Topaze Guided Session # 2

A01 • Requirements

The following guided session uses the file TopGS02_FieldMap.bmp installed during the set up of Topaze stand alone or Ecrin Workstation. It is assumed that the user has at least studied the Topaze guided session #1.

Launch Topaze and go through the process of starting a new project using the default path. Standard test, oil and default PVT, well and reservoir parameters.

B01 • 2D Map

Click on the tab “2D Map”. The “Reference well” has been defined in the middle of the default rectangle and the coordinates of the well is at (0,0).

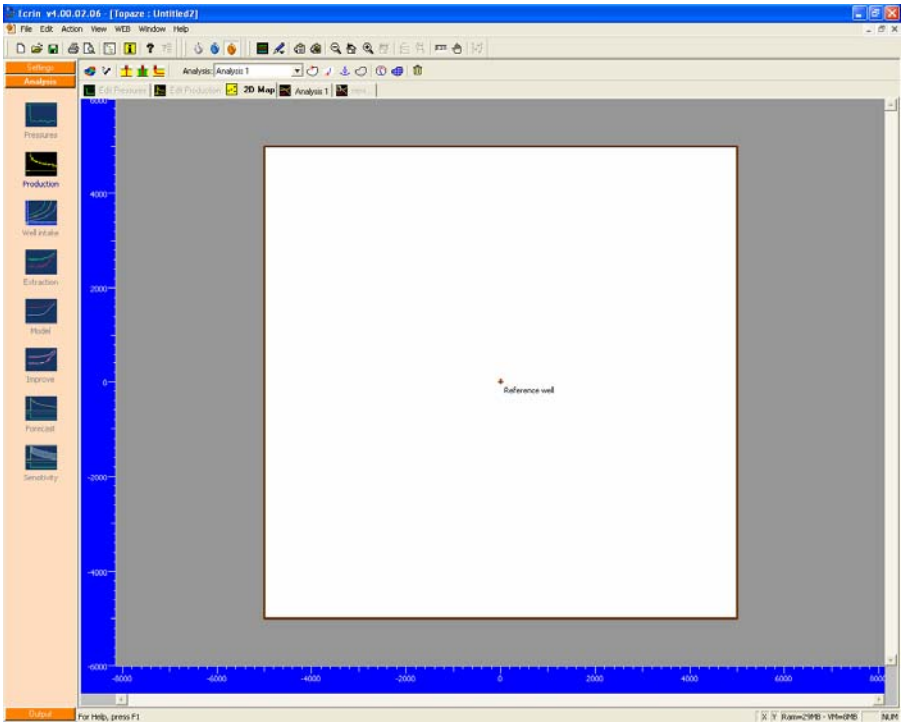


Fig B01.1

Double click on the Reference well and the well radius can be set and the coordinates can be confirmed at (0,0). The well can be a limited entry type or radial composite. The geometry of the well can be vertical, horizontal or fractured set in the geometry droplist. You enter or load the production of the well under the tab “Production”. The rate history of the tested well can also be loaded through the analysis page.
As the objective of this section is to illustrate the use of the 2D Map only we will not load a production history.

In the 2D Map toolbar click on  to load the bitmap file TopGS02_FieldMap.bmp. This and all the other 2D Map options are also accessible, and mirrors the toolbar, through the popup menu available with a right click in the 2D Map area.

