PERFORMANCE PREDICTION OF WATER-FLOODING SYSTEM USING ECLIPSE SIMULATOR

DISSERTATION SUBMITTED
IN PARTIAL FULFILLMENT OF THE REQUIREMENT
FOR THE AWARD OF THE DEGREE OF
BACHELOR OF TECHNOLOGY
IN
PETROLEUM ENGINEERING

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UNDER THE GUIDANCE OF
Prof: Dr B.P.Pandey

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Dehradun
May, 2007

CERTIFICATE

This is to certify that this dissertation, entitled "PERFORMANCE PREDICTION OF WATER FLOOD-SYSTEM USING ECLIPSE SIMULATOR" is a record of project carried out by Sidharth Sattiraju (R010103039), T.Ashwini Kumar (R010103044), and is submitted towards partial fulfillment of the requirements for the award of the degree of B.Tech in Applied Petroleum Engineering, University Of Petroleum & Energy Studies, Dehradun.

The content of this dissertation has not been a basis for any previous degree to him, or to the best of my knowledge, to any other person.

(Prof: Dr. B P Pandey)

ACKNOWLEDGEMENT

There are many who have helped us, in one way or another, in the completion of this project, and to whom thanks are due. In particular, we would like to place our sincere thanks to Prof: Dr.B.P.Pandey for his invaluable help and advice in the preparation of this project. We would also like to extend our gratitude to our course coordinator Prof. C.K.Jain and Prof: Dr. Choubey for their support and help through out the preparation of this project.

We have made significant use of the wealth of petroleum literature available in the public domain. I apologize to particular author(s) if we failed to acknowledge the appropriate reference at the end of this project. Undoubtedly, this project contains slight errors that our countless hours of review did not uncover. We will appreciate notification by any domain specific member of errors in the text.

Above all else, we hope that this project proves beneficial to the rising petroleum engineers who may use it in their professional work.

10/05/07

(Sidharth Sattiraju)

10/05/07

(T.Ashwini Kumar)

ABSTRACT

To make an economic evaluation of a proposed water-flood project, it is necessary to predict the water flood performance, that is, to make a projection of oil productions, or recovery, for the anticipated life of the project. Performance prediction includes composite value of injection rate, producing rate, producing WOR, oil recovery and cumulative injected water, all versus time.

A variety of water-flood performance prediction methods are available today. They are essentially based on some kind of models, which simulate the mechanism of water flooding the reservoir with the help of one or more formational variables, like permeability heterogeneity, injection rate, displacement mechanism etc.

Displacement models simulate the displacement mechanism of waterflooding where an immiscible oil-water front drives the oil out of the reservoir and hence also known as "frontal displacement[1]" provides the concept of overall floodability.

Buckley-Leverett were the first to model it for a linear system by propounding the theory of "Frontal advance equation" and it acted as a strong foundation from which a fundamental understanding of the displacement mechanism evolved.

This project uses a black oil eclipse simulator to study the various parameters involved in the water flooding. The raw data given by the simulator was used to construct charts showing ultimate recovery, percentage recovery as well as the various key parameters.

1. WATERFLOODING PRACTICE

1.1. FACTORS TO CONSIDER IN WATERFLOODING

Thomas, Mahoney, and Winter (1989) pointed out that in determining the suitability of a candidate reservoir for waterflooding, the following reservoir characteristics must be considered:

- Reservoir geometry
- Fluid properties
- Reservoir depth
- Lithology and rock properties
- Fluid saturations
- Reservoir uniformity and pay continuity
- Primary reservoir driving mechanisms

Each of these topics is discussed in detail in the following subsections.

Reservoir Geometry
The areal geometry of the reservoir will influence the location of wells and, if offshore, will influence the location and number of platforms required. The reservoir's geometry will essentially dictate the methods by which a reservoir can be produced through water-injection practices.
An analysis of reservoir geometry and past reservoir performance is often important when defining the presence and strength of a natural water drive and, thus, when defining the need to supplement the natural injection. If a water-drive reservoir is classified as an active water drive, injection may be unnecessary.

Fluid Properties
The physical properties of the reservoir fluids have pronounced effects on the suitability of a given reservoir for further development by waterflooding. The viscosity of the crude oil is considered the most important fluid property that affects the degree of success of a waterflooding project. The oil viscosity has the important effect of determining the mobility ratio that, in turn, controls the sweep efficiency.

Reservoir Depth
Reservoir depth has an important influence on both the technical and economic aspects of a secondary or tertiary recovery project. Maximum injection pressure will increase with depth. The costs of lifting oil from very deep wells will limit the maximum economic water–oil ratios that can be tolerated, thereby reducing the ultimate recovery factor and increasing the total project operating costs. On the other hand, a shallow reservoir imposes a restraint on the injection pressure that can be used, because this must be less than fracture pressure. In waterflood operations, there is a critical pressure (approximately 1 psi/ft of depth) that, if exceeded, permits the injecting water to expand openings along fractures or to create fractures. This results in the channeling of the injected water or the bypassing of large portions of the reservoir matrix. Consequently, an

operational pressure gradient of 0.75 psi/ft of depth normally is allowed to provide a sufficient margin of safety to prevent pressure parting.

Lithology and Rock Properties

Thomas et al. (1989) pointed out that lithology has a profound influence on the efficiency of water injection in a particular reservoir. Reservoir lithology and rock properties that affect flood ability and success are:

- Porosity
- Permeability
- Clay content
- Net thickness

In some complex reservoir systems, only a small portion of the total porosity, such as fracture porosity, will have sufficient permeability to be effective in water-injection operations. In these cases, a water-injection program will have only a minor impact on the matrix porosity, which might be crystalline, granular, or vugular in nature. Although evidence suggests that the clay minerals present in some sands may clog the pores by swelling and deflocculating when waterflooding is used, no exact data are available as to the extent to which this may occur.

Tight (low-permeability) reservoirs or reservoirs with thin net thickness possess water-injection problems in terms of the desired water injection rate or pressure[4]. Note that the water-injection rate and pressure are roughly related by the following expression:

$$p_{inj} \propto \frac{i_w}{hk}$$

where

p_{inj} = water-injection pressure

i_w = water-injection rate

h = net thickness

k = absolute permeability

The above relationship suggests that to deliver a desired daily injection rate of i_w in a tight or thin reservoir, the required injection pressure might exceed the formation fracture pressure

Fluid Saturations

In determining the suitability of a reservoir for waterflooding, a high oil saturation that provides a sufficient supply of recoverable oil is the primary criterion for successful flooding operations. Note that higher oil saturation at the beginning of flood operations increases the oil mobility that, in turn, gives higher recovery efficiency.

Reservoir Uniformity and Pay Continuity

Substantial reservoir uniformity is one of the major physical criterions for successful waterflooding. For example, if the formation contains a stratum of limited thickness with a very high permeability (i.e., thief zone), rapid channeling and bypassing will develop.

Unless this zone can be located and shut off, the producing water–oil ratios will soon become too high for the flooding operation to be considered profitable.

The lower depletion pressure that may exist in the highly permeable zones will also aggravate the water-channeling tendency due to the high permeability variations. Moreover, these thief zones will contain less residual oil than the other layers, and their flooding will lead to relatively lower oil recoveries than other layers.
Areal continuity of the pay zone is also a prerequisite for a successful waterflooding project. Isolated lenses may be effectively depleted by a single well completion, but a flood mechanism requires that both the injector and producer be present in the lens. Breaks in pay continuity and reservoir anisotropy caused by depositional conditions, fractures, or faulting need to be identified and described before determining the proper well spanning and the suitable flood pattern orientation.

1.2. OPTIMUM TIME TO WATERFLOOD

The most common procedure for determining the optimum time[2] to start waterflooding is to calculate:

- Anticipated oil recovery
- Fluid production rates
- Monetary investment
- Availability and quality of the water supply
- Costs of water treatment and pumping equipment
- Costs of maintenance and operation of the water installation facilities
- Costs of drilling new injection wells or converting existing production wells into injectors

These calculations should be performed for several assumed times and the net income for each case determined. The scenario that maximizes the profit and perhaps meets the operator's desirable goal is selected.

Cole (1969) lists the following factors as being important when determining the reservoir pressure (or time) to initiate a secondary recovery project:

Reservoir oil viscosity
Water injection should be initiated when the reservoir pressure reaches its bubble-point pressure since the oil viscosity reaches its minimum value at this pressure. The mobility of the oil will increase with decreasing oil viscosity, which in turns improves the sweeping efficiency.

Free gas saturation
(1) In water injection projects. It is desirable to have initial gas saturation, possibly as much as 10%. This will occur at a pressure that is below the bubble point pressure. (2) In

gas injection projects. Zero gas saturation in the oil zone is desired. This occurs while reservoir pressure is at or above bubble-point pressure.

Cost of injection equipment
This is related to reservoir pressure, and at higher pressures, the cost of injection equipment increases. Therefore, a low reservoir pressure at initiation of injection is desirable.

Productivity of producing wells
A high reservoir pressure is desirable to increase the productivity of producing wells, which prolongs the flowing period of the wells, decreases lifting costs, and may shorten the overall life of the project.

Effect of delaying investment on the time value of money
A delayed investment in injection facilities is desirable from this standpoint.

Overall life of the reservoir
Because operating expenses are an important part of total costs, the fluid injection process should be started as early as possible.

Some of these six factors act in opposition to others. Thus the actual pressure at which a fluid injection project should be initiated will require optimization of the various factors in order to develop the most favorable overall economics.

The principal requirement for a successful fluid injection project is that sufficient oil must remain in the reservoir after primary operations have ceased to render economic the secondary recovery operations. This high residual oil saturation after primary recovery is essential not only because there must be a sufficient volume of oil left in the reservoir, but also because of relative permeability considerations. A high oil relative permeability, i.e., high oil saturation, means more oil recovery with less production of the displacing fluid. On the other hand, low oil saturation means a low oil relative permeability with more production of the displacing fluid at a given time.

1.3. STAGES OF WATERFLOODING

There are 4 stages in waterflooding:

1. Start—interference
2. Interference—fill-up
3. Fill-up—water breakthrough
4. Water breakthrough—end of the project

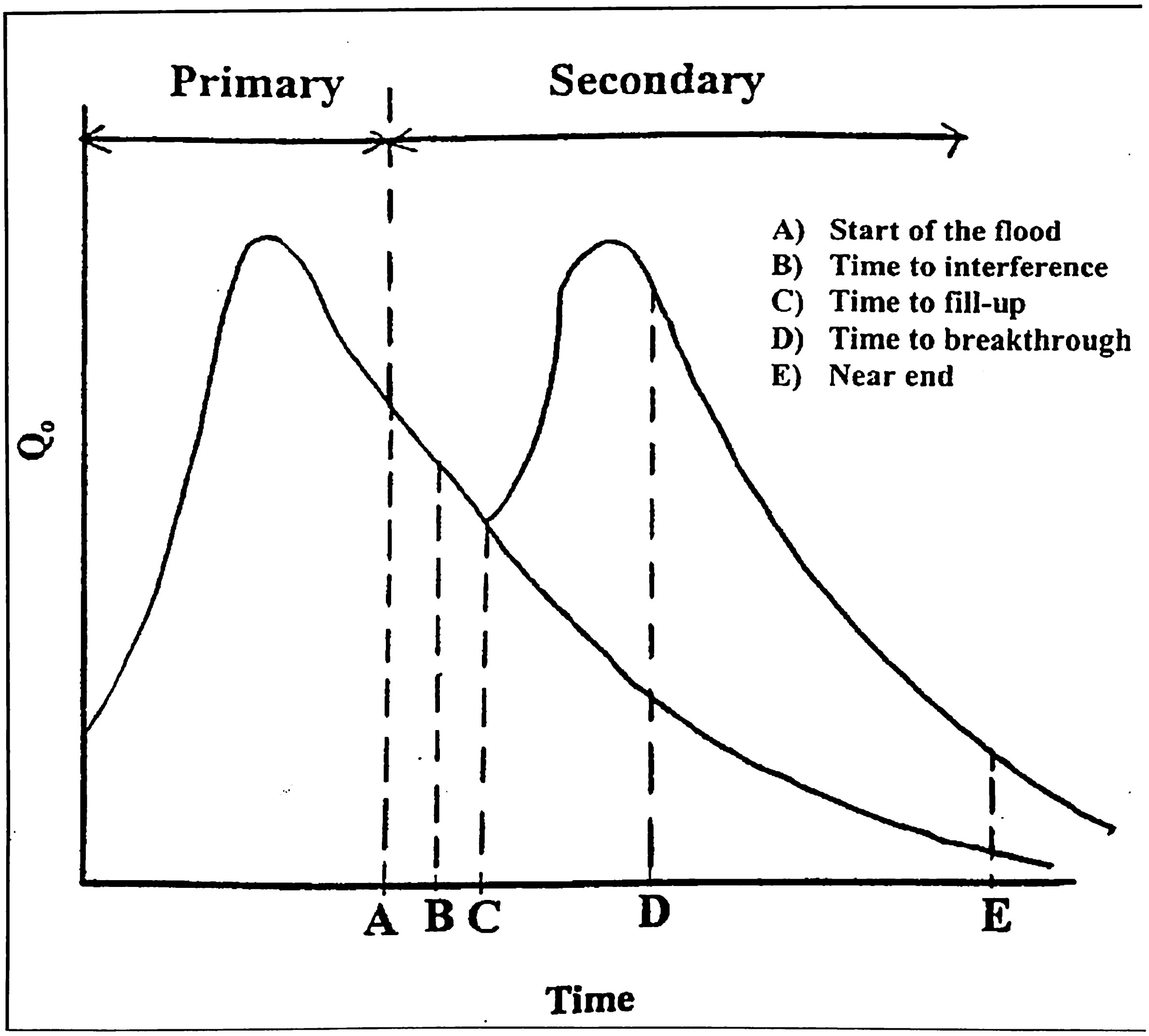


Figure 1. Predicted Production history

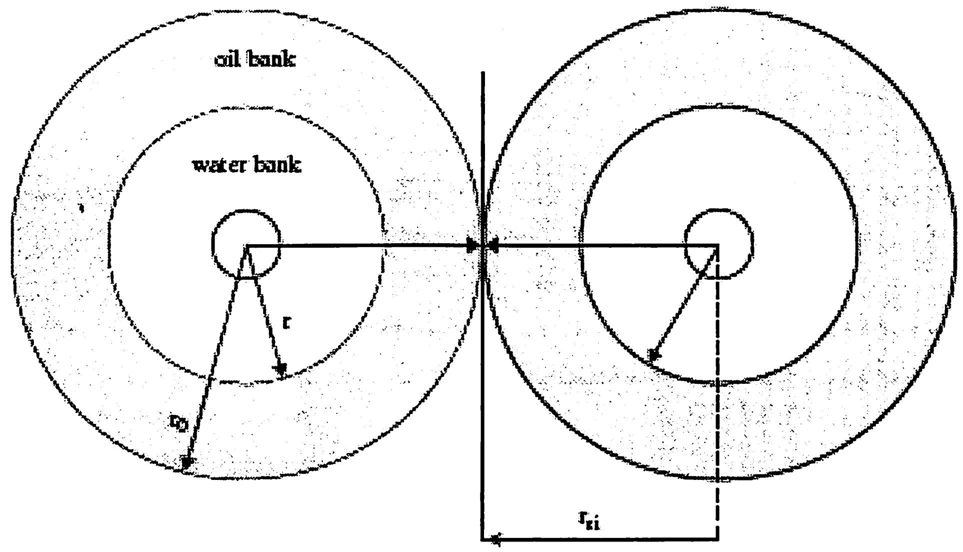


Figure 2. Interference of Oil banks

Stage 1: Start—Interference
At the start of the water-injection process in the selected pattern area of a solution-gas-drive reservoir, high gas saturation usually exists in the flood area as shown schematically in Figure 10.
The current oil production at the start of the flood is represented by point A on the conventional flow rate–time curve[5] of Figure 10.

After the injection is initiated and a certain amount of water injected, an area of high water saturation called the water bank is formed around the injection well at the start of the flood. This stage of the injection is characterized by a radial flow system for both the displacing water and displaced oil.

With continuous water injection, the water bank grows radially and displaces the oil phase that forms a region of high oil saturation that forms an oil bank. This radial flow continues until the oil banks, formed around adjacent injectors, meet. The place where adjacent oil banks meet is termed Interference. During this stage of the flood, the condition around the producer is similar to that of the beginning of the flood, i.e., no changes are seen in the well flow rate Qo.

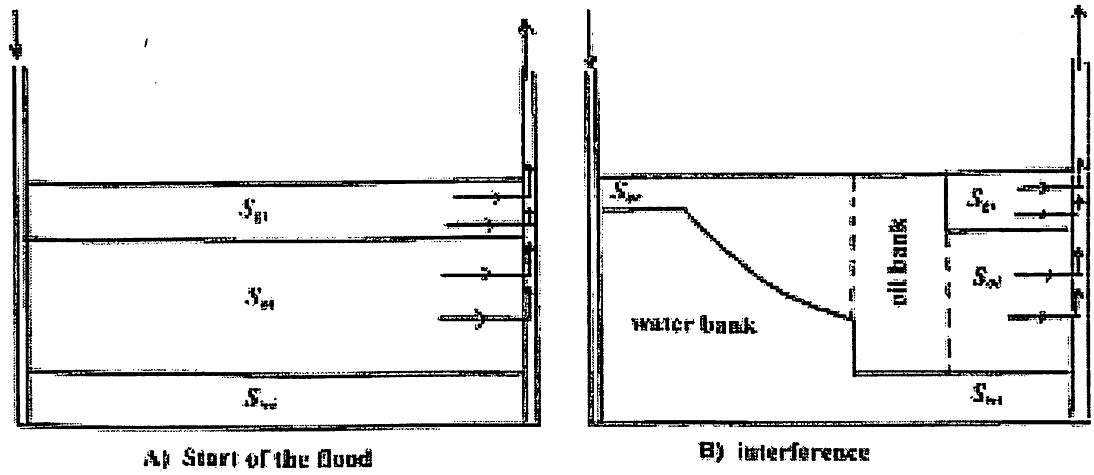


Figure3. Start of Waterflood

Stage 2: Interference—Fill-Up

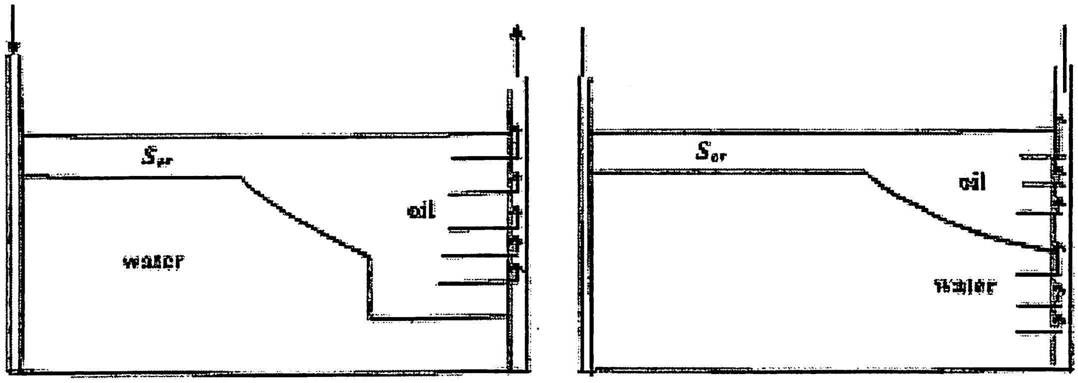
This stage describes the period from interference until the fill-up of the preexisting gas space. Fill-up is the start of oil production response as illustrated by point C on Figure 10. The flow during this time is not strictly radial and is generally complex to quantify mathematically. Therefore, the flood performance can only be determined at the time of fill-up.

Stage 3: Fill-up—Water Breakthrough

The time to fill-up, as represented by point C on Figure-10, marks the following four events:

1. No free gas remaining in the flood pattern
2. Arrival of the oil-bank front to the production well
3. Flood pattern response to the waterflooding
4. Oil flow rate Qo equal to the water injection rate iw

During this stage, the oil production rate is essentially equal to the injection due to the fact that no free gas exists in the swept flood area. With continuous water injection, the leading edge of the water bank eventually reaches the production well, as shown in Figure-13, and marks the time to breakthrough. At breakthrough the water production rises rapidly.



C) Fill-up

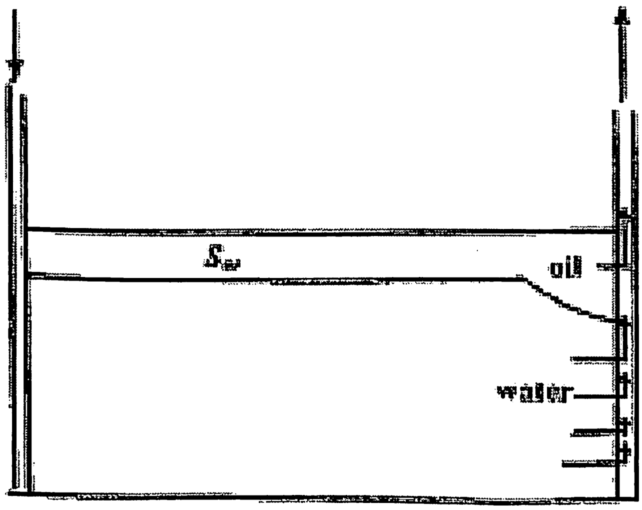
D) water breakthrough

Figure4. Fill – up & Water breakthrough

Stage 4: Water Breakthrough—End of the Project

After breakthrough, the water–oil ratio increases rapidly with a noticeable decline in the oil flow rate as shown in by point D. The swept area will continue to increase as additional water is injected. The incrementally swept area will contribute additional oil production, while the previously swept area will continue to produce both oil and water.

