Case 537

RESERVOIR FLUID STUDY

for

LOWRY et al OPERATING ACCOUNT

Federal 4-13-132

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January 11, 1952

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WEST TEXAS ENGINEERING SERVICE, INC.
Midland, Texas

WEST TEXAS ENGINEERING SERVICE, INC.

Midland, Texas

January 24, 1952

Lowry, et al
Room 213-215
616 East Central Ave.
Albuquerque, New Mexico

Attention: Mr. Hunt

Gentlemen:

Under separate cover, we have submitted a report on the analysis of a reservoir fluid sample taken by our field engineers Messrs. Cates and Black, on your Federal Doswell #4-13, Rio Arriba County, New Mexico.

The bubble point pressure was measured at 2054 pounds per square inch gauge at 175° F. Since the reservoir pressure is 2137 p.s.i.g. this indicates that the oil in the reservoir is slightly undersaturated with gas, but that gas will begin to be liberated as the pressure is reduced by withdrawal. Therefore it may be concluded that unless some pressure maintenance effect (water drive, for example) is observed your operating gas-oil ratio will start to rise fairly soon.

By differential liberation the reservoir oil at 175° F. (reservoir temperature) yielded 862 cubic feet of gas (measured at 60° F. and atmospheric pressure) per barrel of stock tank oil. During this process 1.526 barrels of saturated reservoir oil shrank to one barrel of stock tank oil. This means that the reservoir oil will shrink by about 35% of its volume before reaching the stock tank. It is my understanding that you already maintain a relatively high separator pressure. Bearing in mind the above figure of 35% shrinkage, it might be well to maintain a slight pressure on the tanks and keep the oil as low in temperature as practicable. While there is not much to be gained by raising the gravity, since this figure is already in the 40's,

this maintenance of high pressure and low temperature will keep weathering to a minimum and enable the retention of the greatest liquid volumes possible.

So much for my suggestions on the physical application of these data. Further use can be made in connection with your core analysis on this reservoir. A theoretical calculation can be made of your reserves by use of the formula:

$$\frac{7758 \times P_x (1-C) \times RF}{1.526} = \text{Bbl. Stock Tank Oil per Acre Foot}$$

where 7758 = 1 Acre foot in Bbl. (Known)
P = % Porosity (From core analysis)
C = % Connate water (From core analysis)
RF = % Recovery factor*
1.526 = Relative liquid volume (From sample data)
Then take B.S.T.O./Ac. Ft. x sand thickness x no. of acres of estimated drainage to bore hole = ultimate recovery.

*Just an additional word regarding "RF" above. This relation can be assumed from the data at hand to be around 20 to 25 percent.

I trust that this answers your question in regard to the use of the bottomhole sample analysis. While normally the analysis is used in connection with core analysis, decline curves, subsequent tests, etc. by the operators own engineers or consultants, I am happy if this is of some use to you. It is good information to have if only to "hang on the wrench" for near future use and like virgin reservoir pressures cannot be had or estimated in the later life of the field.

Thank you for this opportunity of serving you and we are looking forward to moving in up there as soon as the volume warrents our doing so.

Very truly yours,

WEST TEXAS ENGINEERING SERVICE, Inc.

/s/ W. T. Hagler
W. T. Hagler

WTH:ech

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Bottom Hole Sample Analysis

Federal Doswell # 4-13

Wildcat Field

Rio Arriba County, New Mexico

Date Sample Taken	January 2 & 3, 1952
Date Analyzed	January 11, 1952
Shut-In Prior to Sampling	24 Hours
Sampling Depth	6676'
Pressure at 6676'	2137 psi
Tubing Depth	6697'
Top of Tocito Formation	6676'
Temperature @ 6676'	175° F

TEST SUMMARY

Saturation Pressure	2054 psig	
Gas in Solution @ 2054 (Differential Lib.) Gas corrected to 14.7 psi & 60° F		862 Cu. Ft./Bbl.
Relative Liquid Volume (2054 psi and 175° F)		1526 Bbl./Bbl. S. T. O.
Thermal Coefficient of Expansion (Sat. Oil & 3000 spig 73° to 150° F)		6.4×10^{-4} Cuft/Cuft/° F.
From 73° F to 175° F		6.55×10^{-4} Cuft/Cuft/psig
Compressibility Coefficient (Saturated Oil @ 175° F)		
From 2054 psi to 2180 psi		13.95×10^{-6} Cuft/cuft/psi
From 2054 psi to 2434 psi		15.40×10^{-6} Cuft/Cuft/psi
From 2054 psi to 2723 psi		15.90×10^{-6} Cuft/Cuft/psi

