Determination of Well Investment Strategy

PNGE 441: Oil and Gas Property Evaluation

Design Project No. 2

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Executive Summary

This design project has accomplished the task of providing the oil company with the best possible well out of two different proposals. The decision was based on three different processes. Decline curve analysis was used to determine the values of the initial production rate, qi, the hyperbolic exponent, b, and the initial nominal decline rate, Di. By determining these values, the monthly production could be forecasted. Type curve matching was used to assure these values. Finally, using a computer application, the net present values of the two wells were calculated based on production. The net present value for well BRN 1-7 was determined to be $236,154 and the net present value of well BK 1-23H was $546,823. These net present values represent the present value of the forecasted three year production of hydrocarbons from the wells. Well BK 1-23H will be selected as long as its purchase price is no more than $310,669 more than the price of well BRN 1-7.

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Introduction

As previously stated, three yardsticks were used to compare the two wells, BRN 1-7 and BK1-23H. Before comparing the two wells, it is imperative to understand the methods of comparison. This introduction will provide the background information needed to understand decline curve analysis, type curve matching, and net present value calculations.

Decline curves are the most common means of forecasting production. They are simply a plot of production rate versus time on semi-log, log-log, or specially scaled paper. There are two types of decline curves: exponential decline and hyperbolic decline. The equation for exponential decline is given below:

$$q = q_i e^{-Dt},$$

where q is the producing rate at time t, q_i is the initial production rate, D is the nominal exponential decline rate, and t is time.

The equation for hyperbolic decline is:

$$q = q_i (1 + bD_i t)^{-1/b},$$

where q, and qi are the same as in the exponential decline equation; Di is the initial nominal decline rate, and b is the hyperbolic exponent.

Type Curve Matching is an accurate means of providing the operator with the initial flow rate and the initial decline rate of a well which is producing under pseudo-steady state conditions. Type Curve Matching was first implemented by M. J. Fetkovitch It can be accomplished through various software programs or by hand. Fetkovich's type curves are a combination of the early transient flow period and the empirical hyperbolic equations.

After completion of the decline curve analysis and type curve matching, the production is forecasted. This is done using the following equation:

$$Np = q_i^{b} / [D_i * (1-b)] * [q_i^{1-b} - q^{1-b}] * f^*$$

where q_i is the initial production rate, q is the current production rate, D is the nominal decline rate, and f* is a factor to cancel time units (in this case to convert year to months).

Now, the economics of the two wells must be understood. The two wells under consideration are mutually exclusive projects. This means that the acceptance of one requires the rejection of the other. This decision is correctly made when the two cash flows are compared at equivalent times (usually time zero) and incorporate the time value of money. This is accomplished using the net present value. The net present value of an investment is calculated by discounting the future net cash flows to time zero and summing them. The equation is given below:

$$NPV = \sum_{j=0}^{L} \frac{NCF_j}{(1+i)^j},$$

where L is the project life, NCF_j is the net cash flow for period j, and NPV is the net present value discounted at interest rate i.

Methodology

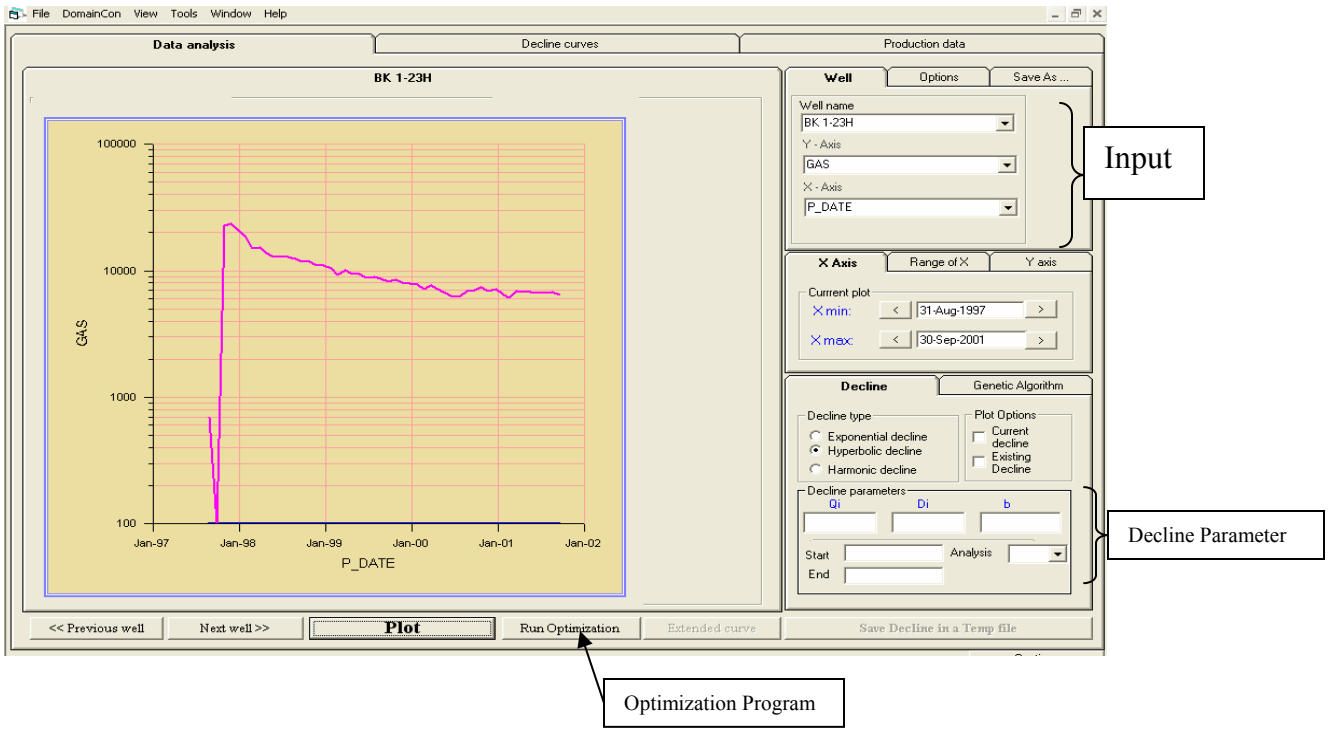
The oil, gas, and water production rates for wells BRN 1-7 and BK 1-23H were provided in a Microsoft Excel spreadsheet. A sample of the spreadsheet is represented below:

Well Name	Latitude	Longitude	P_DATE	OIL	GAS	WATER
BK 1-23H	34.80394	-97.5947	8/31/1997	532	689	948
BK 1-23H	34.80394	-97.5947	9/30/1997	0	0	
BK 1-23H	34.80394	-97.5947	10/31/1997	3,335	22,851	9,334
BK 1-23H	34.80394	-97.5947	11/30/1997	2,123	23,455	1,759
BK 1-23H	34.80394	-97.5947	12/31/1997	1,424	20,814	
BK 1-23H	34.80394	-97.5947	1/31/1998	1,148	18,586	463
BK 1-23H	34.80394	-97.5947	2/28/1998	609	15,080	326

The production history was used for the decline curve analysis, type curve matching, and the net present value calculations.

Decline Curve Analysis

In a Visual Basic computer application, IPDA, the oil production was plotted versus time on a semi-log plot. The optimization program was run to plot the computer program's optimum decline curve fit. This optimization curve fit fairly well to the production data and provided qi, Di, and b. However, a better fit could be attained by varying the values of qi, Di, and b manually. This same process was repeated for the gas production. The interface of the program is shown on the following page with labels identifying the various components used for this design project.