Figure5. End of Project



E) near end of the project

2. RESERVOIR SIMULATION PROCESS & SIMULATORS

2.1. RESERVOIR SIMULATION PROCESS

Reservoir simulation[7] involves solving partial differential equations that describe fluid flow in porous media with numerical methods, such as finite difference method. Partial differential equations are discretized with respect to time and space. A linear equation solver is used to solve all the equations generated in the discretization process.
General reservoir simulation process involves following steps:

- Reservoir characterization
- Simulation
- Simulation validation
- Reservoir management

Reservoir characterization:

- Field mapping
- Production data analysis
- Petrophysical analysis
- Rock characterization
- Fluid characterization
- Volumetric analysis

Field mapping:

- Areal and vertical extent of producing formation
- Isopach maps of gross and net sand thickness
- Correlation of layers and other zones

Reservoir rock characterization:

- Areal variations of average permeability, including directional trends derived from geological interpretations
- Areal variation of the porosity
- Reservoir heterogeneity particularly variation of permeability with thickness and zone

Fluid characterization:

- Relative permeability data for the reservoir rock, reservoir fluid properties include fluid viscosities, densities, FVF, gas solubilities etc. These data are usually obtained by laboratory tests.

Volumetric analysis and production data analysis:

- Included are the field performance histories, the production and injection histories, time dependent pressure distributions and well indexes, the production and injection histories include:
    1. WOR

2. GOR
3. Oil, water & gas injection and production data
4. Fluid break through times

    a. Identification of producing mechanisms- such as fluid expansion, solution gas or water drives
    b. Existence of gas caps or aquifers
    c. Estimation of oil remaining to be produced under primary operations
    d. Pressure distributions in the reservoir
    e. Trapped gas saturation from solution gas drive
    f. Vertical variation of saturation as a result of gravity segregation
    g. Presence of mobile connate water
    h. Areas already water flooded by natural water drive

- Reservoir simulation includes two steps:
    a. Input file construction
    b. History analysis

Input files construction:

- The necessary phase of every simulation study is the gathering of data to be used in the simulator.
- Values of the physical quantities must be specified before a simulation can begin.
- The particular data needed will depend on the nature and complexity of the study.
- Required data can be classified into 3 groups:
    1. Reservoir rock properties
    2. Fluid properties
    3. Field performance

History matching:

Objective of the history match[6] is to reproduce with the simulator the actual reservoir performance. This is achieved by manipulating two fundamental processes that are controlled during history matching the quantity & distribution of fluid within the system. These processes are manipulated by adjusting input data within reasonable limits of conditions existing in the field until a minimal difference remains between the historical data and simulator calculations at same point in time.

Thus history matching is a process of determining poorly known and unknown physical parameters, which are needed as the input to the mathematical reservoir model. Much of the physically measurable information used in the simulator is based on the incomplete or inaccurate field measurements.

Prediction runs:

- After a satisfactory history match of field, performance is obtained within the simulator and prediction runs can be made.

- A number alternative field operations or development scenarios can be evaluated and compared in a short period of time to optimize future reservoir management planning for the field. Because there is no field history to use for comparison with the simulation result for prediction run, it is even more important that critical engineering judgement be applied to the results using the test of reasonabilities.
- Less accuracy in the simulation predictions should be expected when the prediction runs are simulating, operations under a different flow system than that of history matching process.
- A common example of this is history matching primary production performance and then matching predictions of performance under waterflood operations.
- The reason for this is that some uncertain reservoir parameters may have little effect on performance under flow in a gas oil system but may be of critical importance in water-oil system.
- This same caution applies in case of simulator predictions of EOR process performance. Obtaining the best possible reservoir description prior to the simulation work can minimize the potential problems.

Simulation validation:

- Perhaps the most pervasive source of error in the history matching process is the lack of reliable field data. There are many reasons why reported field data may be unreliable. Furthermost, the amount of data is usually limited. Thus the history match may characterize the reported data, but the reported data may not characterize the reservoir.
- Another source of error arises when the derivatives in the mathematical formulation of the model are placed by the finite differences. This error is called the truncation error called numerical dispersion. It can cause a correct set of parameters to yield incorrect results, such as predicting the premature water breakthrough.
- The uniqueness of the parameter sets, the inaccuracy or the incompleteness of the field data and presence of truncation errors in history matching. The engineer should be aware that these problems exist and can cause inexact performance projections.
- Accurate simulation results are dependent on having high quality data on a large number of reservoir parameters.
- One technique that is frequently used to help the guide the data gathering effort and to allocate the data collection time to the critical parameters is to use the simulation model to do sensitivity analysis on selected parameters. By varying each of several selected parameters over a reasonable range of uncertainty and obtaining the effect on simulator performance. The critical controlling parameters can be identified. Further efforts to gather data should be concentrated on these critical parameters.
- Some estimate of OOIP, either by volumetric or MBE, should be made before beginning any field wise simulation study. This independent OOIP calculation provides a check on the simulator input data and reservoir description.
- Also in a large study, the MBE calculation will provide a check on the consistency of the pressure, production and fluid PVT data. If these data cannot

give a reasonably consistent MBE calculation, then proceeding to an expensive simulator study is not justified.

2.2. ECLIPSE 100 SIMULATOR

ECLIPSE 100 is a fully-implicit, three phase, three dimensional, general purpose black oil simulator with gas condensate option. Program is written in FORTRAN77 and operate on any computer with an ANSI-standard FORTRAN77 compiler and with sufficient memory.

ECLIPSE 100 can be used to simulate 1, 2 or 3 phase systems. Two phase options (oil/water, oil/gas, gas/water) are solved as two component systems saving both computer storage and computer time. In addition to gas dissolving in oil (variable bubble point pressure or gas/oil ratio), ECLIPSE 100 may also be used to model oil vaporizing in gas (variable dew point pressure or oil/gas ratio).

Both corner-point and conventional block-center geometry options are available in ECLIPSE. Radial and Cartesian block-center options are available in 1, 2 or 3 dimensions. A 3D radial option completes the circle allowing flow to take place across the 0/360 degree interface.

3. PROBLEM FORMULATION

3.1. RESERVOIR DESCRIPTION

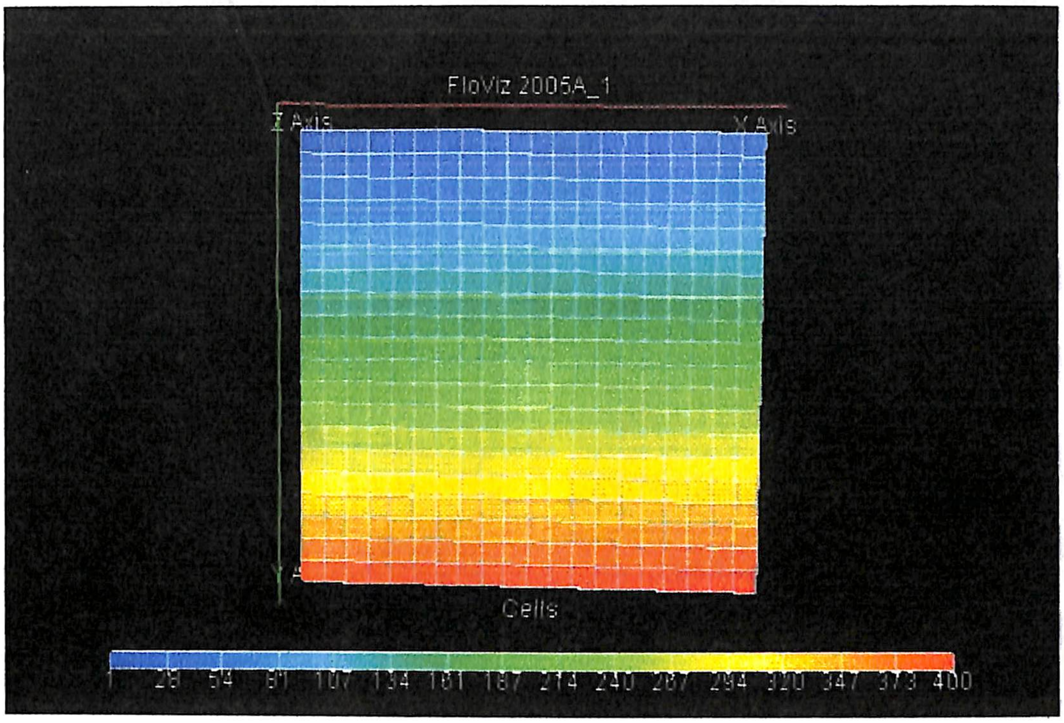
The reservoir to be studied is under production for 2 years. It is planned to waterflood the reservoir to get maximum recovery. This is to be simulated before implementing the plan to estimate the maximum recovery that can be achieved, and to experiment with various waterflood pattern and injection rates to be used.

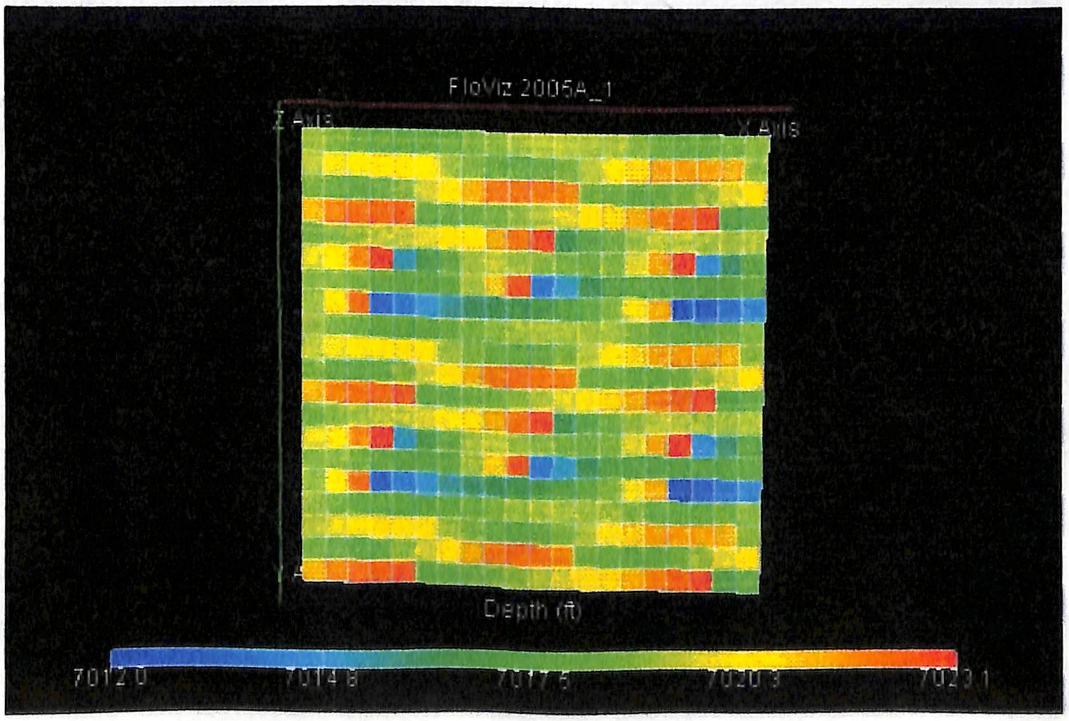
The area of the reservoir studied is 5.74 acres and pay thickness is completed in one layer. The net pay thickness is 20 feet. The reservoir is a homogeneous one and reservoir pressure is 6500 psi. The Oil Initially in Place is 45.38 MMstb. The porosity of the grid blocks are varying and are described in chapter 4. The permeability of the layer is varying throughout the grid blocks in x and y directions. The reservoir bubble point pressure is given by 1050 psi. The reservoir is producing under solution gas drive mechanism and contains 1 well. It was producing at a rate of 1500 bopd after 2 years.

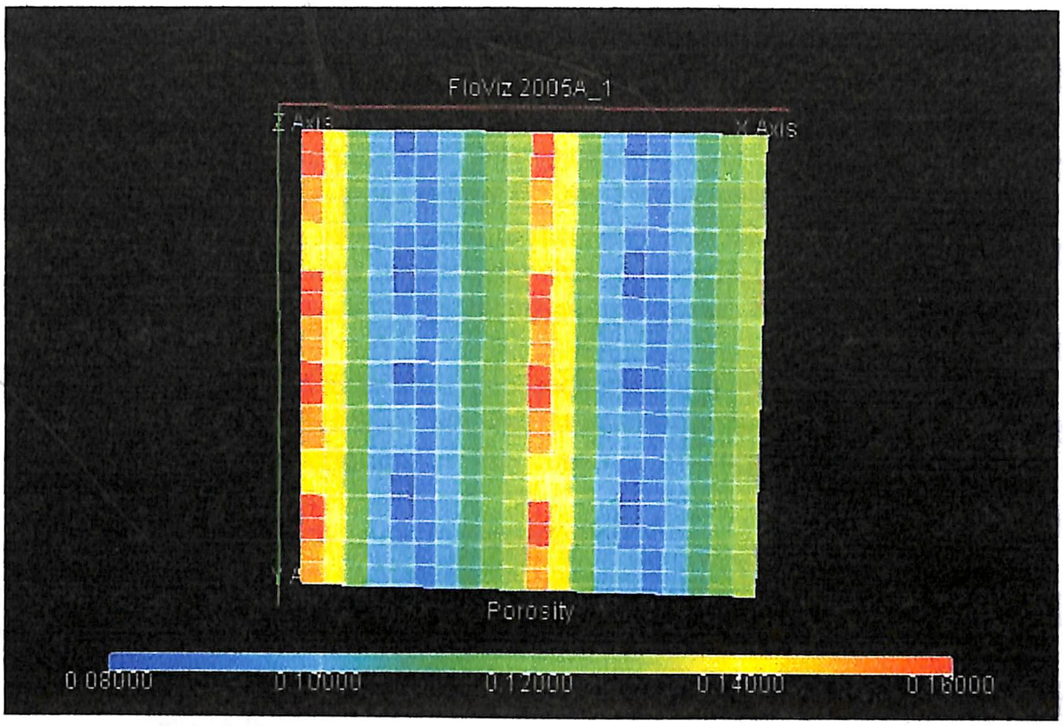
Injection Rates

The reservoir is flooded with different injection rates by taking a fixed 5 spot pattern. The 4 injection wells are placed. Production rates are varied depending on the reservoir pressure. The well will be allowed to produce upto abandonment pressure. Injection pressure is kept constant.

3.2. RESERVOIR MODEL






FloViz 2005A_1
Z Axis
X Axis
Porosity
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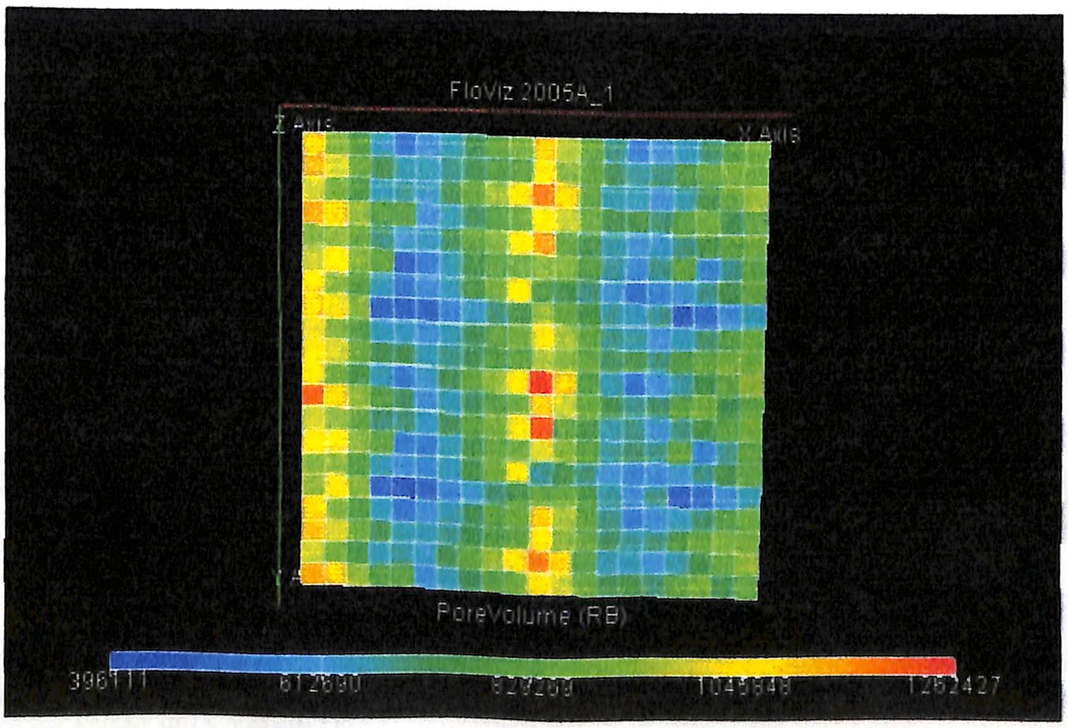
0.10000
0.12000
0.14000
0.16000

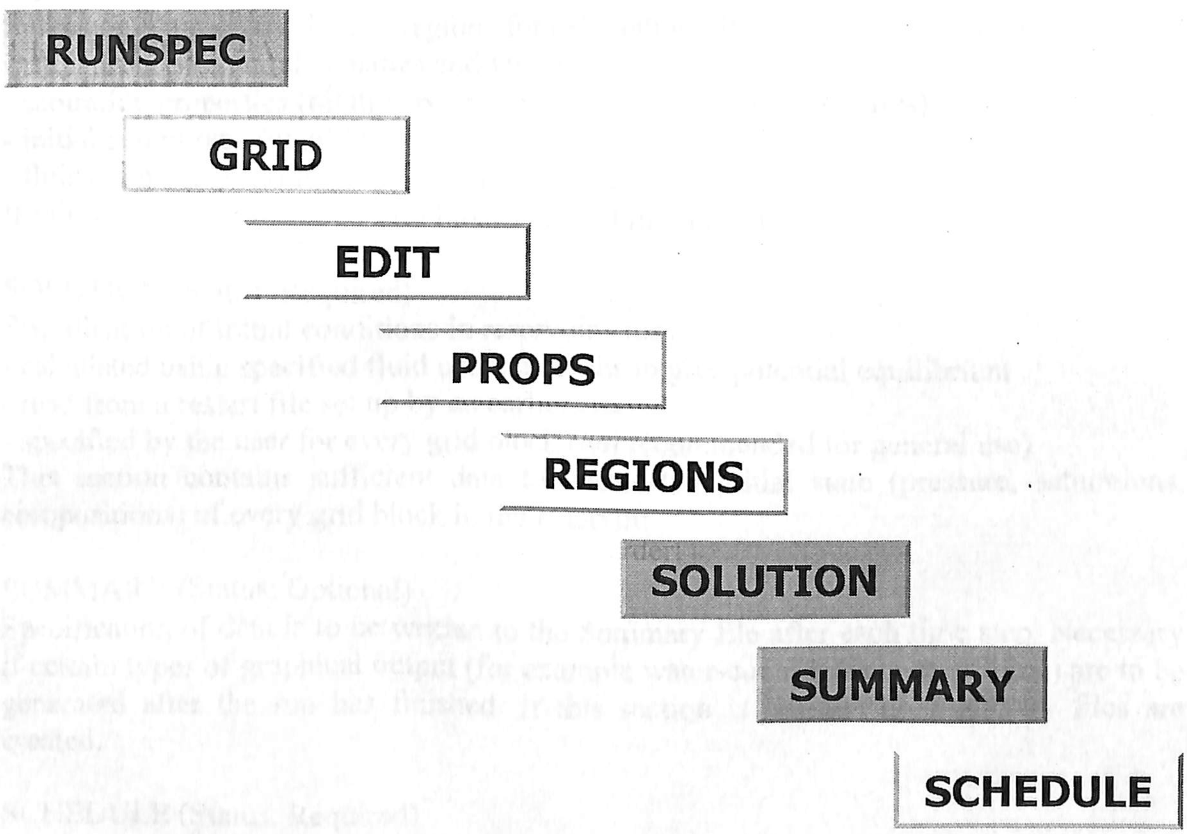

FloViz 2005A_1
Z Axis
X Axis
PoreVolume (RB)
1262427

4. PREDICTION RUNS

4.1. INPUT DATA FILE PREPARATION

- To run simulation you need an input file with all data concerning reservoir and process of its exploitation.
- Input data for ECLIPSE is prepared in free format using a keyword system. Any standard editor may be used to prepare the input file. Alternatively ECLIPSE Office may be used to prepare data interactively through panels, and submit runs.
- The name of input file has to be in the following format: *FILENAME.DATA*

An ECLIPSE data input file is split into sections, each of which is introduced by a section-header keyword. A list of all section-header keywords is given in following, together with a brief description of the contents of each section and examples of keywords using in file code.
The list of section-header keywords in proper order:



The sections must be specified in the shown order.
It is recommended that the body of sections which are not frequently changed be held in separate files which are included in the data using the INCLUDE keyword. A data record has to be ended with a slash [/]

- RUNSPEC (Status: Required)
Title, problem dimensions, switches, phases present, components etc.