C O P Y

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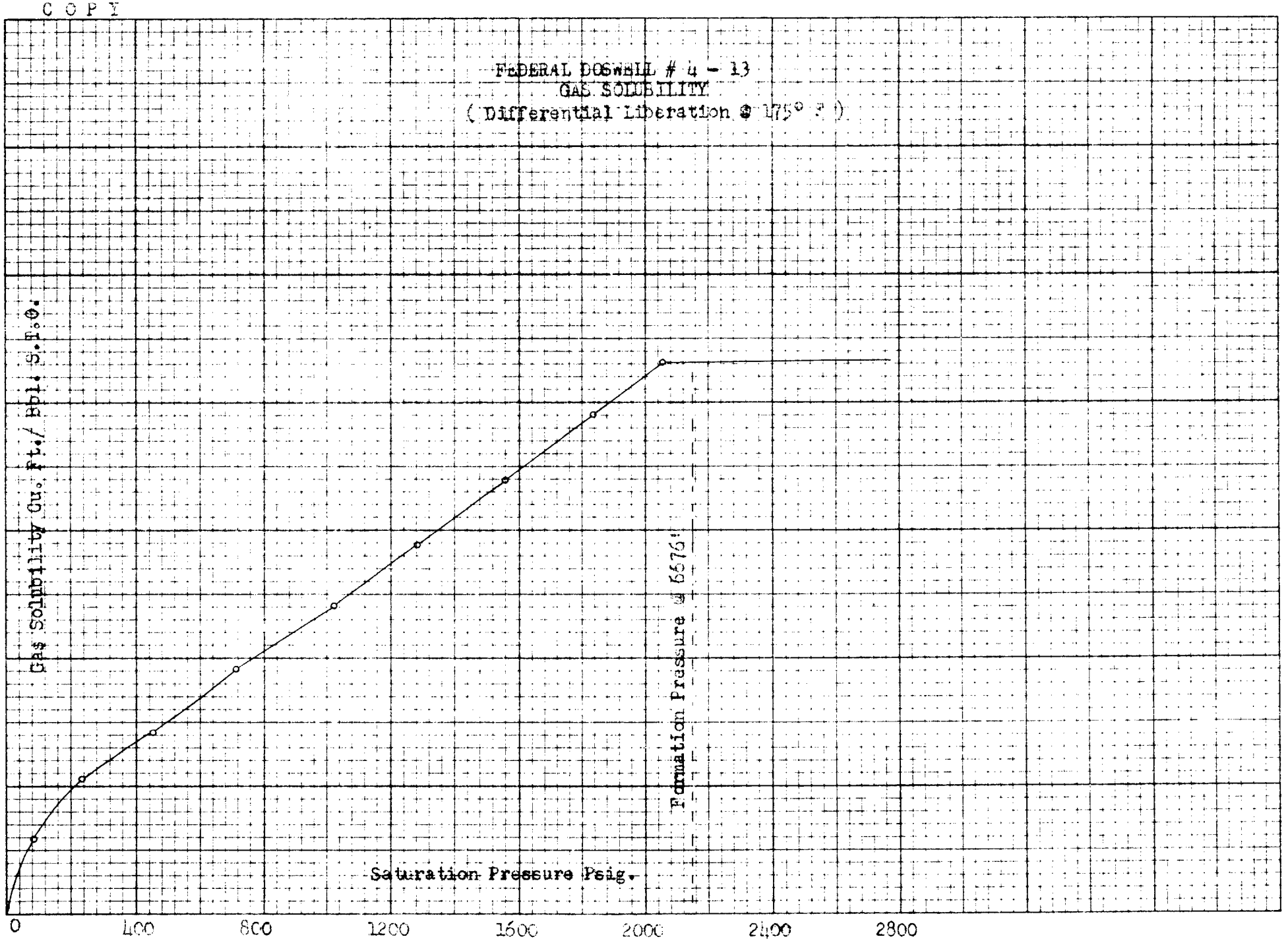

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