STATE OF NEW MEXICO

ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION

HOBBS DISTRICT OFFICE

8-28-89

GARREY CARRUTHERS
GOVERNOR

POST OFFICE BOX 1980
HOBBS, NEW MEXICO 88241-1980
(505) 393-6161

DHC-741

OIL CONSERVATION DIVISION
P. O. BOX 2088
SANTA FE, NEW MEXICO 87501

RE: Proposed:
MC_____
DHC X
NSL_____
NSP_____
SWD_____
WFX_____
PMX_____

Gentlemen:

I have examined the application for the:

Amerada Hess Corp. E.W. Walden #2-K 15-22-37
Operator Lease & Well No. Unit S-T-R

and my recommendations are as follows:

OK

Yours very truly,

Jerry Sexton
Supervisor, District 1

/ed

AMERADA HESS CORPORATION

Drawer "D"
Monument, New Mexico 88265

AUGUST 21, 1989

NEW MEXICO OIL CONSERVATION COMMISSION
P.O. BOX 2088
SANTA FE, NEW MEXICO 87501

RE: E.W. WALDEN #2
REQUEST TO DOWNHOLE COMMINGLE
THE BLINEBRY AND DRINKARD GAS
ZONES

DEAR SIR;

AMERADA HESS CORPORATION IS REQUESTING APPROVAL FOR AN EXCEPTION TO RULE 303-C TO PERMIT DOWNHOLE COMMINGLING OF THE BLINEBRY AND DRINKARD GAS ZONES IN THE WELLBORE OF THE E.W. WALDEN #2. PRESENTLY THE BLINEBRY ZONE IS PRODUCING 1 BO AND 168 MCFPD AND THE DRINKARD ZONE IS CI DUE TO ZERO PRODUCTION. REPEATED SWABS IN THE DRINKARD ZONE HAVE PROVEN UNECONOMICAL TO CONTINUE DUE TO FLUID ENCROACHMENT. IF THIS APPLICATION IS APPROVED, BOTH GAS ZONES WILL BE TURNED TOGETHER AND PLACED ON SUCKER ROD PUMP SO AS TO APPLY A CONTINUOUS SWABBING ACTION IN THE WELLBORE AND PERMIT THE FLOW OF NATURAL GAS INTO THE WELLBORE FROM BOTH ZONES AT AN ECONOMICAL RATE.

IN THE WELLBORE, THE BLINEBRY ZONE IS PERFORATED FROM 5483' TO 5605' AND THE DRINKARD ZONE IS PERFORATED FROM 6262'-6376'. BOTTOM HOLE PRESSURES WERE CALCULATED WITH THE METHOD DOCUMENTED IN THE FOLLOWING ATTACHMENTS.
THE RESULTS OF THESE CALCULATIONS WERE:

BLINEBRY: 302 PSIA @ 5544', 24 HOUR SHUT IN
DRINKARD" 356 PSIA @ 6319', 24 HOUR SHUT IN
ADJUSTED TO A COMMON DATUM
BLINEBRY: 308 PSIA @ 6319'
DRINKARD: 356 PSIA @ 6319'

NO FORMATION PRECIPITATION WHICH MIGHT DAMAGE THE FORMATION IS ANTICIPATED BASED ON PREVIOUS EXPERIENCE. ASSUMING 200 MCFPD TOTAL PRODUCTION WITH 38 MCFPD ALLOCATED TO THE DRINKARD AND 162 MCFPD TO THE BLINEBRY, THE COMBINED STREAM VALUE OF $262/DAY WOULD BE EQUAL TO THE TWO INDIVIDUAL STREAMS.

NO SECONDARY RECOVERY PROJECT INVOLVING THIS WELLBORE IS UNDER CONSIDERATION AT THIS TIME. IF FUTURE RECOVERY PROJECTS WERE TO BE CONSIDERED, NO PROBLEMS WITH THIS COMMINGLING PROSPECT JEOPARDIZING THE EFFICIENCY OF A SECONDARY RECOVERY OPERATION IS ANTICIPATED.

AMERADA HESS CORPORATION WILL BE THE OPERATOR OF THE SAID WELL ON UNIT K, 2009' FSL, 1911' FWL, SEC. 15, T-22S, R-37E, LEA COUNTY, NEW MEXICO. AMERADA HESS CORPORATION HAS COMMON OWNERSHIP OF BOTH ZONES WITH A WORKING INTEREST OF 100%, 1/8 ROYALTY AND NO OVERRIDING ROYALTY.

A PLAT OF THE AREA IS ATTACHED AT THE END OF THIS LETTER. A DIVISION FORM C-116 WHICH SHOWS THE PRODUCTION FROM THE BLINEBRY ZONE IS INCLUDED.

PRODUCTION DECLINE CURVES HAVE BEEN SUPPLIED FOR BOTH PRODUCING FORMATIONS. USING THESE RATES, A COMBINED RATE WAS CALCULATED AS 17.0%/YR.