GRID (Status: Required)
The GRID section determines the basic geometry of the simulation grid and various rock properties (porosity, absolute permeability, net-to-gross ratios) in each grid cell. From this information, the program calculates the grid block pore volumes, mid-point depths and inter-block transmissibilities.

EDIT (Status: Optional)
Modifications to calculated pore volumes, grid block centre depths and transmissibilities.

PROPS (Status: Required)
Tables of properties of reservoir rock and fluids as functions of fluid pressures, saturations and compositions (density, viscosity, relative permeability, capillary pressure etc.). Contains the equation of state description in compositional runs.

REGIONS (Status: Optional)
Splits computational grid into regions for calculation of:
- PVT properties (fluid densities and viscosities),
- saturation properties (relative permeabilities and capillary pressures)
- initial conditions, (equilibrium pressures and saturations)
- fluids in place (fluid in place and inter-region flows)
If this section is omitted, all grid blocks are put in region 1.

SOLUTION (Status: Required)
Specification of initial conditions in reservoir - may be:
- calculated using specified fluid contact depths to give potential equilibrium
- read from a restart file set up by an earlier run
- specified by the user for every grid block (not recommended for general use)
This section contains sufficient data to define the initial state (pressure, saturations, compositions) of every grid block in the reservoir.

SUMMARY (Status: Optional)
Specification of data is to be written to the Summary file after each time step. Necessary if certain types of graphical output (for example water-cut as a function of time) are to be generated after the run has finished. If this section is omitted no Summary files are created.

SCHEDULE (Status: Required)
Specifies the operations to be simulated (production and injection controls and constraints) and the times at which output reports are required. Vertical flow performance curves and simulator tuning parameters may also be specified in the SCHEDULE section.

4.2. INPUT DATA FILE

```
RUNSPEC

TITLE
INITIAL

DIMENS
20     20     1      /

OIL

WATER

FIELD

WELLDIMS
5 1 2 4/

START
1 'JAN' 2007 /

UNIFOUT

--

GRID

BOX
1      20     1      20     1      1      /

DXV
20*500   /

DYV
20*500 /

DZ
38.2   37.4   36.6   36.0   35.8   36.0   36.6   37.3   38.0   38.5   38.7   38.7
38.6   38.6   37.6   36.7   36.2   36.3   37.0   37.9
39.1   40.1   41.0   41.2   41.1   40.8   38.5   37.5   36.5   35.8   36.4   37.5
38.9   40.4   41.9   43.2   43.4   43.1   42.6   38.1
37.3   36.4   35.8   36.6   38.0   39.5   41.1   42.8   44.3   44.6   44.3   44.0
37.3   37.0   36.6   36.6   37.3   38.4   39.7   41.1
42.5   43.8   44.5   44.8   45.0   36.2   36.6   37.0   37.4   38.1   38.8   39.7
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37.1   38.0   38.6   39.0   39.3   39.7   40.4   41.4   42.8   44.4   46.0   32.9
35.1   37.1   38.5   39.1   39.0   38.7   38.6   38.8
39.7   41.4   43.7   46.2   30.6   33.8   36.7   38.7   39.1   38.5   37.8   37.3
37.1   37.7   39.8   42.9   46.0   28.7   32.1   35.3
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38.2   41.1   44.2   25.8   27.8   29.8   31.3   32.3   32.8   33.1   33.6   34.4
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38.9  40.4  41.9  43.2  43.4  43.1  42.6  38.1
37.3  36.4  35.8  36.6  38.0  39.5  41.1  42.8  44.3  44.6  44.3  44.0
37.3  37.0  36.6  36.6  37.3  38.4  39.7  41.1
42.5  43.8  44.5  44.8  45.0  36.2  36.6  37.0  37.4  38.1  38.8  39.7
40.6  41.7  42.8  43.8  44.8  45.6  34.8  36.0
37.1  38.0  38.6  39.0  39.3  39.7  40.4  41.4  42.8  44.4  46.0  32.9
35.1  37.1  38.5  39.1  39.0  38.7  38.6  38.8
39.7  41.4  43.7  46.2  30.6  33.8  36.7  38.7  39.1  38.5  37.8  37.3
37.1  37.7  39.8  42.9  46.0  28.7  32.1  35.3
37.7  38.0  37.3  36.6  36.0  35.7  36.2  38.6  42.0  45.3  27.3  30.1
32.7  34.7  35.4  35.2  34.9  34.8  35.0  36.0
38.2  41.1  44.2  25.8  27.8  29.8  31.3  32.3  32.8  33.1  33.6  34.4
35.7  37.8  40.2  42.7  24.0  25.5  27.0  28.2
38.2  37.4  36.6  36.0  35.8  36.0  36.6  37.3  38.0  38.5  38.7  38.7
38.6  38.6  37.6  36.7  36.2  36.3  37.0  37.9
39.1  40.1  41.0  41.2  41.1  40.8  38.5  37.5  36.5  35.8  36.4  37.5
38.9  40.4  41.9  43.2  43.4  43.1  42.6  38.1
37.3  36.4  35.8  36.6  38.0  39.5  41.1  42.8  44.3  44.6  44.3  44.0
37.3  37.0  36.6  36.6  37.3  38.4  39.7  41.1
42.5  43.8  44.5  44.8  45.0  36.2  36.6  37.0  37.4  38.1  38.8  39.7
40.6  41.7  42.8  43.8  44.8  45.6  34.8  36.0

/

PORO

0.16 0.14 0.12 0.1 0.08 0.09 0.1 0.11 0.12 0.13 0.16 0.14 0.12 0.1 0.08
0.09 0.1 0.11 0.12 0.13
0.16 0.14 0.12 0.1 0.09 0.09 0.1 0.11 0.12 0.13 0.16 0.14 0.12 0.1 0.09
0.09 0.1 0.11 0.12 0.13
0.15 0.14 0.12 0.1 0.10 0.09 0.1 0.11 0.12 0.13 0.15 0.14 0.12 0.1 0.10
0.09 0.1 0.11 0.12 0.13
0.15 0.14 0.12 0.1 0.10 0.09 0.1 0.11 0.12 0.13 0.15 0.14 0.12 0.1 0.10
0.09 0.1 0.11 0.12 0.13
0.14 0.14 0.12 0.1 0.09 0.09 0.1 0.11 0.12 0.13 0.14 0.14 0.12 0.1 0.09
0.09 0.1 0.11 0.12 0.13
0.14 0.14 0.12 0.1 0.08 0.09 0.1 0.11 0.12 0.13 0.14 0.14 0.12 0.1 0.08
0.09 0.1 0.11 0.12 0.13
0.16 0.14 0.12 0.1 0.08 0.09 0.1 0.11 0.12 0.13 0.16 0.14 0.12 0.1 0.08
0.09 0.1 0.11 0.12 0.13
0.16 0.14 0.12 0.1 0.09 0.09 0.1 0.11 0.12 0.13 0.16 0.14 0.12 0.1 0.09
0.09 0.1 0.11 0.12 0.13
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0.09 0.1 0.11 0.12 0.13
0.16 0.14 0.12 0.1 0.08 0.09 0.1 0.11 0.12 0.13 0.16 0.14 0.12 0.1 0.08
0.09 0.1 0.11 0.12 0.13
0.16 0.14 0.12 0.1 0.09 0.09 0.1 0.11 0.12 0.13 0.16 0.14 0.12 0.1 0.09
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0.09 0.1 0.11 0.12 0.13
0.14 0.14 0.12 0.1 0.09 0.09 0.1 0.11 0.12 0.13 0.14 0.14 0.12 0.1 0.09
0.09 0.1 0.11 0.12 0.13
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0.14 0.14 0.12 0.1 0.08 0.09 0.1 0.11 0.12 0.13 0.14 0.14 0.12 0.1 0.08
0.09 0.1 0.11 0.12 0.13
0.16 0.14 0.12 0.1 0.08 0.09 0.1 0.11 0.12 0.13 0.16 0.14 0.12 0.1 0.08
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0.16 0.14 0.12 0.1 0.09 0.09 0.1 0.11 0.12 0.13 0.16 0.14 0.12 0.1 0.09
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0.09 0.1 0.11 0.12 0.13
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PERMX

150 150 8*160 3*40 4*160 2*80 146
140 150 8*160 3*50 4*134 2*68 147
130 150 8*165 3*40 4*142 2*75 149
120 150 8*170 3*55 4*160 2*77 157
110 150 8*175 3*40 4*132 2*64 152
100 150 8*175 3*34 4*135 2*58 156
90  150 8*160 3*47 4*144 2*74 133
80  150 8*160 3*54 4*154 2*86 133
60  150 8*175 3*70 4*160 2*69 162
50  150 8*175 3*30 4*150 2*80 146
150 150 8*160 3*40 4*160 2*80 146
140 150 8*160 3*50 4*134 2*68 147
130 150 8*165 3*40 4*142 2*75 149
120 150 8*170 3*55 4*160 2*77 157
110 150 8*175 3*40 4*132 2*64 152
100 150 8*175 3*34 4*135 2*58 156
90  150 8*160 3*47 4*144 2*74 133
80  150 8*160 3*54 4*154 2*86 133
60  150 8*175 3*70 4*160 2*69 162
50  150 8*175 3*30 4*150 2*80 146
/

PERMY

150 150 8*160 3*140 4*160 2*80 146
140 150 8*160 3*150 4*134 2*68 147
130 150 8*165 3*140 4*142 2*75 149
120 150 8*170 3*155 4*160 2*77 157
110 150 8*175 3*140 4*132 2*64 152
100 150 8*175 3*134 4*135 2*58 156
90  150 8*160 3*147 4*144 2*74 133
80  150 8*160 3*154 4*154 2*86 133
60  150 8*175 3*170 4*160 2*69 162
50  150 8*175 3*130 4*150 2*80 146
150 150 8*160 3*140 4*160 2*80 146
140 150 8*160 3*150 4*134 2*68 147
130 150 8*165 3*140 4*142 2*75 149
120 150 8*170 3*155 4*160 2*77 157
110 150 8*175 3*140 4*132 2*64 152
100 150 8*175 3*134 4*135 2*58 156
90  150 8*160 3*147 4*144 2*74 133
80  150 8*160 3*154 4*154 2*86 133
60  150 8*175 3*170 4*160 2*69 162
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50  150 8*175 3*130 4*150 2*80 146
/
PERMZ

400*150 /

ENDBOX
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TOPS

7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000 7000
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7000 7000 7000 7000 7000 7000

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INIT

--*********************************************
```
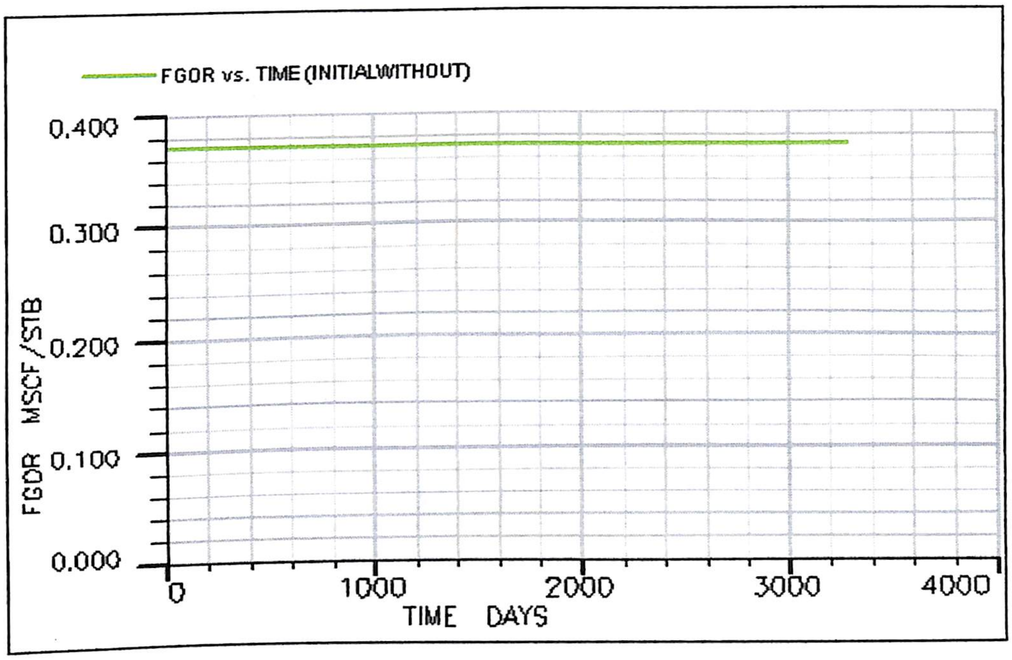

```
EDIT

--*******************************************
PROPS

SWOF
-- Sw          krw            kro          Pcwo
0.20           0.000000       0.900000     0
0.25           0.000364       0.709187     0
0.30           0.002536       0.544963     0
0.35           0.007892       0.405962     0
0.40           0.017660       0.290741     0
0.45           0.032987       0.197760     0
0.50           0.054960       0.125368     0
0.55           0.084625       0.071765     0
0.60           0.122991       0.034959     0
0.65           0.171041       0.012686     0
0.70           0.229732       0.002243     0
0.75           0.300000       0.000000     0
/

-- Specifies PVT properties of OIL
PVDO
400  1.012  1.16
1200 1.0040 1.164
2000 0.9960 1.167
2800 0.9880 1.172
3600 0.9802 1.177
4400 0.9724 1.181
5200 0.9646 1.185
5600 0.9607 1.19
/

PVTW
1050         1            2.67E-06     0.56341      1.20E-07 /

RSCONST
0.37 1050    /

DENSITY
47    63.0200    /

ROCK
1050.0       5.0E-06 /

--*******************************************
REGIONS

--*******************************************
SOLUTION

EQUIL
7020   6500   7020  0    0      /

--*******************************************
SUMMARY
```

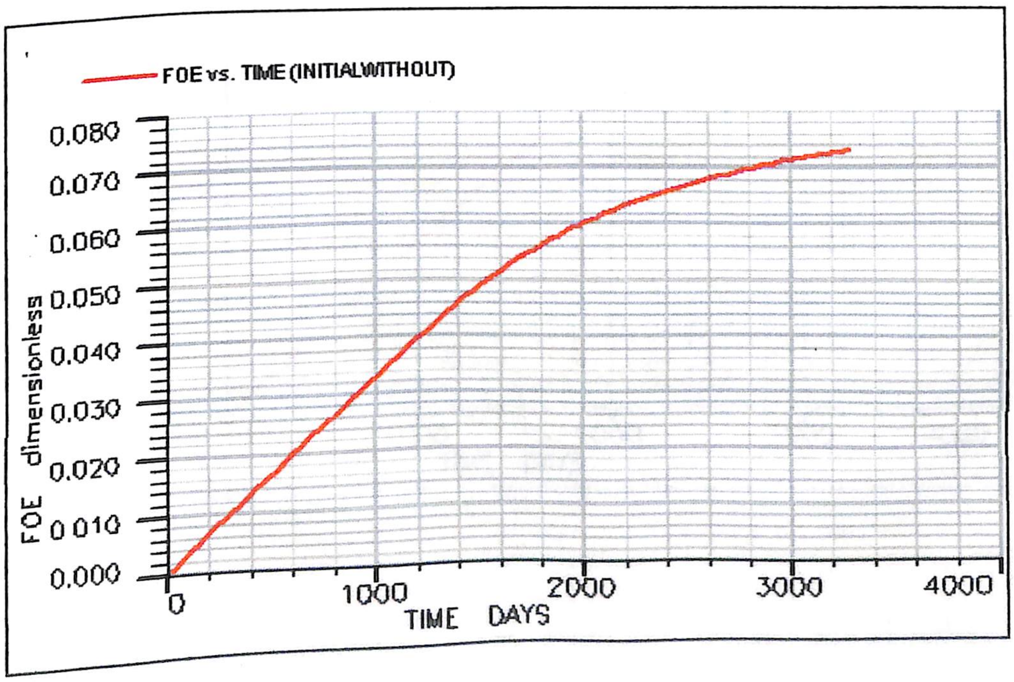
```
-- Average pressure for field.
FPR

-- Oil production total
FOPT

-- Water injection total of field
FWIT

--Water cut
FWCT

--OIL IN PLACE
FOIP

-- FORMATION WATER SATURATION
FWSAT

--Water Reservoir Volume in Place
FWIPR

--Fraction of total oil produced by water influx
FORFW

--FORM OIL PORE VOL
FOPV

--FORM WATER PORE VOL
FWPV

--OIL RECOVERY
FOE

--GOR
FGOR

--Water production
FWPT

-- Average pressure for field.
FPR

-- Oil production total
FOPT

-- Water injection total of field
FWIT

--Water production
FWPT

-- WATER GAS RATIO
FWGR

EXCEL

--*******************************************
```

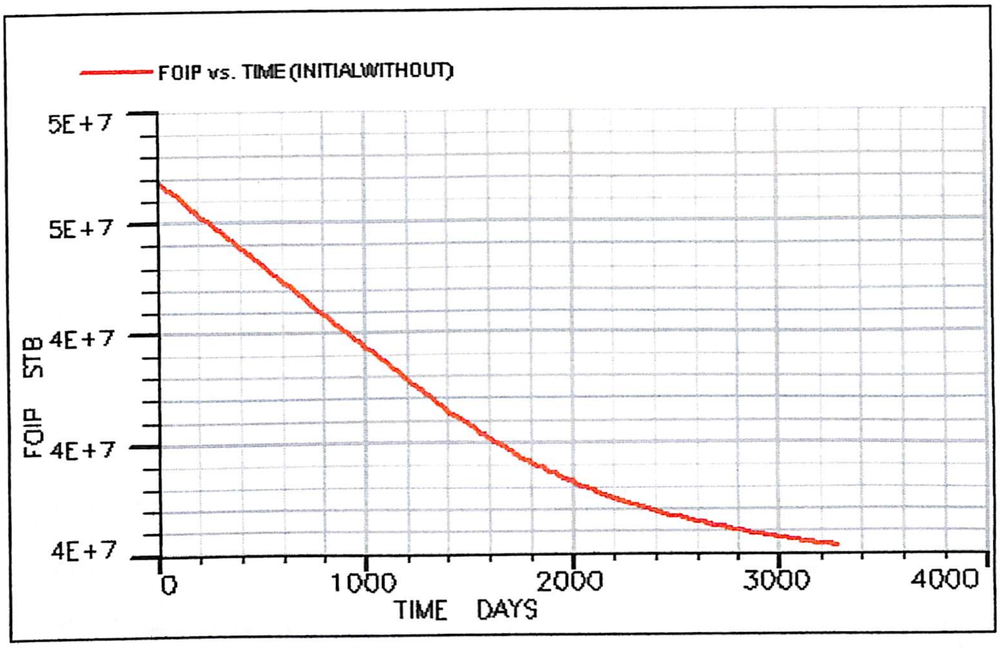
```
SCHEDULE

WELSPECS
P G1 10 10 7015 'OIL' /
/

COMPDAT
P 10 10 1 1 'OPEN' 2*  0.2  /
/

WCONPROD
P 'OPEN' ORATE 1500     4*    1000/
/
TSTEP

31    28    31    30    31    30    31    31    30    31    30    31
31    28    31    30    31    30    31    31    30    31    30    31
/

WELSPECS
I1 G2 7 10  7015 'WAT' /
I2 G2 13 10 7015 'WAT'/
I3 G2 10 7  7015 'WAT'/
I4 G2 10 13 7015 'WAT'/
/

COMPDAT
I1 7 10 1 1 'OPEN' 2*  0.2   /
I2 13 10 1 1 'OPEN' 2*  0.2   /
I3 10 7 1 1 'OPEN' 2*  0.2   /
I4 10 13 1 1 'OPEN' 2*  0.2  /
/

WCONPROD
P 'OPEN' ORATE 1500     4*    1000/
/

WCONINJE
I1 WATER OPEN RATE 4000 1*    5000/
I2 WATER OPEN RATE 4000 1*    5000/
I3 WATER OPEN RATE 4000 1*    5000/
I4 WATER OPEN RATE 4000 1*    5000/

/
TSTEP

31    28    31    30    31    30    31    31    30    31    30    31
31    28    31    30    31    30    31    31    30    31    30    31
31    28    31    30    31    30    31    31    30    31    30    31
31    28    31    30    31    30    31    31    30    31    30    31
31    28    31    30    31    30    31    31    30    31    30    31
31    28    31    30    31    30    31    31    30    31    30    31
31    28    31    30    31    30    31    31    30    31    30    31
/

END
```

