IDENTIFICATION AND ANALYSIS OF PROBLEM WELLS IN A MATURE WEST TEXAS WATERFLOOD

Mark E. Fleming
Chevron U.S.A. Inc.

ABSTRACT

By compiling foreman's costs in a West Texas field, a method was determined for identifying problem wells and keeping a close liaison between field personnel and engineers in the office.

Plots of marginal water and oil production as a function of both oil price and pulling costs were generated and used by field personnel and engineering for identifying unprofitable wells.

INTRODUCTION

In most mature West Texas waterfloods, excessive water production can cause many operational problems and eventually lead to uneconomical wells.

This brings about the need to properly identify and calculate operating costs for a field and use those costs along with the current oil price to identify problem wells.

CALCULATION OF OPERATING COSTS

Operating costs are those expenditures that will benefit the period in which they are made. The operating costs for any field can be divided into two categories: fixed and variable.

Fixed costs are those costs that can be attributed to the field in general and do not vary on a well count basis. Fixed costs are usually fixed for a range of activity. For example, the addition of wells to a field may not require any additional management or field personnel; however, the level of activity may be increased such that additional personnel may be needed. The following can be included: company labor, contract labor, contract services, materials, repair parts and transportation.

dividing by the number of producing wells times the number of days producing will give a fixed cost in dollars per well per day.

Variable costs, sometimes called lifting costs, are those costs that increase with an increase in activity. For example, a well that produces 300 barrels of fluid a day (BFPD) costs more to operate than a well producing 5 BFPD. The following can be included in the calculation of variable costs: well pulling, subsurface equipment repairs and service, total lease fuels, utilities and chemicals. The sum of these divided by the total fluid production will give the cost for a barrel of fluid to be produced.

Using both the calculated operating costs, the cost in dollars to operate a specific well for one day can be done in the following manner:

fixed cost + variable cost (water production + oil production)

If the specified well does not generate this much money, then that well is uneconomical and some sort of action should be taken.

DISCUSSION

In Fig. 1, a simple Lotus 1-2-3 worksheet has been developed to monitor the operating costs for an example field. After entering the appropriate field costs, the worksheet will then calculate the fixed cost per well per day and the variable cost per barrel of fluid. Using these costs, the worksheet will then generate a marginal water production table. To use this table, go to the column which contains the appropriate oil production, move down to the row which contains the appropriate annual pulling costs, and read the marginal water production. This is the maximum amount of water that the subject well can produce and still generate a positive cash flow.

Using the data in Fig. 1, a plot of oil and water production as a function of pulling costs has been made (Fig. 2).

After locating a well's current production on the plot, determine whether or not that point is above the appropriate annual pulling cost. If so, then that well is losing money and something should be done to correct the problem.

Given the recent fluctuation in oil prices, an even more useful tool for identifying and evaluating uneconomical wells is a plot that demonstrates the sensitivity of marginal water production to the price of oil (Fig. 3). To generate the data for this plot, the Marginal Water Production Table was calculated at several different oil prices, and the data from the $0 pulling costs row plotted. Assuming $0 pulling costs will give a maximum allowable water production for that well to economically produce.

CONCLUSION

In order to efficiently operate a waterflood, operating costs must be continuously updated and all wells closely monitored. Using the methods mentioned in this paper both in the field and the office can be a useful tool in keeping costs minimal and identifying wells which are no longer profitable.

REFERENCES

1. Thompson, Robert S., Wright, John D.: Oil Property Evaluation, Thompson-Wright Associates (1985).

Date = April 1991
Field Name = Example Field

Description	Cost	Description	
Company Labor	$400,000	Prod Well Days	92,000
Contract Labor	$48,000	Oil Prod (bbl)	1,200,000
Contract Services	$180,000	Water Prod (bbl)	3,100,000
Material/Parts	$94,000		
Transportation	$96,000	Royalty (%)	12.50%
		Severance Tax (%)	8.50%
		Oil Price ($/bbl)	$22
Well Pulling	$150,000		
SS-Tech Serv	$55,000		
SS-Equip Repairs	$60,000	Operating Costs	
Lease Fuels	$6,600		
Utilities	$380,000	Fixed Costs/PWD	$8.89
Chemicals	$250,000	Var Costs/BTFPD	$0.21

Marginal Water Production Table

Oil Price = = $22

BOPD	1	2	3	4	5	6
PULLING COSTS						
$0	40.6	123.6	206.6	289.6	372.6	455.6
$1,000	27.5	110.5	193.5	276.5	359.6	442.6
$2,000	14.5	97.5	180.5	263.5	346.5	429.5
$3,000	1.4	84.4	167.4	250.4	333.4	416.4
$4,000	(11.7)	71.3	154.3	237.3	320.4	403.4
$5,000	(24.7)	58.3	141.3	224.3	307.3	390.3
$6,000	(37.8)	45.2	128.2	211.2	294.2	377.2
$7,000	(50.9)	32.1	115.1	198.1	281.2	364.2
$8,000	(63.9)	19.1	102.1	185.1	268.1	351.1
$9,000	(77.0)	6.0	89.0	172.0	255.0	338.0
$10,000	(90.1)	(7.1)	75.9	158.9	242.0	325.0

