SCHUTTE AND KOERTING COMPANY
CORNWELLS HEIGHTS, BUCKS COUNTY, PENNSYLVANIA 19020
PHONE: 215-639-0900 • CABLE: SCHUTTE • TELEX: 84-5283 • TWX: 510-667-1618 "U"

13 October 1969

Please Reply to: **SCHUTTE AND KOERTING CO.**
P. O. Box 22114
(4223 RICHMOND AVE.)
HOUSTON, TEXAS 77027
PHONE: 713-MO 6-1996
TWX: 910-881-1735

CONTINENTAL OIL COMPANY
VCM Plant
P. O. Box 605
West Lake, Louisiana 70669

Attention: Mr. Dick Churns

Subject: Gas Compressor

Gentlemen:

We have asked our home office to look over your application for compressing ethylene gases, as we discussed at your plant on September 17, 1969. Unfortunately, after examination, our engineers feel they must turn down this application for the following reasons.

First of all, we are dealing with a critical compression of a relatively hot suction gas. This requires a large amount of motive energy, which is not available at your stated pressure and motive flow. Our calculations indicate that even at the 220 PSIG with 19,000#/hr motive ethylene, we can only pick up approximately 740#/hr of ethylene at atmospheric pressure and 150°F. The weight ratio in this case is only .0391b. suction/lb motive. Under these conditions, we could not guarantee the performance.

The use of lower motive pressures naturally makes the entrainment flow even worse down to the point where in trying 150 PSIG inlet pressure, we ended with a minus value on entrainment. In short, we need the full 19,000#/hr and about 175 PSIG inlet pressure just to be able to obtain the back pressure and entrain absolutely nothing.

We regret there is nothing we can do to come up with a workable unit, and hope that in the future we can be of assistance to you.