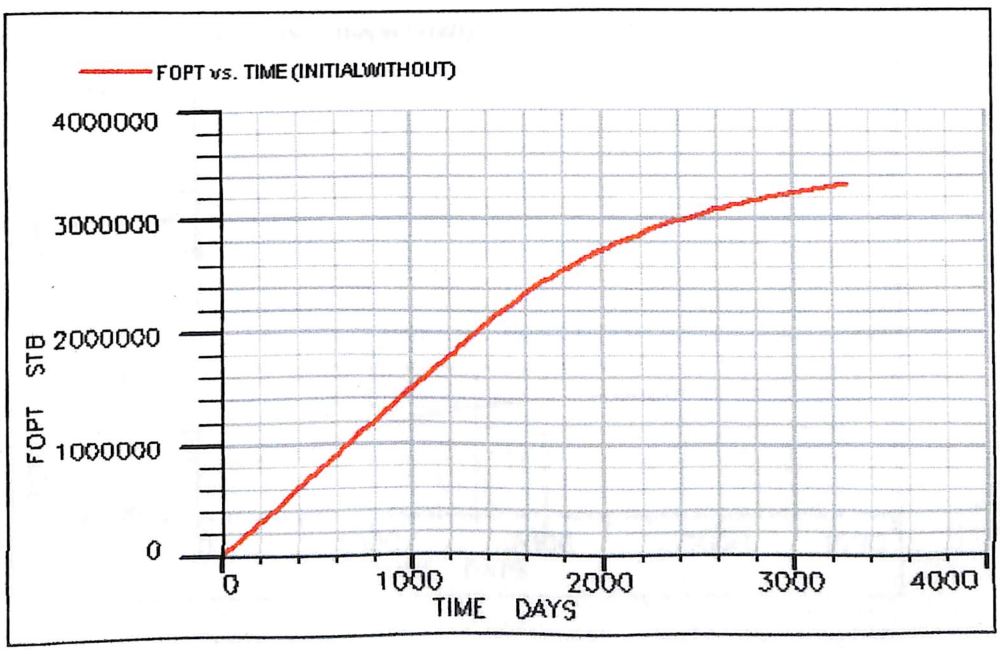
5. RESULTS

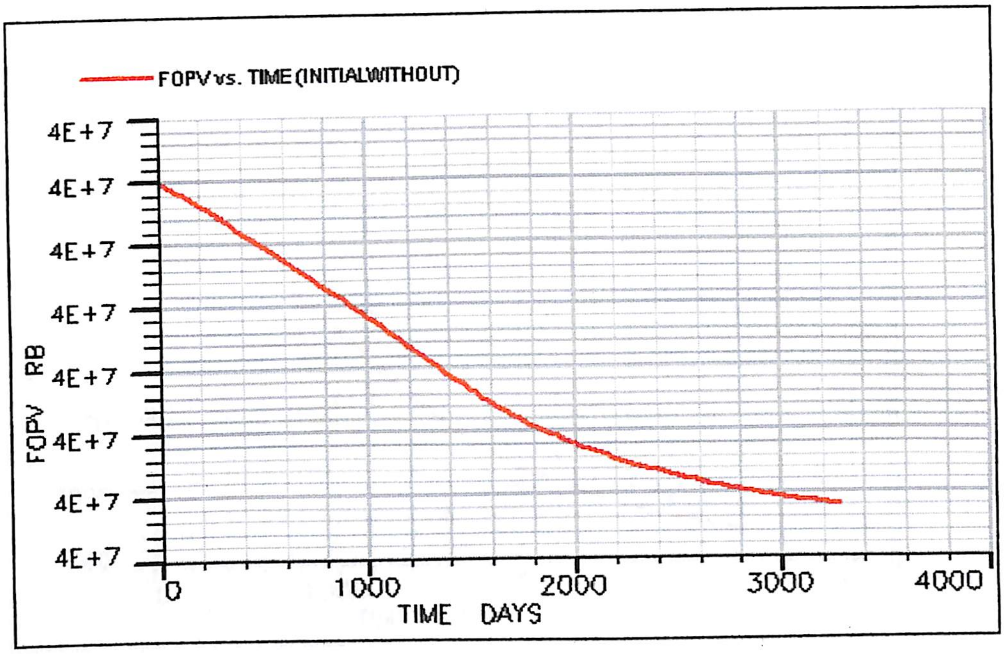
BEFORE WATER INJECTION

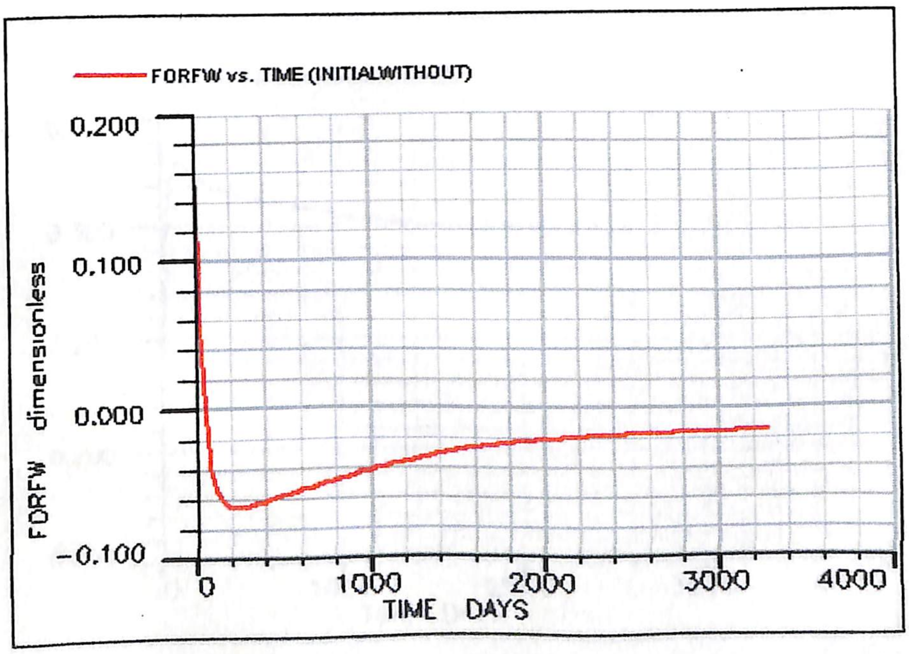


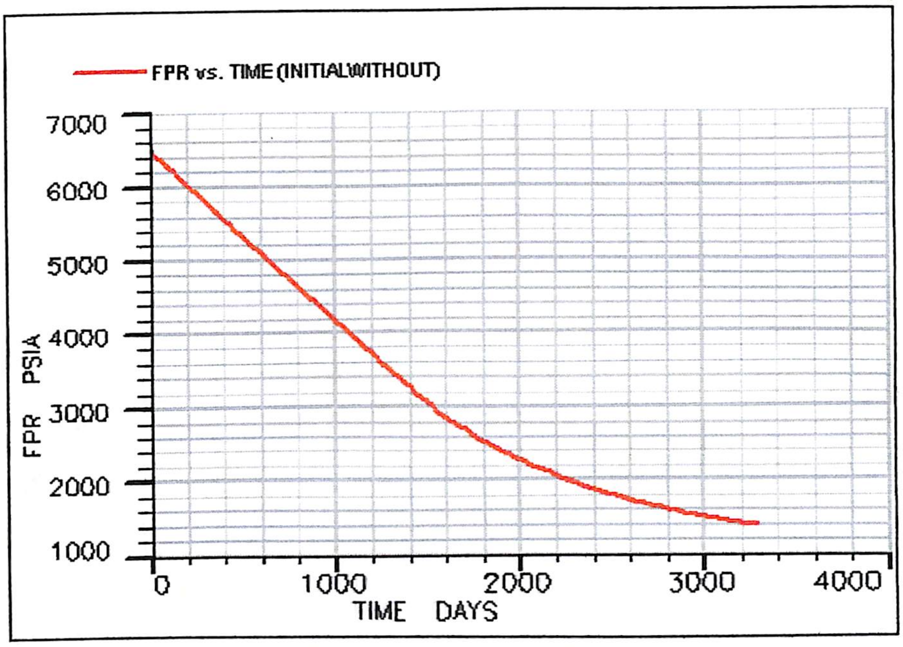


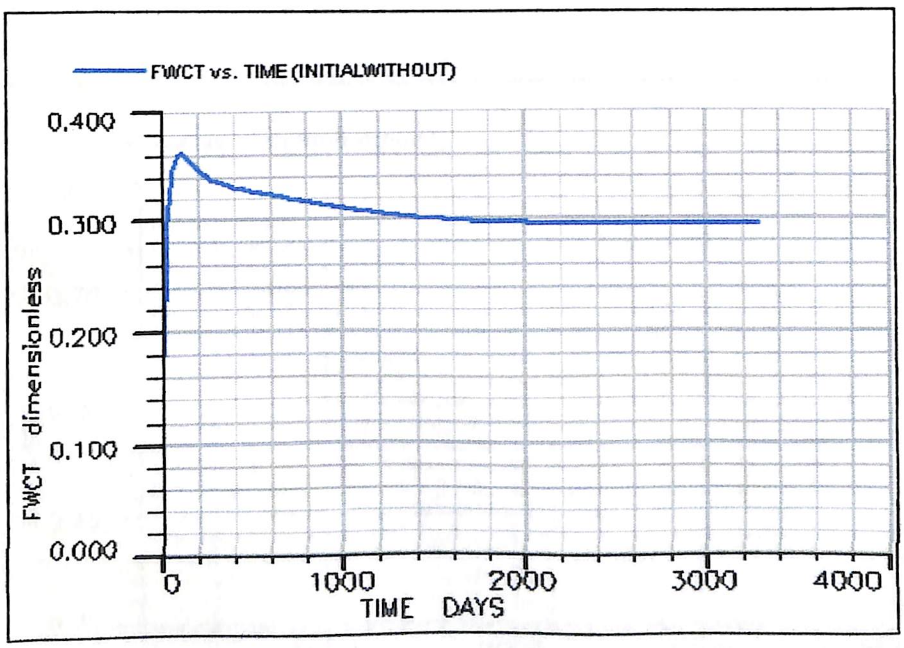

FOIP vs. TIME (INITIALWITHOUT)
5E+7
5E+7
4E+7
4E+7
4E+7
FOIP STB
0
1000
2000
3000
4000
TIME DAYS

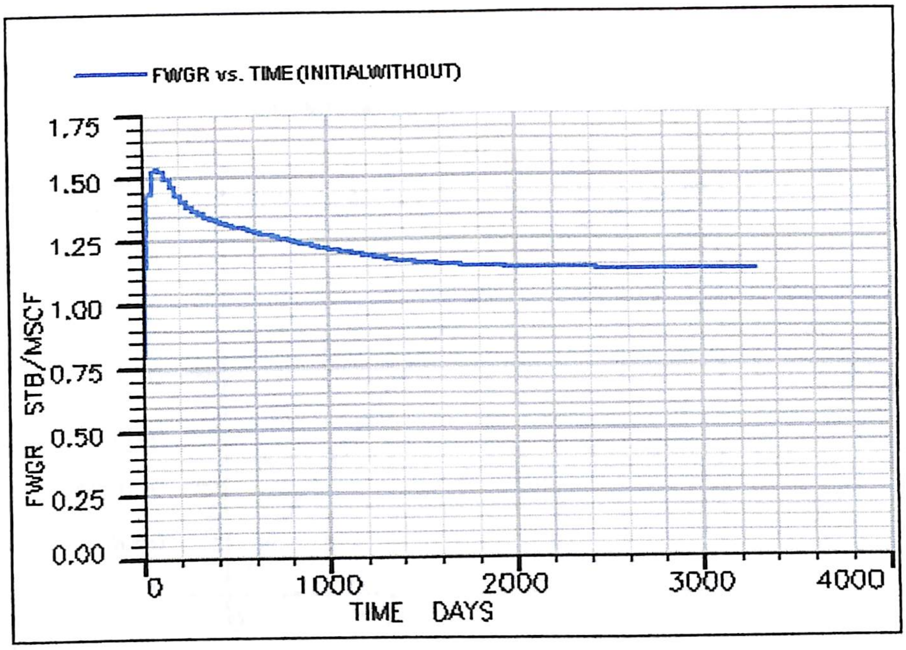

FOPT vs. TIME (INITIALWITHOUT)
4000000
3000000
2000000
1000000
0
FOPT STB
0
1000
2000
3000
4000
TIME DAYS

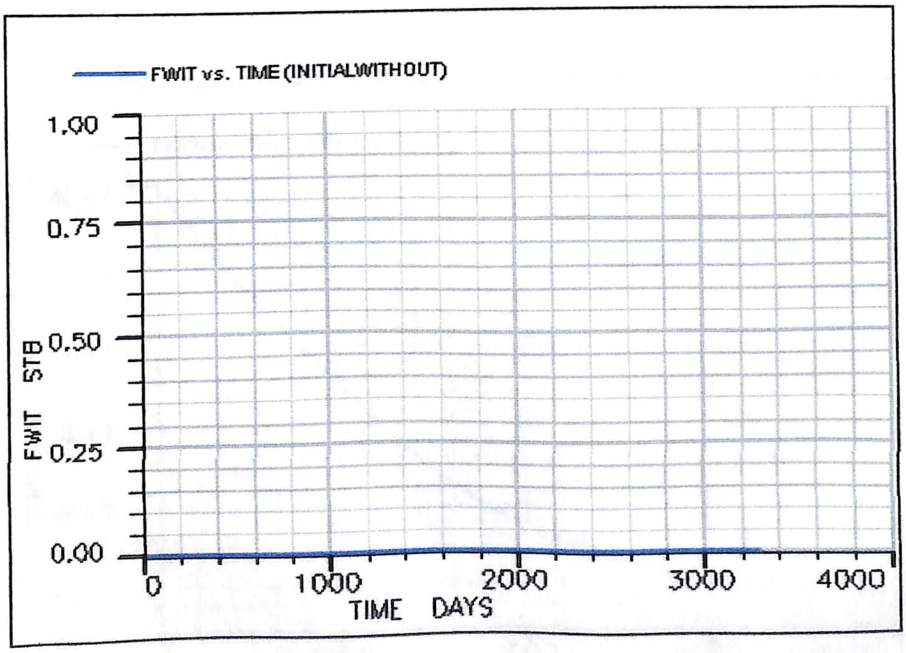

FOPV vs. TIME (INITIALWITHOUT)
4E+7
4E+7
4E+7
4E+7
4E+7
4E+7
4E+7
4E+7
FOPV RB
0
1000
2000
3000
4000
TIME DAYS

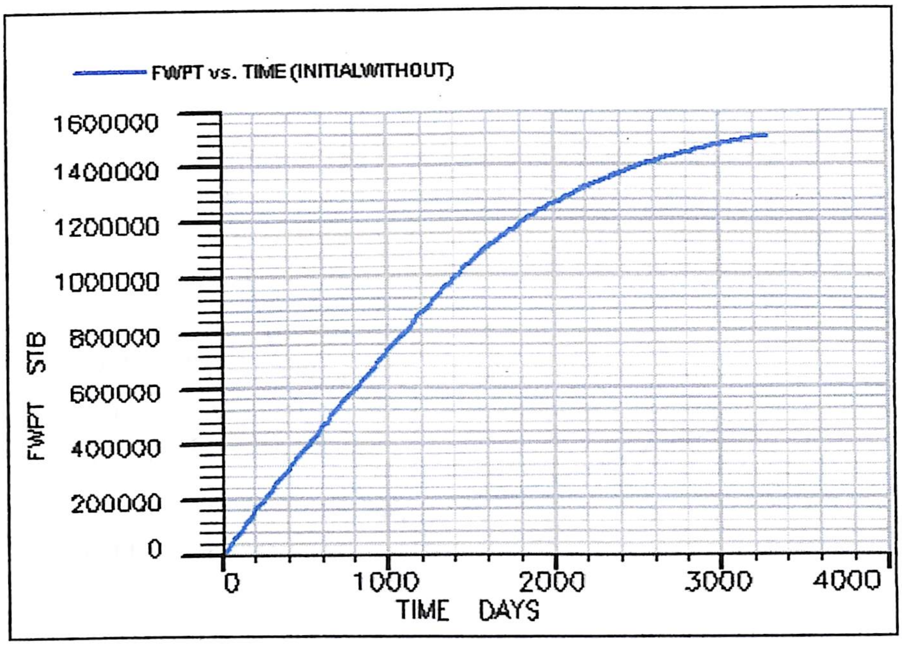

FORFW vs. TIME (INITIALWITHOUT)
0.200
0.100
0.000
-0.100
FORFW dimensionless
0
1000
2000
3000
4000
TIME DAYS

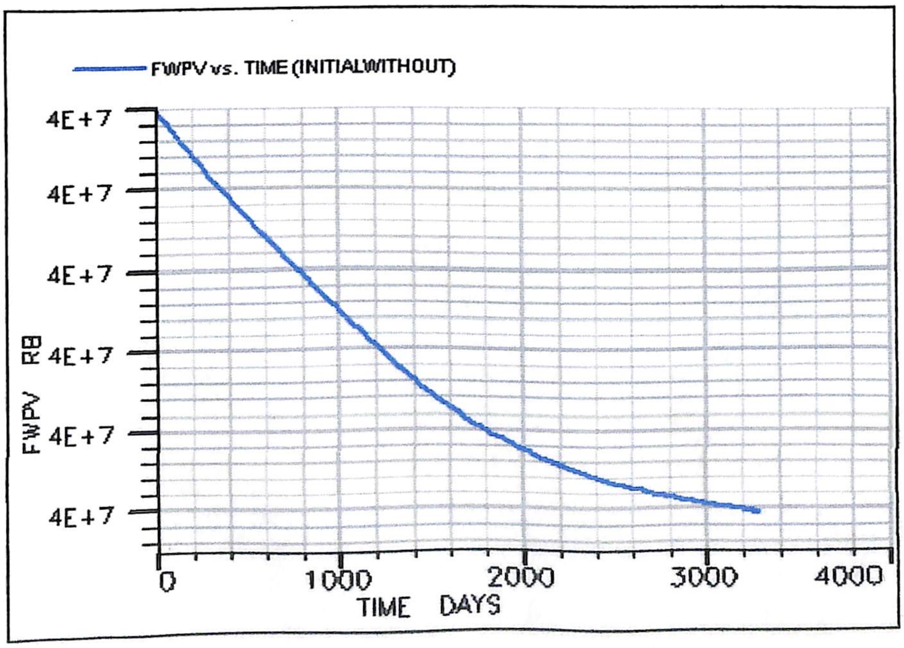

FPR vs. TIME (INITIALWITHOUT)
7000
6000
5000
4000
3000
2000
1000
FPR PSIA
0
1000
2000
3000
4000
TIME DAYS

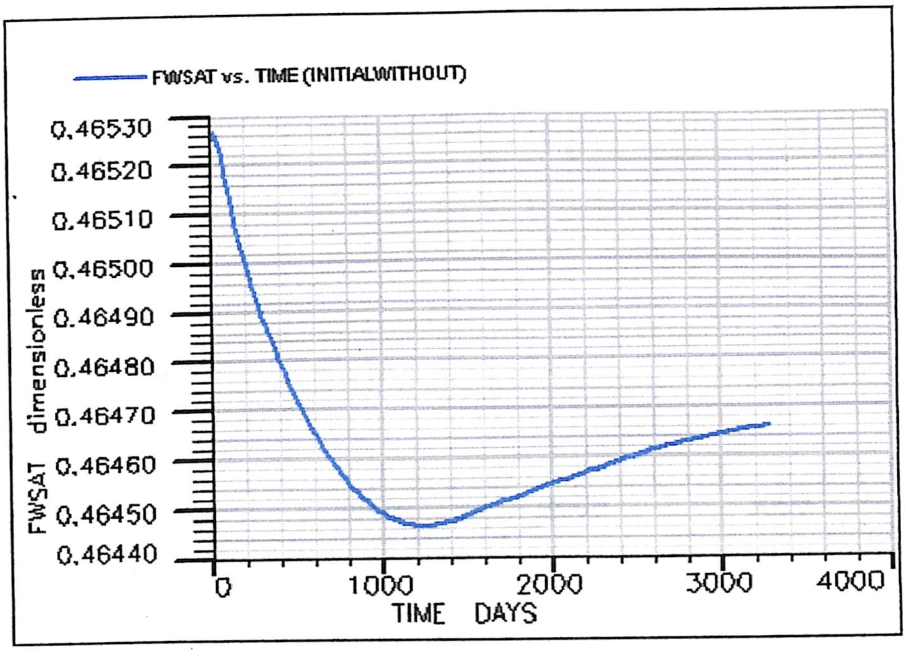

FWCT vs. TIME (INITIALWITHOUT)
0.400
0.300
0.200
0.100
0.000
FWCT dimensionless
0
1000
2000
3000
4000
TIME DAYS


FWGR vs. TIME (INITIALWITHOUT)
FWGR STB/MSCF
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
0
1000
2000
3000
4000
TIME DAYS