OFFSET OPERATORS HAVE BEEN NOTIFIED OF THIS PROPOSAL BY A COPY OF THIS LETTER.

IF THERE ARE ANY QUESTIONS REGARDING THIS PROPOSAL, PLEASE CONTACT ME AT (505) 393-0087.

SINCERLY,

Denise Ward-Wann

DENISE WARD-WANN
SENIOR PETROLEUM ENGINEER

BLINEBRY DECLINE RATE

qi = 2400 MCFPM
q = 2000 MCFPM
t = 1 yr

$$a = \frac{\ln \frac{2400}{2000}}{\frac{}{1}}$$

a = .182
a = 18.2%

DRINDARD DECLINE RATE

qi = 540 MCFPM
q = 480 MCFPM
t = 1 yr

$$a = \frac{\ln \frac{540}{480}}{\frac{}{1}}$$

a = .118
a = 11.8%

COMBINED DECLINE RATE

qi = 2940 MCFPM
q = 2480 MCFPM
t = 1 yr

$$a = \frac{\ln \frac{2940}{2480}}{\frac{}{1}}$$

a = .170
a = 17.0%

ALLOCATION BASED ON DECLINE RATES

If: x = Blinebry
1-x = Drinkard

$a_c = x(a_{blinebry}) + (1-x)(a_{drinkard})$

$.170 = x(.182) + 1-x\ (.118)$

$.170 = .182x + .118 - .118x$

$.170 - .182 = .182x - .118x$

$.052 = .064x$

$x = .052/.064$

$x = .812$

$1 - x = .188$

Blinebry allocation = 81%
Drinkard allocation = 19%

E.W. WALDEN #2

Blinebry Perfs - 5483'-5605' avg. depth ($\bar{L}$) = 5544'

Drinkard Perfs - 6262'-6376' avg. depth ($\bar{L}$) = 6319'

γ_{G} Blinebry = .694

γ_{G} Drinkard = .702

Assume Patm = 13.2 psia
Assume temp. grad. = 0.4 F/100'
Assume avg. surface temp. = 74 degrees F

BHT (Blinebry) = 74 F + 5544' (.4/100') = 96°F

BHT (Drinkard) = 74 F + 6319' (.4/100') = 99°F

Pswh (Blinebry) = 250 + 13.2 = 263.2 psia

Pswh (Drinkard) = 290 + 13.2 = 303.2 psia

BLINEBRY ZONE

SBHP

Formula: $P_{sfs} = P_{whs}\, e^{c/z}$

$$\bar{T} = \frac{74^{\circ}F + 96^{\circ}F}{2} + 460^{\circ}R = 545^{\circ}R$$

$$C = \frac{\gamma_g \bar{L}}{53.34\,\bar{T}} = \frac{(.694)(5544)}{53.34\,(545)} = 0.131$$

Fig. 16-6

Ppc = 666 psia

Tpc = 388 R

$$Tr = \frac{\bar{T}}{\overline{Tpc}} = 545/388 = 1.40$$

TRIAL & ERROR METHOD

Assume: Psfs = 302 psia $\quad \overline{P} = \frac{302 + 263}{2} = 282$ psia

$$Pr = \frac{\bar{P}}{\overline{Ppc}}$$

Pr = 282 psia/666 psia = 0.42

Tr = 1.40

FIG. 16-4

Z = .952

$$Psfs = Pwhs\ e^{c/z}$$

$$Psfs = 263\ e^{.131/.952}$$

Psfs = 302 psia

DRINKARD ZONE

$$\bar{T} = \frac{74^{\circ} + 99^{\circ}}{2} + 460^{\circ} = 546^{\circ}R$$

$$C = \frac{(.702)(6319)}{53.34\ (546)} = .152$$

FIG. 16-6

Ppc = 665 psia

Tpc = 390° R

$$Tr = \frac{\bar{T}}{Tpc} = 546/390 = 1.40$$

TRIAL & ERROR METHOD

Assume: Psfs = 356 psia

$$P = \frac{356 + 303}{2} = 330 \text{ psia}$$

$$Pr = \frac{\bar{P}}{Ppc} = 330/665 = .50$$

Tr = 1.40

Fig. 16-4

Z = .945

$$Psfs = Pwhs\ e^{c/z}$$

$$Psfs = 303\ e^{.152/.945}$$

Psfs = 356 psia

BLINEBRY SBHP @ 5544' = 302 psia
DRINKARD SBHP @ 6319' = 356 psia

Adjusted to a common datum @ 6319'
∴ Blinebry zone SBHP needs to be adjusted 775'

$$\bar{T} = \frac{96^{\circ} + 99^{\circ}}{2} + 460^{\circ} = 557.5\ ^{\circ}R$$

Ppc = 666 psia

Tpc = 388 °R

$$Tr = \frac{557}{388} = 1.44$$

$$C = \frac{(.694)(775)}{(53.34)(557)} = .018$$

TRIAL & ERROR METHOD

Assume: Psfs = 307 psia $\qquad \bar{P} = \frac{307 + 302}{2} = 304.5$

$$Pr = \frac{\bar{P}}{Ppc} = 304.5 \text{ psia}/666 \text{ psia} = 0.46$$

Tr = 1.44

Fig. 16-4

Z = .96

$$Psfs = 302\ e^{.018/.96}$$

Psfs = 308 psia close to 307 psia

.: Psfs = 308 psia Blinebry adjusted to common datum of 6319'

