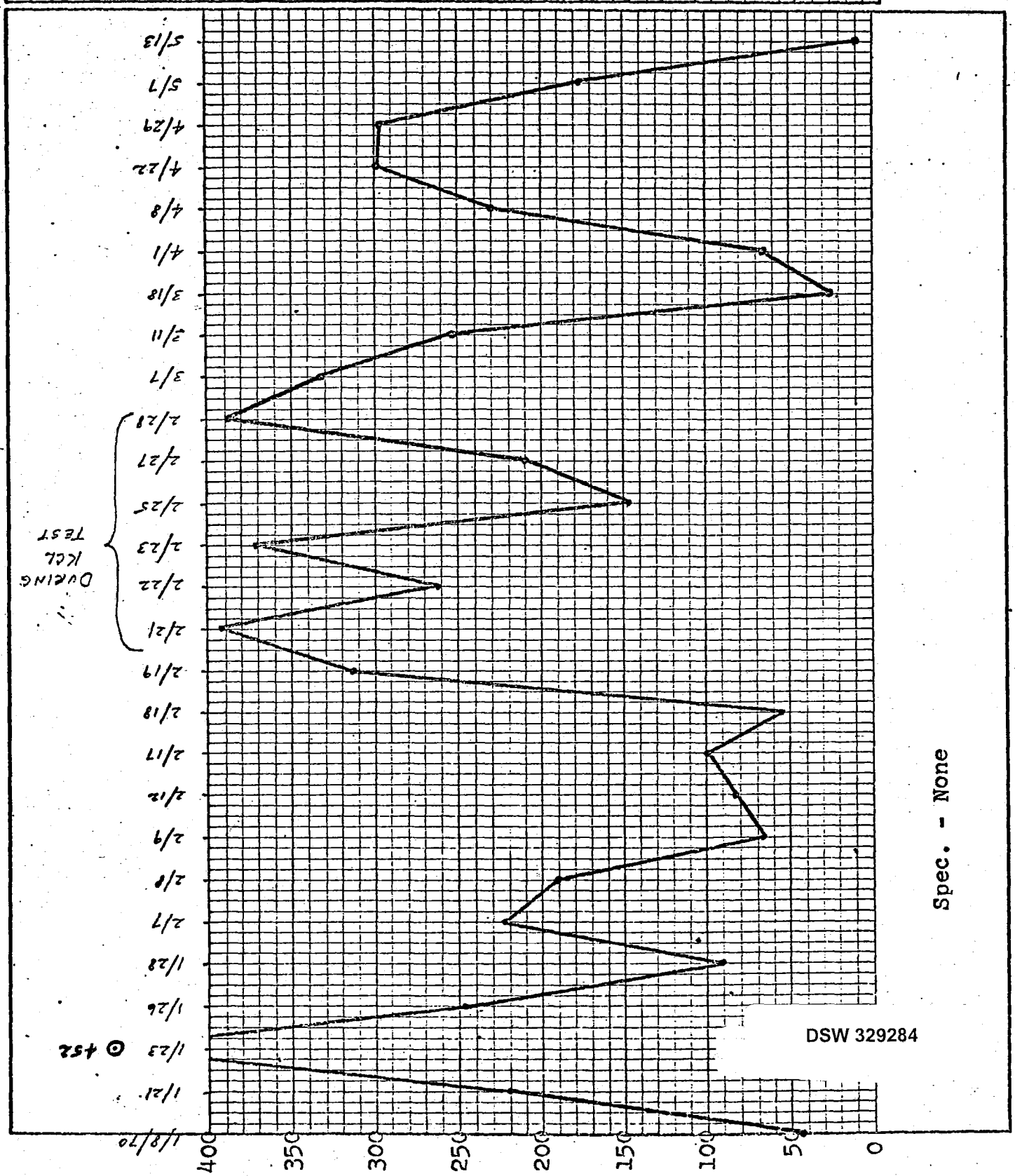
T O: Chlorine

ppm Br_2

LEGEND:
AVERAGE
WARNING LIMIT
SPECIFICATION

PLANT
PRODUCT
CODE
DEPT.
PERIOD / / TO / /

DAY	
MONTH	
ANALYST	
LOT NUMBER SERIES	



STLCOPCB4075992

MONSANTO CHEMICAL COMPANY - CONTROL CHART

SHEET 4 OF A

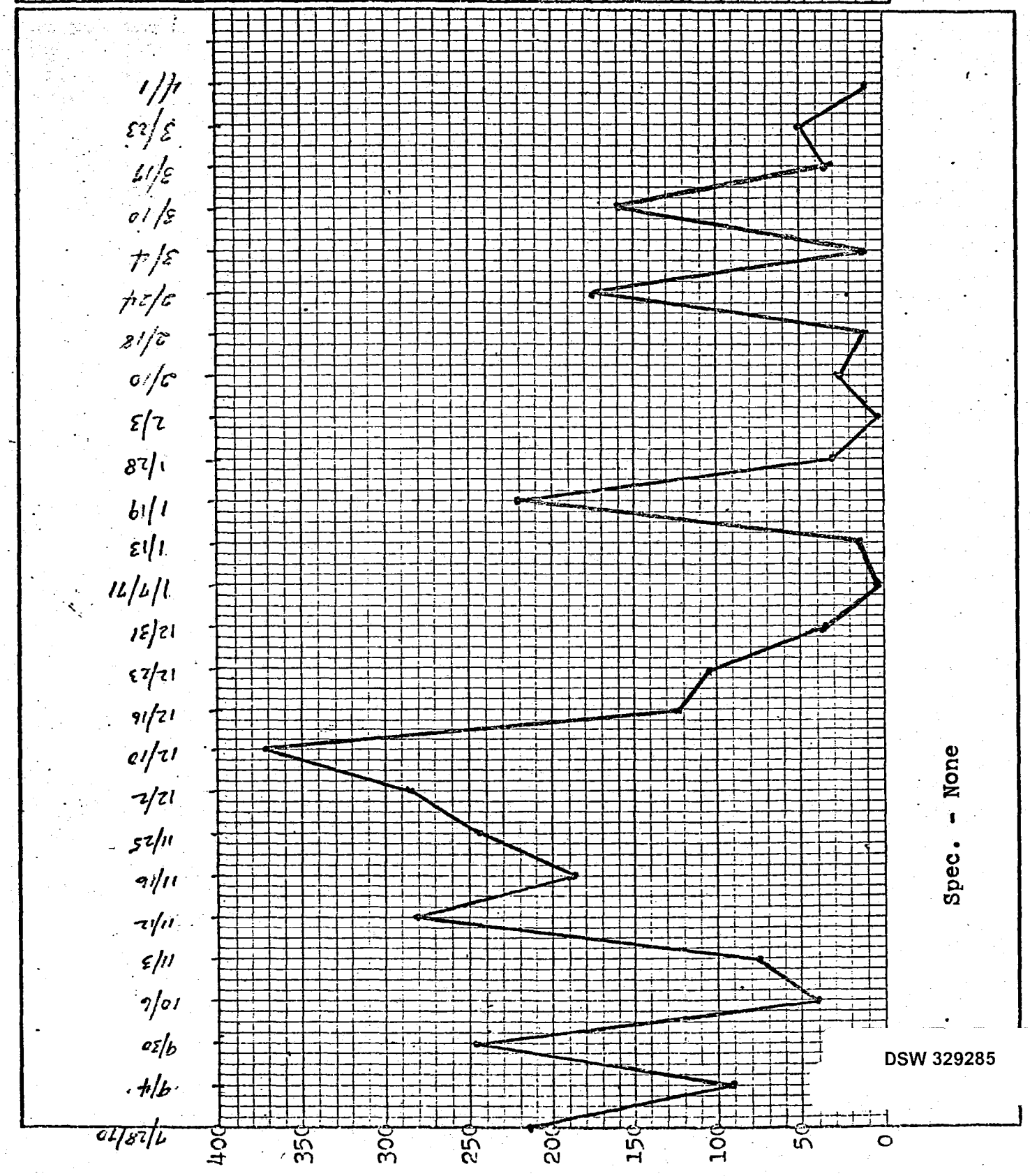
TO: Chlorine

ppm Br_2

LEGEND:
AVERAGE
WARNING LIMIT
SPECIFICATION

PLANT
PRODUCT
CODE
DEPT.
PERIOD / / TO / /

DAY	
MONTH	
ANALYST	
LOT NUMBER SERIES	



DSW 329285

STLCOPCB4075993

MONSANTO CHEMICAL COMPANY - CONTROL CHART

SHEET 2 OF

TO

Crude - #9 Chlorinator

% $FeCl_3$

LEGEND:

AVERAGE ● ● ● ● ● ● ● ● ● ●

WARNING LIMIT

SPECIFICATION

AMT PRODUCT

CODE

DEPT.

