Best Well Production

Project #1

Melanie McBride

235-35-1071

March 27, 2003

Group #2

On The Top

Executive Summary

The purpose of this report was to figure out which well of three produced the most gas and oil combined over the next ten years in comparison to each other for the highest yield of profit that our company could recommend for our parent company to purchase. The method to figure this problem out was by using the hyperbolic decline curve equation to forecast the oil and gas production and then by using the Net Present Value equation to turn the predicted money into today's money for comparison. CHAMBERS, FM ET AL A 4-2 proved to produce the highest amount of profit, $2,910,469.64 for our parent company to consider to purchase.

Table Of Contents

Introduction

The purpose of the company was to select three comparable wells from ninety-four different wells, and then choose the one well of the three picked that produced more in the future using different equations. The three wells the company picked, Moore, WH #4-64, CHAMBERS, FM ET AL A 4-2, and Chambers, FM #6-65, had data from previous years that were used to make a graph. Then using the Hyperbolic Decline Curve, a graph was created that matched each well's actual graph as closely as possible in production. Using the Hyperbolic Decline Cure, a prediction of what the wells would produce in the next ten years was created. After that, the Net Profit Value equation was used to turn the production values into money values. After taking away taxes and operating costs from the production costs, a recommendation could then be made for the purchase of the most profitable well.

Methodology

Equations

Hyperbolic Decline Curve

q=qi*((1+b*Di*t)^(-1/b))

Where:

qi—initial production

b—decline rate

Di—decline exponent

t—time

Net Present Value

P=F/((1+i)^n)

Where:

P—present worth

F—future worth

n—number of years

i—interest rate

Revenue

Revenue = Production * Price

Taxes

Taxes = Rate * (Production – Operation Cost)

Net Cash Flow

NCF = Revenue –(Taxes + Operation Cost)

Other needed Information

- **bbls**—standard measurement of oil production
- **MCF**—one thousand cubic feet of gas, also the standard measurement of gas production
- **Tax Rate:** 48% or 0.48
- **Interest Rate:** 10% or 0.10
- **Operating Cost:**

  oil—$0.65

  gas—$4.35
- **Economic Limit**

  oil—1 bbls/month

  gas—10 MCF/month
- **Price**

  oil—$3/bbls

  gas—$50/MCF

Results and Discussion

Note: The procedures used on the three wells are all the same, but to keep from being repetitive, the procedure will only be stated once for the first well and will apply to the following two wells with a brief description of each step. The program used for this project was Microsoft Excel, so all of the following refers how this was done in Excel only.

The first thing that needed to be done, once all of the data for the wells had been received, was to determine how many wells existed. Using advanced filter, a determination was made that there were ninety-four wells. The total production of the ninety-four wells was determined by using a pivot table. Using this information, the total gas production was plotted on a bubble graph. An area of the graph with several bubbles representing the wells was chosen to find three comparable wells. The three wells are marked on Figure 1 below.

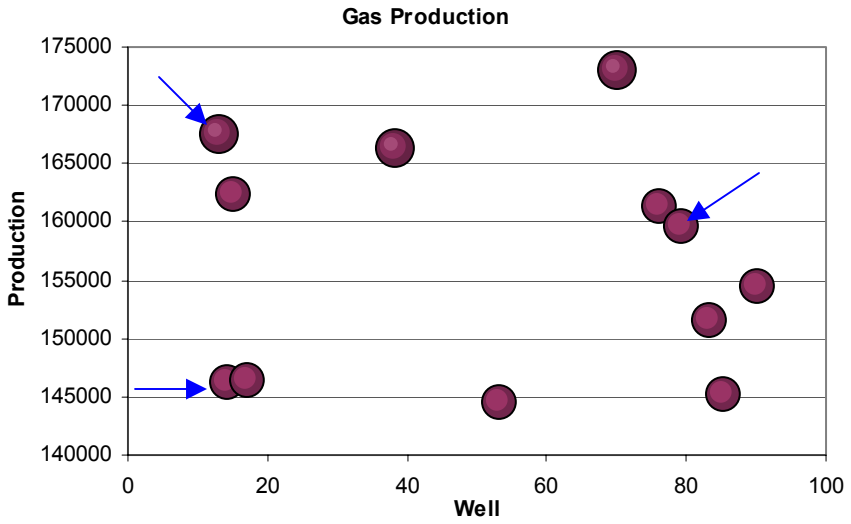

Figure 1: Bubble graph of the three wells picked: Moore, WH #4-64, Chambers, FM ET AL A 4-2, and Chambers, FM #6-65.