BLINEBRY ZONE SBHP = 308 psia
DRINKARD ZONE SBHP = 356 psia

E.W. WALDEN #2

GAS STREAM VALUES

Gas Price as of AUGUST 1989

Drinkard - $1.31 /mcf
Blinebry - $1.31 /mcf

Assuming 200 mcfpd total production:

Drinkard production - (20 mcfpd)($1.31 mcf) = $ 26.20
Blinebry production - (180 mcfpd)($1.31 mcf) = $235.80

$262.00 /day

Combined stream value = (200 mcfpd)($1.31 /mcf) = $262.00 /day

Values are equal.

Anadarko Petroleum
P.O. Box 2497
Midland, Texas 79702

Conoco, Inc.
P.O. Box 460
Hobbs, New Mexico 88240

Exxon
P.O. Box 1600
Midland, Texas 79701

John Hendrix
222 W. Wall
Suite 525
Midland, Texas 79701

Oryx Energy Co.
P.O. Box 1861
Midland, Texas 79702

Presidio Exploration
3131 Turtle Creek Blvd.
Suite 400
Dallas, Texas 75219

Sohio Petroleum Co.
P.O. Box 4587
Houston, Texas 77210

Chevron
P.O. Box 670
Hobbs, New Mexico 88240

Dekalb Energy Company
800 Central
Odessa, Texas 79761

Two States
P.O. Box 176
Eunice, New Mexico 88231

Wagner & Brown
P.O. Box 1714
Midland, Texas 79702

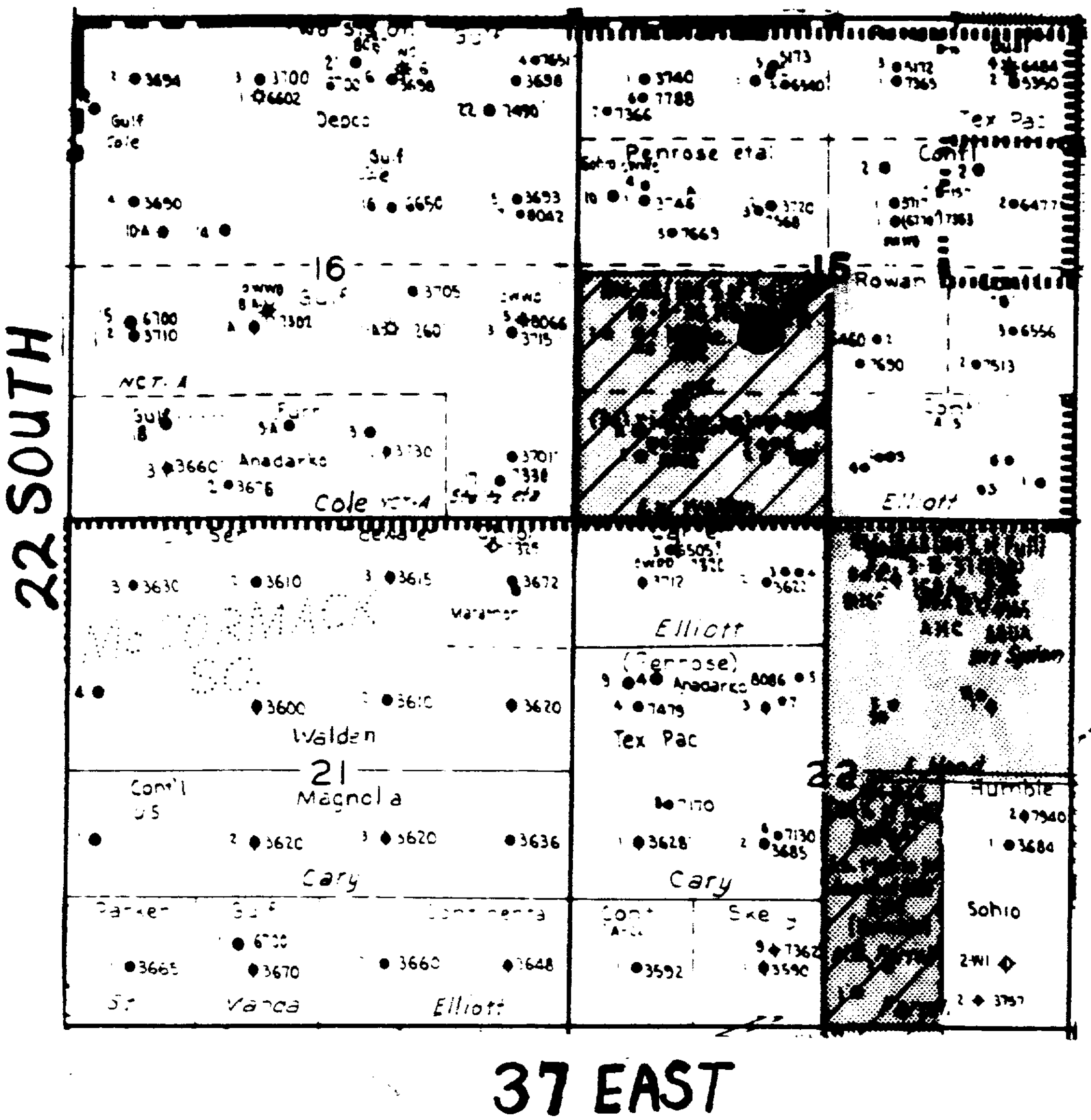
Warrior
P.O. Box 17479
Ft. Worth, Texas 76102