Sincerely yours

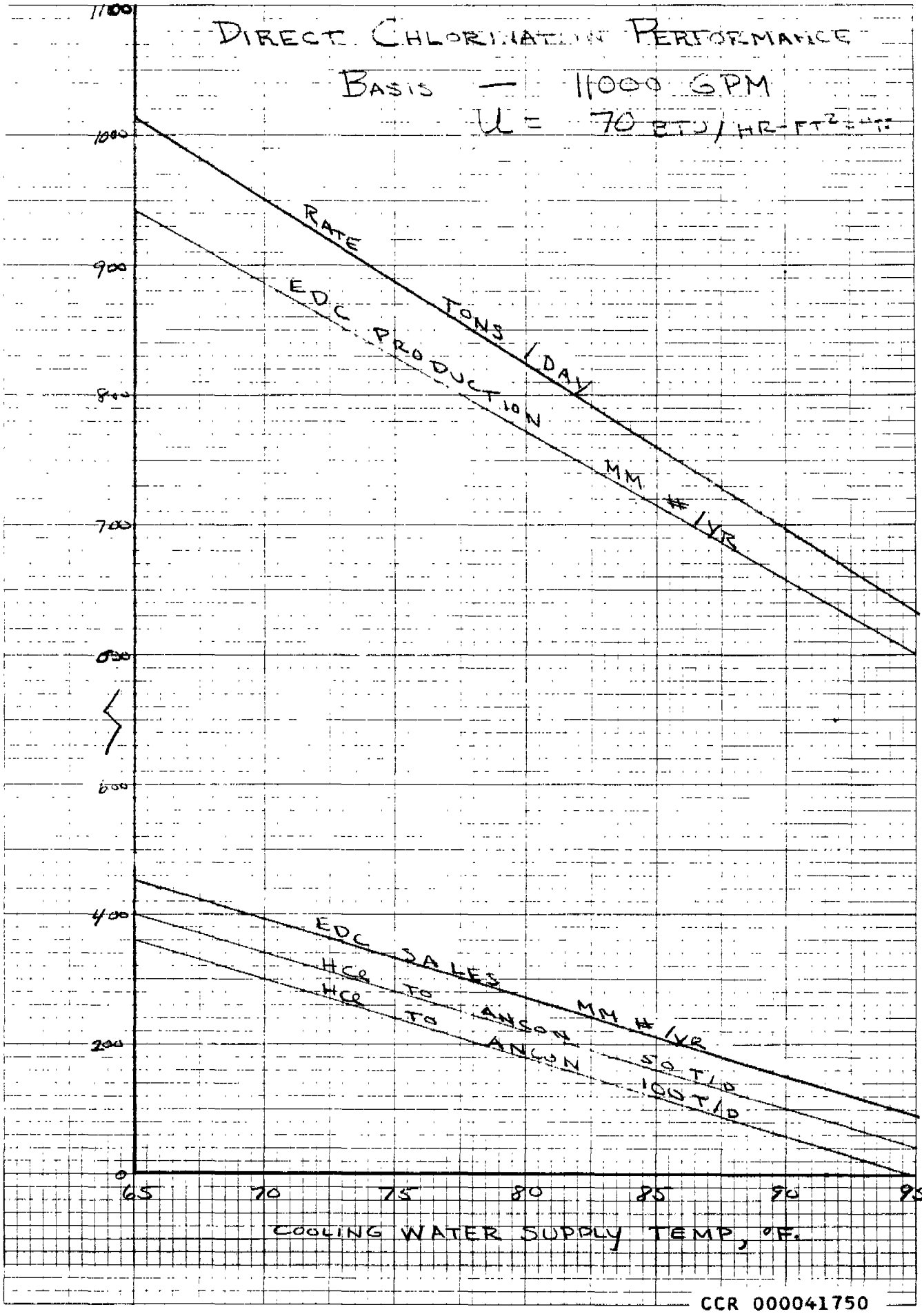
SCHUTTE AND KOERTING COMPANY

R. E. Dauphinee

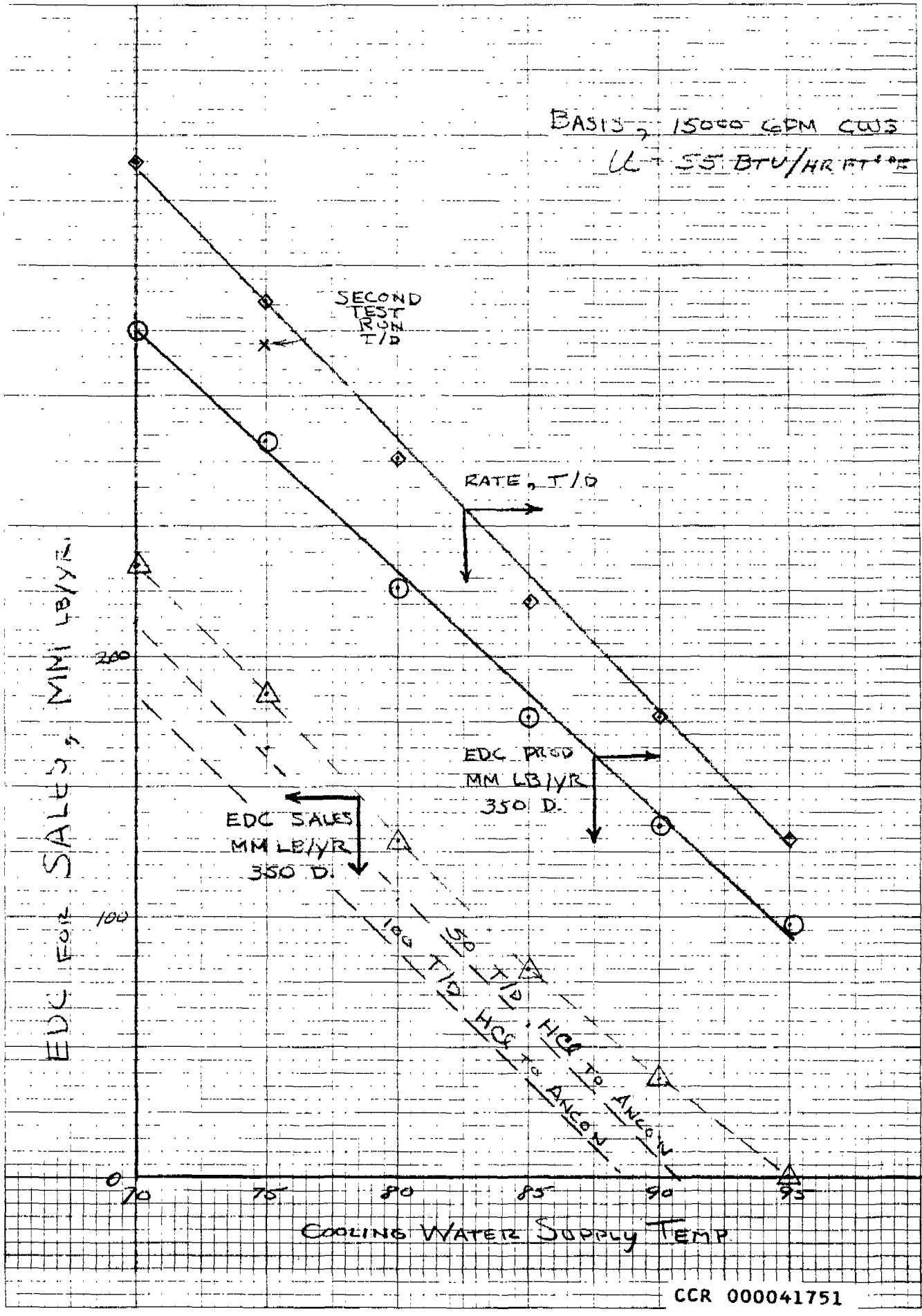
CCR 000041749

RED:ef

5-27-69
FWC

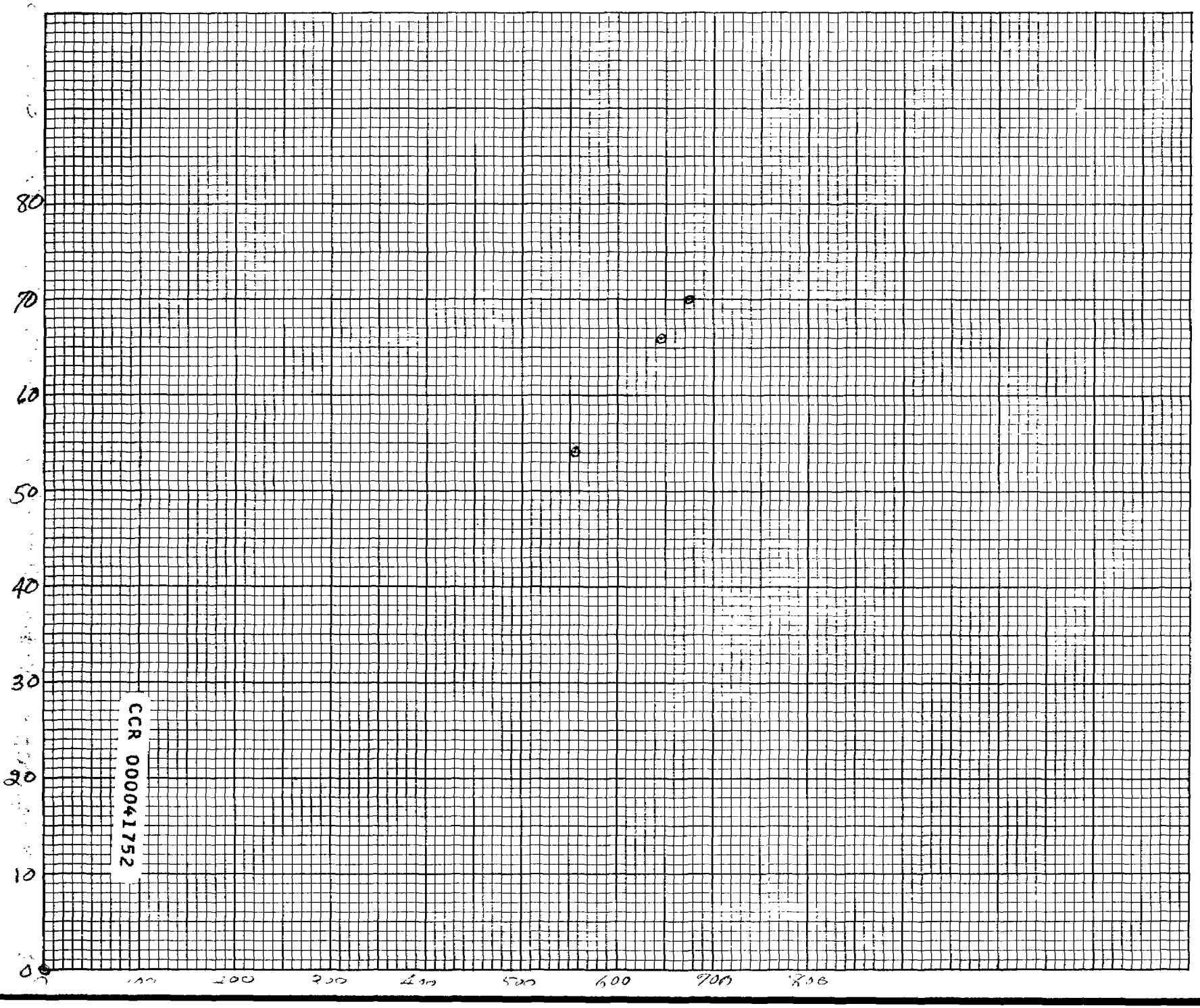


4-24-69
RWC



NO. 31,225. 10 X 10 DIVISIONS PER ¾-INCH UNIT. 100 BY 120 DIVISIONS.

CODEX BOOK COMPANY, INC. NORWOOD, MASSACHUSETTS.
PRINTED IN U.S.A.



4-24-09
RWC

EDC SALES TANK = $\frac{18}{32}$ × 95000 × 42 × 10

= 130,000,000 #/EDC

13,000,000 LB = 1 MONTH @ 75°F CW

CCR 000041754

120000 x 36.

379

	Top	Bot
	60.2	56.7
	37	30.

-1

6- 11.62

117-1