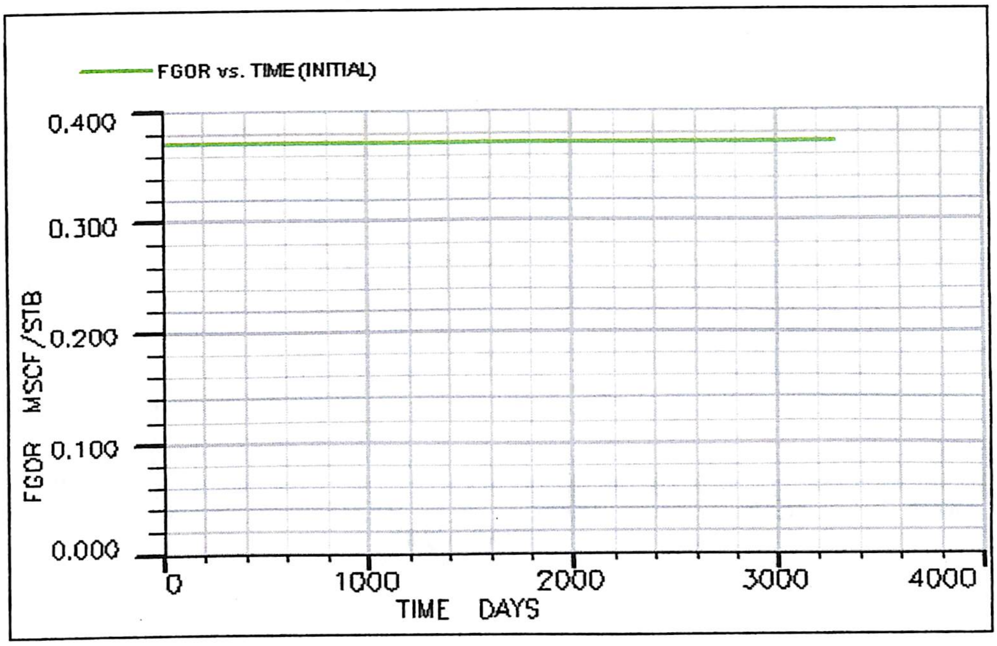

FWIT vs. TIME (INITIALWITHOUT)
FWIT STB
1.00
0.75
0.50
0.25
0.00
0
1000
2000
3000
4000
TIME DAYS

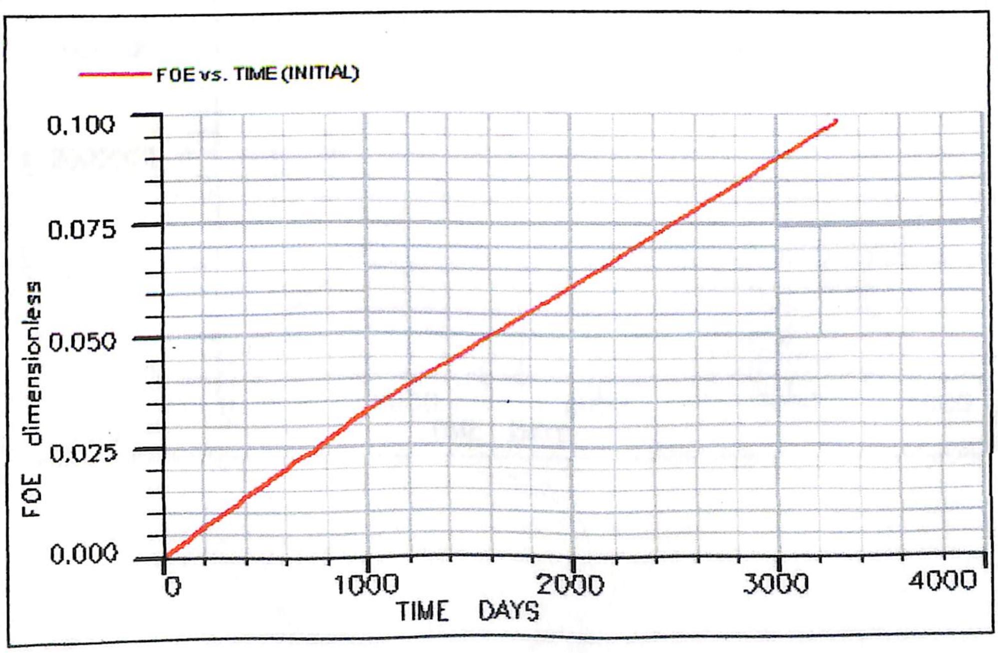

FWPT vs. TIME (INITIALWITHOUT)
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
FWPT STB
0
1000
2000
3000
4000
TIME DAYS

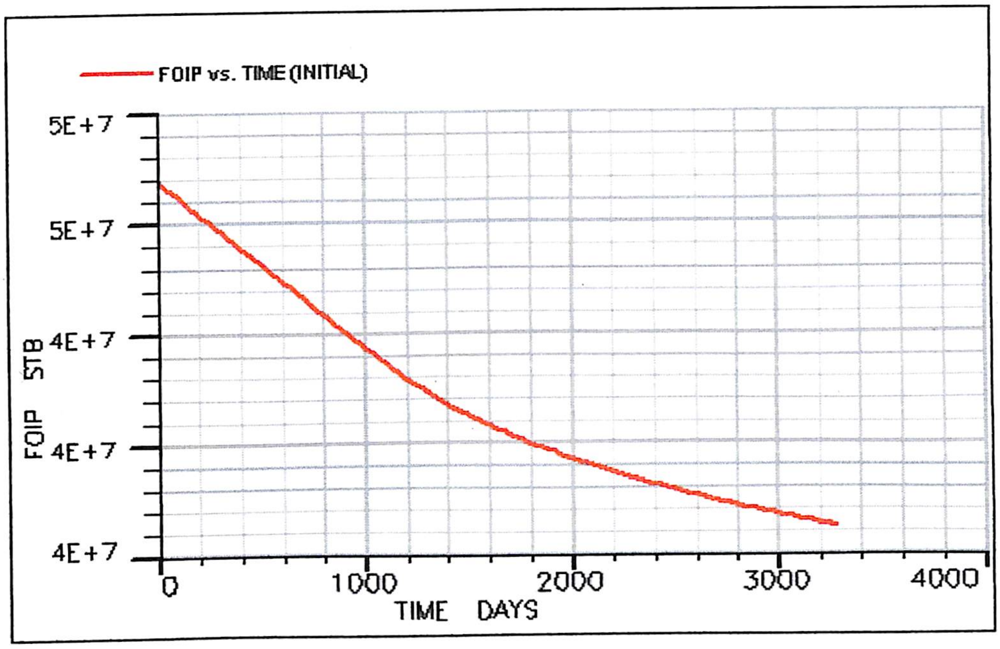

FWPV vs. TIME (INITIALWITHOUT)
4E+7
4E+7
4E+7
4E+7
4E+7
4E+7
FWPV RB
0
1000
2000
3000
4000
TIME DAYS


FWSAT vs. TIME (INITIALWITHOUT)
0.46530
0.46520
0.46510
0.46500
0.46490
0.46480
0.46470
0.46460
0.46450
0.46440
FWSAT dimensionless
0
1000
2000
3000
4000
TIME DAYS

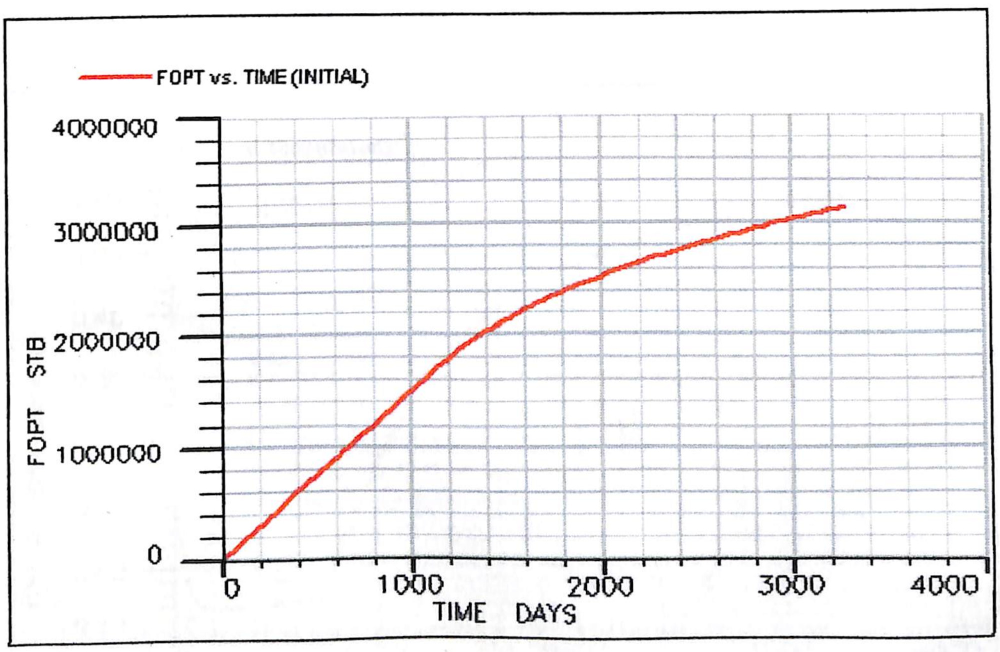
AFTER WATERFLOODING



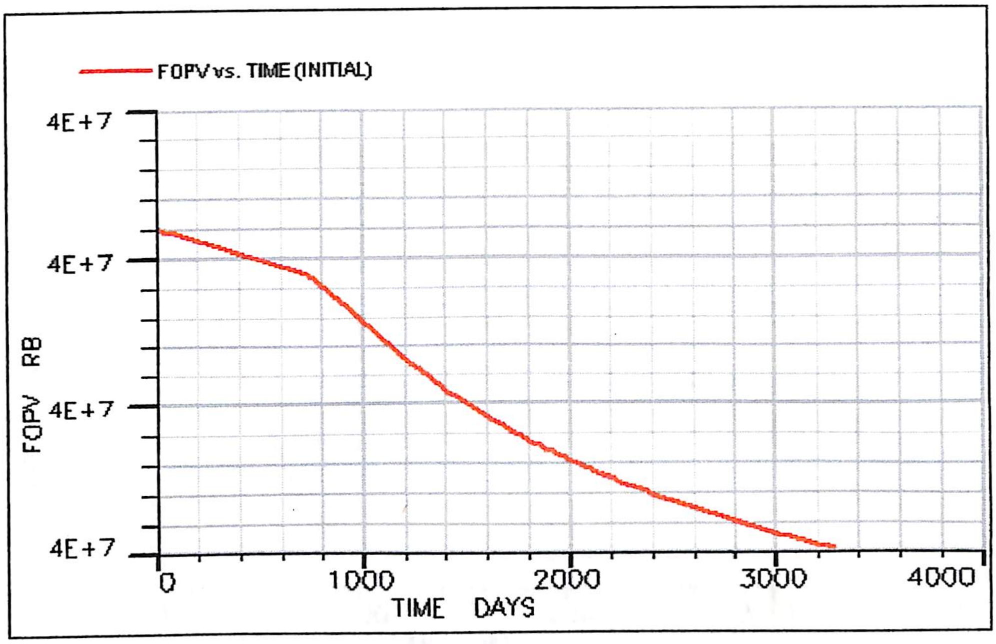


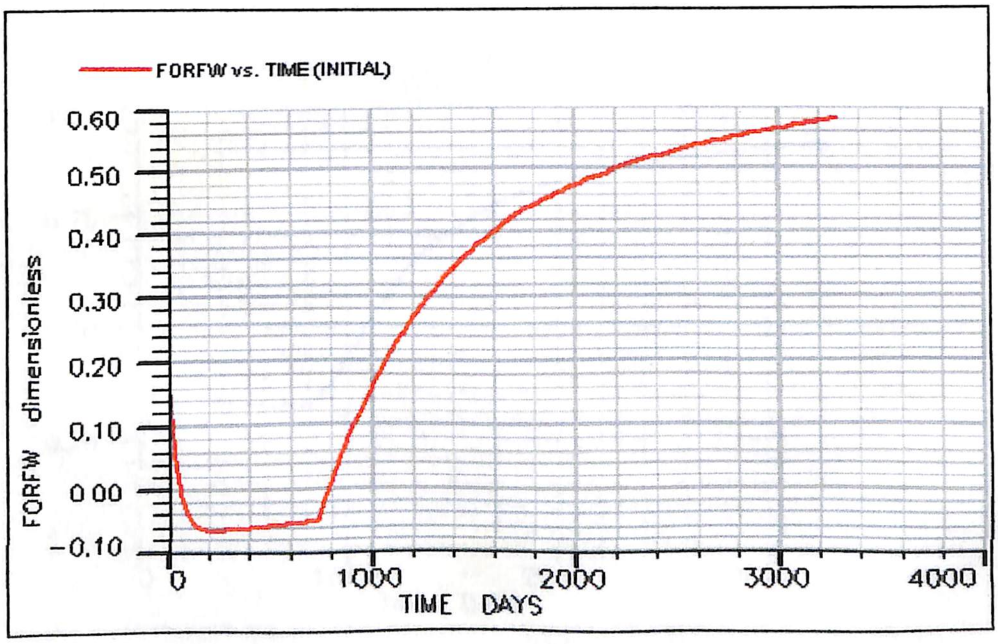


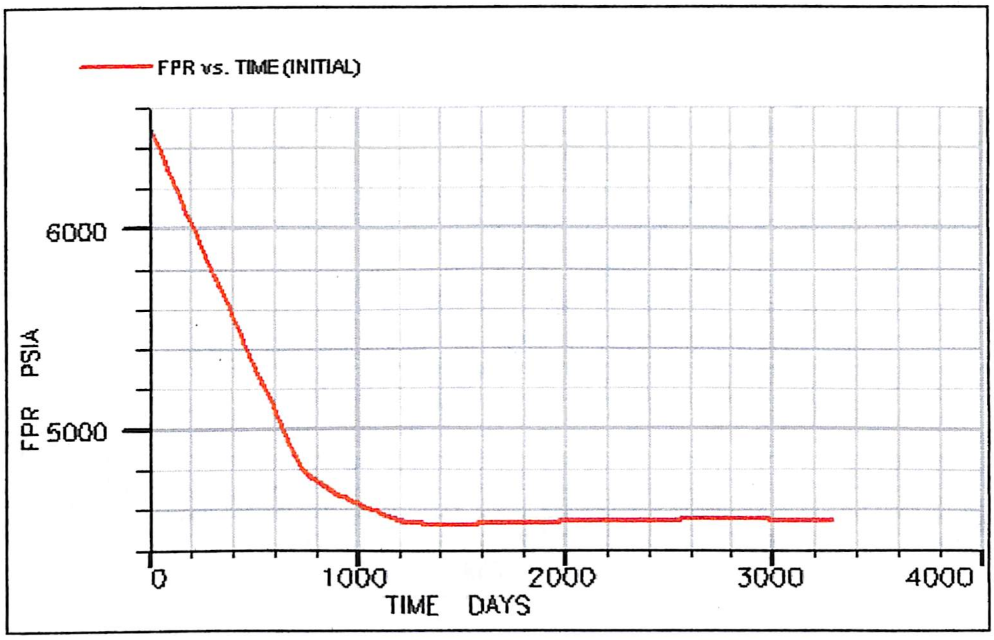
FOIP vs. TIME (INITIAL)
5E+7
5E+7
4E+7
4E+7
4E+7
FOIP STB
0
1000
2000
3000
4000
TIME DAYS

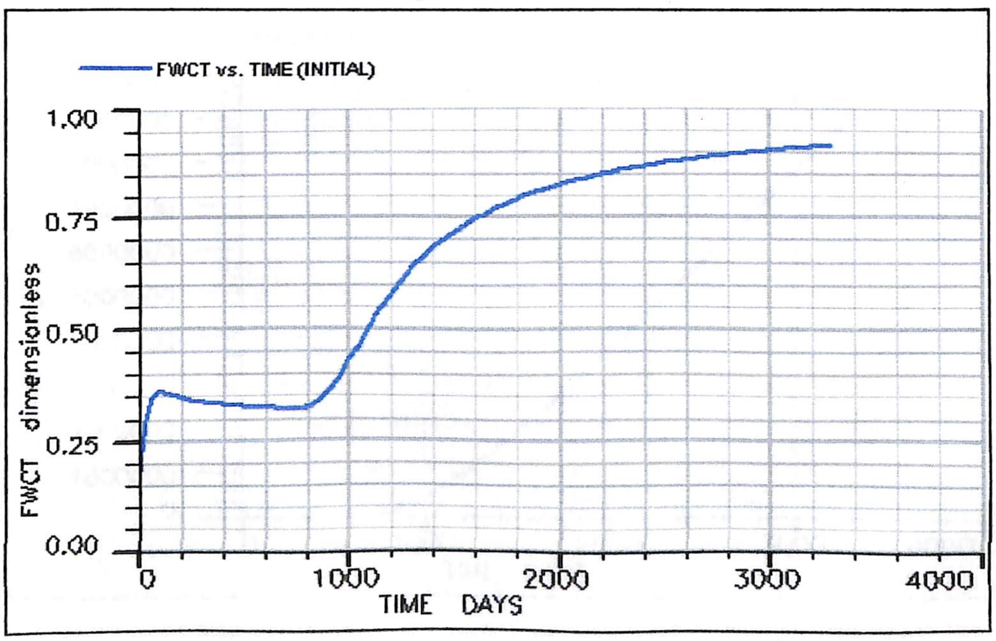


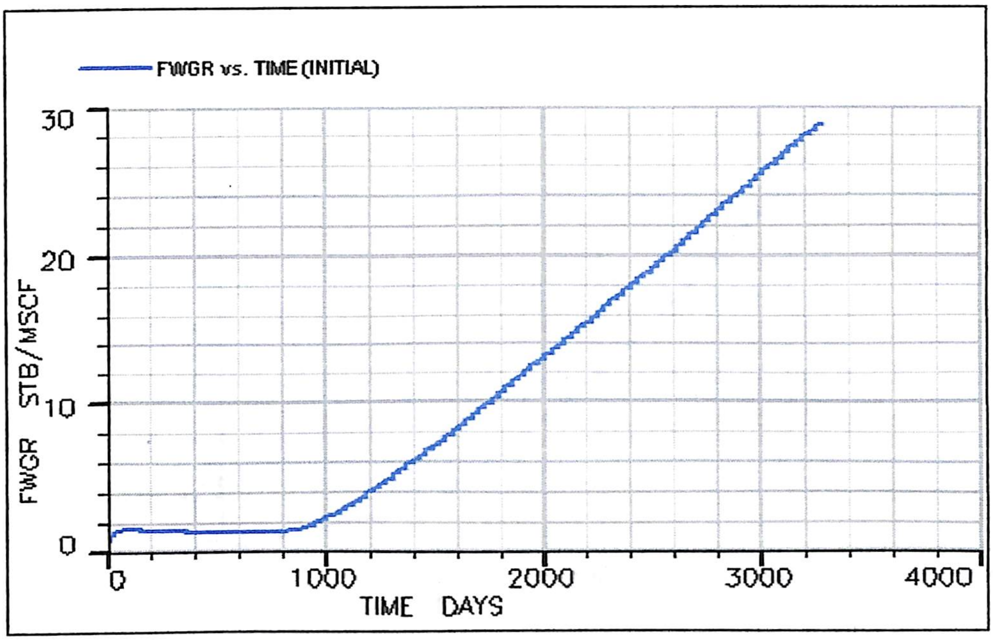
FOPT vs. TIME (INITIAL)
4000000
3000000
2000000
1000000
0
FOPT STB
0
1000
2000
3000
4000
TIME DAYS