Moore, WH #4-64

After the wells were chosen, the information from each well was used to plot its data using time and total production. Each well having two graphs apiece, one being oil and the other gas, showed a decline in the production of each well as time passed. The first one plotted was oil.

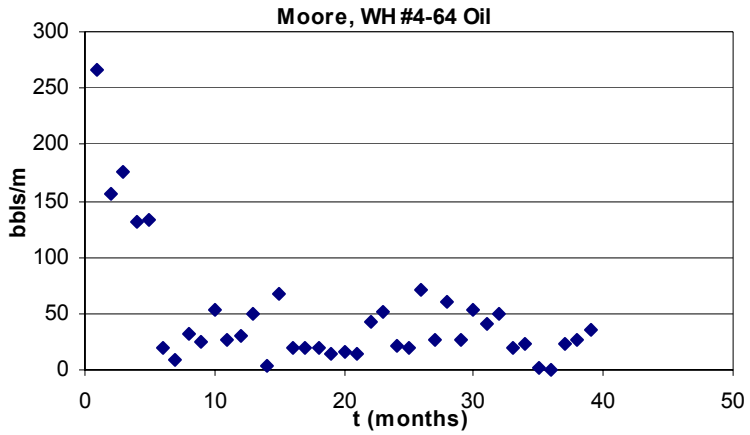

Figure 2: Past Oil Production

Applying the Hyperbolic Decline Curve, by picking different values for b, Di, and qi, the resulting curve resembled the decline of the past oil production.

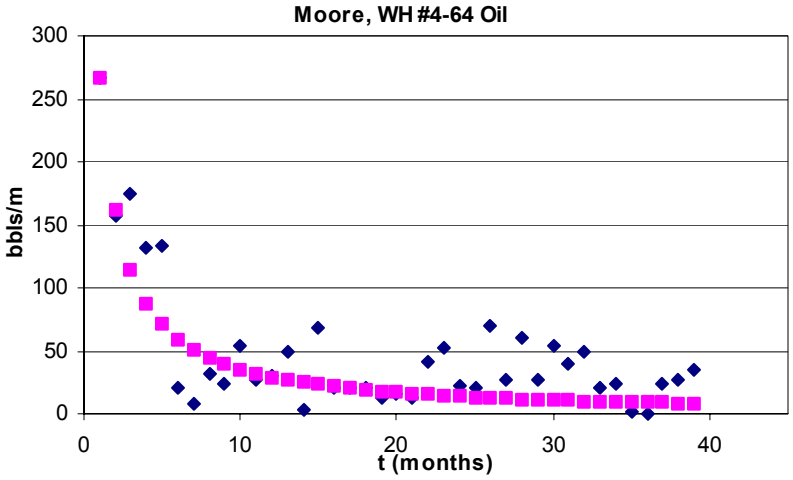

Figure 3: Hyperbolic Decline Curve for this well's future oil production.

Using this curve, a prediction of production for the next ten years for the well was created.

Moore, WH #4-64	n (year)	bbls/oil
	1	84.34265425
	2	65.11028713
	3	52.80603761
	4	44.28331255
	5	38.0453112
	6	33.29039975
	7	29.551197
	8	26.53716193
	9	24.0583801
	10	21.98558426

Table 1: Oil production for the next ten years.

With the data for the next ten years, the production was then calculated into money by coming up with the figure of how much the oil cost per year, $3/bbls. For gas it is $50/MCF.

Revenue ($3/bbls)
$253.03
$195.33
$158.42
$132.85
$114.14
$99.87
$88.65
$79.61
$72.18
$65.96

Table 2: The revenue for oil.

After calculating taxes and operation costs, a value was reached for the oil production once the costs were removed.

Opperating cost $0.65	taxes 48%	NCF
$54.82	$95.14	$103.07
$42.32	$73.44	$79.56
$34.32	$59.57	$64.53
$28.78	$49.95	$54.11
$24.73	$42.92	$46.49
$21.64	$37.55	$40.68
$19.21	$33.33	$36.11
$17.25	$29.93	$32.43
$15.64	$27.14	$29.40
$14.29	$24.80	$26.87

Table 3: The future production cost after taxes and operating costs.