CCR 000041755

6-3
61.5 / 57.5
86% 65%
.53 x 3208 Oxy
8.20 Cl_2
21.4 —

6+3 4/30 PM
61.5 57.5
344327 + 1336
.52 x 3208
21.2 35.4
d_4 8.2 R 16°F
385#

59.8 - 56.2

7.3 o/s

38.5 4 75°F

8.25 Reading

3/pass duct

76 " duct

220°F duct

460°F duct

24.2 33.8

6-12-69

60.3 56.3

292 [illegible] 9690

29. [illegible]

RECYCLE 176.4 G/M

OXY 7.4×14.5

L.E. 9.4×44.5

144 H.E 440

35 PURE 7.9×52

WE TIKY

50
50
100

200
50
600

(CCR 0000041756)

$5,500,000 (t_0 - t_1) = 635250 (289 - t_0 - t_2)$

$5,500,000\, t_0 - 5500000 t_2 = 183,587,250 - 635250 t_2$

$6,135,250\, t_0 = 183,587,250 + 4,864,750\, t_2$

$6308500 t_0 = 183,587,250 + 491500 t_2$

49.8509 T/D

T/D x 1.395 x 2000 x 350 x 0.95

927675

DESIGN EDC — 0 SALES

M/H = 676.5

#/yr = 676.5 x 71.0 x

6470.9 x 8000 x 1.395 x .95

493 MM LB/yr

t_2 83.2

t_0 = 71.0

To: Mr. L. N. Vernis

Subj: Direct Chlorination Capacity

In order to determine the amount of EDC available for sales, we must determine the capacity of the direct chlorination reactor. The throughput of this reactor is limited by the amount of heat of reaction that can be carried away. This is a function of the cooling water supply temperature