Type Curve Matching

The gas or oil production data for a specified well and the specified time interval (usually months) is listed and then multiplied to obtain dimensionless ratios for each term. These ratios can be changed by two values (one for flow rate and one for the time interval) to move the graph either up or down and left or right. This data is plotted over a series of curved lines representing the type curves. When the plotted data is best fit over the type curve, match points can be used to determine the initial flow rate and the initial decline rate of the well. The hyperbolic exponent can be obtained by identifying the line that represents the data in the most suitable fashion. A match point is a shared point by both the plotted data and the type curve. Both the plotted data and the type curve have different values for the shared point. The shared point can be a data point or a place where the grid lines match up. The match points are labeled as such:

Y-axis:	X-axis
q_{Dd} – dimensionless flow rate, from the plotted data	t_{Dd} – dimensionless time, from the plotted data
q(t) – actual flow rate, from the type curve	t – actual time, from the type curve

b- hyperbolic exponent, matched on both curves

Note: two match points for each graph should be chosen to ensure that they both agree.

From this data, the initial flow rate and the initial decline rate can be calculated. If the data plots along the lower right portion of the type curve, it is in the Empirical Region. The initial flow rate and initial decline rate are found by evaluating:

$$Qi = \frac{Q}{QDd} \qquad Di = \frac{TDd}{T}$$

b – evaluated from the matched curve

If the data plots in the upper left portion of the Type Curve, it is in the Analytical Region; the initial flow rate and initial decline rate are found by evaluating:

$$TDd = \frac{\frac{0.00634kt}{\varphi uc r w^2}}{0.5[(\frac{re}{rw})^2 - 1][\ln(\frac{re}{rw}) - 0.5]} \qquad QDd = \frac{Q(t)}{\frac{kh(Pi - Pwf)}{141.3uB[\ln(\frac{re}{rw}) - 0.5]}}$$

$\frac{re}{rw}$ – evaluated from the matched curve

Economic Analysis

Data from the decline curve analysis is then used to forecast the future production of both wells for the next three years. Next, an Excel spreadsheet was developed in order to calculate the monthly net cash flow for each well. The monthly net cash flow is calculated using the forecasted monthly production rates, current oil and gas prices,

constant production costs and constant tax rates. Finally, the net cash flow is then entered into the Net Present Value Calculator that was developed in Design Project One. The application then calculates the monthly net cash flow's present and net present value at the desired interest rate. Also, a present value profile is generated for various interest rates.

Results and Discussion

Well BRN 1-7 has a decline curve with an initial oil production rate of 2800 STB/D, an initial nominal decline of 1.5/year, and a hyperbolic exponent of 1.4 as shown in Figures 1 and 2.

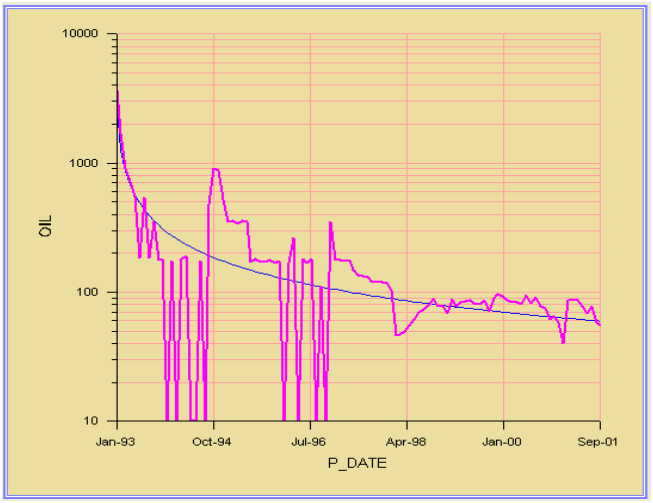


Fig. 1: Decline Curve Analysis: Well BRN 1-7

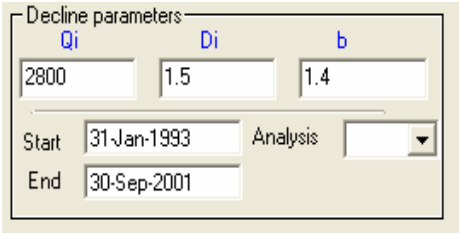


Fig. 2: Decline Parameters: Well BRN 1-7

Comparing these values to that of Well BK 1-23H, Well BK 1-23H has a greater initial oil production rate of 3301.4 STB/D, while both the decline rate (Di=0.78) and the hyperbolic exponent (b=1.27) are smaller. This is shown in Figures 3 and 4.

