

CORE ANALYSIS REPORT
FOR
KEWANEE OIL COMPANY
LARKIN NO. 2 WELL
HALLET FIELD
HODGEMAN COUNTY, KANSAS



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

January 22, 1957

REPLY TO
710 NORTH BROADWAY
OKLAHOMA CITY, OKLAHOMA

Kewanee Oil Company
P. O. Box 2093
Wichita, Kansas

Attention: Mr. Paul G. Arnold

Subject: Core Analysis
Larkin No. 2 Well
Hallet Field
Hodgeman County, Kansas

Gentlemen:

Diamond coring equipment and water base mud containing ten per cent diesel oil were used to core the intervals from 4580 to 4585, 4586 to 4606.5, 4608 to 4630, and 4631 to 4659 feet in the Larkin No. 2. Representatives of Kewanee Oil Company selected and quick-froze samples of recovered formation on which analysis was desired, and submitted these samples to the Oklahoma City laboratory. The analysis was made by whole-core procedures using long segments of full-diameter core, and the results are presented in this report.

Mississippian formation from 4593.0 to 4605.2 feet is characterized throughout by very favorable residual oil and total water saturations, and the zone is interpreted to be oil productive. The low total water saturations observed throughout this interval indicate that oil production will be obtained on a virtually water-free basis. There are present in the interval 10.4 feet of formation having permeability equal to or greater than 0.1 millidarcy, the observed permeability values ranging from 1.4 to 184 millidarcys and averaging 79 millidarcys. The total observed productive capacity of the section is 822 millidarcy-feet, possibly adequate to support satisfactory rates of fluid production without treatment. The porosity in the permeable portions of this zone ranges from 14.1 to 23.9 per cent and

averages 19.5 per cent. The empirically calculated connate water saturation is 42.1 per cent of pore space.

Another Mississippian section from 4612.0 to 4630.0 feet also exhibits at permeable points very favorable residual oil and total water saturations, and is interpreted to be oil productive with little or no possibility of water cuts. The permeability development is somewhat poorer in this zone than in the zone previously discussed, the observed permeability values for the 15 feet of formation having permeability equal to or greater than 0.1 millidarcy ranging from 1.8 to 110 millidarcys and averaging 32 millidarcys. The observed productive capacity is 480 millidarcy-feet, and it is possible that treatment will be required in order to obtain satisfactory productive performance from the zone. The porosity averages 16.0 per cent, and the empirically calculated connate water saturation is 51.8 per cent of pore space.

The third and final oil productive Mississippian interval extends from 4632.0 to 4635.7 feet, and formation in this zone has an arithmetic average permeability of 20 millidarcys and a productive capacity of 74 millidarcy-feet. Treatment of the zone will probably be necessary in order to increase the effective productive capacity to a point at which the zone will contribute significant volumes of fluid to the well stream. The porosity in this zone averages 16.8 per cent, and the empirically calculated connate water saturation is 44.0 per cent of pore space.

Estimates of recoverable oil have been calculated for the three oil productive Mississippian sections, using the observed core analysis data from each of the sections in conjunction with estimated reservoir fluid characteristics considered applicable. These estimates are presented on pages one and two of the report, and are subject to the conditions set forth in the body of and in the footnotes to the summary page.

Formation from 4635.7 to 4637.3 feet is interpreted to be nonproductive.

Thank you for the opportunity to be of service to you.

Very truly yours,

Core Laboratories, Inc.


J. W. Barbour, Jr.,
District Manager

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

Page 1 of 2 File CP-1-2778 WC
Well Larkin No. 2

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: Mississippian 4593.0 - 4605.2

FEET OF CORE RECOVERED FROM ABOVE INTERVAL	12.2	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	42.1
FEET OF CORE INCLUDED IN AVERAGES	10.4	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE (c)	42.1
AVERAGE PERMEABILITY: Max. : MILLIDARCY 900 :	79 70	OIL GRAVITY: °API (e)	38
PRODUCTIVE CAPACITY: Max. : MILLIDARCY-Feet 900 :	822 728	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL (e)	480
AVERAGE POROSITY: PER CENT	19.5	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL (e)	1.29
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE	23.9	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT	679

Calculated maximum solution gas drive recovery is 171 barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is 318 barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (Please refer to footnotes for further discussion of recovery estimates.)