Lastly, the future production was turned into today's current money by using the Net Present Value Equation with the discount rate at 10%.

i(discount rate)	NPV
10%	$93.70
10%	$65.76
10%	$48.48
10%	$36.96
10%	$28.87
10%	$22.96
10%	$18.53
10%	$15.13
10%	$12.47
10%	$10.36

Total Cost: $353.21

Table 4: The cost of the oil production in today's money.

The same steps used in predicting oil production were used for predicting gas production.

Plotting of the data.

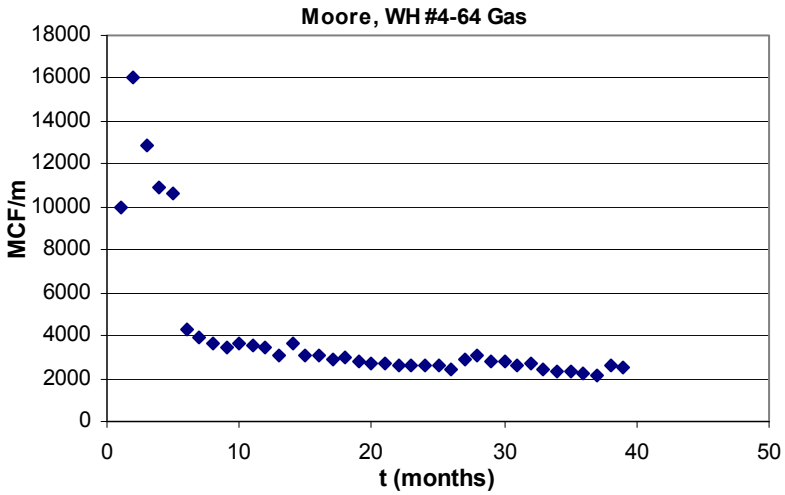

Figure 4: Past Gas Production

Finding the Hyperbolic Decline Curve.

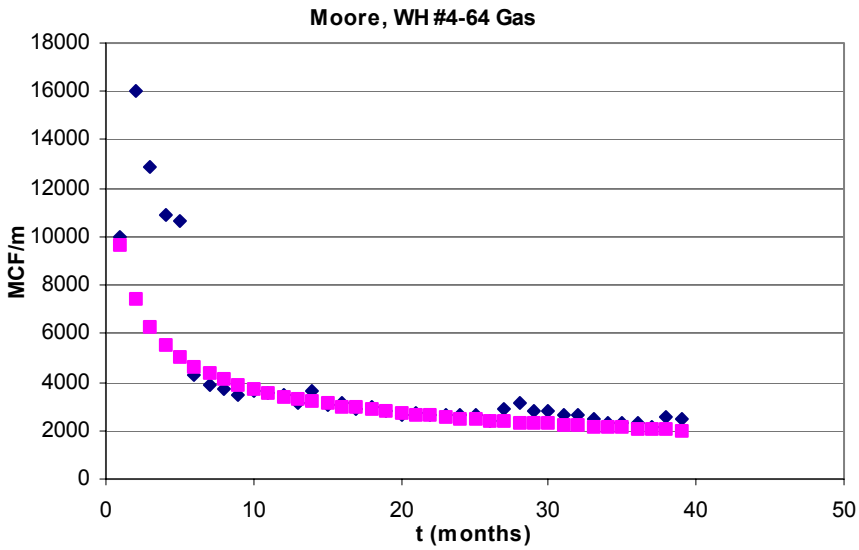

Figure 5: Hyperbolic Decline Curve for this well's future gas production.

Using the curve to predict the production for the next ten years.

Moore, WH #4-64	n (year)	MCF/gas
	1	22626.63307
	2	20339.13574
	3	18659.60328
	4	17356.78882
	5	16306.87157
	6	15436.63417
	7	14699.5829
	8	14064.55905
	9	13509.77958
	10	13019.48802

Table 5: Gas production for the next ten years.

The Revenue.

Revenue ($50/MCF)
$1,131,331.65
$1,016,956.79
$932,980.16
$867,839.44
$815,343.58
$771,831.71
$734,979.15
$703,227.85
$675,488.98
$650,974.40

Table 6: The revenue for oil.

Operating Costs, Taxes, and Final Production Amount.