Aqua
P.O. Box 1976
Hobbs, New Mexico 88240

Arch
777 Taylor Street
Suite II-A
Ft. Worth, Texas 76102

Meridian
21 Desta Drive
Midland, Tesas 79705

New Mexico Oil Conservation Commission
P.O. Box 1980
Hobbs, New Mexico



22 SOUTH
37 EAST
16
15
21
22
Deoco
Penrose et al
Tex Pac
Rowan
Anadarko
Cole
Elliott
Walden
Magnolia
Cary
Humble
Sohio
Vanda

Submit 2 copies to Appropriate District Office.
DISTRICT I
P.O. Box 1980, Hobbs, NM 88240
DISTRICT II
P.O. Drawer DD, Artesia, NM 88210
DISTRICT III
1000 Rio Brazos Rd., Aztec, NM 87410

State of New Mexico
Energy, Minerals and Natural Resources Department

OIL CONSERVATION DIVISION

P.O. Box 2088
Santa Fe, New Mexico 87504-2088

Form C-116
Revised 1/1/89

GAS - OIL RATIO TEST

Operator	Pool	County
AMERADA HESS CORPORATION	Blinebry Gas	Lea

Address	TYPE OF TEST - (X)	Scheduled	Completion	Special
Drawer "D", Monument, NM 88265		[X]	[ ]	[ ]

LEASE NAME	WELL NO.	LOCATION U	S	T	R	DATE OF TEST	STATUS	CHOKE SIZE	TBG. PRESS.	DAILY ALLOW-ABLE	LENGTH OF TEST HOURS	PROD. DURING TEST WATER BBLS.	GRAV. OIL	OIL BBLS.	GAS M.C.F.	GAS - OIL RATIO CU.FT/BBL.
E.W. Walden	2	K	15	22	37	9-10-88	F	2"	55	GAS WELL	24	0	--	1	194	194,000

Instructions:

During gas-oil ratio test, each well shall be produced at a rate not exceeding the top unit allowable for the pool in which well is located by more than 25 percent. Operator is encouraged to take advantage of this 25 percent tolerance in order that well can be assigned increased allowables when authorized by the Division.

Gas volumes must be reported in MCF measured at a pressure base of 15.025 psia and a temperature of 60° F. Specific gravity base will be 0.60.

Report casing pressure in lieu of tubing pressure for any well producing through casing.