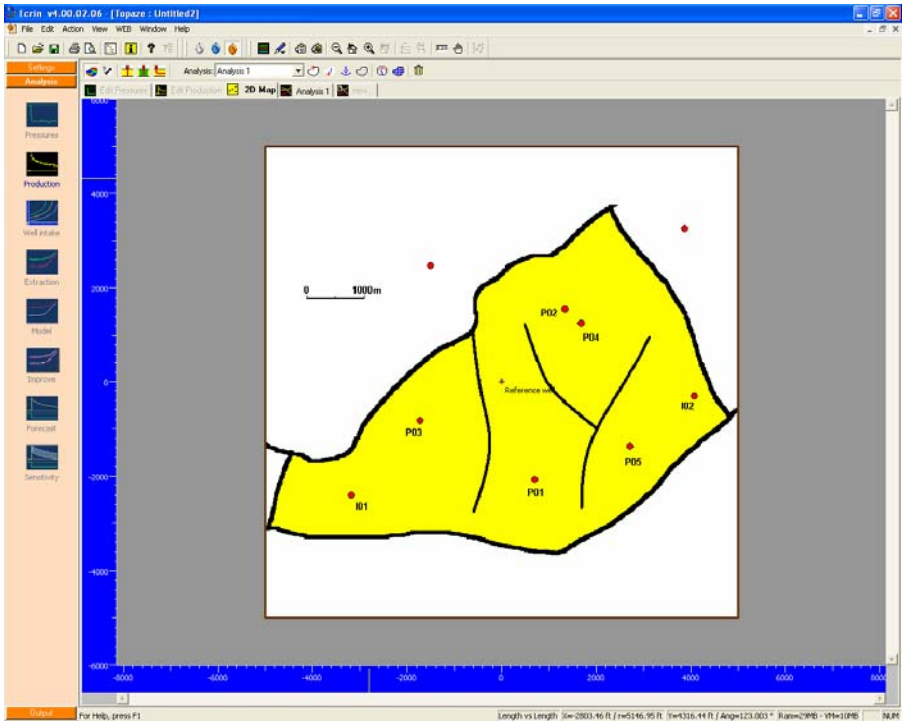


Fig B01.2 Load bitmap

The tested well can be moved to PO1 using the mouse. The use of the bitmap is to help you in defining contours, other wells, faults and setting the scale.

Define the other vertical wells using the  icon. Fractured  and horizontal  wells can also be defined using the toolbar or the popup menu. Define P03 as a fractured well, click once to set one end of the fracture and click a second time to terminate. The position of the well can be changed interactively afterwards using the mouse. By clicking on the well the fracture length and orientation can again be changed. Double clicking on the well allows the specification of the exact fracture half length and orientation. Double click on each of the wells to change the name in the well dialog to the appropriate well name indicated on the bitmap. In the well dialog the properties of the wells can be changed and the production histories loaded or entered. The sense of the reference well can be changed to other wells and any wells can be excluded from any consequent model generation or simulation.

The next step is to draw the contour of the field. Click on  and start by a first click anywhere on the contour indicated by the bitmap, move the mouse to a next point on the contour, click again.

Proceed around the contour by moving the mouse and clicking until the “rubber band” of the overlaid trace is complete. Double click to finish. Any time a mistake is made you can go back by using the Esc. key. A double click on the contour will bring up the contour dialog where you can reset the contour to a circle or rectangle and browse the size of the current contour area. The trajectory can be loaded from an outside file or modified manually. Segments of the contour can be set to constant pressure or sealing.

There is a scale indicator on the map and we need to set the scale. Click on the  icon and use the mouse to draw a line from 0 to 1000 m on the scale indicator. To be more accurate it is a good idea to zoom on the scale indicator before this operation. Set 1000 m in the Length box of the dialog.

Finally we will draw in the sealing faults indicated on the bitmap. Click on  and use exactly the same technique used to draw the contour. When a node on the contour or on an existing fault turns green it means that the fault you are in the process of drawing will snap to this point. Double clicking on a fault will bring up the fault dialog where the fault can be set to sealing or any degree of leakage. The trajectory can also be browsed or modified.
The bitmap is only a visualization of the field and has helped you to set up the model, it is no longer needed and it can be hidden. Click on the  icon again to hide it. Your 2D Map should look like Fig B01.3.