Opperating cost $4.35	taxes 48%	NCF
$98,425.85	$495,794.78	$537,111.02
$88,475.24	$445,671.14	$482,810.40
$81,169.27	$408,869.23	$442,941.66
$75,502.03	$380,321.96	$412,015.45
$70,934.89	$357,316.17	$387,092.52
$67,149.36	$338,247.53	$366,434.82
$63,943.19	$322,097.26	$348,938.70
$61,180.83	$308,182.57	$333,864.45
$58,767.54	$296,026.29	$320,695.15
$56,634.77	$285,283.02	$309,056.61

Table 7: The future production cost after taxes and operating costs.

Using the Net Present Value Equation.

i(discount rate)	NPV
10%	$488,282.74
10%	$399,016.86
10%	$332,788.63
10%	$281,412.10
10%	$240,354.00
10%	$206,842.90
10%	$179,060.73
10%	$155,750.23
10%	$136,006.05
10%	$119,154.70

Total Cost: $2,538,668.94

Table 8: The cost of the oil production in today's money.

The total for the ten years were added up and then the oil and gas totals are added together. The well with the highest income is the recommended well.

Total Cost
$353.21
$2,538,668.94
$2,539,022.15

Final Cost: $2,539,022.15

Table 9: The final cost for this well.

CHAMBERS, FM ET AL A 4-2

OIL

Plotting of the data.

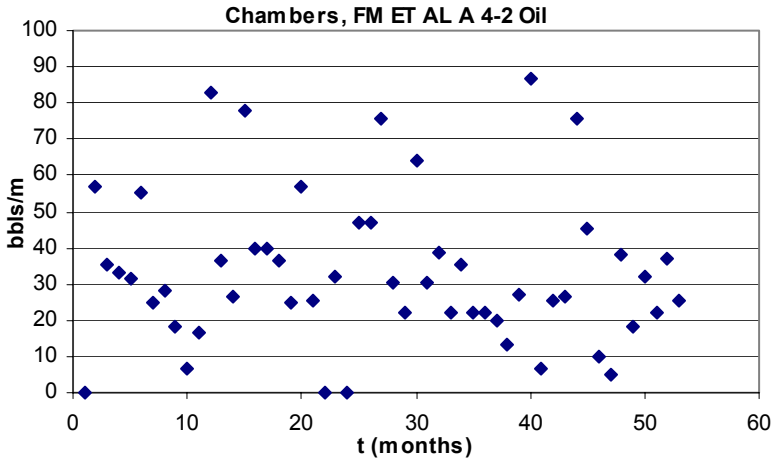

Figure 6: Past Oil Production

Finding the Hyperbolic Decline Curve.

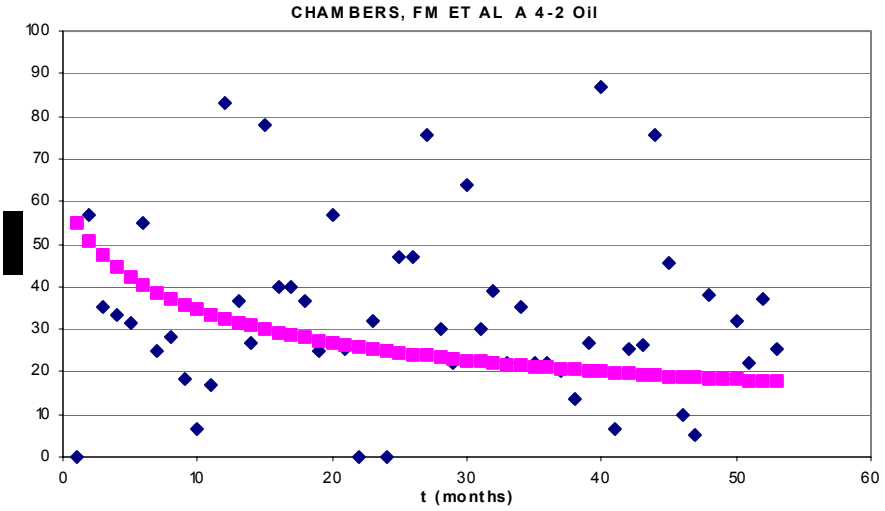

Figure 7: Hyperbolic Decline Curve for this well's future oil production.

Using the curve to predict the production for the next ten years.

CHAMBERS, FM ET AL A 4-2	n (year)	bbls/oil
	1	200.6807126
	2	184.212527
	3	171.2356055
	4	160.6670684
	5	151.8429882
	6	144.3305073
	7	137.833698
	8	132.1424431
	9	127.1028703
	10	122.599359

Table 10: Oil production for the next ten years.