$$Q = UA\,\Delta T$$

$$= 0.10\,R \times 23100 \times \frac{289 - t_1 - t_2}{2}$$

$$= 110329\,R$$

$$110329 = 0.10 \times 23100 \times \frac{289 - t_1 - t_2}{2}$$

$$110329 = 333795 - 1155\,t_1 - 1155\,t_2$$

$$193.4771 = t_1 + t_2$$

$$t_2 = 193.4771 - t_1$$

$$\Delta t = \frac{289 - 193.4771}{2} = 47.76$$

$$Q = 110329\,R = 5{,}500{,}000\,(t_2 - t_1)$$

$$= 110329\,R = 5{,}500{,}000\,(-2t_1 + 193.4771)$$

$$110329\,R = -11{,}000{,}000\,t_1 + 1{,}064{,}124{,}050$$

$$R = -99.7\,t_1 + 9645$$

$$R = 9645 - 99.7018\,t_1$$

t_1	60	70	80	90
R	3663	2666	1669	672

6-2-64
RWC

60°F

$Q = 1155\ R\ (229 - t_2)$

$= 5500000\ (t_2 - 60)$

$264495\ R - 1155\ R t_2$

$= 5,500,000\ t_2 - 330,000,000$

$5500000\ t_2 + 1155\ R\ t_2 = 330,000,000 + 264495\ R$

$t_2 = \dfrac{330,000,000 + 264495\ R}{5,500,000 + 1155\ R}$

R	500	700	900
t_2	21.76	29.35	

4-24-69
RWC

Cl_2 (PPG) ~ 960 T/D (MAX)

$Q = U A \Delta T_{LM}$

FIRST TEST RUN

$Q = 71.3 \ \overline{M}$

$A = 23100$ 645 T/D

$\Delta T_{LM} = 28 \times 1.8 = 50\ ^\circ F$ (25.9 × 1.8 = 46.6)

$U = 61.5$ BTU/HR FT² °F ↘ 66.2

SECOND TEST RUN

$Q = 79.3 \ \overline{M}$ 720 T/D

$A = 23100$

$\Delta T_{LM} = 33 \times 1.8 = 59\ ^\circ F$ 60.8

$U =$ ~~58.3~~ BTU/HR FT² °F ↘ 56.7

4-24-69 SPOT TEST 0900

$Q = 61.2 \ \overline{M}$ 555 T/D

$A = 23100$

$\Delta T_{LM} = 27 \times 1.8 = 49\ ^\circ F$

$U = 54.1$ BTU/HR FT² °F

4-24-69 SPOT 1500

$Q = 61.2 \ \overline{M}$ 555 T/D

$A = 23100$

$\Delta T_{LM} = 27.1 \times 1.8 = 49\ ^\circ F$

$U = 54.1$ BTU/HR FT² °F

4-25 SPOT

$Q = 61.2\ \overline{M}$ 555 T/D

$\Delta T_{LM} = 27.25 \times 1.8 = 49\ ^\circ F$

$U = 54.1$ BTU/HR FT^2 °F

CWS = 11320

4-28 SPOT 0900

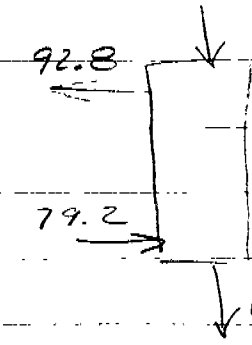
$Q = 383\ T/D \times 110400 = 42.3\ \overline{M}$