FORMATION NAME AND DEPTH INTERVAL: Mississippian 4612.0 - 4630.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL	18.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	51.8
FEET OF CORE INCLUDED IN AVERAGES	15.0	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE (c)	51.8
AVERAGE PERMEABILITY: Max. : MILLIDARCY 900 :	32 29	OIL GRAVITY: °API (e)	38
PRODUCTIVE CAPACITY: Max. : MILLIDARCY-Feet 900 :	480 435	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL (e)	480
AVERAGE POROSITY: PER CENT	16.0	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL (e)	1.29
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE	21.6	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT	464

Calculated maximum solution gas drive recovery is 115 barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is 195 barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (Please refer to footnotes for further discussion of recovery estimates.)

(c) Calculated (e) Estimated (m) Measured (*) Refer to attached letter.

These recovery estimates represent theoretical maximum values for solution gas and water drive. They assume that production is started at original reservoir pressure; i.e., no account is taken of production to date or of prior drainage to other areas. The effects of factors tending to reduce actual ultimate recovery, such as economic limits on oil production rates, gas-oil ratios, or water-oil ratios, have not been taken into account. Neither have factors been considered which may result in actual recovery intermediate between solution gas and complete water drive recoveries, such as gas cap expansion, gravity drainage, or partial water drive. Detailed predictions of ultimate oil recovery to specific abandonment conditions may be made in an engineering study in which consideration is given to overall reservoir characteristics and economic factors.

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc., and its officers and employees assume no responsibility and make no warranty or representation as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Page 2 of 2 File CP-1-2778 WC
 Well Larkin No. 2

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: Mississippian 4632.0 - 4635.7			
FEET OF CORE RECOVERED FROM ABOVE INTERVAL	3.7	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	44.0
FEET OF CORE INCLUDED IN AVERAGES	3.7	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE (c)	44.0
AVERAGE PERMEABILITY: MILLIDARCYS Max. : 20 900 : 20		OIL GRAVITY: °API (e)	38
PRODUCTIVE CAPACITY: MILLIDARCY-FEET Max. : 74 900 : 74		ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL (e)	480
AVERAGE POROSITY: PER CENT	16.8	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL (e)	1.29
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE	27.6	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT	566

Calculated maximum solution gas drive recovery is 142 barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is 206 barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (Please refer to footnotes for further discussion of recovery estimates.)

FORMATION NAME AND DEPTH INTERVAL:

FEET OF CORE RECOVERED FROM ABOVE INTERVAL		AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	
FEET OF CORE INCLUDED IN AVERAGES		AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	
AVERAGE PERMEABILITY: MILLIDARCYS		OIL GRAVITY: °API	
PRODUCTIVE CAPACITY: MILLIDARCY-FEET		ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	
AVERAGE POROSITY: PER CENT		ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT	

Calculated maximum solution gas drive recovery is _____ barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is _____ barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (Please refer to footnotes for further discussion of recovery estimates.)

(c) Calculated (e) Estimated (m) Measured (*) Refer to attached letter.

These recovery estimates represent theoretical maximum values for solution gas and water drive. They assume that production is started at original reservoir pressure; i.e., no account is taken of production to date or of prior drainage to other areas. The effects of factors tending to reduce actual ultimate recovery, such as economic limits on oil production rates, gas-oil ratios, or water-oil ratios, have not been taken into account. Neither have factors been considered which may result in actual recovery intermediate between solution gas and complete water drive recoveries, such as gas cap expansion, gravity drainage, or partial water drive. Detailed predictions of ultimate oil recovery to specific abandonment conditions may be made in an engineering study in which consideration is given to overall reservoir characteristics and economic factors.

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc., and its officers and employees assume no responsibility and make no warranty or representation as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.