Getting the Revenue.

Revenue ($3/bbls)
$602.04
$552.63
$513.71
$482
$455.53
$432.99
$413.50
$396.43
$381.31
$122.60

Table 11: The revenue for oil.

Operating Costs, Taxes, and Final Production Amount.

Opperating cost $0.65	taxes 48%	NCF
$130.44	$226.37	$245.23
$119.74	$207.79	$225.10
$111.30	$193.16	$209.25
$104.43	$181.23	$196.33
$98.70	$171.28	$185.55
$93.81	$162.80	$176.37
$89.59	$155.48	$168.43
$85.89	$149.06	$161.48
$82.62	$143.37	$155.32
$79.69	$20.60	$22.31

Table 12: The future production cost after taxes and operating costs.

Using the Net Present Value Equation.

i(discount rate)	NPV
10%	$222.94
10%	$186.04
10%	$157.21
10%	$134.10
10%	$115.21
10%	$99.56
10%	$86.43
10%	$75.33
10%	$65.87
10%	$8.60

Total Cost: $1,151.29

Table 13: The cost of the oil production in today's money.

GAS

Plotting of the data.

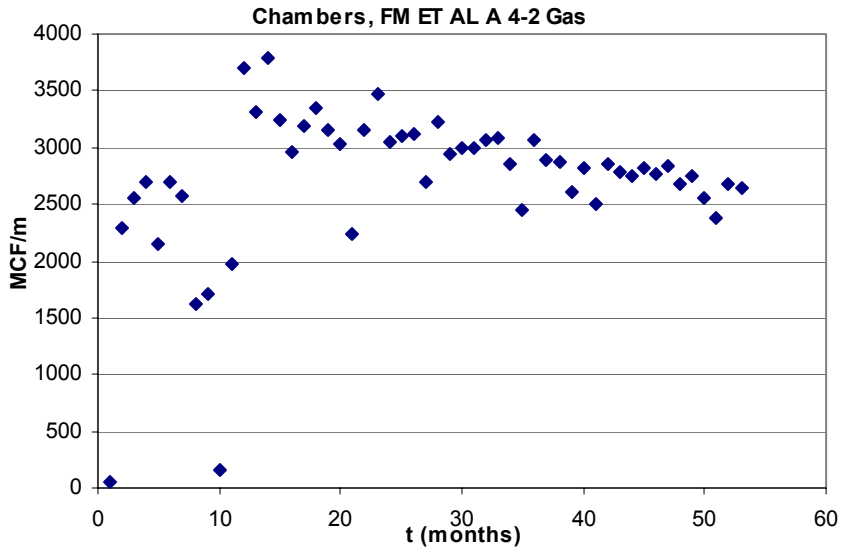

Figure 8: Past Gas Production

Finding the Hyperbolic Decline Curve.

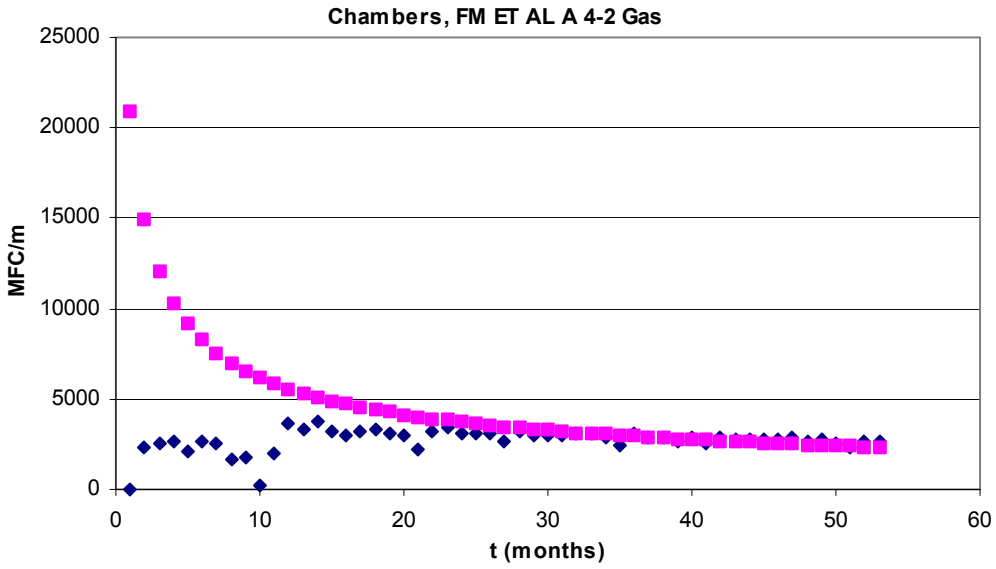

Figure 9: Hyperbolic Decline Curve for this well's future gas production.