$\Delta T_{LM} = 14.6 \times 1.8 = 26.3\ ^\circ F$

$U = 70$ BTU/HR FT^2 °F

CWS =

5-27-69
RWC



11 AM 5-27-69

ΔT_{AV} = 47.65

FLOW = 61250 #/HR → 735T/

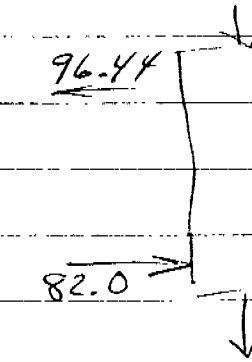
G = 81.093 M B/HR

U = 73.7

CWS = 11925 GPM

COEFFICIENT 55 → 70

SALES 93 → 255 M



ΔT_{AV} = 48.2

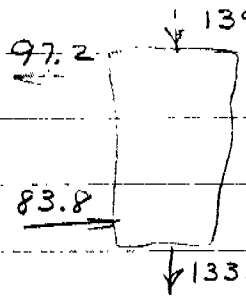
FLOW = 61250 #/HR → 735T/

Q = 81.093 M

U = 72.8

CWS = 11263 GPM

USE 700 CV



11 AM 5-28-64

ΔT = 45.75

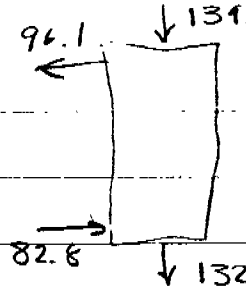
? FLOW = 55843 #/HR → 670T/

Q = 73.9

U = 70.0

CWS = 11030 GPM

90
30 700
60 100
100
60



2 PM 5-28-69

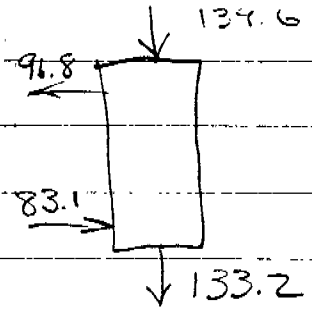
ΔT = 46.5

FLOW = 692T/D

Q = 76.3

U = 71.1

CWS = 11473



5-28 4 30 PM

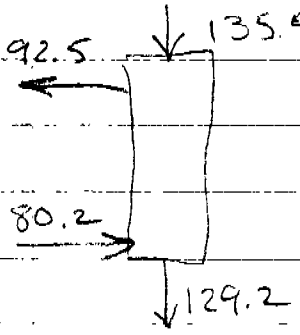
ΔT = 46.45

Q = 679 T/D

Flow 74.9

U - 69.8

CWS 10934



5-29 4 30 PM

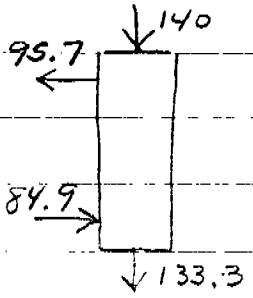
ΔT = 46.0

Q = 74.9

F = 679 T/D

U = 70.5

CWS = 12178 OK



6-2 10 20 AM

ΔT = 46.35

Q = 74.9

U = 70.0

CWS - 13870 NO

4-24-69
RWC

DIRECT CHLORINATION LIMITS

FIRST TEST RUN

RATE = 645 T/D x 2000 #/T x 1/24 H/D

= 53700 #/HR Cl_2

Q = 53700 x 94000 / 71

= 71.1 M BTU/HR

71,000,000 / 3600

CWS = 71.1 M / (1.8 x 4.0 x 500) 7.0

= 20000 GPM OR 11400

SECOND TEST RUN

RATE = 720 T/D x 2000 #/T x 1/24 H/D

= 60000 #/HR Cl_2

Q = 60000 x 94000 / 71

= 79.3 M BTU/HR

CWS = 79.3 / (1.8 x 8 x 500) 7.0

= ~~11200~~ GPM 11500 ✓

4-24-69 TEST 0900

RATE = 555 T/D x 2000 x 1/24 = 46200 #/HR

Q = 61.2 M

CWS = 61.2 / (1.8 x 3.0 x 500) = 22700 GPM

4-24-69 - 1500 Q = 61.2

CWS = 61.2 / (1.8 x 5.5 x 500) = 12350 ✓

6-2-67
LWC

$G \quad UA\Delta T = W \times \Delta H_2 = CWS(\Delta t)$

$= 0.10(T/D)\,2300\left(\frac{T_1 + T_2 - t_1 - t_2}{2}\right) = 1155(T/D)(289 - t$