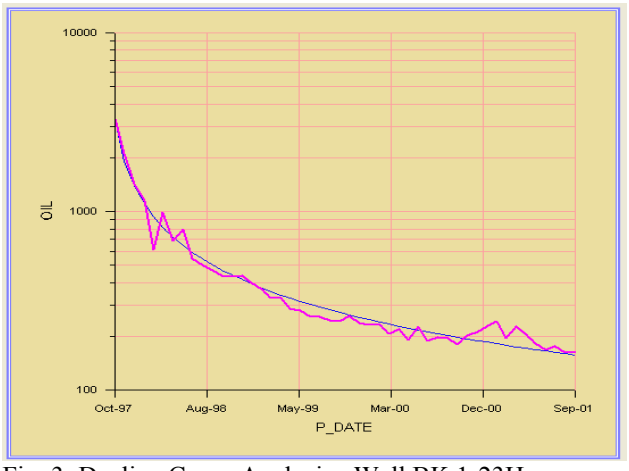


Fig. 3: Decline Curve Analysis: Well BK 1-23H

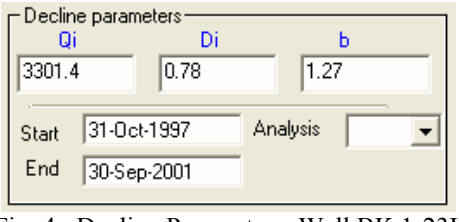
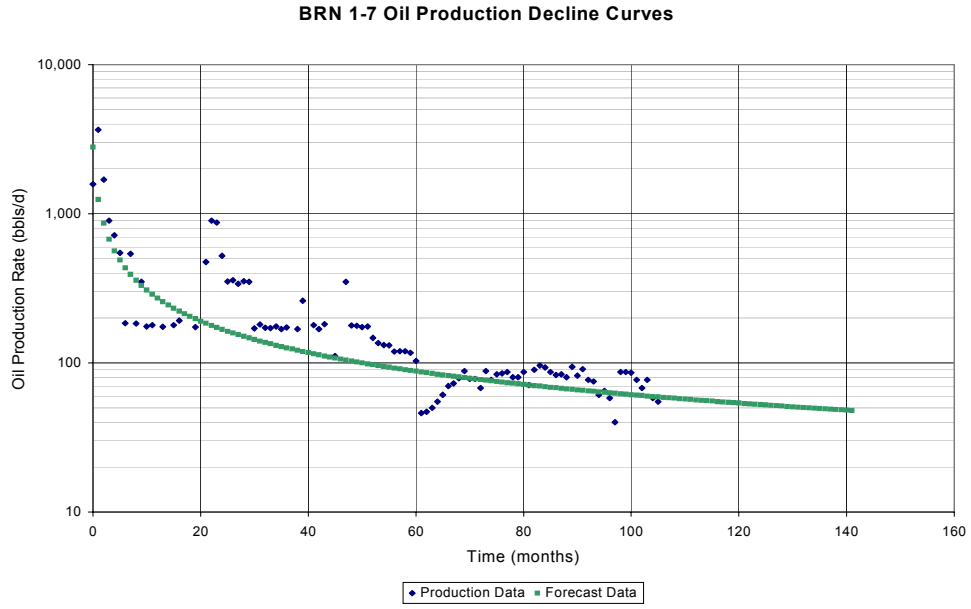
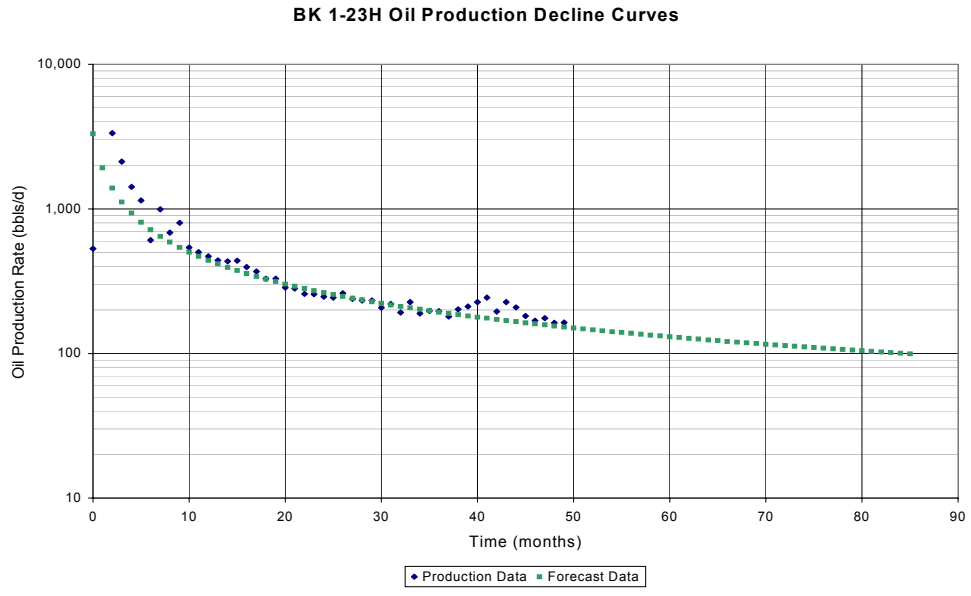


Fig. 4: Decline Parameters: Well BK 1-23H

The oil production decline curves for both wells were also plotted in Excel. Actual and forecasted production rates versus time in months were plotted on a semi-log graph. The forecasted production rates were calculated by using the hyperbolic equation for decline and the results from the IPDA program. The oil production decline curves are presented below.





The oil production is not the only element that should be considered, gas production would also play an important role in the selection. The decline curve for gas production in well BRN 1-7 is shown in Figure 5. The initial production was 40,577.6 SCF/D with a decline rate of 0.18/year and a hyperbolic exponent of 1.14 as shown in Figure 6.

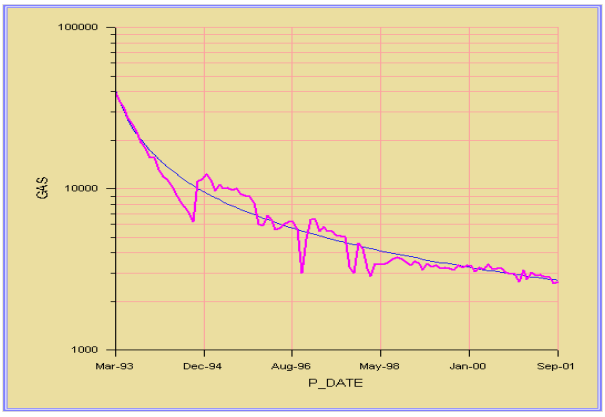


Figure 5: Decline Curve Analysis: Well BRN 1-7

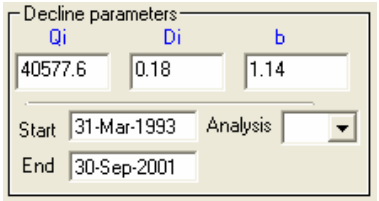


Figure 6: Decline Parameters:Well BRN 1-7

The decline curve for gas production in well BK 1-23H is shown in Figure 7. The initial production was 23,344.7 SCF/D with a decline rate of 0.18/year and a hyperbolic exponent of 2.26 as shown in Figure 8.