Using the curve to predict the production for the next ten years.

CHAMBERS, FM ET AL A 4-2	n (year)	MCF/gas
	1	26369.51562
	2	23668.45393
	3	21605.25995
	4	19965.81302
	5	18624.33362
	6	17501.53348
	7	16544.6743
	8	15717.16126
	9	14992.71679
	10	14351.92995

Table 14: Gas production for the next ten years.

The Revenue.

Revenue ($50/MCF)
$1,318,475.78
$1,183,422.70
$1,080,263
$998,290.65
$931,216.68
$875,076.64
$827,233.71
$785,858.06
$749,635.84
$717,596.50

Table 15: The revenue for oil.

Operating Costs, Taxes, and Final Production Amount.

Opperating cost $4.35	taxes 48%	NCF
$114,707.39	$577,808.83	$625,959.56
$102,957.77	$518,623.16	$561,841.76
$93,982.88	$473,414.46	$512,865.66
$86,851.29	$437,490.89	$473,948.47
$81,015.85	$408,096.40	$442,104.43
$76,131.67	$383,493.59	$415,451.38
$71,969.33	$362,526.90	$392,737.48
$68,369.65	$344,394.44	$373,093.97
$65,218.32	$328,520.41	$355,897.11
$62,430.90	$314,479.49	$340,686.11

Table 16: The future production cost after taxes and operating costs.

Using the Net Present Value Equation.

i(discount rate)	NPV
10%	$569,054.15
10%	$464,332.03
10%	$385,323.56
10%	$323,713.18
10%	$274,512.07
10%	$234,511.48
10%	$201,536.42
10%	$174,051.09
10%	$150,935.12
10%	$131,349.25

Total Cost: $2,909,318.35

Table 17: The cost of the oil production in today's money.

The Total Cost.

Total Cost
$1,151.29
$2,909,318.35
$2,910,469.64

Final Cost: $2,910,469.64

Table 18: The final cost for this well.

CHAMBERS, FM #6-5

OIL

Plotting of the data.

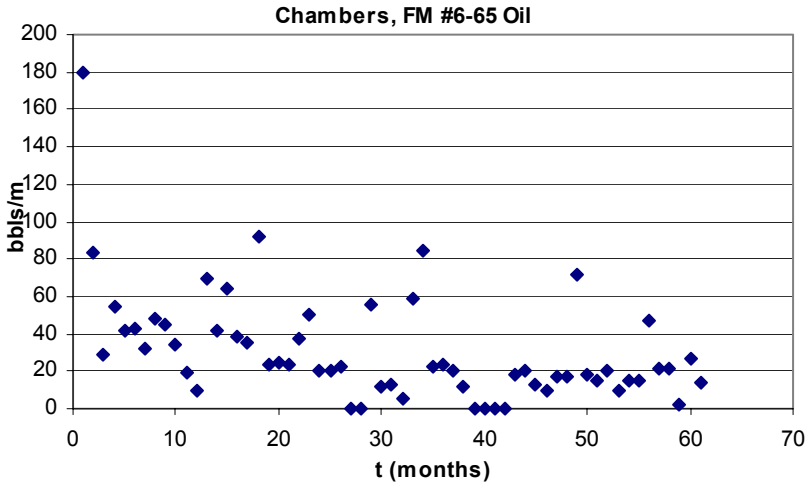

Figure 10: Past Oil Production

Finding the Hyperbolic Decline Curve.