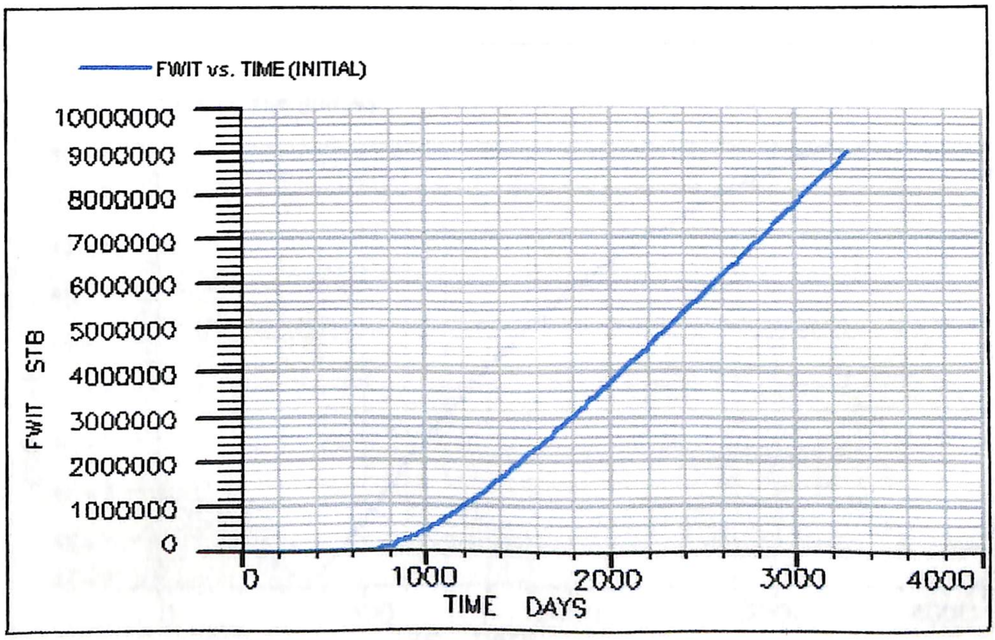

FOPV vs. TIME (INITIAL)
4E+7
4E+7
4E+7
4E+7
FOPV RB
0
1000
2000
3000
4000
TIME DAYS

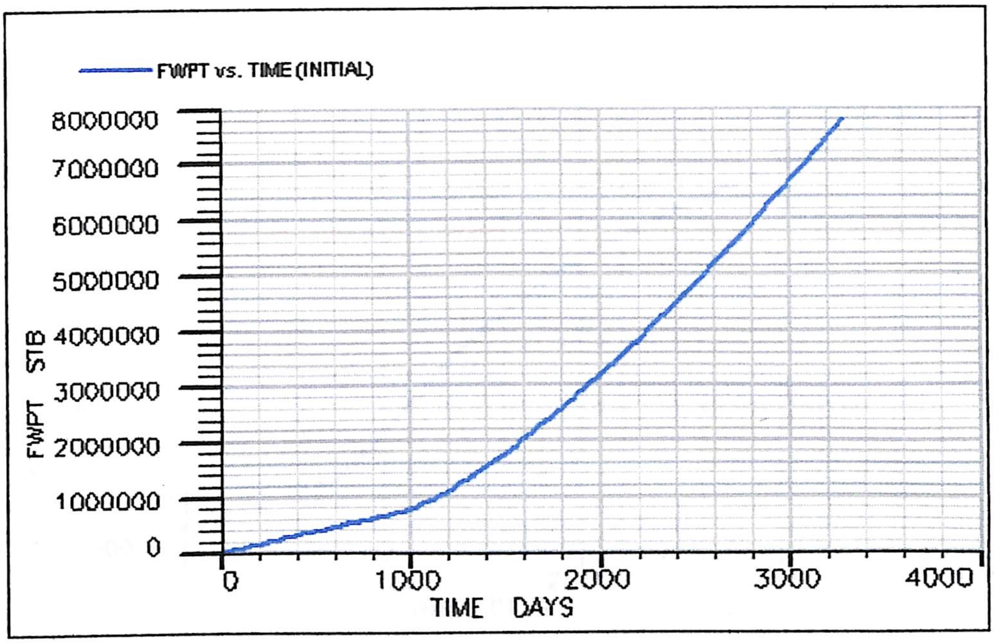

FORFW vs. TIME (INITIAL)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
FORFW dimensionless
0
1000
2000
3000
4000
TIME DAYS

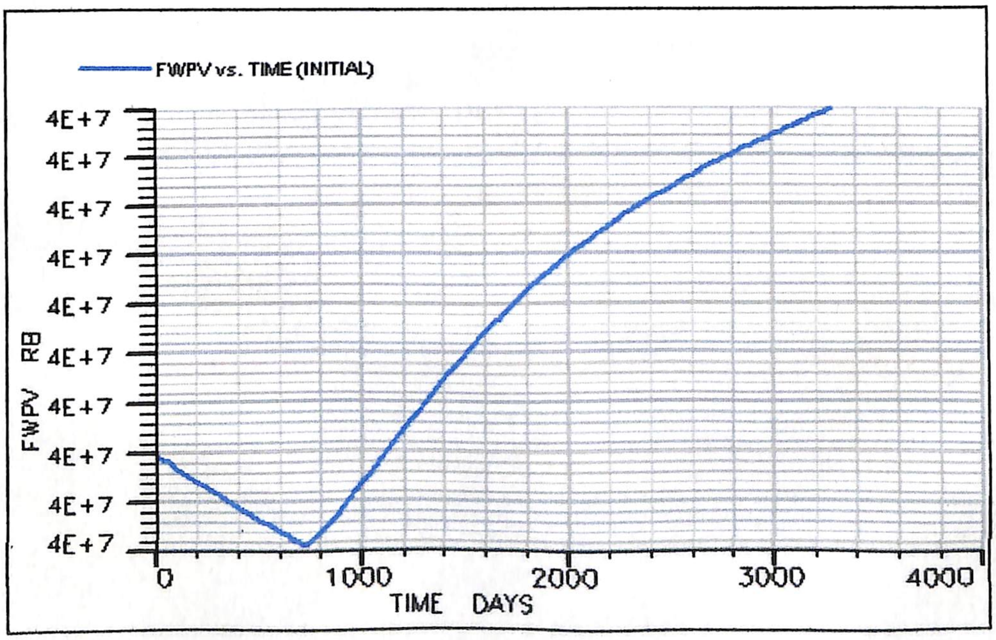

FPR vs. TIME (INITIAL)
FPR PSIA
6000
5000
0
1000
2000
3000
4000
TIME DAYS

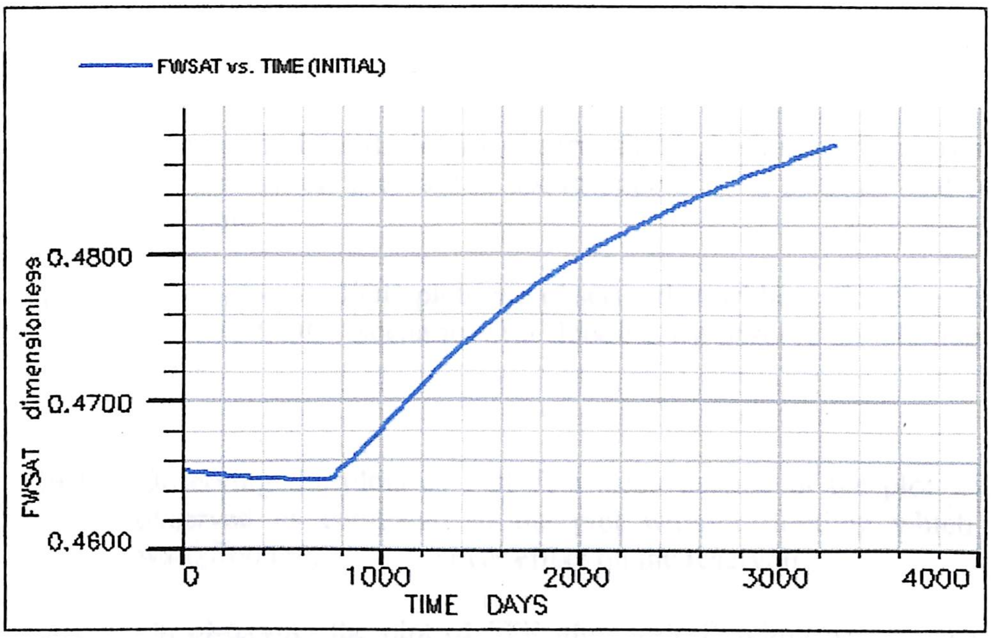

FWCT vs. TIME (INITIAL)
FWCT dimensionless
1.00
0.75
0.50
0.25
0.00
0
1000
2000
3000
4000
TIME DAYS


FWGR vs. TIME (INITIAL)
30
20
10
0
FWGR STB/MSCF
0
1000
2000
3000
4000
TIME DAYS


FWIT vs. TIME (INITIAL)
10000000
9000000
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
FWIT STB
0
1000
2000
3000
4000
TIME DAYS


FWPT vs. TIME (INITIAL)
FWPT STB
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
0
1000
2000
3000
4000
TIME DAYS


FWPV vs. TIME (INITIAL)
FWPV RB
4E+7
0
1000
2000
3000
4000
TIME DAYS


FWSAT vs. TIME (INITIAL)
FWSAT dimensionless
0.4800
0.4700
0.4600
0
1000
2000
3000
4000
TIME DAYS

6. COMPARATIVE STUDY AND CONCLUSION

It must be noted that that in the 9 year prediction run the reservoir pressure did not fall below bubble point pressure. The production rate of the formation doesn't change before and after the implementation of waterflooding program.

i.) Comparing FOGR plot we observe that in both scenarios it remains constant, since reservoir pressure is above bubble point pressure and production rate constant.

ii.) If we observe FOE plots we observe that without flooding the recovery[3] is 7.3% of OOIP. Scenario with flooding we observe an additional recovery of 2.6%.

iii.) Observing the plots of FOPV, a steep decline in the plot with flooding is observed as compared to the plot without flooding which explains that waterflooding has a positive effect on the reservoir.

iv.) On observing the plot of FPR after waterflooding we see that, the reservoir pressure has been stabilized after a certain period of time which is not the same in the case of without waterflooding.

v.) Post waterflooding it is observed that water saturation in the reservoir has increased to 0.4875 as compared to the initial value of 0.4655.

A comparative result from graphs are made and it clearly shows that the waterflooding project will enhance the recovery with given flow rates and injection rates. So the project needs an economic evaluation for its feasibility in field operation.

REFERENCES

i.) S. E. Buckley and M. C. Leverett "Mechanism of fluid displacements in sands", Trans. AIME, (1942), p.iv.

ii.) H. Dykstra and R. L. Parsons, "The prediction of oil recovery by water flood", secondary recovery of oil in united states, Second edition, (New York: American Petroleum Institute, 1950), p.3.

iii.) C. E. Johnson, Jr., "Prediction of oil recovery by water flood- A simplified graphical treatment", Trans. AIME, (1956), p.39.

iv.) F. E. Suder and J. C. Calhoun, Jr., "Water-flood Calculations", Drilling and Production practice, API, (1949), p.2.

v.) P. S. Ache, "Inclusion of radial flow in Use of permeability distributionsin water flood calculations", paper presented before 32nd Annual meeting of SPE of AIME, Oct. 6-9, 1957, Dallas, Texas, p.6.

vi.) Dimensionless Equations for Water flood history matching (SPE 25521), 1992 Stein, M. H. Carlson, p.10.

vii.) Simulation studies of Water flooding practice – Ferreira .H, Mamora .D. D and startzman .R .A, p.9