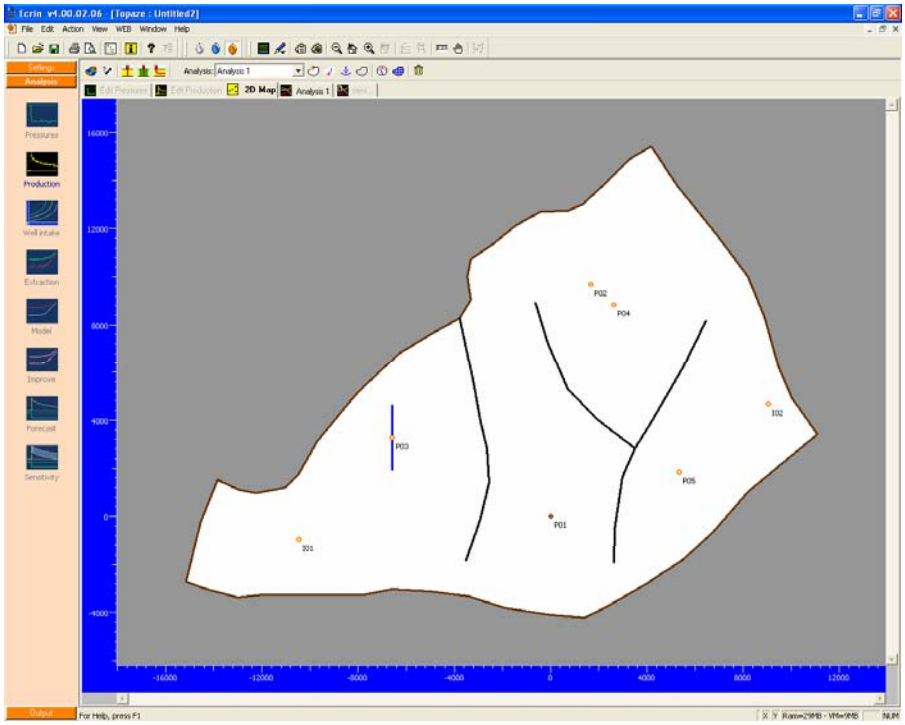


Fig B01.3 Finalized model

Clicking on the  icon will calculate the automatic Voronoi grid with local refinements around each well. Clicking on the settings  icon will access amongst others the tab 

for manual grid control. The Voronoi grid is the basis for the numerical solution of the pressure at the tested well and solves for the influence of the tested well and the influence from any wells added during the simulation. However the field map can also be used for analytical multi well simulations. Fig B01.4. (Only the well position is retained in this case).

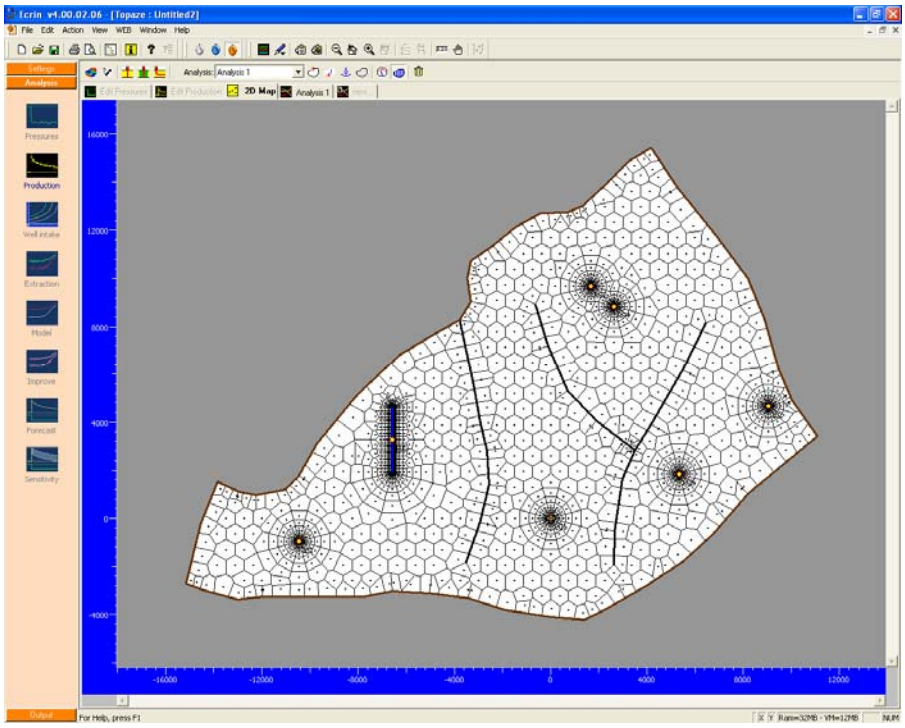


Fig B01.4 Voronoi grid

B02• Using the Numerical model

The previous sections described how to build a problem using the 2D Map facility. The present section describes the generation of a numerical model for the defined problem.

The Numerical model, like the Analytical model in Topaze, can be used for interpretation (to match some loaded data), or as a design tool. The latter use is demonstrated below.