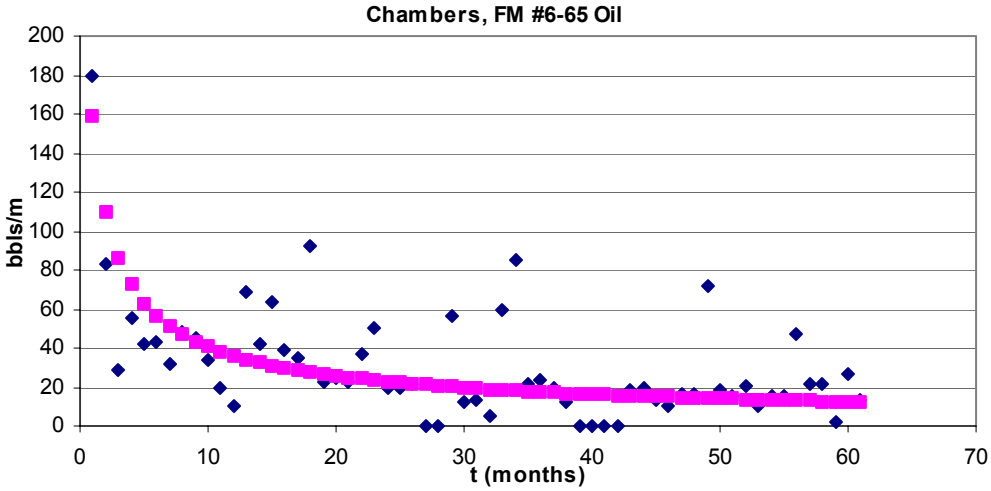

Figure 11: Hyperbolic Decline Curve for this well's future oil production.

Using the curve to predict the production for the next ten years.

Chambers, FM #6-65	n (year)	bbls/oil
	1	14685.82588
	2	124.5918629
	3	113.4579677
	4	104.5208418
	5	97.15963566
	6	90.97186295
	7	85.68413352
	8	81.10365838
	9	77.09023977
	10	73.53926747

Table 19: Oil production for the next ten years.

The Revenue.

Revenue ($3/bbls)
$44,057.48
$373.78
$340.37
$313.56
$291.48
$272.92
$257.05
$243.31
$231.27
$220.62

Table 20: The revenue for oil.

Operating Costs, Taxes, and Final Production Amount.

Opperating cost $0.65	taxes 48%	NCF
$9,545.79	$16,565.61	$17,946.08
$80.98	$140.54	$152.25
$73.75	$127.98	$138.64
$67.94	$117.90	$127.72
$63.15	$109.60	$118.73
$59.13	$102.62	$111.17
$55.69	$96.65	$104.70
$52.72	$91.48	$99.11
$50.11	$86.96	$94.20
$47.80	$82.95	$89.87

Table 21: The future production cost after taxes and operating costs.

Using the Net Present Value Equation.

i(discount rate)	NPV
10%	$16,314.62
10%	$125.83
10%	$104.16
10%	$87.24
10%	$73.72
10%	$62.75
10%	$53.73
10%	$46.23
10%	$39.95
10%	$34.65

Total Cost: $16,942.88

Table 22: The cost of the oil production in today's money.

GAS

Plotting of the data.

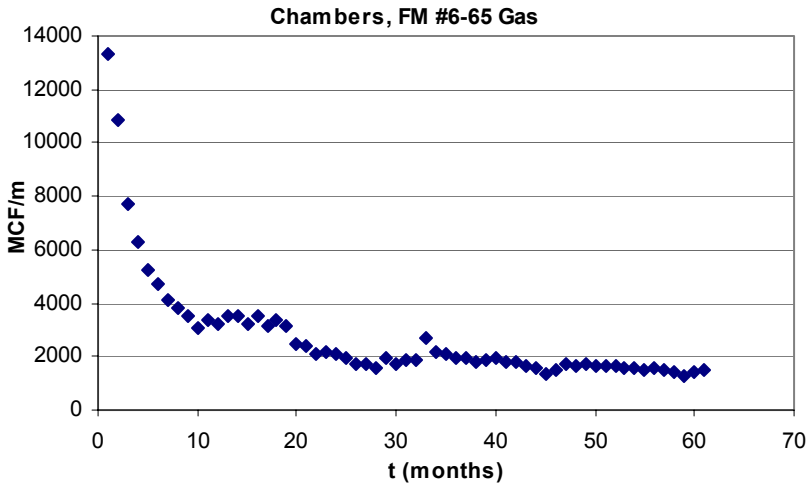

Figure 12: Past Gas Production

Finding the Hyperbolic Decline Curve.