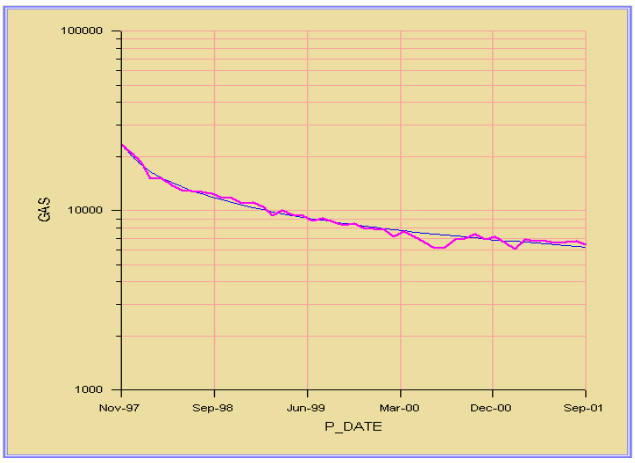


Fig. 7: Decline Curve Analysis: Well BK 1-23H

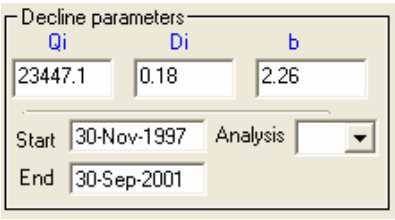
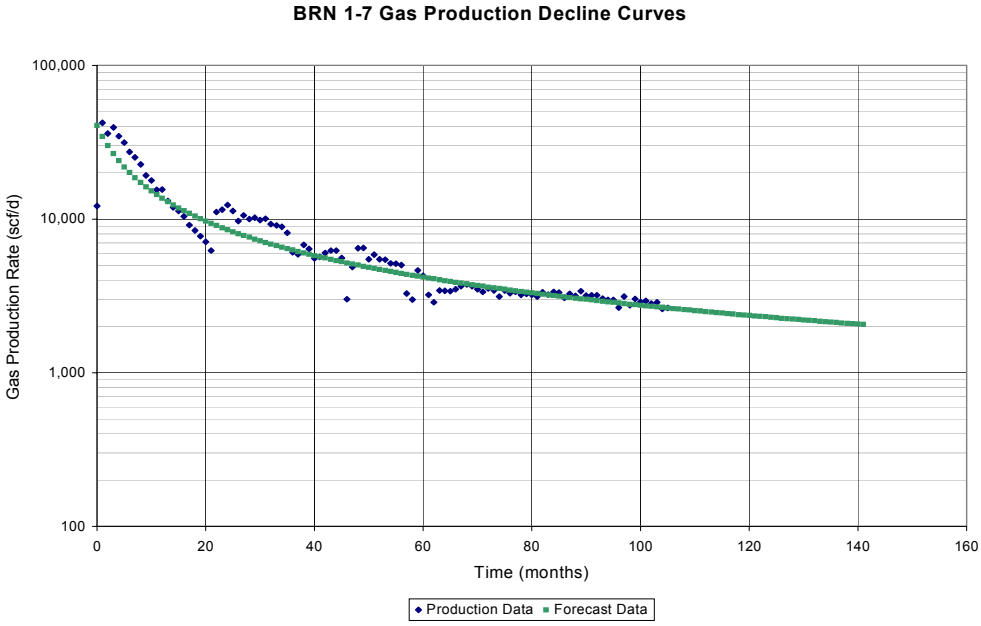
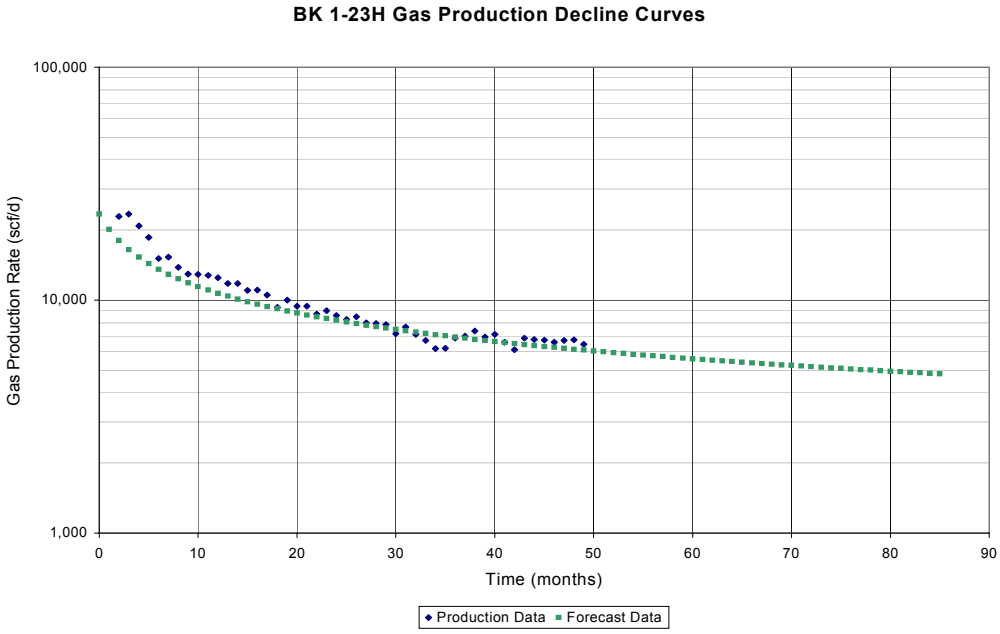


Fig. 8: Decline Parameters: Well BK 1-23H

The gas production decline curves for both wells were also plotted in Excel. Actual and forecasted production rates versus time in months were plotted on a semi-log graph.

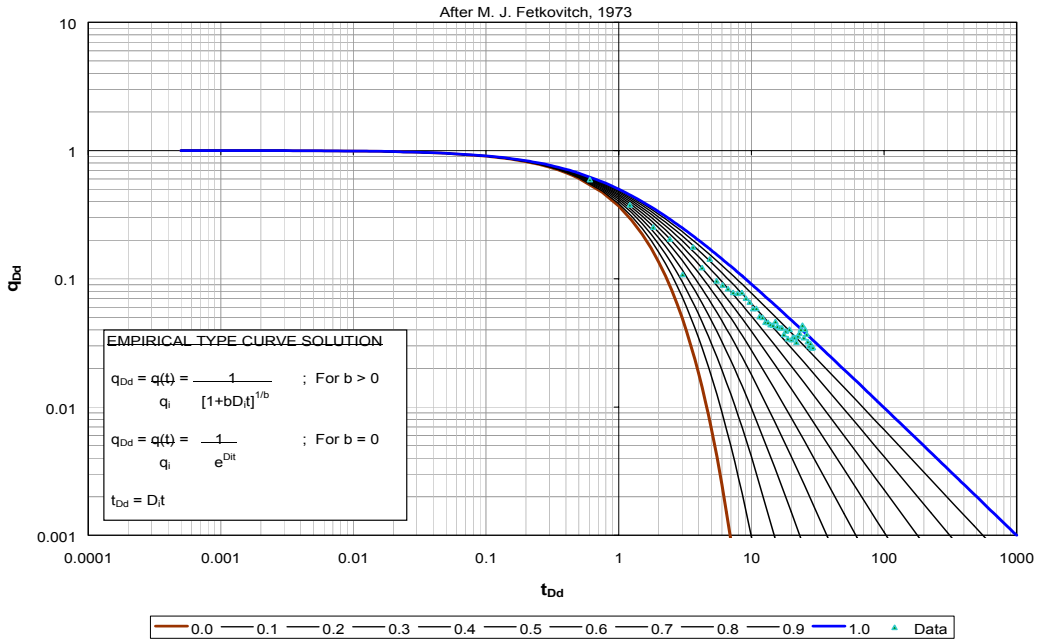
The forecasted production rates were calculated by using the hyperbolic equation for decline and the results from the IPDA program. The gas production decline curves are pictured below.



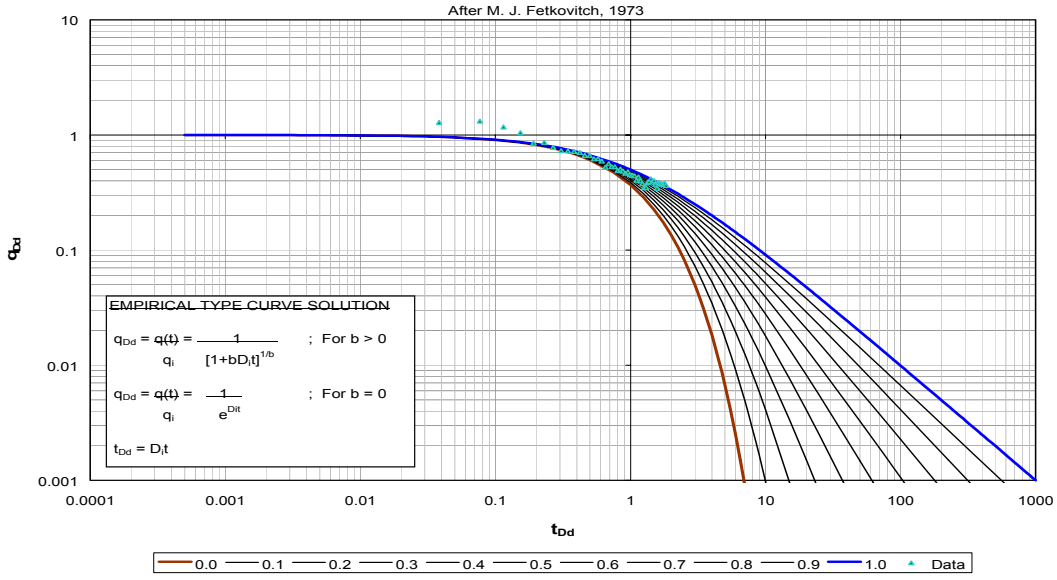


Through the evaluation of the production data fitted to the Type Curve, the initial flow rate and the initial decline rate for each phase of the wells BK 1-23H and BRN 1-7. The plotted data for each phase and well is shown here in the following charts:

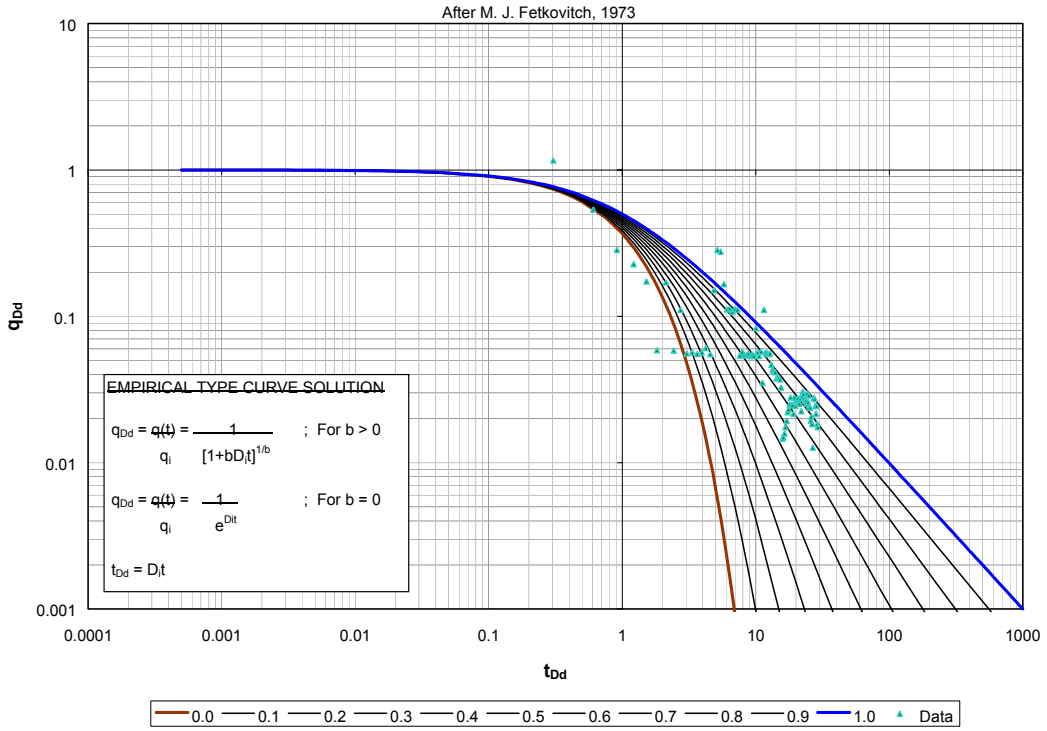
BK 1-23H for oil



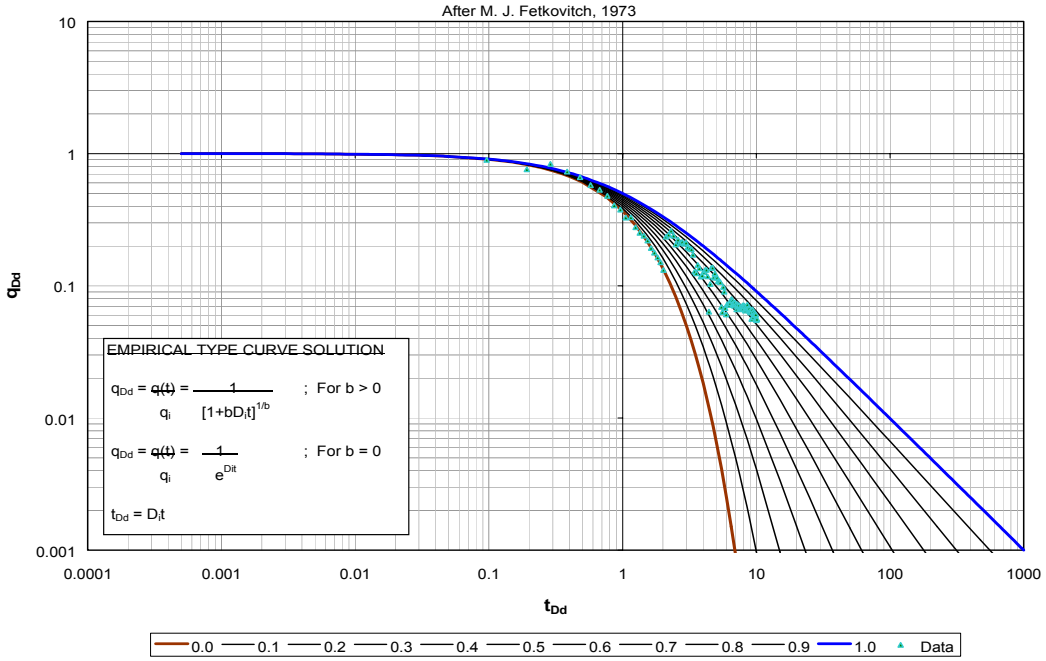
BK 1-23H for Gas



BRN 1-7 for Oil



BRN 1-7 for Gas



The match points and the calculated initial flow rate and initial decline rate are shown in the following tables.

From 1st Match Point

Well	Phase	q(t)	t	qDd	tDd	qi (bbl/mo)	Di (/mo)	b
BK 1-23H	Oil	3,335	30.4	0.593	0.607	5,624	0.02	0.8
BK 1-23H	Gas	22,851	30.4	1.285	0.038	17,783	0.0013	0.6
BRN 1-7	Oil	3,659	30.4	1.157	0.304	3,162	0.01	0.8
BRN 1-7	Gas	42,391	30.4	0.896	0.096	47,311	0.0032	0.7

From 2nd Match Point

Well	Phase	q(t)	t	qDd	tDd	qi (bbl/mo)	Di (/mo)	b
BK 1-23H	Oil	609	152	0.108	3.033	5,639	0.02	0.8
BK 1-23H	Gas	15080	152	0.848	0.191	17,783	0.0013	0.6
BRN 1-7	Oil	1692	60.8	0.535	0.608	3,163	0.01	0.8
BRN 1-7	Gas	6237	638.4	0.132	2.019	47,250	0.0032	0.7

The type curves are not a good source of the values of qi, Di, and b. This is due to the fact that some assumptions are made. The type curve applies to transient, radial flow of as single phase slightly compressible fluid. This does not hold true for these wells. Therefore, the decline curve analysis results are the most accurate to use.

The monthly net cash flow for each well is calculated in Excel using the following constant terms for each well.

Oil Price ($/bbl)	Gas Price ($/Mcf)	Oil Cost ($/bbl)	Gas Cost ($/Mcf)	Tax Rate %	Interest Rate %
$27.00	$ 4.32	$ 2.00	$ 0.20	50%	15%

First, the oil and gas production rates (q) were determined for each month. Then cumulative oil and gas production, Np and Gp, were forecasted at the end of each month for the three years. To calculate the monthly production, the cumulative oil and gas production at the end of each month was subtracted from the next month's cumulative production to determine the next month's total production. The oil revenue was calculated by multiplying the monthly production by the current oil prices. The gas revenue was

calculated in the same manner, but using the change in gas production and the current gas price. The total revenue was calculated by adding the revenues together and subtracting the costs. Tax on the total revenue was also calculated. The net cash flow was then determined by subtracting the taxes from the total revenue. The results of the net cash flow calculations for each well are listed in the charts below.