Click on the Analysis 1 tab. Select Forecast, and chose the Numerical tab, Fig. B02.11

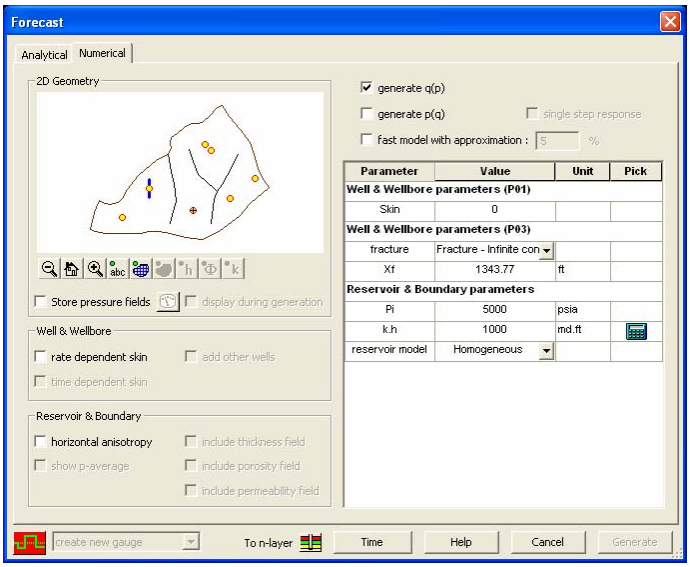


Fig B02.1

A number of controls are given, similar to what is offered with an analytical model. Note that the “Add other wells” is currently disabled. This is because no production history has been defined for those wells. In the simulation, the nearby wells can be controlled by rates only. This will be illustrated later.

Check that the option is to simulate rates from pressures, q(p). To define the input pressure history click on . The history is defined by entering a series of steps and their duration. We consider a single pressure step of 1000 hrs, at 3000 psia.

Change the kh to 2000 md.ft. Generate the solution, Fig. B02.2. A rate gauge and associated cumulative is created and from now on, Topaze will behave as if the data had been loaded.

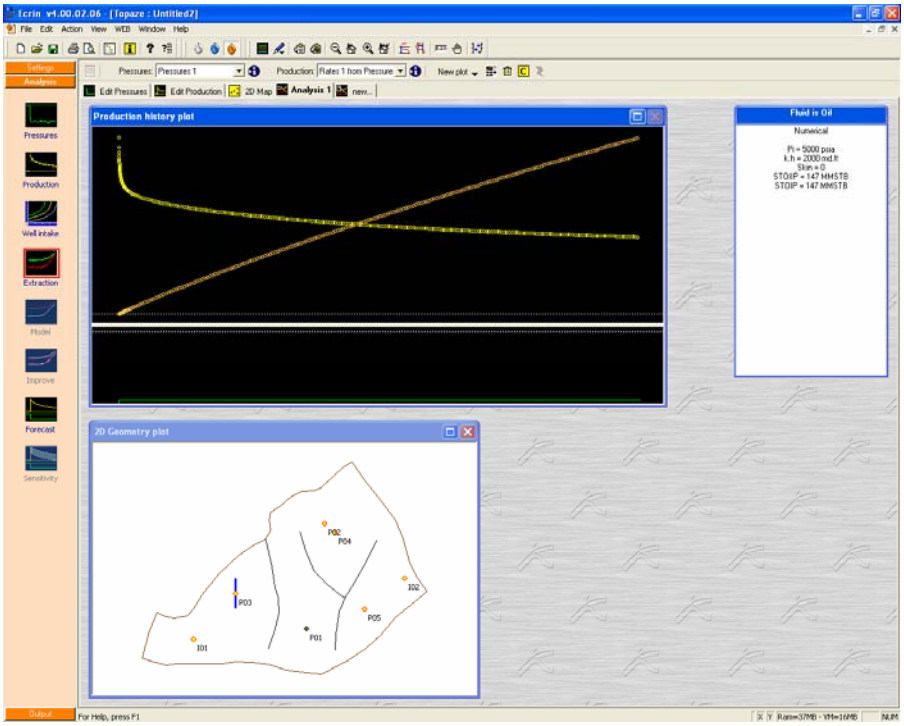


Fig B02.2

Select Extraction with all the defaults. After extraction you can delete some plots using the close box, eg. Fetkovich Type-Curve, Arps, and Normalized Rate-Cumulative plots.