PERIOD / / TO / /

DAY	
MONTH	
ANALYST	
LOT NUMBER SERIES	

7/21
7/20
7/10
7/8
7/6
6/29
6/22
6/12
6/8
6/1
5/25
5/18
5/11
5/4
4/27
4/14
4/6
3/23
3/16
3/9
2/16
2/9
2/2
1/26
1/19
1/12
1/5/70

.30 .25 .20 .15 .10 .05 0

Spec. - None

DSW 329286

STLCOPCB4075994

MONSANTO CHEMICALS COMPANY - CONTROL CHART

SHEET 2 OF A

Crude - #9 Chlorinator

% $FeCl_3$

LEGEND:

AVERAGE

PRODUCT

CODE

DEPT.

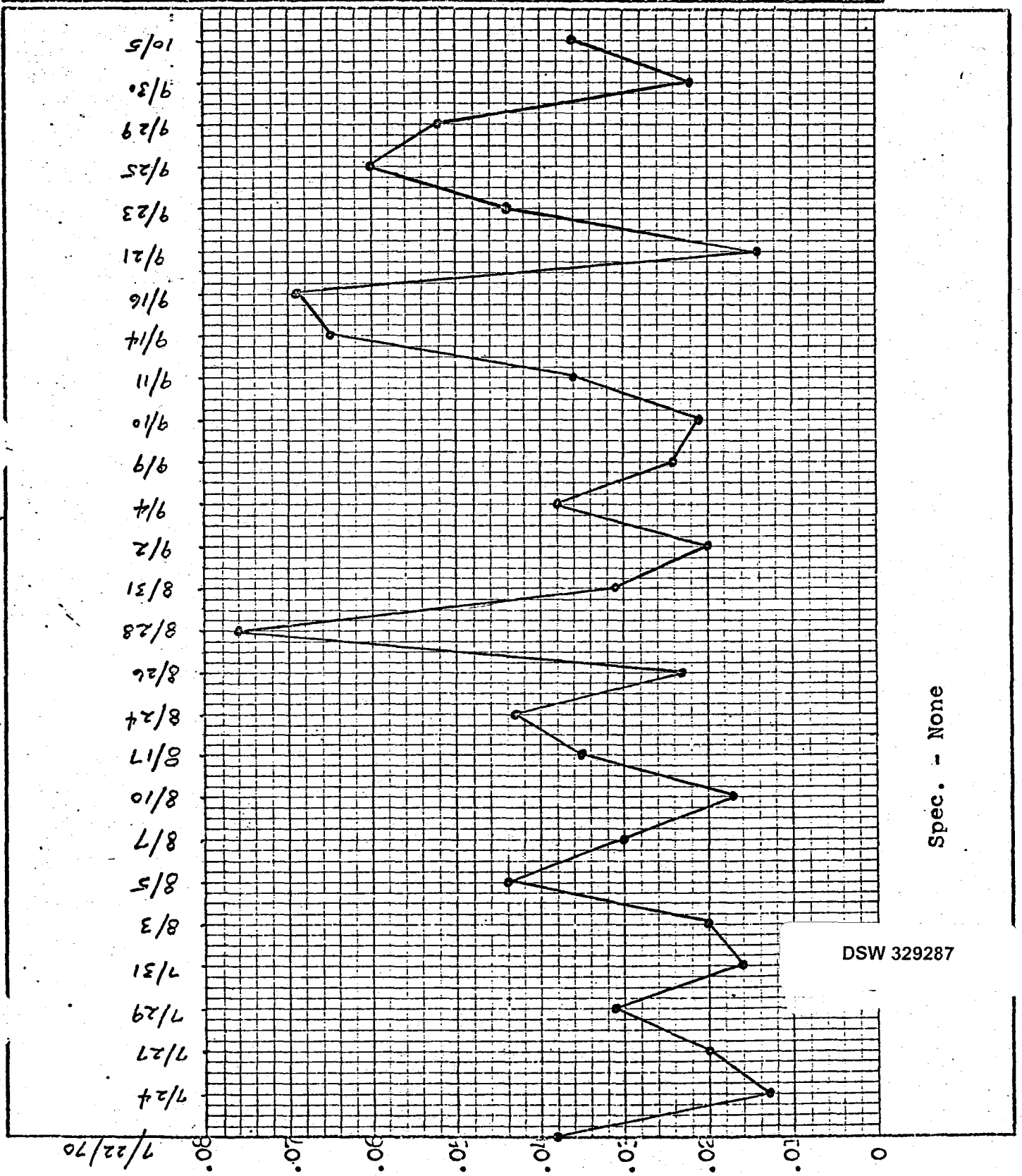
PERIOD / / TO / /

DAY

MONTH

ANALYST

LOT NUMBER SERIES



Spec. - None

DSW 329287

STLCOPCB4075995

MONSANTO CHEMICAL COMPANY - CONTROL CHART

SHEET 2 OF 8

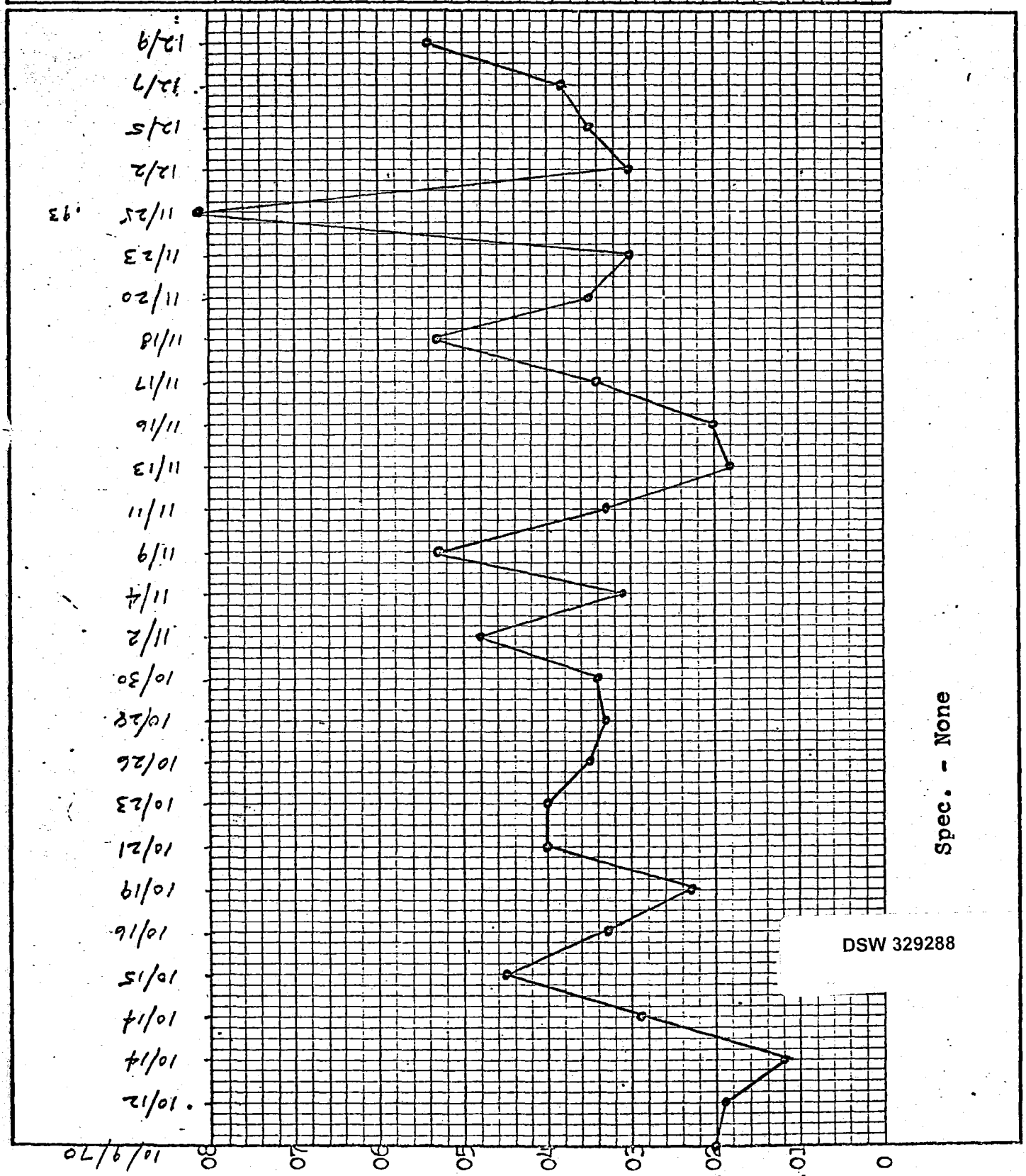
Crude - #9 Chlorinator

% $FeCl_3$

LEGEND:
AVERAGE
WARNING LIMIT
SPECIFICATION

PLANT
PRODUCT
CODE
DEPT.
PERIOD / / TO / /

DAY	
MONTH	
ANALYST	
LOT NUMBER SERIES	



DSW 329288

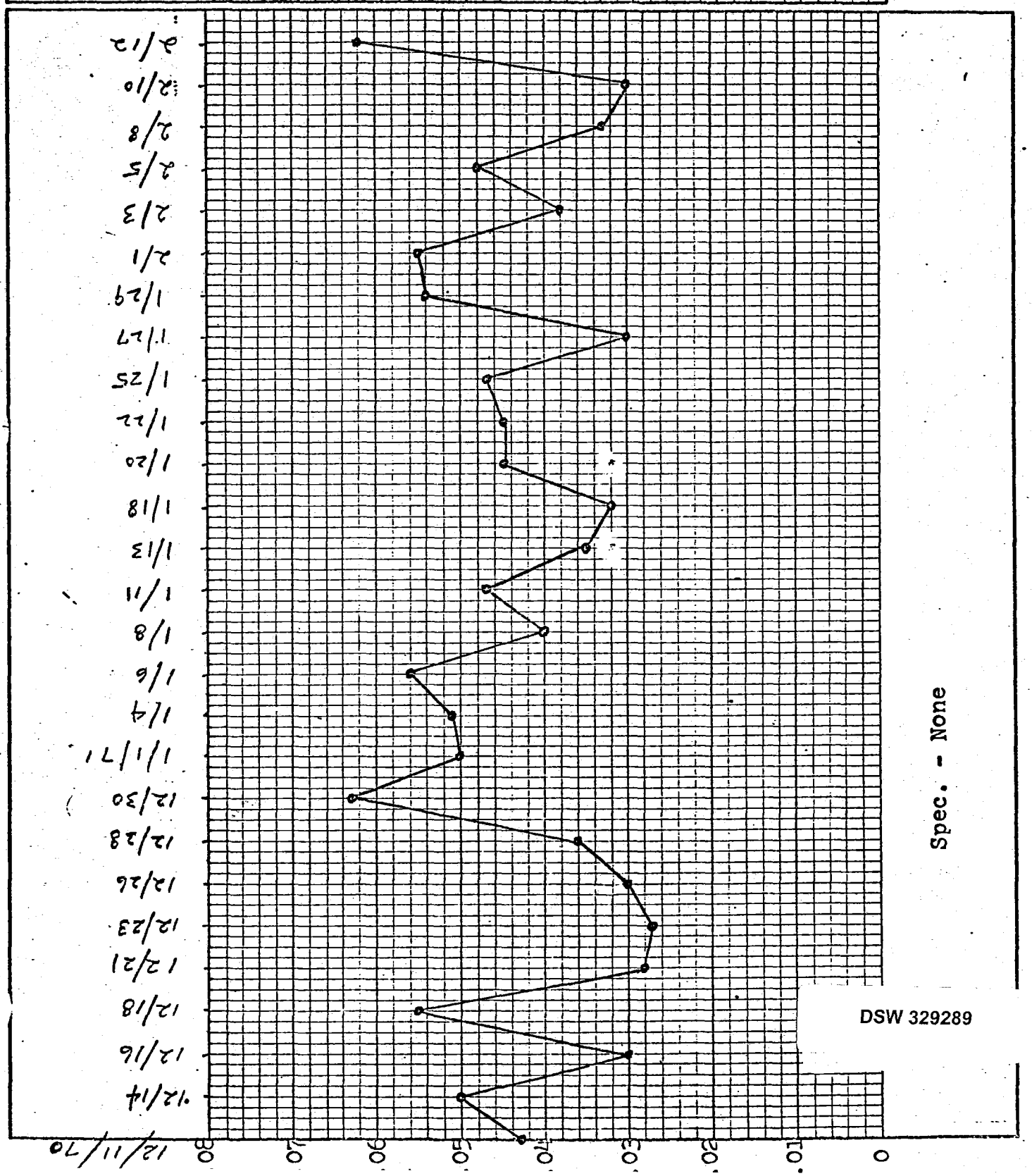
STLCOPCB4075996

MONSANTO CHEMICAL COMPANY - CONTROL CHART

SHEET 2 OF C