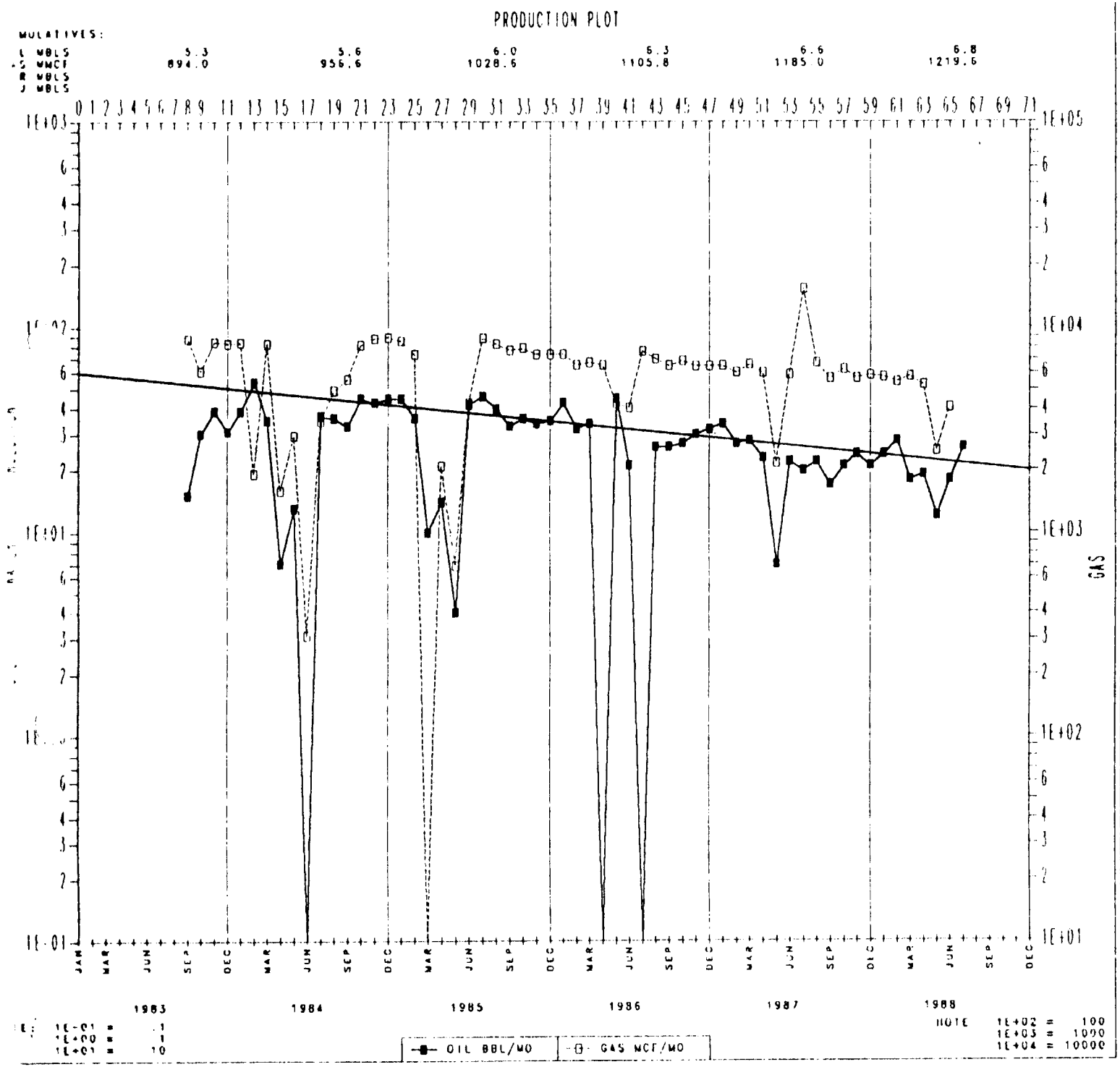
(See Rule 301, Rule 1116 & appropriate pool rules.)

I hereby certify that the above information is true and complete to the best of my knowledge and belief.

Denise Wann
Signature

Denise Wann - Senior Petroleum Engineer
Printed name and title

August 23, 1989 (505) 393-2144
Date Telephone No.



PLOT DATE: 8/ 9/88
PLOT NO.: 1334

REGION: SOUTHWEST REGIO
FIELD: EUNICE FIELD 269
POOL: /BLINEBRY GAS/
LEASE: 02645 WALDEN, E W
WELL: 21
STATE CODE: 30 NEW MEXICO
POD CODE: 623