BK 1-23H					
Month	q	Np	Gp	ΔNp	ΔGp
0	-	243171.57	5520.59	-	–
1	150.43	244990.77	5593.53	1,819.20	72.94
2	148.14	246782.10	5665.86	1,791.33	72.33
3	145.94	248546.51	5737.59	1,764.41	71.73
4	143.81	250284.91	5808.75	1,738.40	71.15
5	141.74	251998.14	5879.33	1,713.23	70.59
6	139.75	253687.03	5949.37	1,688.88	70.04
7	137.81	255352.33	6018.87	1,665.31	69.50
8	135.94	256994.79	6087.84	1,642.46	68.97
9	134.12	258615.11	6156.31	1,620.32	68.46
10	132.36	260213.95	6224.27	1,598.84	67.96
11	130.65	261791.94	6291.74	1,577.99	67.48
12	128.99	263349.70	6358.74	1,557.76	67.00
13	127.37	264887.80	6425.28	1,538.10	66.53
14	125.80	266406.80	6491.36	1,519.00	66.08
15	124.28	267907.23	6556.99	1,500.43	65.63
16	122.79	269389.59	6622.19	1,482.36	65.20
17	121.35	270854.37	6686.96	1,464.78	64.77
18	119.94	272302.04	6751.32	1,447.67	64.35
19	118.57	273733.05	6815.26	1,431.01	63.95
20	117.23	275147.82	6878.81	1,414.77	63.55
21	115.93	276546.76	6941.96	1,398.95	63.15
22	114.66	277930.28	7004.73	1,383.52	62.77
23	113.42	279298.76	7067.12	1,368.47	62.39
24	112.21	280652.55	7129.14	1,353.79	62.02
25	111.03	281992.01	7190.80	1,339.46	61.66
26	109.88	283317.49	7252.11	1,325.48	61.30
27	108.76	284629.31	7313.06	1,311.82	60.95
28	107.66	285927.78	7373.67	1,298.47	60.61
29	106.58	287213.21	7433.95	1,285.43	60.28
30	105.53	288485.89	7493.89	1,272.68	59.94
31	104.51	289746.11	7553.51	1,260.22	59.62
32	103.50	290994.14	7612.81	1,248.03	59.30
33	102.52	292230.24	7671.80	1,236.10	58.99
34	101.56	293454.67	7730.48	1,224.43	58.68
35	100.61	294667.68	7788.85	1,213.01	58.38
36	99.69	295869.51	7846.93	1,201.83	58.08

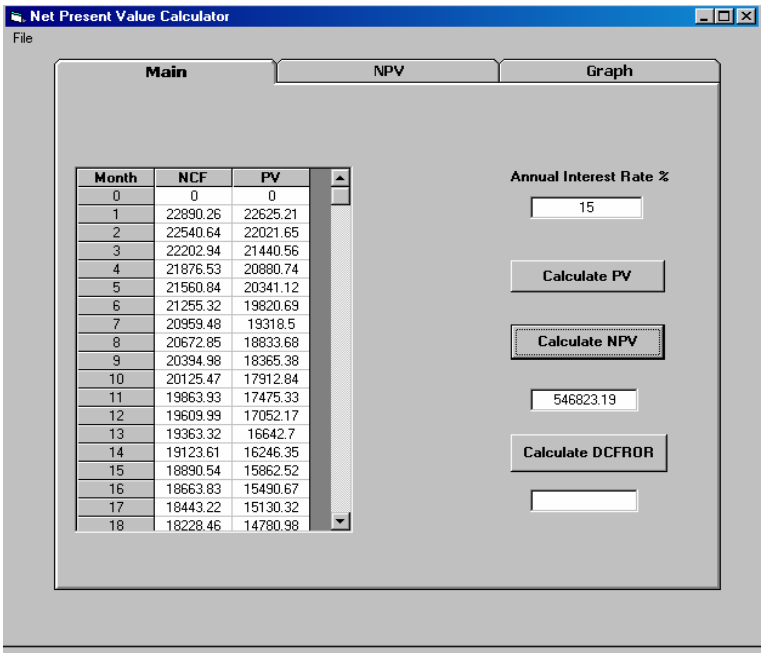
BK 1-23H						
Month	Oil Revenue	Oil Cost	Gas Revenue	Gas Cost	Tax	NCF
1	$ 49,118.40	$ 3,638.40	$ 315.11	$ 14.59	$ 22,890.26	$ 22,890.26
2	$ 48,365.95	$ 3,582.66	$ 312.46	$ 14.47	$ 22,540.64	$ 22,540.64
3	$ 47,639.16	$ 3,528.83	$ 309.89	$ 14.35	$ 22,202.94	$ 22,202.94
4	$ 46,936.70	$ 3,476.79	$ 307.38	$ 14.23	$ 21,876.53	$ 21,876.53
5	$ 46,257.33	$ 3,426.47	$ 304.93	$ 14.12	$ 21,560.84	$ 21,560.84
6	$ 45,599.87	$ 3,377.77	$ 302.55	$ 14.01	$ 21,255.32	$ 21,255.32
7	$ 44,963.25	$ 3,330.61	$ 300.23	$ 13.90	$ 20,959.48	$ 20,959.48
8	$ 44,346.45	$ 3,284.92	$ 297.97	$ 13.79	$ 20,672.85	$ 20,672.85
9	$ 43,748.53	$ 3,240.63	$ 295.76	$ 13.69	$ 20,394.98	$ 20,394.98
10	$ 43,168.61	$ 3,197.67	$ 293.60	$ 13.59	$ 20,125.47	$ 20,125.47
11	$ 42,605.84	$ 3,155.99	$ 291.50	$ 13.50	$ 19,863.93	$ 19,863.93
12	$ 42,059.46	$ 3,115.52	$ 289.44	$ 13.40	$ 19,609.99	$ 19,609.99
13	$ 41,528.73	$ 3,076.20	$ 287.43	$ 13.31	$ 19,363.33	$ 19,363.33
14	$ 41,012.97	$ 3,038.00	$ 285.46	$ 13.22	$ 19,123.61	$ 19,123.61
15	$ 40,511.51	$ 3,000.85	$ 283.54	$ 13.13	$ 18,890.54	$ 18,890.54
16	$ 40,023.77	$ 2,964.72	$ 281.66	$ 13.04	$ 18,663.83	$ 18,663.83
17	$ 39,549.15	$ 2,929.57	$ 279.81	$ 12.95	$ 18,443.22	$ 18,443.22
18	$ 39,087.12	$ 2,895.34	$ 278.01	$ 12.87	$ 18,228.46	$ 18,228.46
19	$ 38,637.16	$ 2,862.01	$ 276.25	$ 12.79	$ 18,019.30	$ 18,019.30
20	$ 38,198.80	$ 2,829.54	$ 274.52	$ 12.71	$ 17,815.53	$ 17,815.53
21	$ 37,771.56	$ 2,797.89	$ 272.82	$ 12.63	$ 17,616.93	$ 17,616.93
22	$ 37,355.02	$ 2,767.04	$ 271.16	$ 12.55	$ 17,423.29	$ 17,423.29
23	$ 36,948.76	$ 2,736.94	$ 269.53	$ 12.48	$ 17,234.43	$ 17,234.43
24	$ 36,552.39	$ 2,707.58	$ 267.94	$ 12.40	$ 17,050.17	$ 17,050.17
25	$ 36,165.55	$ 2,678.93	$ 266.37	$ 12.33	$ 16,870.33	$ 16,870.33
26	$ 35,787.88	$ 2,650.95	$ 264.83	$ 12.26	$ 16,694.75	$ 16,694.75
27	$ 35,419.04	$ 2,623.63	$ 263.32	$ 12.19	$ 16,523.27	$ 16,523.27
28	$ 35,058.72	$ 2,596.94	$ 261.84	$ 12.12	$ 16,355.75	$ 16,355.75
29	$ 34,706.62	$ 2,570.86	$ 260.39	$ 12.06	$ 16,192.04	$ 16,192.04
30	$ 34,362.44	$ 2,545.37	$ 258.96	$ 11.99	$ 16,032.02	$ 16,032.02
31	$ 34,025.91	$ 2,520.44	$ 257.56	$ 11.92	$ 15,875.55	$ 15,875.55
32	$ 33,696.77	$ 2,496.06	$ 256.18	$ 11.86	$ 15,722.52	$ 15,722.52
33	$ 33,374.78	$ 2,472.21	$ 254.82	$ 11.80	$ 15,572.80	$ 15,572.80
34	$ 33,059.68	$ 2,448.87	$ 253.49	$ 11.74	$ 15,426.29	$ 15,426.29
35	$ 32,751.26	$ 2,426.02	$ 252.18	$ 11.68	$ 15,282.87	$ 15,282.87
36	$ 32,449.29	$ 2,403.65	$ 250.90	$ 11.62	$ 15,142.46	$ 15,142.46