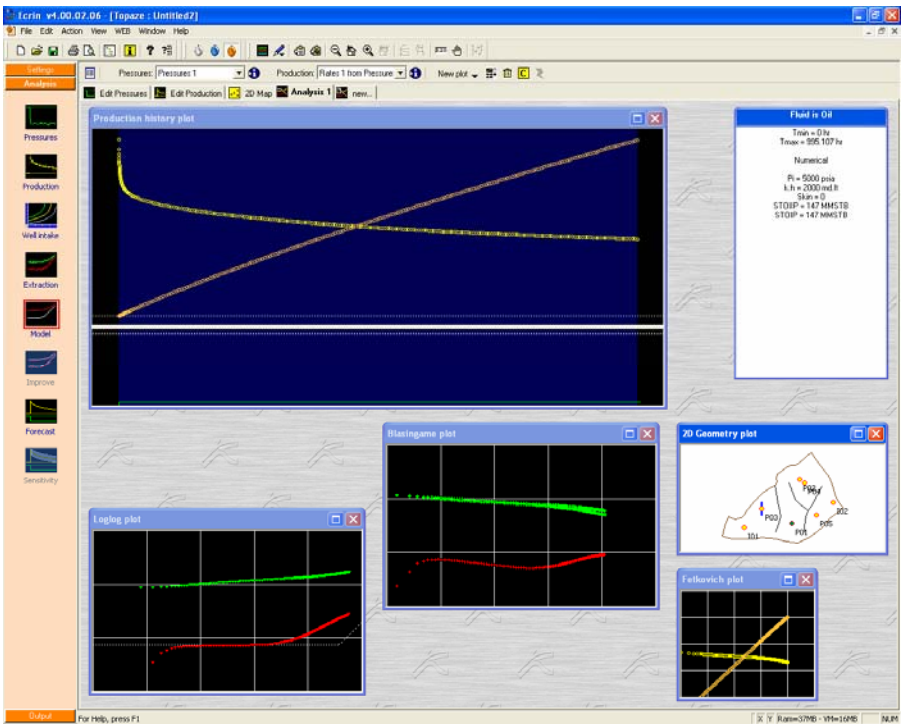


Fig B02.3

When you have made a forecast, the model used is kept in memory unless you run an automatic model. The 2D geometry plot currently displayed shows that the model is still known to Topaze.
Go to Model, select “Store pressure fields” and “display during generation”. Generate.

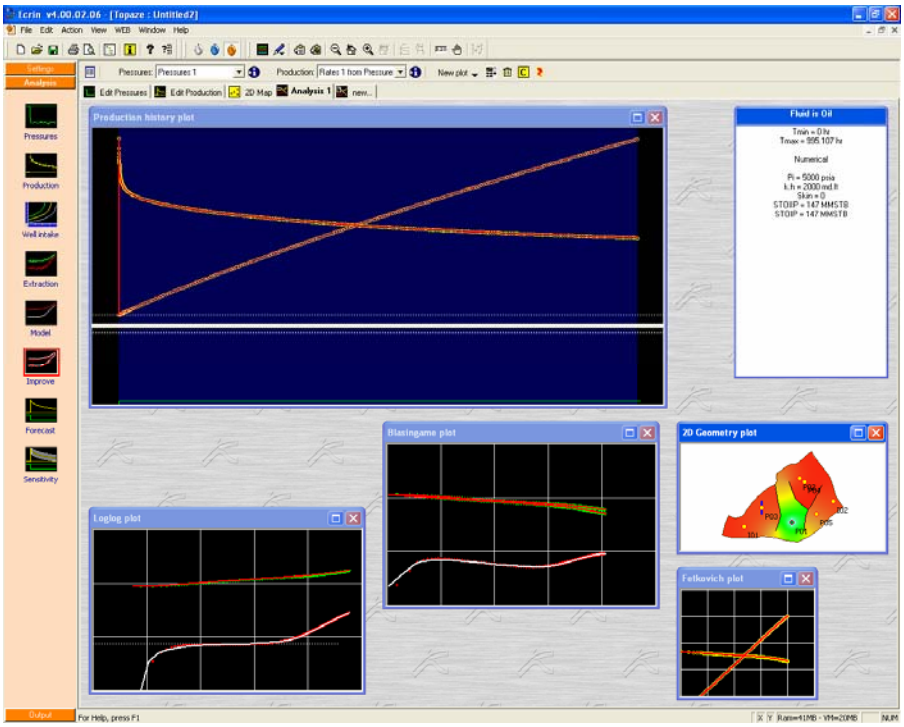


Fig B02.4

The model channels appear, and overlay with the markers. An animation of the pressure fields is played during generation of the model in the geometry plot. When the generation is finished, maximize the geometry plot, and click on the button  to return to the first pressure field. It is possible to play back the pressure field animation manually or automatically. The user can also decide which field to display by using a pick option.

 Show first field

 Show previous field

 Show next field

 Show last field

 Stop animation

 Run animation

 Run animation loop

Click on  to edit the settings.