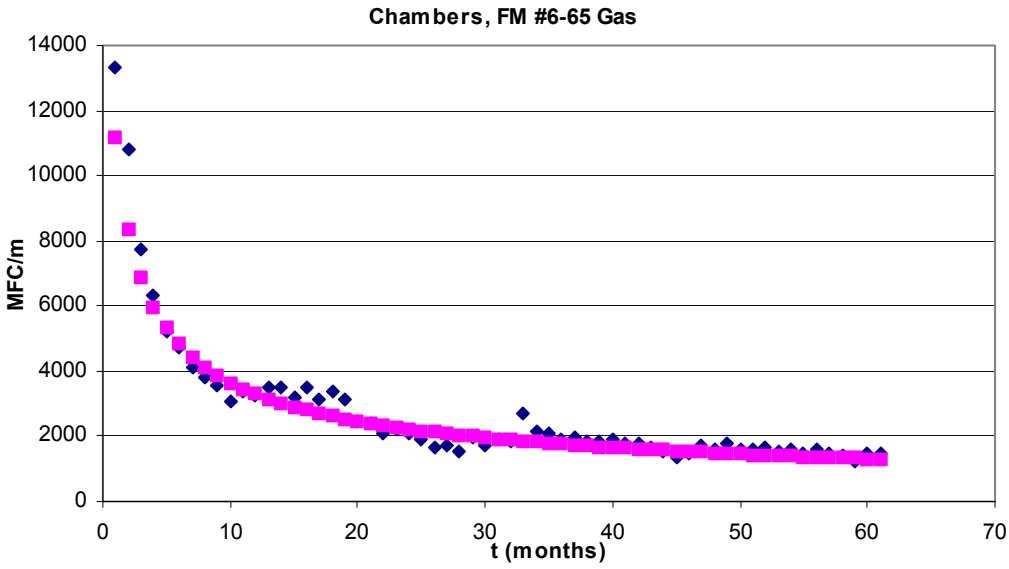

Figure 13: Hyperbolic Decline Curve for this well's future gas production.

Using the curve to predict the production for the next ten years.

Chambers, FM #6-65	n (year)	MCF/gas
	1	14685.82588
	2	13343.95165
	3	12289.22192
	4	11433.24793
	5	10721.39571
	6	10117.87265
	7	9598.140723
	8	9144.752827
	9	8744.752827
	10	8389.058192

Table 23: Gas production for the next ten years.

The Revenue.

Revenue ($50/MCF)
$734,291.29
$667,197.58
$614,461.10
$571,662.40
$536,069.79
$505,893.63
$479,907.04
$457,237.64
$437,237.64
$419,452.91

Table 24: The revenue for oil.

Operating Costs, Taxes, and Final Production Amount.

Opperating cost $4.35	taxes 48%	NCF
$63,883.34	$321,795.81	$348,612.13
$58,046.19	$292,392.67	$316,758.72
$53,458.12	$269,281.43	$291,721.55
$49,734.63	$250,525.33	$271,402.44
$46,638.07	$234,927.22	$254,504.49
$44,012.75	$221,702.82	$240,178.06
$41,751.91	$210,314.46	$227,840.67
$39,779.67	$200,379.82	$217,078.14
$38,039.67	$191,615.02	$207,582.94
$36,492.40	$183,821.04	$199,139.46

Table 25: The future production cost after taxes and operating costs.

Using the Net Present Value Equation.

i(discount rate)	NPV
10%	$316,920.12
10%	$261,784.07
10%	$219,174.72
10%	$185,371.52
10%	$158,027.27
10%	$135,574.25
10%	$116,918.29
10%	$101,268.56
10%	$88,035.43
10%	$76,776.88

Total Cost: $1,659,851.11

Table 26: The cost of the oil production in today's money.

The Total Cost.

Total Cost
$16,942.88
$1,659,851.11
$1,676,793.99

Final Cost: $1,676,793.99

Table 27: The final cost for this well.

Conclusion

Once the three wells were chosen from the ninety-four wells, the ten-year prediction for all of the oil and gas for each well was calculated, the future profit was determined, the future profit in today's money was determined, and then the final totals for the three wells were compared, as illustrated below.

Moore, WH #4-64: **$2,539,022.15**

CHAMBERS, FM ET AL A 4-2: **$2,910,469.64** ◄——— **Highest Sum**

CHAMBERS, FM #6-5: **$1,676,793.99**

After many calculations and careful consideration of the information gathered, the well Chambers, FM ET AL A 4-2 will be recommended to the parent company as the most advantageous and profitable investment.