BRN 1-7					
Month	q	Np	Gp	ΔNp	ΔGp
0	-	205996.09	9006.48	–	–
1	58.74	206703.39	9038.02	707.31	31.54
2	58.35	207405.97	9069.31	702.58	31.29
3	57.97	208103.89	9100.35	697.92	31.05
4	57.59	208797.24	9131.16	693.34	30.80
5	57.22	209486.07	9161.73	688.83	30.57
6	56.85	210170.46	9192.06	684.39	30.34
7	56.49	210850.49	9222.17	680.02	30.11
8	56.13	211526.20	9252.05	675.72	29.88
9	55.78	212197.68	9281.71	671.48	29.66
10	55.44	212864.98	9311.16	667.30	29.44
11	55.10	213528.17	9340.38	663.19	29.23
12	54.76	214187.30	9369.40	659.13	29.02
13	54.43	214842.43	9398.21	655.14	28.81
14	54.10	215493.63	9426.81	651.20	28.60
15	53.78	216140.95	9455.21	647.32	28.40
16	53.47	216784.44	9483.42	643.49	28.20
17	53.15	217424.15	9511.42	639.72	28.01
18	52.85	218060.15	9539.24	636.00	27.81
19	52.54	218692.48	9566.86	632.33	27.62
20	52.24	219321.19	9594.30	628.71	27.44
21	51.95	219946.33	9621.55	625.14	27.25
22	51.66	220567.95	9648.62	621.62	27.07
23	51.37	221186.09	9675.51	618.15	26.89
24	51.09	221800.81	9702.22	614.72	26.71
25	50.81	222412.15	9728.76	611.34	26.54
26	50.53	223020.15	9755.13	608.00	26.37
27	50.26	223624.86	9781.32	604.71	26.20
28	49.99	224226.31	9807.35	601.45	26.03
29	49.72	224824.56	9833.22	598.24	25.86
30	49.46	225419.63	9858.92	595.07	25.70
31	49.20	226011.58	9884.46	591.95	25.54
32	48.94	226600.43	9909.84	588.86	25.38
33	48.69	227186.24	9935.07	585.80	25.23
34	48.44	227769.03	9960.14	582.79	25.07
35	48.19	228348.84	9985.06	579.81	24.92
36	47.95	228925.71	10009.83	576.87	24.77

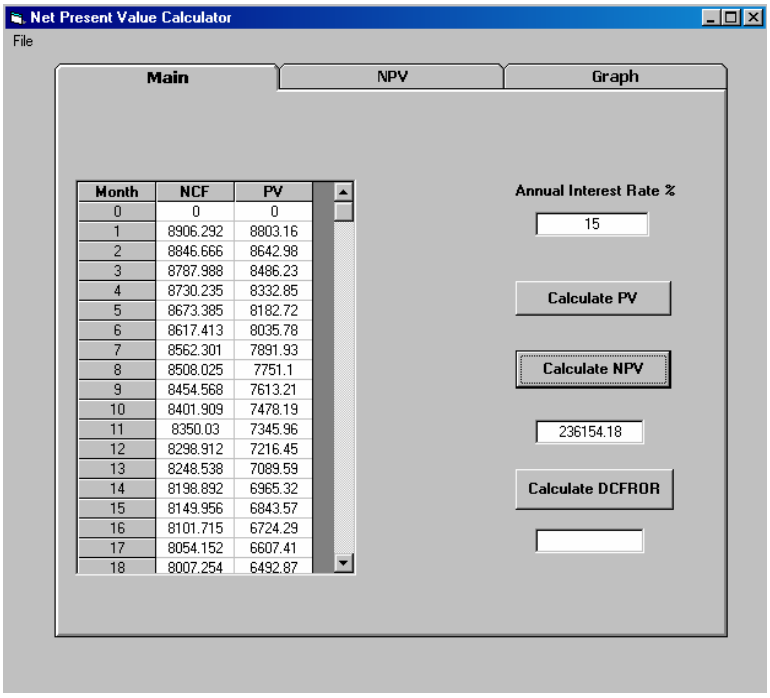
BRN 1-7						
Month	Oil Revenue	Oil Cost	Gas Revenue	Gas Cost	Tax	NCF
1	$19,097.26	$ 1,414.61	$ 136.25	$ 6.31	$ 8,906.29	$ 8,906.29
2	$18,969.57	$ 1,405.15	$ 135.17	$ 6.26	$ 8,846.67	$ 8,846.67
3	$18,843.92	$ 1,395.85	$ 134.12	$ 6.21	$ 8,787.99	$ 8,787.99
4	$18,720.24	$ 1,386.68	$ 133.08	$ 6.16	$ 8,730.24	$ 8,730.24
5	$18,598.49	$ 1,377.67	$ 132.06	$ 6.11	$ 8,673.38	$ 8,673.38
6	$18,478.63	$ 1,368.79	$ 131.05	$ 6.07	$ 8,617.41	$ 8,617.41
7	$18,360.60	$ 1,360.04	$ 130.06	$ 6.02	$ 8,562.30	$ 8,562.30
8	$18,244.37	$ 1,351.43	$ 129.09	$ 5.98	$ 8,508.03	$ 8,508.03
9	$18,129.89	$ 1,342.95	$ 128.13	$ 5.93	$ 8,454.57	$ 8,454.57
10	$18,017.12	$ 1,334.60	$ 127.19	$ 5.89	$ 8,401.91	$ 8,401.91
11	$17,906.01	$ 1,326.37	$ 126.26	$ 5.85	$ 8,350.03	$ 8,350.03
12	$17,796.54	$ 1,318.26	$ 125.35	$ 5.80	$ 8,298.91	$ 8,298.91
13	$17,688.66	$ 1,310.27	$ 124.45	$ 5.76	$ 8,248.54	$ 8,248.54
14	$17,582.33	$ 1,302.40	$ 123.57	$ 5.72	$ 8,198.89	$ 8,198.89
15	$17,477.53	$ 1,294.63	$ 122.69	$ 5.68	$ 8,149.96	$ 8,149.96
16	$17,374.21	$ 1,286.98	$ 121.84	$ 5.64	$ 8,101.71	$ 8,101.71
17	$17,272.35	$ 1,279.43	$ 120.99	$ 5.60	$ 8,054.15	$ 8,054.15
18	$17,171.91	$ 1,271.99	$ 120.16	$ 5.56	$ 8,007.25	$ 8,007.25
19	$17,072.86	$ 1,264.66	$ 119.33	$ 5.52	$ 7,961.01	$ 7,961.01
20	$16,975.17	$ 1,257.42	$ 118.53	$ 5.49	$ 7,915.39	$ 7,915.39
21	$16,878.81	$ 1,250.28	$ 117.73	$ 5.45	$ 7,870.40	$ 7,870.40
22	$16,783.75	$ 1,243.24	$ 116.94	$ 5.41	$ 7,826.02	$ 7,826.02
23	$16,689.97	$ 1,236.29	$ 116.17	$ 5.38	$ 7,782.23	$ 7,782.23
24	$16,597.43	$ 1,229.44	$ 115.40	$ 5.34	$ 7,739.03	$ 7,739.03
25	$16,506.12	$ 1,222.68	$ 114.65	$ 5.31	$ 7,696.39	$ 7,696.39
26	$16,416.00	$ 1,216.00	$ 113.90	$ 5.27	$ 7,654.32	$ 7,654.32
27	$16,327.06	$ 1,209.41	$ 113.17	$ 5.24	$ 7,612.79	$ 7,612.79
28	$16,239.26	$ 1,202.91	$ 112.45	$ 5.21	$ 7,571.80	$ 7,571.80
29	$16,152.59	$ 1,196.49	$ 111.74	$ 5.17	$ 7,531.33	$ 7,531.33
30	$16,067.02	$ 1,190.15	$ 111.03	$ 5.14	$ 7,491.38	$ 7,491.38
31	$15,982.53	$ 1,183.89	$ 110.34	$ 5.11	$ 7,451.93	$ 7,451.93
32	$15,899.10	$ 1,177.71	$ 109.65	$ 5.08	$ 7,412.98	$ 7,412.98
33	$15,816.71	$ 1,171.61	$ 108.98	$ 5.05	$ 7,374.51	$ 7,374.51
34	$15,735.33	$ 1,165.58	$ 108.31	$ 5.01	$ 7,336.52	$ 7,336.52
35	$15,654.95	$ 1,159.63	$ 107.65	$ 4.98	$ 7,299.00	$ 7,299.00
36	$15,575.55	$ 1,153.74	$ 107.00	$ 4.95	$ 7,261.93	$ 7,261.93