Figure 1

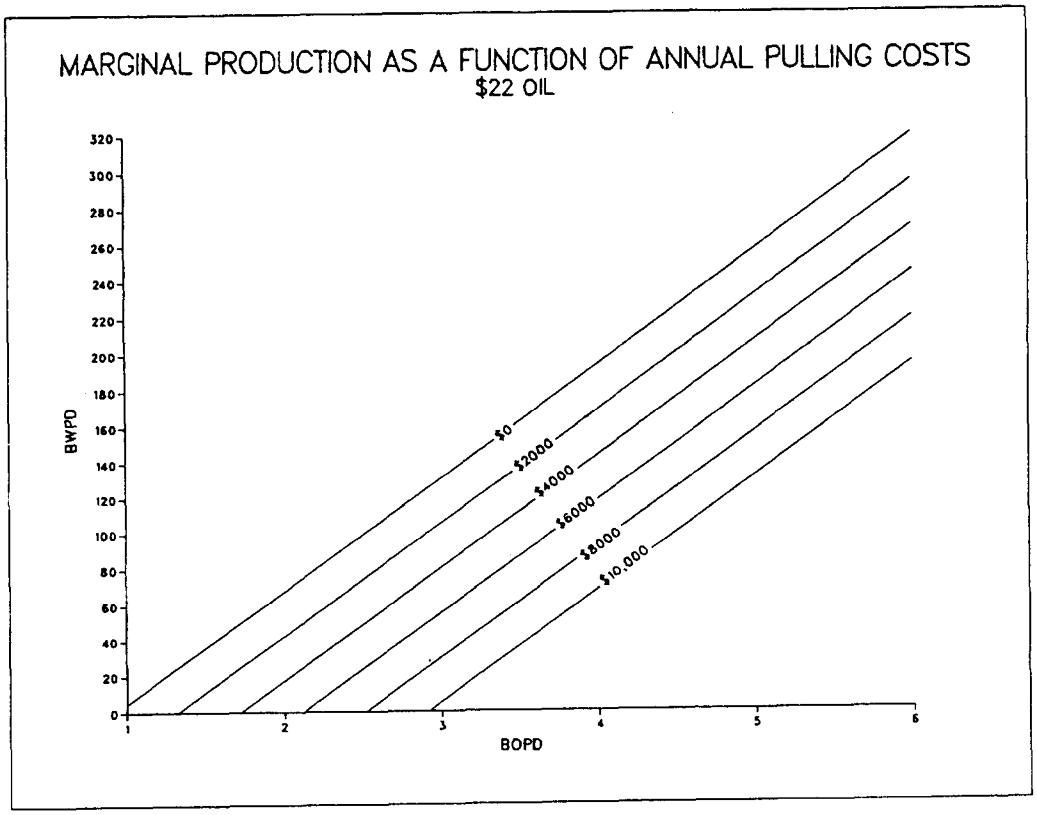

Figure 2

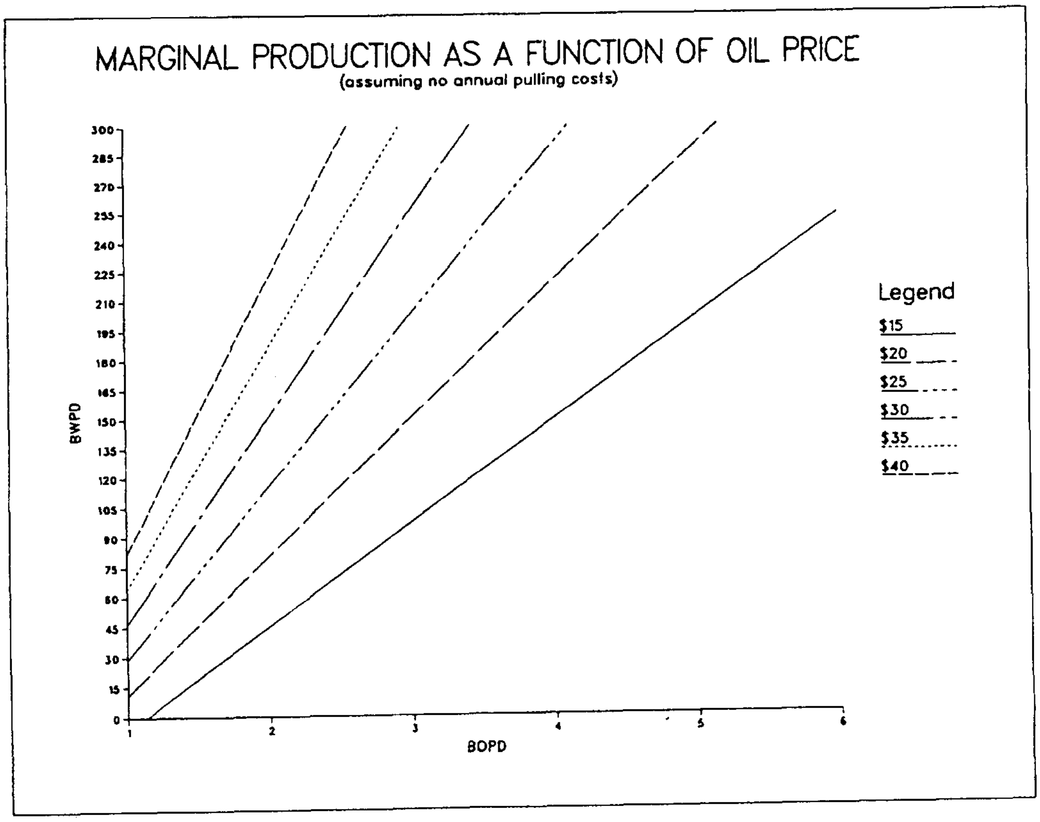

Figure 3