APPENDIX A – OUTPUT DATA FILE FOR WATER FLOODING

```
 Version =  2005a
Annex    | Modification date    | Update date          | baseline
=====    | ================     | ===========          | ========
ECLIPSE  | 29-SEP-2005 19:01:55 | 06-OCT-2005 09:22:21 | S:\2005a_1_w39i
system   | 14-SEP-2005 12:31:07 | 24-SEP-2005 04:17:36 | S:\2005a_1_w39
utility  | 27-JAN-2005 12:36:55 | 24-SEP-2005 04:17:40 | S:\2005a_1_w39


1

 ******** ECHO OF INPUT DATA FOR RUN initial

 0: RUNSPEC
 0:
 0: TITLE
 0: INITIAL
 0:
 0: DIMENS
 0: 20  20     1      /
 0:
 0: OIL
 0:
 0: WATER
 0:
 0: FIELD
 0:
 0: WELLDIMS
 0: 5 1 2      4/
 0:
 0: START
 0: 1 'JAN' 2007 /
 0:
 0: UNIFOUT
 0:
 0: --
 0:
 0: GRID
 0:
 0: BOX
 0: 1   20      1       20      1       1       /
 0:
 0: DXV
 0: 20*500  /
 0:
 0: DYV
 0: 20*500 /
 0:
 0: DZ
 0: 38.2  37.4  36.6  36.0  35.8  36.0  36.6  37.3  38.0  38.5  38.7  38.7  38.6  38.6
37.6  36.7  36.2  36.3  37.0  37.9
 0: 39.1  40.1  41.0  41.2  41.1  40.8  38.5  37.5  36.5  35.8  36.4  37.5  38.9  40.4
41.9  43.2  43.4  43.1  42.6  38.1
 0: 37.3  36.4  35.8  36.6  38.0  39.5  41.1  42.8  44.3  44.6  44.3  44.0  37.3  37.0
36.6  36.6  37.3  38.4  39.7  41.1
 0: 42.5  43.8  44.5  44.8  45.0  36.2  36.6  37.0  37.4  38.1  38.8  39.7  40.6  41.7
42.8  43.8  44.8  45.6  34.8  36.0
 0: 37.1  38.0  38.6  39.0  39.3  39.7  40.4  41.4  42.8  44.4  46.0  32.9  35.1  37.1
38.5  39.1  39.0  38.7  38.6  38.8
 0: 39.7  41.4  43.7  46.2  30.6  33.8  36.7  38.7  39.1  38.5  37.8  37.3  37.1  37.7
39.8  42.9  46.0  28.7  32.1  35.3
 0: 37.7  38.0  37.3  36.6  36.0  35.7  36.2  38.6  42.0  45.3  27.3  30.1  32.7  34.7
35.4  35.2  34.9  34.8  35.0  36.0
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40.2  42.7  24.0  25.5  27.0  28.2
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37.6  36.7  36.2  36.3  37.0  37.9
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41.9  43.2  43.4  43.1  42.6  38.1
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42.8  43.8  44.8  45.6  34.8  36.0
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39.8  42.9  46.0  28.7  32.1  35.3
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35.4  35.2  34.9  34.8  35.0  36.0
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40.2  42.7  24.0  25.5  27.0  28.2
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41.9  43.2  43.4  43.1  42.6  38.1
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7000 7000 7000
 0:
 0: /
 0:
 0: INIT
 0:
 0: --*******************************************
 0: EDIT
 0:
 0: --*******************************************
 0: PROPS
 0:
 0: SWOF
 0: -- Sw                krw          kro          Pcwo
 0: 0.20                0.000000     0.900000     0
 0: 0.25                0.000364     0.709187     0
 0: 0.30                0.002536     0.544963     0
 0: 0.35                0.007892     0.405962     0
 0: 0.40                0.017660     0.290741     0
 0: 0.45                0.032987     0.197760     0
 0: 0.50                0.054960     0.125368     0
 0: 0.55                0.084625     0.071765     0
 0: 0.60                0.122991     0.034959     0
 0: 0.65                0.171041     0.012686     0
 0: 0.70                0.229732     0.002243     0
 0: 0.75                0.300000     0.000000     0
 0: /
 0:
 0:
 0: -- Specifies PVT properties of OIL
 0: PVDO
 0: 400  1.012  1.16
 0: 1200 1.0040 1.164
 0: 2000 0.9960 1.167
 0: 2800 0.9880 1.172
 0: 3600 0.9802 1.177
 0: 4400 0.9724 1.181
 0: 5200 0.9646 1.185
 0: 5600 0.9607 1.19
 0: /
 0:
 0: PVTW
 0: 1050                1            2.67E-06     0.56341      1.20E-07 /
 0:
 0:
 0: RSCONST
 0: 0.37 1050  /
 0:
 0: DENSITY
 0: 47  63.0200   /
```

```
0:
0: ROCK
0: 1050.0     5.0E-06 /
0:
0: --*******************************************
0: REGIONS
0:
0: --*******************************************
0: SOLUTION
0:
0: EQUIL
0: 7020       6500    7020    0    0 /
0:
0:
0: --*******************************************
0: SUMMARY
0:
0: -- Average pressure for field.
0: FPR
0:
0: -- Oil production total
0: FOPT
0:
0: -- Water injection total of field
0: FWIT
0:
0: --Water cut
0: FWCT
0:
0: --OIL IN PLACE
0: FOIP
0:
0: -- FORMATION WATER SATURATION
0: FWSAT
0:
0: --Water Reservoir Volume in Place
0: FWIPR
0:
0: --Fraction of total oil produced by water influx
0: FORFW
0:
0: --FORM OIL PORE VOL
0: FOPV
0:
0: --FORM WATER PORE VOL
0: FWPV
0:
0: --OIL RECOVERY
0: FOE
0:
0: --GOR
0: FGOR
0:
0: --Water production
0: FWPT
0:
0: -- Average pressure for field.
0: FPR
0:
0: -- Oil production total
0: FOPT
0:
0: -- Water injection total of field
0: FWIT
0:
0: --Water production
0: FWPT
0:
0: -- WATER GAS RATIO
0: FWGR
0:
```

```
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0: WELSPECS
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0: /
0:
0:
0: COMPDAT
0: P 10 10 1 1 'OPEN' 2*  0.2  /
0: /
0:
0: WCONPROD
0: P 'OPEN' ORATE 1500       4*      1000/
0: /
0:
0:
0: TSTEP
0:
0: 31  28      31      30      31      30      31      31      30      31      30      31
0: 31  28      31      30      31      30      31      31      30      31      30      31
0: /
0:
0: WELSPECS
0: I1 G2 7 10  7015 'WAT' /
0: I2 G2 13 10 7015 'WAT'/
0: I3 G2 10 7  7015 'WAT'/
0: I4 G2 10 13 7015 'WAT'/
0: /
0:
0: COMPDAT
0: I1 7 10 1 1 'OPEN' 2*  0.2   /
0: I2 13 10 1 1 'OPEN' 2*  0.2   /
0: I3 10 7 1 1 'OPEN' 2*  0.2   /
0: I4 10 13 1 1 'OPEN' 2*  0.2  /
0: /
0:
0: WCONPROD
0: P 'OPEN' ORATE 1500       4*      1000/
0: /
0:
0: WCONINJE
0: I1 WATER OPEN RATE 4000 1*       5000/
0: I2 WATER OPEN RATE 4000 1*       5000/
0: I3 WATER OPEN RATE 4000 1*       5000/
0: I4 WATER OPEN RATE 4000 1*       5000/
0:
0: /
0:
0: TSTEP
0:
0: 31  28      31      30      31      30      31      31      30      31      30      31
0: 31  28      31      30      31      30      31      31      30      31      30      31
0: 31  28      31      30      31      30      31      31      30      31      30      31
0: 31  28      31      30      31      30      31      31      30      31      30      31
0: 31  28      31      30      31      30      31      31      30      31      30      31
0: 31  28      31      30      31      30      31      31      30      31      30      31
0: 31  28      31      30      31      30      31      31      30      31      30      31
0:
0: /
0:
0: END
0:
0:
0:
0:

******** END OF INPUT DATA FOR RUN initial
    1 READING RUNSPEC
```

```
      2 READING TITLE
      3 READING DIMENS
      4 READING OIL
      5 READING WATER
      6 READING FIELD
      7 READING WELLDIMS
      8 READING START
      9 READING UNIFOUT
     10 READING GRID
1

   LIST OF ECLIPSE 100 SPECIAL OPTIONS
   ====================================

  POLYMER FLOOD    -  -  -  -  -  -  -  -  -  NOT AVAILABLE
  NETWORKS       -  -  -  -  -  -  -  -  -  -  NOT AVAILABLE
  LOCAL GRID REFINEMENT/COARSENING    -  -  -  -  -  AVAILABLE
  FLUX BOUNDARY OPTION  -  -  -  -  -  -  -  -  NOT AVAILABLE
  SOLVENT FLOOD MODEL   -  -  -  -  -  -  -  -  NOT AVAILABLE
  GAS FIELD OPERATIONS MODEL -  -  -  -  -  -  -  AVAILABLE
  WELLBORE FRICTION OPTION  -  -  -  -  -  -  -  NOT AVAILABLE
  GI-MODEL     -  -  -  -  -  -  -  -  -  -  NOT AVAILABLE
  SURFACTANT FLOOD -  -  -  -  -  -  -  -  -  NOT AVAILABLE
  GAS LIFT OPTIMISATION -  -  -  -  -  -  -  -  AVAILABLE
  PARALLEL OPTIONS -  -  -  -  -  -  -  -  -  NOT AVAILABLE
  ENVIRONMENTAL TRACERS -  -  -  -  -  -  -  -  NOT AVAILABLE
  COAL BED METHANE OPTION  -  -  -  -  -  -  -  AVAILABLE
  MULTI-SEGMENT WELL OPTION -  -  -  -  -  -  -  NOT AVAILABLE
  RESERVOIR COUPLING   -  -  -  -  -  -  -  -  AVAILABLE
  FOAM MODEL  -  -  -  -  -  -  -  -  -  -  NOT AVAILABLE
  GAS QUALITY CONTROL OPTION -  -  -  -  -  -  -  AVAILABLE
  UNCODED GRADIENTS    -  -  -  -  -  -  -  -  NOT AVAILABLE

    THE PRESENT PROGRAM/PASSWORD COMBINATION EXPIRES ON  4/DEC/2008

1
     12 READING BOX
     13 READING DXV
     14 READING DYV
     15 READING DZ
     16 READING PORO
     17 READING PERMX
     18 READING PERMY
     19 READING PERMZ
     20 READING ENDBOX

 @--WARNING  AT TIME        0.0   DAYS    ( 1-JAN-2007):
 @           SPURIOUS DATA BEFORE TOPS     KEYWORD
 @           /
     21 READING TOPS
     22 READING INIT
     23 READING EDIT

 @--MESSAGE  AT TIME        0.0   DAYS    ( 1-JAN-2007):
 @           NEITHER OLDTRAN,OLDTRANR NOR NEWTRAN SPECIFIED
 @           BLOCK CENTRE TRANSMISSIBILITIES TO BE CALCULATED
 @           USING  OLDTRAN
     24 READING PROPS

 @--COMMENT  AT TIME        0.0   DAYS    ( 1-JAN-2007):
 @           NO NON-NEIGHBOUR CONNECTIONS FOUND

 @--MESSAGE  AT TIME        0.0   DAYS    ( 1-JAN-2007):
 @           NUMBER OF ACTIVE CELLS IS      400

 @--MESSAGE  AT TIME        0.0   DAYS    ( 1-JAN-2007):
 @           PROBLEM REQUIRES       0.571 MEGABYTES
 @               1497 ( BYTES PER ACTIVE CELL )
```

```
@--MESSAGE  AT TIME        0.0   DAYS    ( 1-JAN-2007):
@             48522 CHARACTER VARIABLES USED
   25 READING SWOF
   26 READING PVDO
   27 READING PVTW

@--WARNING  AT TIME        0.0   DAYS    ( 1-JAN-2007):
@           SPURIOUS DATA BEFORE RSCONST  KEYWORD
@
   28 READING RSCONST
   29 READING DENSITY
   30 READING ROCK
   31 READING REGIONS
   32 READING SOLUTION
   33 READING EQUIL
   34 READING SUMMARY
   35 READING FPR
   36 READING FOPT
   37 READING FWIT
   38 READING FWCT
   39 READING FOIP
   40 READING FWSAT
   41 READING FWIPR

@--WARNING  AT TIME        0.0   DAYS    ( 1-JAN-2007):
@           UNRECOGNISED KEYWORD FWIPR    IN SUMMARY FILE SPECIFICATION
   42 READING FORFW
   43 READING FOPV
   44 READING FWPV
   45 READING FOE
   46 READING FGOR
   47 READING FWPT
   48 READING FPR
   49 READING FOPT
   50 READING FWIT
   51 READING FWPT
   52 READING FWGR
   53 READING EXCEL
   54 READING SCHEDULE
   55 READING WELSPECS
   56 READING COMPDAT
   57 READING WCONPROD
   58 READING TSTEP
1
**********************************************************************   1
  SIMULATE AT     0.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT   0      1 JAN 2007     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP    1 TIME=    1.00  DAYS (  +1.0  DAYS INIT  1 ITS) (2-JAN-2007)
  PAV=  6497.9  PSIA   WCT=0.163 GOR=     0.37 MSCF/STB WGR=   0.5263 STB/MSCF

 STEP    2 TIME=    4.00  DAYS (  +3.0  DAYS MAXF  1 ITS) (5-JAN-2007)
  PAV=  6492.3  PSIA   WCT=0.180 GOR=     0.37 MSCF/STB WGR=   0.5926 STB/MSCF

 STEP    3 TIME=   13.00  DAYS (  +9.0  DAYS MAXF  2 ITS) (14-JAN-2007)
  PAV=  6474.5  PSIA   WCT=0.228 GOR=     0.37 MSCF/STB WGR=   0.7961 STB/MSCF

 STEP    4 TIME=   31.00  DAYS ( +18.0  DAYS REPT  2 ITS) (1-FEB-2007)
  PAV=  6435.0  PSIA   WCT=0.299 GOR=     0.37 MSCF/STB WGR=   1.1547 STB/MSCF
1
**********************************************************************   2
  SIMULATE AT     31.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT   1      1 FEB 2007     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007
```

```
*************************************************************************

 STEP    5 TIME=    59.00  DAYS ( +28.0  DAYS REPT  2 ITS) (1-MAR-2007)
  PAV=  6368.7  PSIA   WCT=0.349 GOR=     0.37 MSCF/STB WGR=   1.4470 STB/MSCF
1
*********************************************************************    3
  SIMULATE AT    59.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT   2     1 MAR 2007   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP    6 TIME=    90.00  DAYS ( +31.0  DAYS REPT  2 ITS) (1-APR-2007)
  PAV=  6293.5  PSIA   WCT=0.363 GOR=     0.37 MSCF/STB WGR=   1.5386 STB/MSCF
1
*********************************************************************    4
  SIMULATE AT    90.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT   3     1 APR 2007   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP    7 TIME=  120.00  DAYS ( +30.0  DAYS REPT  1 ITS) (1-MAY-2007)
  PAV=  6220.9  PSIA   WCT=0.362 GOR=     0.37 MSCF/STB WGR=   1.5334 STB/MSCF
1
*********************************************************************    5
  SIMULATE AT   120.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT   4     1 MAY 2007   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP    8 TIME=  151.00  DAYS ( +31.0  DAYS REPT  2 ITS) (1-JUN-2007)
  PAV=  6146.4  PSIA   WCT=0.357 GOR=     0.37 MSCF/STB WGR=   1.5000 STB/MSCF
1
*********************************************************************    6
  SIMULATE AT   151.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT   5     1 JUN 2007   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP    9 TIME=  181.00  DAYS ( +30.0  DAYS REPT  1 ITS) (1-JLY-2007)
  PAV=  6074.8  PSIA   WCT=0.352 GOR=     0.37 MSCF/STB WGR=   1.4656 STB/MSCF
1
*********************************************************************    7
  SIMULATE AT   181.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT   6     1 JLY 2007   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   10 TIME=  212.00  DAYS ( +31.0  DAYS REPT  1 ITS) (1-AUG-2007)
  PAV=  6001.4  PSIA   WCT=0.347 GOR=     0.37 MSCF/STB WGR=   1.4350 STB/MSCF
1
*********************************************************************    8
  SIMULATE AT   212.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT   7     1 AUG 2007   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   11 TIME=  243.00  DAYS ( +31.0  DAYS REPT  1 ITS) (1-SEP-2007)
  PAV=  5928.3  PSIA   WCT=0.343 GOR=     0.37 MSCF/STB WGR=   1.4104 STB/MSCF
```

```
1
**********************************************************************   9
  SIMULATE AT   243.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT   8     1 SEP 2007   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   12 TIME=  273.00  DAYS ( +30.0  DAYS REPT  1 ITS) (1-OCT-2007)
  PAV=  5858.0  PSIA   WCT=0.340 GOR=     0.37 MSCF/STB WGR=   1.3913 STB/MSCF
1
**********************************************************************  10
  SIMULATE AT   273.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT   9     1 OCT 2007   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   13 TIME=  304.00  DAYS ( +31.0  DAYS REPT  1 ITS) (1-NOV-2007)
  PAV=  5785.5  PSIA   WCT=0.337 GOR=     0.37 MSCF/STB WGR=   1.3756 STB/MSCF
1
**********************************************************************  11
  SIMULATE AT   304.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  10     1 NOV 2007   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   14 TIME=  334.00  DAYS ( +30.0  DAYS REPT  1 ITS) (1-DEC-2007)
  PAV=  5715.5  PSIA   WCT=0.335 GOR=     0.37 MSCF/STB WGR=   1.3631 STB/MSCF
1
**********************************************************************  12
  SIMULATE AT   334.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  11     1 DEC 2007   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   15 TIME=  365.00  DAYS ( +31.0  DAYS REPT  1 ITS) (1-JAN-2008)
  PAV=  5643.4  PSIA   WCT=0.334 GOR=     0.37 MSCF/STB WGR=   1.3525 STB/MSCF
1
**********************************************************************  13
  SIMULATE AT   365.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  12     1 JAN 2008   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   16 TIME=  396.00  DAYS ( +31.0  DAYS REPT  1 ITS) (1-FEB-2008)
  PAV=  5571.3  PSIA   WCT=0.332 GOR=     0.37 MSCF/STB WGR=   1.3433 STB/MSCF
1
**********************************************************************  14
  SIMULATE AT   396.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  13     1 FEB 2008   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   17 TIME=  424.00  DAYS ( +28.0  DAYS REPT  1 ITS) (29-FEB-2008)
  PAV=  5506.4  PSIA   WCT=0.331 GOR=     0.37 MSCF/STB WGR=   1.3358 STB/MSCF
1
**********************************************************************  15
  SIMULATE AT   424.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
```

```
  REPORT  14    29 FEB 2008    *WIN32 RUN
 * RUN AT 14:30 ON 01 MAY 2007

 **************************************************************************

  STEP   18 TIME=  455.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-MAR-2008)
   PAV=  5434.5  PSIA   WCT=0.330 GOR=     0.37 MSCF/STB WGR=   1.3283 STB/MSCF
 1
 ********************************************************************** 16
  SIMULATE AT    455.00   DAYS *INITIAL
 * ECLIPSE  VERSION 2005a
  REPORT  15    31 MAR 2008    *WIN32 RUN
 * RUN AT 14:30 ON 01 MAY 2007

 **************************************************************************

  STEP   19 TIME=  485.00  DAYS ( +30.0  DAYS REPT  2 ITS) (30-APR-2008)
   PAV=  5365.0  PSIA   WCT=0.328 GOR=     0.37 MSCF/STB WGR=   1.3214 STB/MSCF
 1
 ********************************************************************** 17
  SIMULATE AT    485.00   DAYS *INITIAL
 * ECLIPSE  VERSION 2005a
  REPORT  16    30 APR 2008    *WIN32 RUN
 * RUN AT 14:30 ON 01 MAY 2007

 **************************************************************************

  STEP   20 TIME=  516.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-MAY-2008)
   PAV=  5293.3  PSIA   WCT=0.327 GOR=     0.37 MSCF/STB WGR=   1.3147 STB/MSCF
 1
 ********************************************************************** 18
  SIMULATE AT    516.00   DAYS *INITIAL
 * ECLIPSE  VERSION 2005a
  REPORT  17    31 MAY 2008    *WIN32 RUN
 * RUN AT 14:30 ON 01 MAY 2007

 **************************************************************************

  STEP   21 TIME=  546.00  DAYS ( +30.0  DAYS REPT  2 ITS) (30-JUN-2008)
   PAV=  5223.8  PSIA   WCT=0.326 GOR=     0.37 MSCF/STB WGR=   1.3084 STB/MSCF
 1
 ********************************************************************** 19
  SIMULATE AT    546.00   DAYS *INITIAL
 * ECLIPSE  VERSION 2005a
  REPORT  18    30 JUN 2008    *WIN32 RUN
 * RUN AT 14:30 ON 01 MAY 2007

 **************************************************************************

  STEP   22 TIME=  577.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-JLY-2008)
   PAV=  5152.1  PSIA   WCT=0.325 GOR=     0.37 MSCF/STB WGR=   1.3020 STB/MSCF
 1
 ********************************************************************** 20
  SIMULATE AT    577.00   DAYS *INITIAL
 * ECLIPSE  VERSION 2005a
  REPORT  19    31 JLY 2008    *WIN32 RUN
 * RUN AT 14:30 ON 01 MAY 2007

 **************************************************************************

  STEP   23 TIME=  608.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-AUG-2008)
   PAV=  5080.3  PSIA   WCT=0.324 GOR=     0.37 MSCF/STB WGR=   1.2958 STB/MSCF
 1
 ********************************************************************** 21
  SIMULATE AT    608.00   DAYS *INITIAL
 * ECLIPSE  VERSION 2005a
  REPORT  20    31 AUG 2008    *WIN32 RUN
 * RUN AT 14:30 ON 01 MAY 2007

 **************************************************************************
```

```
 STEP   24 TIME=  638.00  DAYS ( +30.0  DAYS REPT  2 ITS) (30-SEP-2008)
  PAV=  5011.0  PSIA   WCT=0.323 GOR=     0.37 MSCF/STB WGR=   1.2898 STB/MSCF
1
**********************************************************************  22
  SIMULATE AT   638.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  21     30 SEP 2008    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   25 TIME=  669.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-OCT-2008)
  PAV=  4939.3  PSIA   WCT=0.322 GOR=     0.37 MSCF/STB WGR=   1.2837 STB/MSCF
1
**********************************************************************  23
  SIMULATE AT   669.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  22     31 OCT 2008    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   26 TIME=  699.00  DAYS ( +30.0  DAYS REPT  2 ITS) (30-NOV-2008)
  PAV=  4869.9  PSIA   WCT=0.321 GOR=     0.37 MSCF/STB WGR=   1.2779 STB/MSCF
1
**********************************************************************  24
  SIMULATE AT   699.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  23     30 NOV 2008    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   27 TIME=  730.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-DEC-2008)
  PAV=  4798.4  PSIA   WCT=0.320 GOR=     0.37 MSCF/STB WGR=   1.2720 STB/MSCF
    59 READING WELSPECS
    60 READING COMPDAT
    61 READING WCONPROD
    62 READING WCONINJE
    63 READING TSTEP
1
**********************************************************************  25
  SIMULATE AT   730.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  24     31 DEC 2008    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 @--MESSAGE  AT TIME      730.0   DAYS    (31-DEC-2008):
 @           ******************************************
 @           * WELL I1       HAS CHANGED TO           *
 @           * CONTROL BY BOTTOM HOLE PRESSURE        *
 @           * FROM TIME     730.00    DAYS  .        *
 @           ******************************************

 @--MESSAGE  AT TIME      730.0   DAYS    (31-DEC-2008):
 @           ******************************************
 @           * WELL I2       HAS CHANGED TO           *
 @           * CONTROL BY BOTTOM HOLE PRESSURE        *
 @           * FROM TIME     730.00    DAYS  .        *
 @           ******************************************

 @--MESSAGE  AT TIME      730.0   DAYS    (31-DEC-2008):
 @           ******************************************
 @           * WELL I3       HAS CHANGED TO           *
 @           * CONTROL BY BOTTOM HOLE PRESSURE        *
 @           * FROM TIME     730.00    DAYS  .        *
 @           ******************************************

 @--MESSAGE  AT TIME      730.0   DAYS    (31-DEC-2008):
```

```
@            *******************************************
@            * WELL I4         HAS CHANGED TO          *
@            * CONTROL BY BOTTOM HOLE PRESSURE         *
@            * FROM TIME    730.00   DAYS  .           *
@            *******************************************

 STEP   28 TIME=  761.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-JAN-2009)
  PAV=  4774.8  PSIA   WCT=0.321 GOR=     0.37 MSCF/STB WGR=   1.2759 STB/MSCF
1
**********************************************************************  26
  SIMULATE AT   761.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  25     31 JAN 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   29 TIME=  789.00  DAYS ( +28.0  DAYS REPT  2 ITS) (28-FEB-2009)
  PAV=  4753.2  PSIA   WCT=0.324 GOR=     0.37 MSCF/STB WGR=   1.2926 STB/MSCF
1
**********************************************************************  27
  SIMULATE AT   789.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  26     28 FEB 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   30 TIME=  820.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-MAR-2009)
  PAV=  4730.5  PSIA   WCT=0.330 GOR=     0.37 MSCF/STB WGR=   1.3310 STB/MSCF
1
**********************************************************************  28
  SIMULATE AT   820.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  27     31 MAR 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   31 TIME=  850.00  DAYS ( +30.0  DAYS REPT  2 ITS) (30-APR-2009)
  PAV=  4710.4  PSIA   WCT=0.340 GOR=     0.37 MSCF/STB WGR=   1.3902 STB/MSCF
1
**********************************************************************  29
  SIMULATE AT   850.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  28     30 APR 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   32 TIME=  881.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-MAY-2009)
  PAV=  4691.7  PSIA   WCT=0.353 GOR=     0.37 MSCF/STB WGR=   1.4763 STB/MSCF
1
**********************************************************************  30
  SIMULATE AT   881.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  29     31 MAY 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   33 TIME=  911.00  DAYS ( +30.0  DAYS REPT  1 ITS) (30-JUN-2009)
  PAV=  4675.0  PSIA   WCT=0.370 GOR=     0.37 MSCF/STB WGR=   1.5854 STB/MSCF
1
**********************************************************************  31
  SIMULATE AT   911.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  30     30 JUN 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************
```

```
 STEP   34 TIME=  942.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-JLY-2009)
  PAV=  4658.9  PSIA   WCT=0.390 GOR=     0.37 MSCF/STB WGR=   1.7263 STB/MSCF
1
*********************************************************************** 32
  SIMULATE AT   942.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  31    31 JLY 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   35 TIME=  973.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-AUG-2009)
  PAV=  4643.6  PSIA   WCT=0.412 GOR=     0.37 MSCF/STB WGR=   1.8942 STB/MSCF
1
*********************************************************************** 33
  SIMULATE AT   973.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  32    31 AUG 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   36 TIME= 1003.00  DAYS ( +30.0  DAYS REPT  2 ITS) (30-SEP-2009)
  PAV=  4629.5  PSIA   WCT=0.435 GOR=     0.37 MSCF/STB WGR=   2.0823 STB/MSCF
1
*********************************************************************** 34
  SIMULATE AT  1003.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  33    30 SEP 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   37 TIME= 1034.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-OCT-2009)
  PAV=  4615.3  PSIA   WCT=0.460 GOR=     0.37 MSCF/STB WGR=   2.3006 STB/MSCF
1
*********************************************************************** 35
  SIMULATE AT  1034.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  34    31 OCT 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   38 TIME= 1064.00  DAYS ( +30.0  DAYS REPT  2 ITS) (30-NOV-2009)
  PAV=  4601.9  PSIA   WCT=0.484 GOR=     0.37 MSCF/STB WGR=   2.5318 STB/MSCF
1
*********************************************************************** 36
  SIMULATE AT  1064.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  35    30 NOV 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   39 TIME= 1095.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-DEC-2009)
  PAV=  4587.9  PSIA   WCT=0.508 GOR=     0.37 MSCF/STB WGR=   2.7858 STB/MSCF
1
*********************************************************************** 37
  SIMULATE AT  1095.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  36    31 DEC 2009   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   40 TIME= 1126.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-JAN-2010)
  PAV=  4573.9  PSIA   WCT=0.531 GOR=     0.37 MSCF/STB WGR=   3.0560 STB/MSCF
1
*********************************************************************** 38
```

```
  SIMULATE AT  1126.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  37    31 JAN 2010    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 @--MESSAGE  AT TIME    1126.0   DAYS    (31-JAN-2010):
 @           ******************************************
 @           * WELL P          HAS CHANGED TO         *
 @           * CONTROL BY BOTTOM HOLE PRESSURE        *
 @           * FROM TIME   1126.00   DAYS  .          *
 @           ******************************************

 STEP   41 TIME= 1154.00  DAYS ( +28.0  DAYS REPT  2 ITS) (28-FEB-2010)
  PAV=  4562.0  PSIA   WCT=0.551 GOR=      0.37 MSCF/STB WGR=   3.3136 STB/MSCF
1
********************************************************************** 39
  SIMULATE AT  1154.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  38    28 FEB 2010    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   42 TIME= 1185.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-MAR-2010)
  PAV=  4551.8  PSIA   WCT=0.572 GOR=      0.37 MSCF/STB WGR=   3.6093 STB/MSCF
1
********************************************************************** 40
  SIMULATE AT  1185.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  39    31 MAR 2010    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   43 TIME= 1215.00  DAYS ( +30.0  DAYS REPT  1 ITS) (30-APR-2010)
  PAV=  4543.9  PSIA   WCT=0.591 GOR=      0.37 MSCF/STB WGR=   3.9030 STB/MSCF
1
********************************************************************** 41
  SIMULATE AT  1215.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  40    30 APR 2010    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   44 TIME= 1246.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-MAY-2010)
  PAV=  4537.5  PSIA   WCT=0.609 GOR=      0.37 MSCF/STB WGR=   4.2126 STB/MSCF
1
********************************************************************** 42
  SIMULATE AT  1246.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  41    31 MAY 2010    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   45 TIME= 1276.00  DAYS ( +30.0  DAYS REPT  2 ITS) (30-JUN-2010)
  PAV=  4532.8  PSIA   WCT=0.626 GOR=      0.37 MSCF/STB WGR=   4.5171 STB/MSCF
1
********************************************************************** 43
  SIMULATE AT  1276.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  42    30 JUN 2010    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   46 TIME= 1307.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-JLY-2010)