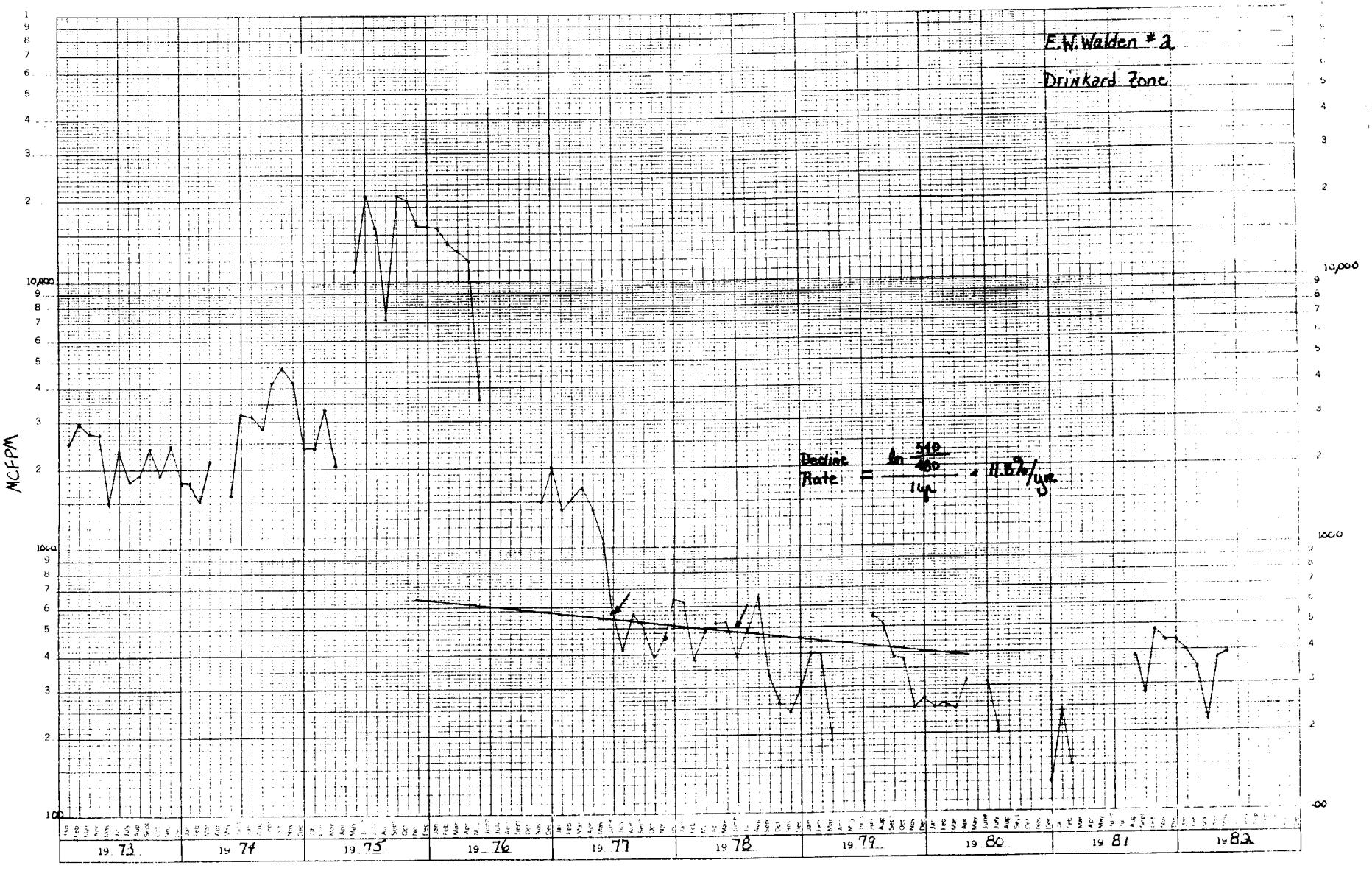
STATUS:
41 ON 6/14/88

GAS
FLOWING

$$\text{Decline Rate} = \frac{\ln \frac{2400}{2000}}{1\text{yr}} = 18.2\%/\text{yr}$$

WORK OVER CODES:

X - CHEMICAL SQUEEZE	
T - PARAFFIN INHIBITOR	U - ABANDONED
R - WELL HEAD	S - CORROSION INHIBITOR
P - SCALE INHIBITOR	Q - TUBING
N - RODS AND/OR PUMP	O - SWAB
L - POLISH ROD	M - SUBMERSIBLE EQUIP.
J - LINER	K - PACKER
H - HOT OIL	I - HYDRAULIC EQUIPMENT
F - FRESH WATER	G - GAS LIFT VALVES
D - CLEAN OUT	E - CUT PARAFFIN
B - CONVERT TO SALTWATER	C - CASING
9 - CONVERT TO OIL	A - CONVERT TO WI
7 - FISH	8 - GRAVEL PACK
5 - ACIDIZE	6 - DRILL OUT
3 - PERFORATE	4 - FRAC
1 - SQUEEZE	2 - PLUG BACK



K-E 10 YEARS BY MONTHS x 3 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

47 6743

...JTHEAST NEW MEXICO PACKER LEA... ...E TEST

Operator			Lease		Well No.
Amerada Hess Corp.			E. W. Walden		2
Location of Well: Unit K	Sec 15	Twp 22S	Rge 37E	County Lea	

	Name of Reservoir or Pool	Type of Prod (Oil or Gas)	Method of Prod Flow, Art Lift	Prod. Medium (Tbg or Csg)	Choke S
Upper Compl	Blinebry	Gas	Flow	Tbg.	2"
Lower Compl	Drinkard	Gas	Flow	Tbg.	2"

FLOW TEST NO. 1

Both zones shut-in at (hour, date): 9:00 A.M. 4-3-89

	Upper Completion	Lowe Comple
Well opened at (hour, date): 9:00 A.M. 4-4-89		
Indicate by (X) the zone producing	X	
Pressure at beginning of test	250	290
Stabilized? (Yes or No)	YES	YES
Maximum pressure during test	250	290
Minimum pressure during test	50	290
Pressure at conclusion of test	50	290
Pressure change during test (Maximum minus Minimum)	200	--
Was pressure change an increase or a decrease?	decrease	--
Well closed at (hour, date): 9:00 A.M. 4-5-89	Total Time On Production 24 hrs.	