$= 94000 \times 71.524\,(T/D) = 110329\,T/D$

$= 11000 \times 500\,(t_2 - t_1)$

$1155(T/D)(289 - t_1 - t_2) = 5500000\,(t_2 - t_1)$

$110329(T/D) = (333795 - 1155\,t_1 - 1155\,t_2)(T/D) = 5500000\,(t_2 - t_1$

$110329 = 333795 - 1155\,t_1 - 1155\,t_2$

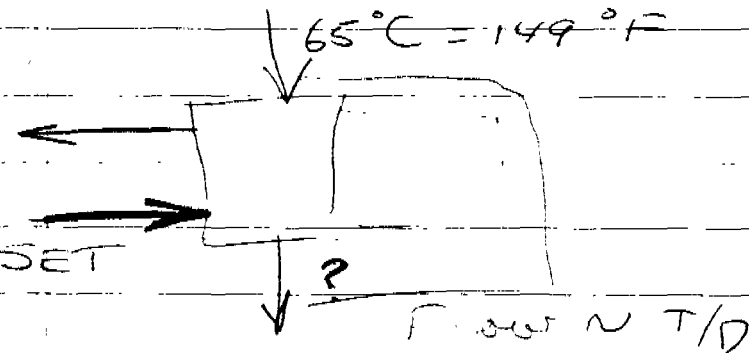
$1155\,t_1 = 223466 - 1155\,t_2$

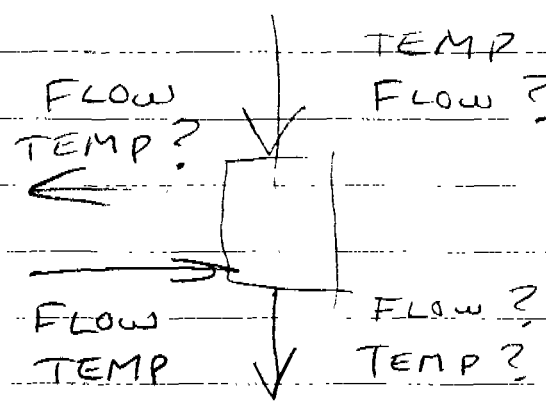
$t_1 = 193.4771 - t_2$

$5500000\,(t_2 - 193.4771 + t_2) = 110329\ T/D$

$5500000\,(2t_2 - 193.4771) = 110329\ T/D$

t_1	T/D
60	
70	
80	
90	





$$\Delta T_{lm} = \frac{(T_i - t_o) - (T_o -}{\ln \frac{T_2 - t_o}{T_o - t_2}}$$

$$Q = 110{,}400\ T/D = 5{,}750{,}000\ (t_{set} - t_i) = 23100\,(55)\ \frac{(T_i - t_o) + (T_o}{2}$$

65

CCR 000041767

TABLE 4

MONTHLY CAPACITIES

MONTH	CHLORINE RATE TONS DAY	EDC PRODUCTION MILLION #/MN	EDC SALES MILLION LB/MN HCL TO ANCON 0	50	T/D 100
JAN	700	55.03	13.16	9.16	5.1
FEB	710	50.48	12.66	9.05	5.4
MAR	680	53.51	11.64	7.64	3.6
APR	625	47.67	7.15	3.28	*
MAY	610	47.39	5.52	1.52	*
JUN	575	43.73	3.21	*	*
JUL	560	44.25	2.38	*	*
AUG	555	43.57	1.70	*	*
SEP	620	47.01	6.49	2.62	*
OCT	610	49.26	7.39	3.39	*
NOV	645	49.32	8.80	4.93	1.0
DEC	700	55.12	13.25	9.25	5.2
		586.34	93.35		

* INDICATES EDC PRODUCTION NOT SUFFICIENT TO SUSTAIN VCM PRODUCTION AT 600,000,000 LB/YR. RATE.