  PAV=  4529.4  PSIA   WCT=0.642 GOR=      0.37 MSCF/STB WGR=   4.8362 STB/MSCF
```

```
1
*********************************************************************** 44
  SIMULATE AT  1307.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  43     31 JLY 2010     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   47 TIME= 1338.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-AUG-2010)
  PAV=  4527.2  PSIA   WCT=0.656 GOR=     0.37 MSCF/STB WGR=   5.1564 STB/MSCF
1
*********************************************************************** 45
  SIMULATE AT  1338.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  44     31 AUG 2010     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   48 TIME= 1368.00  DAYS ( +30.0  DAYS REPT  1 ITS) (30-SEP-2010)
  PAV=  4525.9  PSIA   WCT=0.669 GOR=     0.37 MSCF/STB WGR=   5.4693 STB/MSCF
1
*********************************************************************** 46
  SIMULATE AT  1368.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  45     30 SEP 2010     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   49 TIME= 1399.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-OCT-2010)
  PAV=  4525.3  PSIA   WCT=0.682 GOR=     0.37 MSCF/STB WGR=   5.7893 STB/MSCF
1
*********************************************************************** 47
  SIMULATE AT  1399.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  46     31 OCT 2010     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   50 TIME= 1429.00  DAYS ( +30.0  DAYS REPT  1 ITS) (30-NOV-2010)
  PAV=  4525.4  PSIA   WCT=0.693 GOR=     0.37 MSCF/STB WGR=   6.1058 STB/MSCF
1
*********************************************************************** 48
  SIMULATE AT  1429.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  47     30 NOV 2010     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   51 TIME= 1460.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-DEC-2010)
  PAV=  4525.9  PSIA   WCT=0.704 GOR=     0.37 MSCF/STB WGR=   6.4399 STB/MSCF
1
*********************************************************************** 49
  SIMULATE AT  1460.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  48     31 DEC 2010     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   52 TIME= 1491.00  DAYS ( +31.0  DAYS REPT  2 ITS) (31-JAN-2011)
  PAV=  4526.7  PSIA   WCT=0.714 GOR=     0.37 MSCF/STB WGR=   6.7592 STB/MSCF
1
*********************************************************************** 50
  SIMULATE AT  1491.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
```

```
  REPORT  49    31 JAN 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   53 TIME= 1519.00  DAYS ( +28.0  DAYS REPT  1 ITS) (28-FEB-2011)
  PAV=  4527.3  PSIA   WCT=0.723 GOR=     0.37 MSCF/STB WGR=   7.0554 STB/MSCF
1
********************************************************************* 51
  SIMULATE AT  1519.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  50    28 FEB 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   54 TIME= 1550.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-MAR-2011)
  PAV=  4528.2  PSIA   WCT=0.732 GOR=     0.37 MSCF/STB WGR=   7.3974 STB/MSCF
1
********************************************************************* 52
  SIMULATE AT  1550.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  51    31 MAR 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   55 TIME= 1580.00  DAYS ( +30.0  DAYS REPT  1 ITS) (30-APR-2011)
  PAV=  4529.0  PSIA   WCT=0.741 GOR=     0.37 MSCF/STB WGR=   7.7373 STB/MSCF
1
********************************************************************* 53
  SIMULATE AT  1580.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  52    30 APR 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   56 TIME= 1611.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-MAY-2011)
  PAV=  4529.8  PSIA   WCT=0.750 GOR=     0.37 MSCF/STB WGR=   8.0962 STB/MSCF
1
********************************************************************* 54
  SIMULATE AT  1611.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  53    31 MAY 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   57 TIME= 1641.00  DAYS ( +30.0  DAYS REPT  1 ITS) (30-JUN-2011)
  PAV=  4530.6  PSIA   WCT=0.758 GOR=     0.37 MSCF/STB WGR=   8.4506 STB/MSCF
1
********************************************************************* 55
  SIMULATE AT  1641.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  54    30 JUN 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************

 STEP   58 TIME= 1672.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-JLY-2011)
  PAV=  4531.4  PSIA   WCT=0.766 GOR=     0.37 MSCF/STB WGR=   8.8229 STB/MSCF
1
********************************************************************* 56
  SIMULATE AT  1672.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  55    31 JLY 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

*************************************************************************
```

```
 STEP   59 TIME= 1703.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-AUG-2011)
  PAV=  4532.2  PSIA   WCT=0.773 GOR=     0.37 MSCF/STB WGR=   9.2000 STB/MSCF
1
********************************************************************** 57
  SIMULATE AT  1703.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  56    31 AUG 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   60 TIME= 1733.00  DAYS ( +30.0  DAYS REPT  1 ITS) (30-SEP-2011)
  PAV=  4533.0  PSIA   WCT=0.780 GOR=     0.37 MSCF/STB WGR=   9.5688 STB/MSCF
1
********************************************************************** 58
  SIMULATE AT  1733.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  57    30 SEP 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   61 TIME= 1764.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-OCT-2011)
  PAV=  4533.8  PSIA   WCT=0.786 GOR=     0.37 MSCF/STB WGR=   9.9527 STB/MSCF
1
********************************************************************** 59
  SIMULATE AT  1764.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  58    31 OCT 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   62 TIME= 1794.00  DAYS ( +30.0  DAYS REPT  1 ITS) (30-NOV-2011)
  PAV=  4534.5  PSIA   WCT=0.793 GOR=     0.37 MSCF/STB WGR=  10.3249 STB/MSCF
1
********************************************************************** 60
  SIMULATE AT  1794.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  59    30 NOV 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   63 TIME= 1825.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-DEC-2011)
  PAV=  4535.2  PSIA   WCT=0.798 GOR=     0.37 MSCF/STB WGR=  10.7101 STB/MSCF
1
********************************************************************** 61
  SIMULATE AT  1825.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  60    31 DEC 2011    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   64 TIME= 1856.00  DAYS ( +31.0  DAYS REPT  1 ITS) (31-JAN-2012)
  PAV=  4535.9  PSIA   WCT=0.804 GOR=     0.37 MSCF/STB WGR=  11.0924 STB/MSCF
1
********************************************************************** 62
  SIMULATE AT  1856.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  61    31 JAN 2012    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   65 TIME= 1884.00  DAYS ( +28.0  DAYS REPT  1 ITS) (28-FEB-2012)
  PAV=  4536.6  PSIA   WCT=0.809 GOR=     0.37 MSCF/STB WGR=  11.4350 STB/MSCF
1
********************************************************************** 63
```

```
  SIMULATE AT  1884.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  62     28 FEB 2012    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   66 TIME= 1915.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-MAR-2012)
  PAV=  4537.2  PSIA   WCT=0.814 GOR=      0.37 MSCF/STB WGR=  11.8001 STB/MSCF
1
**********************************************************************  64
  SIMULATE AT  1915.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  63     30 MAR 2012    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   67 TIME= 1945.00  DAYS ( +30.0  DAYS REPT  2 ITS) (29-APR-2012)
  PAV=  4537.9  PSIA   WCT=0.818 GOR=      0.37 MSCF/STB WGR=  12.1542 STB/MSCF
1
**********************************************************************  65
  SIMULATE AT  1945.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  64     29 APR 2012    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   68 TIME= 1976.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-MAY-2012)
  PAV=  4538.5  PSIA   WCT=0.822 GOR=      0.37 MSCF/STB WGR=  12.5214 STB/MSCF
1
**********************************************************************  66
  SIMULATE AT  1976.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  65     30 MAY 2012    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   69 TIME= 2006.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-JUN-2012)
  PAV=  4539.1  PSIA   WCT=0.827 GOR=      0.37 MSCF/STB WGR=  12.8789 STB/MSCF
1
**********************************************************************  67
  SIMULATE AT  2006.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  66     29 JUN 2012    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   70 TIME= 2037.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-JLY-2012)
  PAV=  4539.8  PSIA   WCT=0.831 GOR=      0.37 MSCF/STB WGR=  13.2488 STB/MSCF
1
**********************************************************************  68
  SIMULATE AT  2037.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  67     30 JLY 2012    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   71 TIME= 2068.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-AUG-2012)
  PAV=  4540.4  PSIA   WCT=0.834 GOR=      0.37 MSCF/STB WGR=  13.6097 STB/MSCF
1
**********************************************************************  69
  SIMULATE AT  2068.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  68     30 AUG 2012    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007
```

```
***************************************************************************

 STEP   72 TIME= 2098.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-SEP-2012)
  PAV=  4540.9  PSIA   WCT=0.838 GOR=     0.37 MSCF/STB WGR=  13.9626 STB/MSCF
1
***********************************************************************  70
  SIMULATE AT  2098.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  69    29 SEP 2012   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   73 TIME= 2129.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-OCT-2012)
  PAV=  4541.5  PSIA   WCT=0.841 GOR=     0.37 MSCF/STB WGR=  14.3318 STB/MSCF
1
***********************************************************************  71
  SIMULATE AT  2129.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  70    30 OCT 2012   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   74 TIME= 2159.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-NOV-2012)
  PAV=  4542.0  PSIA   WCT=0.845 GOR=     0.37 MSCF/STB WGR=  14.6936 STB/MSCF
1
***********************************************************************  72
  SIMULATE AT  2159.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  71    29 NOV 2012   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   75 TIME= 2190.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-DEC-2012)
  PAV=  4542.5  PSIA   WCT=0.848 GOR=     0.37 MSCF/STB WGR=  15.0720 STB/MSCF
1
***********************************************************************  73
  SIMULATE AT  2190.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  72    30 DEC 2012   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   76 TIME= 2221.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-JAN-2013)
  PAV=  4543.0  PSIA   WCT=0.851 GOR=     0.37 MSCF/STB WGR=  15.4546 STB/MSCF
1
***********************************************************************  74
  SIMULATE AT  2221.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  73    30 JAN 2013   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   77 TIME= 2249.00  DAYS ( +28.0  DAYS REPT  2 ITS) (27-FEB-2013)
  PAV=  4543.5  PSIA   WCT=0.854 GOR=     0.37 MSCF/STB WGR=  15.8039 STB/MSCF
1
***********************************************************************  75
  SIMULATE AT  2249.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  74    27 FEB 2013   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

 STEP   78 TIME= 2280.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-MAR-2013)
  PAV=  4544.0  PSIA   WCT=0.857 GOR=     0.37 MSCF/STB WGR=  16.1936 STB/MSCF
```

```
1
**********************************************************************  76
  SIMULATE AT  2280.00    DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  75     30 MAR 2013    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   79 TIME= 2310.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-APR-2013)
  PAV=  4544.5  PSIA   WCT=0.860 GOR=     0.37 MSCF/STB WGR=  16.5741 STB/MSCF
1
**********************************************************************  77
  SIMULATE AT  2310.00    DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  76     29 APR 2013    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   80 TIME= 2341.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-MAY-2013)
  PAV=  4545.0  PSIA   WCT=0.862 GOR=     0.37 MSCF/STB WGR=  16.9518 STB/MSCF
1
**********************************************************************  78
  SIMULATE AT  2341.00    DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  77     30 MAY 2013    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   81 TIME= 2371.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-JUN-2013)
  PAV=  4545.5  PSIA   WCT=0.865 GOR=     0.37 MSCF/STB WGR=  17.3223 STB/MSCF
1
**********************************************************************  79
  SIMULATE AT  2371.00    DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  78     29 JUN 2013    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   82 TIME= 2402.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-JLY-2013)
  PAV=  4546.0  PSIA   WCT=0.867 GOR=     0.37 MSCF/STB WGR=  17.6921 STB/MSCF
1
**********************************************************************  80
  SIMULATE AT  2402.00    DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  79     30 JLY 2013    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   83 TIME= 2433.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-AUG-2013)
  PAV=  4546.5  PSIA   WCT=0.870 GOR=     0.37 MSCF/STB WGR=  18.0676 STB/MSCF
1
**********************************************************************  81
  SIMULATE AT  2433.00    DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  80     30 AUG 2013    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

**************************************************************************

 STEP   84 TIME= 2463.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-SEP-2013)
  PAV=  4547.0  PSIA   WCT=0.872 GOR=     0.37 MSCF/STB WGR=  18.4369 STB/MSCF
1
**********************************************************************  82
  SIMULATE AT  2463.00    DAYS *INITIAL
* ECLIPSE  VERSION 2005a
```

```
REPORT  81    29 SEP 2013   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   85 TIME= 2494.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-OCT-2013)
 PAV=  4547.4  PSIA   WCT=0.874 GOR=     0.37 MSCF/STB WGR=  18.8238 STB/MSCF
1
**********************************************************************  83
 SIMULATE AT  2494.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  82    30 OCT 2013   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   86 TIME= 2524.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-NOV-2013)
 PAV=  4547.9  PSIA   WCT=0.877 GOR=     0.37 MSCF/STB WGR=  19.2025 STB/MSCF
1
**********************************************************************  84
 SIMULATE AT  2524.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  83    29 NOV 2013   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   87 TIME= 2555.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-DEC-2013)
 PAV=  4548.3  PSIA   WCT=0.879 GOR=     0.37 MSCF/STB WGR=  19.5969 STB/MSCF
1
**********************************************************************  85
 SIMULATE AT  2555.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  84    30 DEC 2013   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   88 TIME= 2586.00  DAYS ( +31.0  DAYS REPT  2 ITS) (30-JAN-2014)
 PAV=  4548.7  PSIA   WCT=0.881 GOR=     0.37 MSCF/STB WGR=  19.9479 STB/MSCF
1
**********************************************************************  86
 SIMULATE AT  2586.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  85    30 JAN 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   89 TIME= 2614.00  DAYS ( +28.0  DAYS REPT  1 ITS) (27-FEB-2014)
 PAV=  4548.9  PSIA   WCT=0.882 GOR=     0.37 MSCF/STB WGR=  20.2868 STB/MSCF
1
**********************************************************************  87
 SIMULATE AT  2614.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  86    27 FEB 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   90 TIME= 2645.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-MAR-2014)
 PAV=  4549.1  PSIA   WCT=0.884 GOR=     0.37 MSCF/STB WGR=  20.6753 STB/MSCF
1
**********************************************************************  88
 SIMULATE AT  2645.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  87    30 MAR 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************
```

```
STEP   91 TIME= 2675.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-APR-2014)
 PAV=  4549.2  PSIA   WCT=0.886 GOR=     0.37 MSCF/STB WGR=  21.0582 STB/MSCF
1
*********************************************************************** 89
 SIMULATE AT  2675.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  88     29 APR 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   92 TIME= 2706.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-MAY-2014)
 PAV=  4549.2  PSIA   WCT=0.888 GOR=     0.37 MSCF/STB WGR=  21.4577 STB/MSCF
1
*********************************************************************** 90
 SIMULATE AT  2706.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  89     30 MAY 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   93 TIME= 2736.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-JUN-2014)
 PAV=  4549.2  PSIA   WCT=0.890 GOR=     0.37 MSCF/STB WGR=  21.8470 STB/MSCF
1
*********************************************************************** 91
 SIMULATE AT  2736.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  90     29 JUN 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   94 TIME= 2767.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-JLY-2014)
 PAV=  4549.1  PSIA   WCT=0.892 GOR=     0.37 MSCF/STB WGR=  22.2509 STB/MSCF
1
*********************************************************************** 92
 SIMULATE AT  2767.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  91     30 JLY 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   95 TIME= 2798.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-AUG-2014)
 PAV=  4549.0  PSIA   WCT=0.893 GOR=     0.37 MSCF/STB WGR=  22.6562 STB/MSCF
1
*********************************************************************** 93
 SIMULATE AT  2798.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  92     30 AUG 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   96 TIME= 2828.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-SEP-2014)
 PAV=  4548.9  PSIA   WCT=0.895 GOR=     0.37 MSCF/STB WGR=  23.0475 STB/MSCF
1
*********************************************************************** 94
 SIMULATE AT  2828.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
 REPORT  93     29 SEP 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***************************************************************************

STEP   97 TIME= 2859.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-OCT-2014)
 PAV=  4548.8  PSIA   WCT=0.897 GOR=     0.37 MSCF/STB WGR=  23.4503 STB/MSCF
1
*********************************************************************** 95
```

```
  SIMULATE AT  2859.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  94    30 OCT 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***********************************************************************

 STEP   98 TIME= 2889.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-NOV-2014)
  PAV=  4548.6  PSIA   WCT=0.898 GOR=     0.37 MSCF/STB WGR=  23.8269 STB/MSCF
1
*******************************************************************  96
  SIMULATE AT  2889.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  95    29 NOV 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***********************************************************************

 STEP   99 TIME= 2920.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-DEC-2014)
  PAV=  4548.4  PSIA   WCT=0.900 GOR=     0.37 MSCF/STB WGR=  24.2133 STB/MSCF
1
*******************************************************************  97
  SIMULATE AT  2920.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  96    30 DEC 2014   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***********************************************************************

 STEP  100 TIME= 2951.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-JAN-2015)
  PAV=  4548.3  PSIA   WCT=0.901 GOR=     0.37 MSCF/STB WGR=  24.5991 STB/MSCF
1
*******************************************************************  98
  SIMULATE AT  2951.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  97    30 JAN 2015   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***********************************************************************

 STEP  101 TIME= 2979.00  DAYS ( +28.0  DAYS REPT  1 ITS) (27-FEB-2015)
  PAV=  4548.1  PSIA   WCT=0.902 GOR=     0.37 MSCF/STB WGR=  24.9479 STB/MSCF
1
*******************************************************************  99
  SIMULATE AT  2979.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  98    27 FEB 2015   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***********************************************************************

 STEP  102 TIME= 3010.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-MAR-2015)
  PAV=  4547.9  PSIA   WCT=0.904 GOR=     0.37 MSCF/STB WGR=  25.3340 STB/MSCF
1
******************************************************************* 100
  SIMULATE AT  3010.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT  99    30 MAR 2015   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

***********************************************************************

 STEP  103 TIME= 3040.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-APR-2015)
  PAV=  4547.7  PSIA   WCT=0.905 GOR=     0.37 MSCF/STB WGR=  25.7084 STB/MSCF
1
******************************************************************* 101
  SIMULATE AT  3040.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 100    29 APR 2015   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007
```

```
******************************************************************************

 STEP  104 TIME= 3071.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-MAY-2015)
  PAV=  4547.5  PSIA   WCT=0.906 GOR=     0.37 MSCF/STB WGR=  26.0951 STB/MSCF
1
************************************************************************* 102
  SIMULATE AT  3071.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 101     30 MAY 2015     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  105 TIME= 3101.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-JUN-2015)
  PAV=  4547.4  PSIA   WCT=0.907 GOR=     0.37 MSCF/STB WGR=  26.4693 STB/MSCF
1
************************************************************************* 103
  SIMULATE AT  3101.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 102     29 JUN 2015     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  106 TIME= 3132.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-JLY-2015)
  PAV=  4547.2  PSIA   WCT=0.909 GOR=     0.37 MSCF/STB WGR=  26.8546 STB/MSCF
1
************************************************************************* 104
  SIMULATE AT  3132.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 103     30 JLY 2015     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  107 TIME= 3163.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-AUG-2015)
  PAV=  4547.0  PSIA   WCT=0.910 GOR=     0.37 MSCF/STB WGR=  27.2386 STB/MSCF
1
************************************************************************* 105
  SIMULATE AT  3163.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 104     30 AUG 2015     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  108 TIME= 3193.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-SEP-2015)
  PAV=  4546.8  PSIA   WCT=0.911 GOR=     0.37 MSCF/STB WGR=  27.6079 STB/MSCF
1
************************************************************************* 106
  SIMULATE AT  3193.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 105     29 SEP 2015     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  109 TIME= 3224.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-OCT-2015)
  PAV=  4546.7  PSIA   WCT=0.912 GOR=     0.37 MSCF/STB WGR=  27.9864 STB/MSCF
1
************************************************************************* 107
  SIMULATE AT  3224.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 106     30 OCT 2015     *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  110 TIME= 3254.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-NOV-2015)
  PAV=  4546.5  PSIA   WCT=0.913 GOR=     0.37 MSCF/STB WGR=  28.3501 STB/MSCF
```

```
******************************************************************************

 STEP  104 TIME= 3071.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-MAY-2015)
  PAV=  4547.5  PSIA   WCT=0.906 GOR=     0.37 MSCF/STB WGR=  26.0951 STB/MSCF
1
************************************************************************** 102
  SIMULATE AT  3071.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 101     30 MAY 2015    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  105 TIME= 3101.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-JUN-2015)
  PAV=  4547.4  PSIA   WCT=0.907 GOR=     0.37 MSCF/STB WGR=  26.4693 STB/MSCF
1
************************************************************************** 103
  SIMULATE AT  3101.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 102     29 JUN 2015    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  106 TIME= 3132.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-JLY-2015)
  PAV=  4547.2  PSIA   WCT=0.909 GOR=     0.37 MSCF/STB WGR=  26.8546 STB/MSCF
1
************************************************************************** 104
  SIMULATE AT  3132.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 103     30 JLY 2015    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  107 TIME= 3163.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-AUG-2015)
  PAV=  4547.0  PSIA   WCT=0.910 GOR=     0.37 MSCF/STB WGR=  27.2386 STB/MSCF
1
************************************************************************** 105
  SIMULATE AT  3163.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 104     30 AUG 2015    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  108 TIME= 3193.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-SEP-2015)
  PAV=  4546.8  PSIA   WCT=0.911 GOR=     0.37 MSCF/STB WGR=  27.6079 STB/MSCF
1
************************************************************************** 106
  SIMULATE AT  3193.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 105     29 SEP 2015    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  109 TIME= 3224.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-OCT-2015)
  PAV=  4546.7  PSIA   WCT=0.912 GOR=     0.37 MSCF/STB WGR=  27.9864 STB/MSCF
1
************************************************************************** 107
  SIMULATE AT  3224.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 106     30 OCT 2015    *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007

******************************************************************************

 STEP  110 TIME= 3254.00  DAYS ( +30.0  DAYS REPT  1 ITS) (29-NOV-2015)
  PAV=  4546.5  PSIA   WCT=0.913 GOR=     0.37 MSCF/STB WGR=  28.3501 STB/MSCF
```

```
1
*********************************************************************** 108
  SIMULATE AT  3254.00   DAYS *INITIAL
* ECLIPSE  VERSION 2005a
  REPORT 107    29 NOV 2015   *WIN32 RUN
* RUN AT 14:30 ON 01 MAY 2007
****************************************************************************

 STEP  111 TIME= 3285.00  DAYS ( +31.0  DAYS REPT  1 ITS) (30-DEC-2015)
  PAV=  4546.3  PSIA   WCT=0.914 GOR=     0.37 MSCF/STB WGR=  28.7228 STB/MSCF
    64 READING END

 Error summary
 Comments              1
 Warnings              3
 Problems              0
 Errors                0
 Bugs                  0
```