Oil Production During Test: 1 bbls; Grav. -- ; Gas Production During Test 168 MCF; GOR 168,000

Remarks

FLOW TEST NO. 2

Upper ... Lowe...

FIG. 16-4

Compressibility factors at low reduced pressures

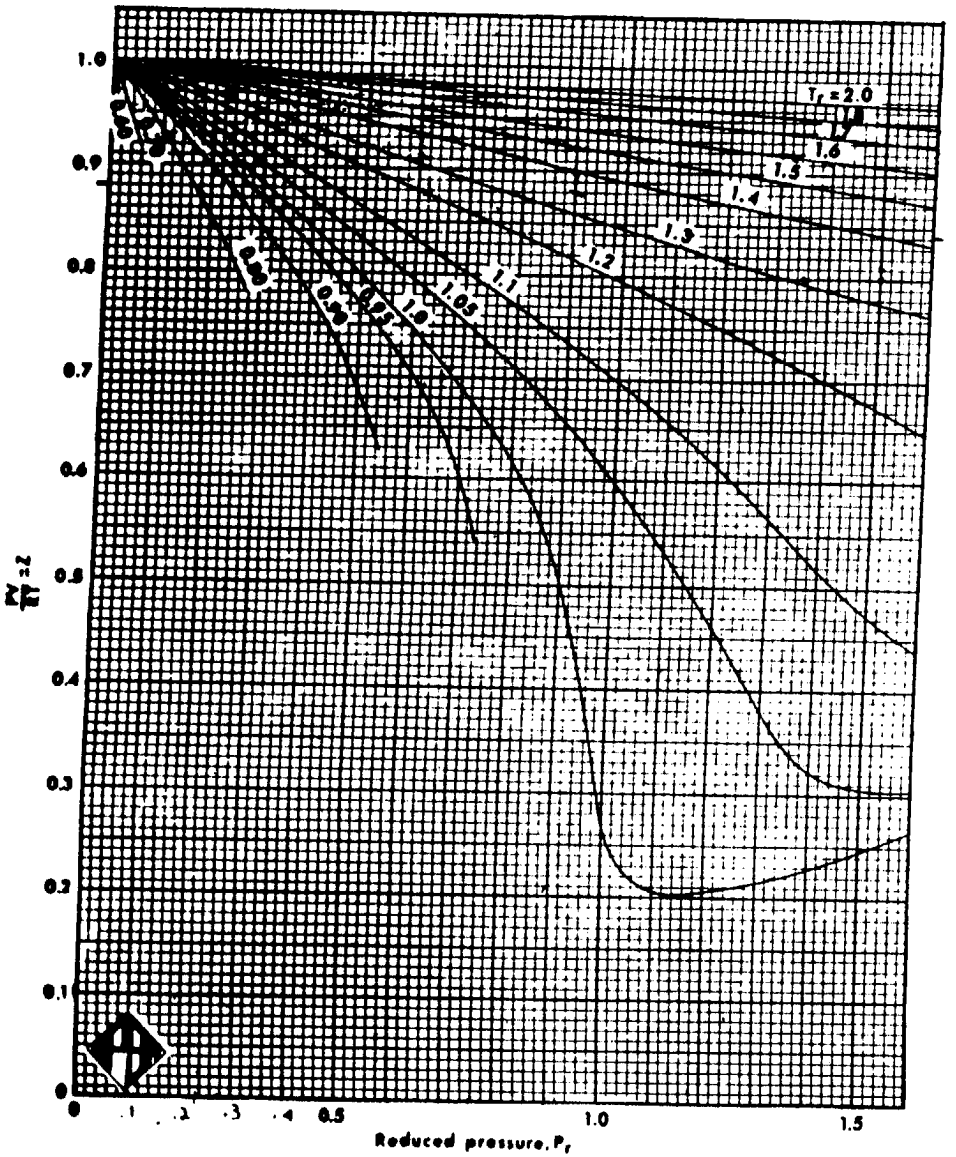
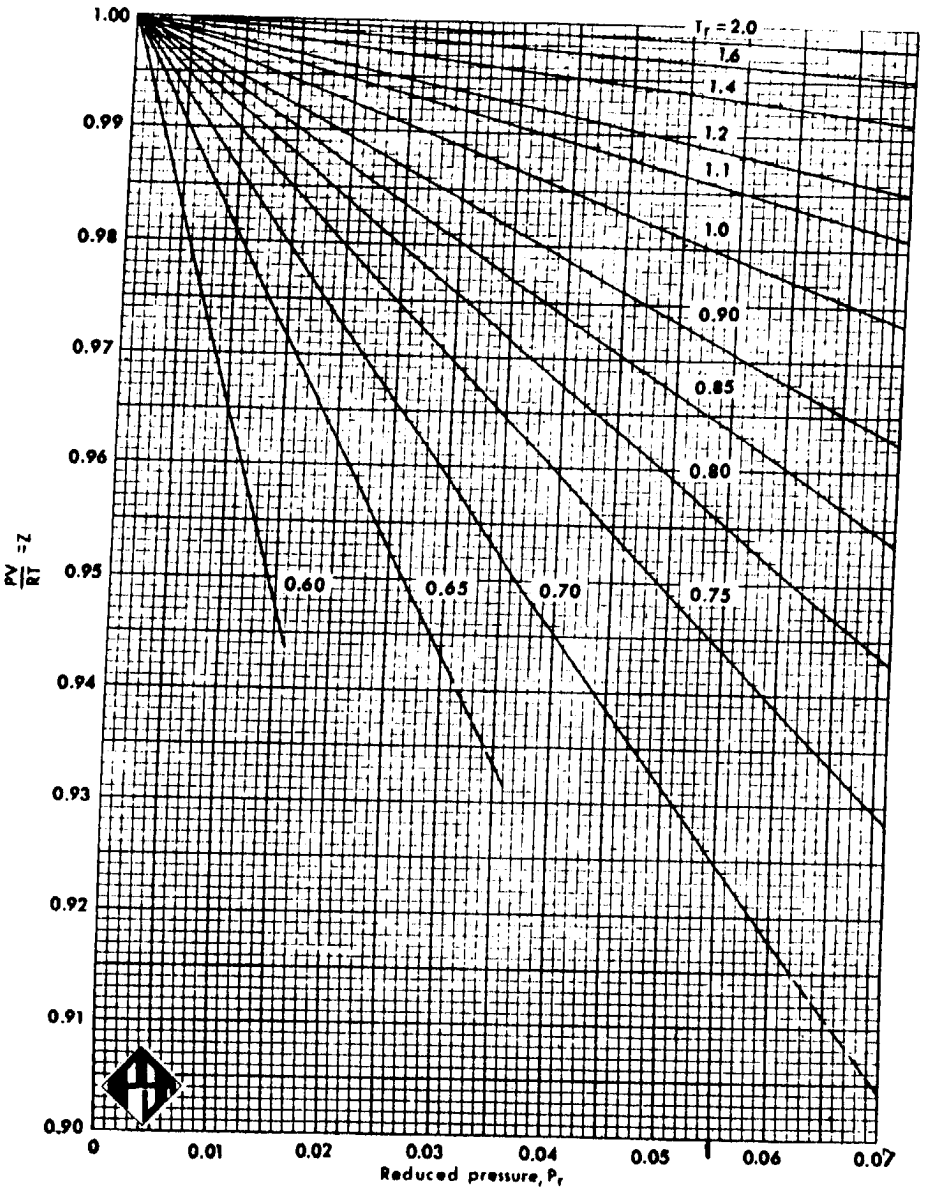