Next the net cash flow's net present value was calculated for each well using the Net Present Value Calculator. The results for each well are shown below.

NPV for BK 1-23H

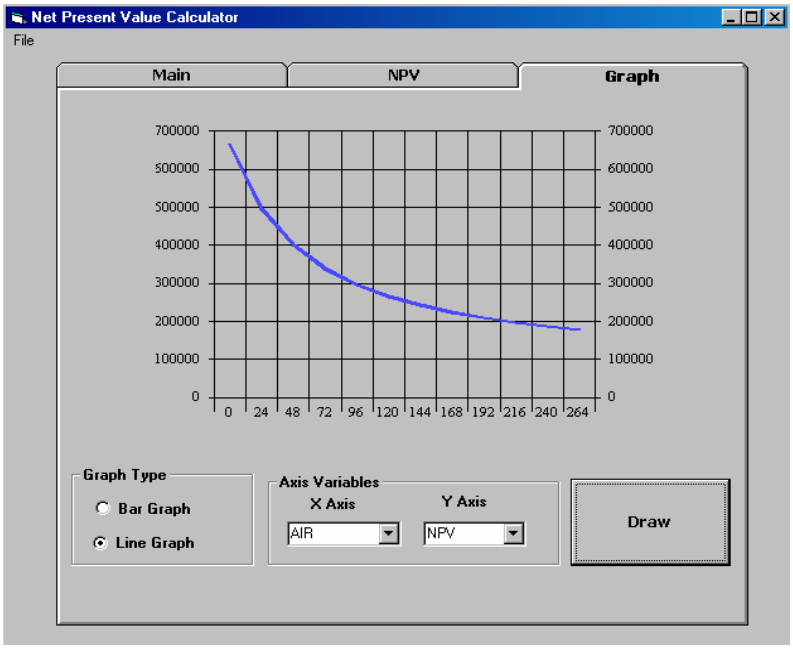


NPV for BRN 1-7

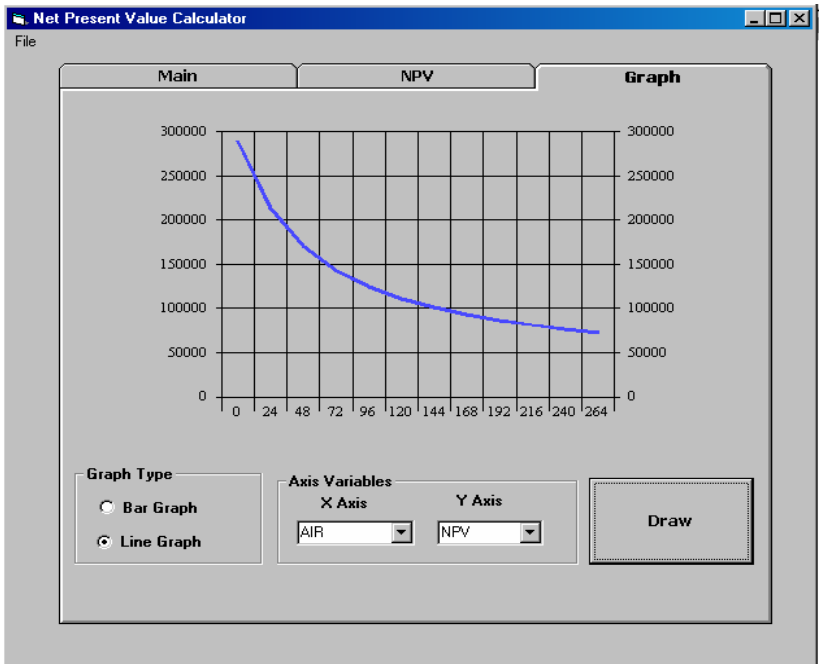


The Net Present Value Calculator produced the present value profile for each well as well. The graphs both show decreasing NPV when interest rate increases. They are displayed below.

PVP for BK 1-23H



PVP for BRN 1-7



Conclusions

This design project has accomplished the task of providing the oil company with the best possible well out of two different proposals. Decline curve analysis determined the values of the initial production rate, the hyperbolic exponent, and the initial nominal decline rate for wells BK 1-23H and BRN 1-7. With these values, the next three year's production for each well was forecasted. With the forecasted production data a monthly net cash flow of each well was calculated. Using a computer application, the net present values of the two wells were calculated. The net present value for well BRN 1-7 was determined to be $236,154 and the net present value of well BK 1-23H was $546,823. These net present values represent the present value of the forecasted three year production of hydrocarbons from the wells. Well BK 1-23H should be selected as long as its purchase price is no more than $310,669 more than the price of well BRN 1-7. If the purchase price of well BK 1-23H exceeds the purchase price of well BRN 1-7 by more than $310,669, then well BRN 1-7 should be selected.

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Appendix

		Bevin	Josh	Andy
BRN 1-7 Plot				**x**
BRN 1-7 IPDA		**x**		
BRN 1-7 Type Curve			**x**	
BK 1-23H Plot				**x**
BK 1-23H IPDA		**x**		
BK 1-23 Type Curve			**x**	
Economics				**x**
Executive Summary		**x**	**x**	**x**
Introduction		**x**		
Methodology		**x**	**x**	
Results and Discussion		**x**	**x**	**x**
Conclusions			**x**	**x**

Appendix

Henry Hub Natural Gas Jan 2003 (NYMEX:NGF 3)

US Light, Sweet Crude Oil Jan 2003 (NYMEX CLF 3)