T	Crude - #9 Chlorinator	LEGEND: AVERAGE / WARNING LIMIT / SPECIFICATION	PLANT / PRODUCT / CODE / DEPT. / PERIOD / / TO / /
O	% $FeCl_3$		

DAY	
MONTH	
ANALYST	
LOT NUMBER SERIES	



DSW 329289

STLCOPCB4075997

MONSANTO CHEMICAL COMPANY - CONTROL CHART

PLANT | SHEET 2 OF D

T O: Crude - #9 Chlorinator

% $FeCl_3$

LEGEND: AVERAGE ● ● ●

BATCH CHLORINATORS

VARIABLE: TIME FROM BEGINNING OF CHLORINATION TO 140°C.

CONTROL LIMIT: ~~30~~ 40 MINUTES

	WEEK 1	WEEK 2	WEEK 3	WEEK 4
CHLORINATOR	4/1/71	4/7/71	4/18/71	4/24/71
#1	20 MIN	15 min.	20 min.	25 min.
#2	20 MIN	20 min.	25 min.	15 min
#3	OUT OF SERVICE	out of service	out of service	10 min
#4	3:10 HRS	3:00 hrs.	25 min.	35 min.
#5	15 MIN	25 min.	20 min.	20 min

15 of 17

KNOWN CHLORINATOR BATCHES WHERE LESS THAN 2 LBS. OF FERRIC CHLORIDE WAS ADDED:

BATCH CHLORINATOR END POINTS OUTSIDE NORMAL LIMITS:

CHLORINE FLOW TO CHLORINATOR BATCHES OUTSIDE NORMAL PATTERN OF ≤ 900 #/HR FIRST 3 HRS. & ≤ 1400 #/HR TO END POINT:

POUNDS OF LIME ADDED PER ADDITION AND FREQUENCY OF ADDITIONS OUTSIDE NORMAL LIMITS (MINIMUM); 150 # AT START 150 # AFTER 15,000 GAL., PUMPOVER AFTER 35,000 GALLONS:

DSW 329291

STLCOPCB4075999

Notes

Abnormal Operations & Equipment Changes:

1970

1/15/70 Enlarged sparger holes to 3/8" on #1 absorber.

5/8/70 Acid in the Cl_2 stopped reaction in two batch chlorinators, had bad color and TCC.

6/11/70 Acid in the Cl_2 stopped reaction in #2 & 3 chlorinators, used material as NE.

6/14/70 Acid in the Cl_2 stopped reaction in #2 chlorinator.

6/18/70 Acid in the Cl_2 stopped reaction in #2 chlorinator.

6/19/70 Both elements in the Cl_2 brink tanks were saturated with acid, taken out and repacked. Tanks were washed out and acid put in as a seal. Brink demisters were put back on 6/22.

8/27/70 Changed bed in #3 absorber.

11/30/70 First time material was pumped from the new blow brink tank to the HCl storage tank.

12/28/70 Started using HCl condensate (from the HCl storage tank) to make 1254 as normal production.

12/30/70 Our line was changed at the header in the Cl_2 department. Our line now comes off the top of the header instead of the bottom.

1971

2/16/71 Renewed brink element in east Cl_2 tank.

2/26/71 Tubes failed in the HCl cooling condenser. H_2O and acid got into several tanks.

3/4/71 Changed the porocel bed in #1 absorber.

4/5/71 Installed cyclone flush on mechanical seal on #4 still circulating pump.

Notes (Cont'd)

Abnormal Operations & Equipment Changes (Cont'd)

1971 (Cont'd)

4/16/71 Drained HCl catch pot at 236 high line (1 gal.)
Patched pin hole leak.

4/17/71 Cleaned Intermediate Storage tank and installed an eductor on circulating line.

4/23/71 Changed mechanical seal on #3 Still circulating pump.

4/29/71 Changed therminol surge tank pump.

R. M. McCutchan

DSW 329293