FIG. 16-5

Compressibility factors for gases near atmospheric pressure



vapors. For example for propane at 300 psia and 140°F., turn to the Mollier chart for propane, Fig. 17-6, locate the 300 psia and 140°F. point, and interpolate on the constant specific volume lines to obtain 0.33 cu ft/lb. Dividing this into 1 gives 3.03 lb/cu ft as the density, D_V. If the compressibility is required,

$$Z = \frac{M\,P}{10.73\,T\,D_V}$$

Symbols have been defined previously. Then

$$Z = \frac{(44.09)\ \ (300)}{(10.73)\ \ (460+140)\ \ (3.03)} = 0.68$$

ACID GASES

Natural gases which contain H_2S and/or CO_2 frequently exhibit different compressibility factor behavior than do sweet gases. Wichert and Aziz (Gas Processing/Canada, pp 20-25, January February 1971; Hydrocarbon Processing, pp 119-122, May 1972) present a simple easy to use calculational procedure to account for these differences. The method uses the standard gas compressibility factor chart (Figure 16-3) and provides accurate sour gas compressibilities for gas compositions that contain as much as 80% total acid gas.

Wichert and Aziz define a "Critical temperature adjustment factor" which is a function of the concentrations of CO_2 and H_2S in the sour gas. This correction factor is then used to adjust the pseudo critical temperature and pressure of the sour gases according to the equations:

$$T_c' = T_c - \epsilon$$

$$P_c' = \frac{P_c\,T_c'}{[T_c + B\,(1-B)\,\epsilon]}$$

Where:

T_c = Mole Fraction average pseudo critical temperature

P_c = Mole Fraction average pseudo critical pressure

T_c' = Pseudo critical temperature adjusted for acid gas composition

(Text cont'd. p. 16-15)

FIG. 16-6

Pseudocritical properties of natural gases