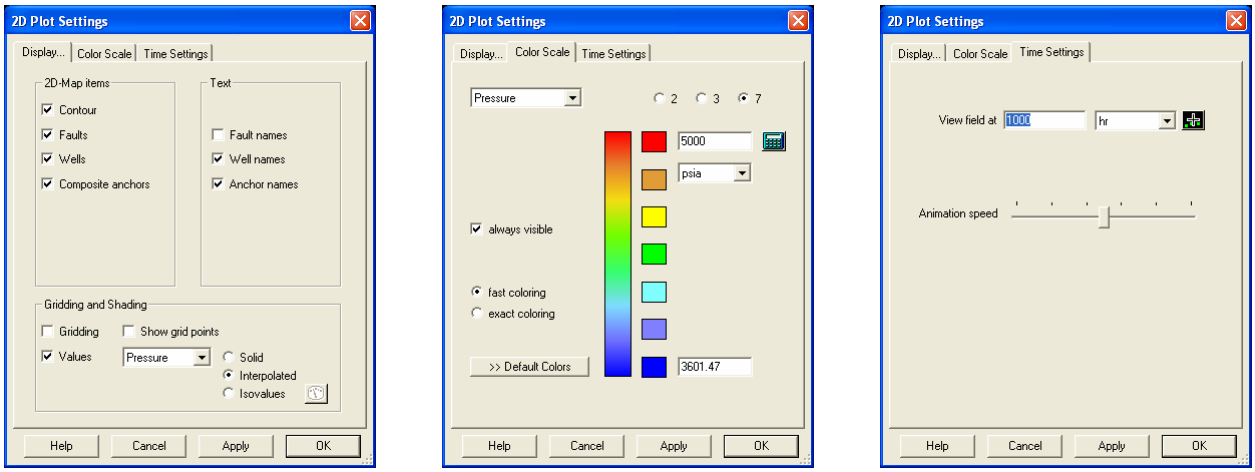


Fig. B02.5

Choose or confirm Shading, Pressure and Interpolated in the Display Tab. Choose 7 colors and click on  to choose the method of min-max of the color scale, choose “All fields min-max”.

Then click on  to run the animation. The figure below illustrates the animation at field= 440 hrs.

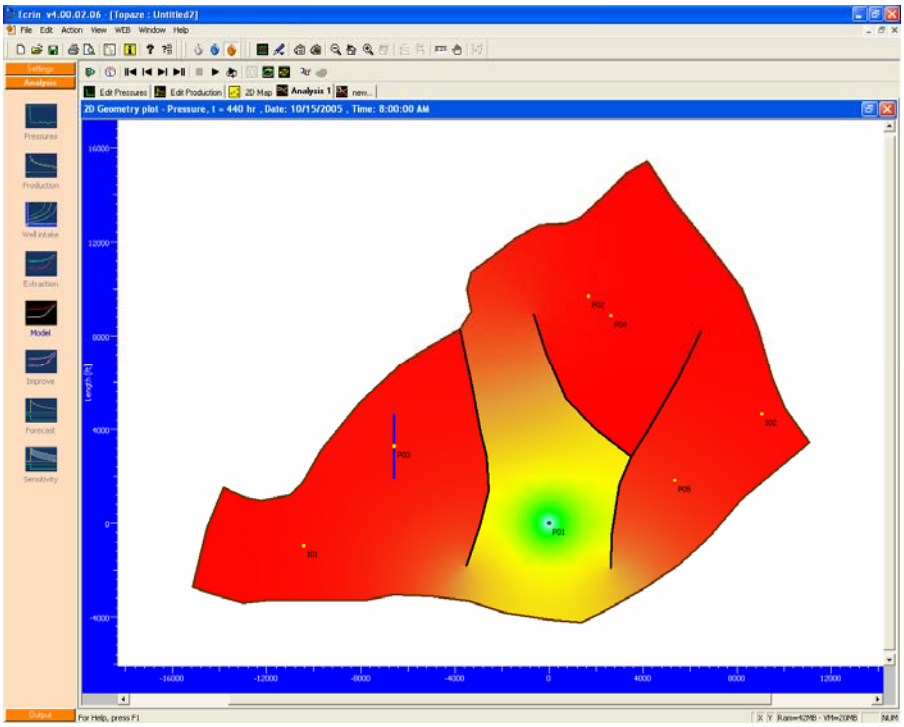


Fig. B02.6

The animation can also be seen in pseudo 3D. Click on .
The following figure illustrates the same time field as Fig. B02.6.

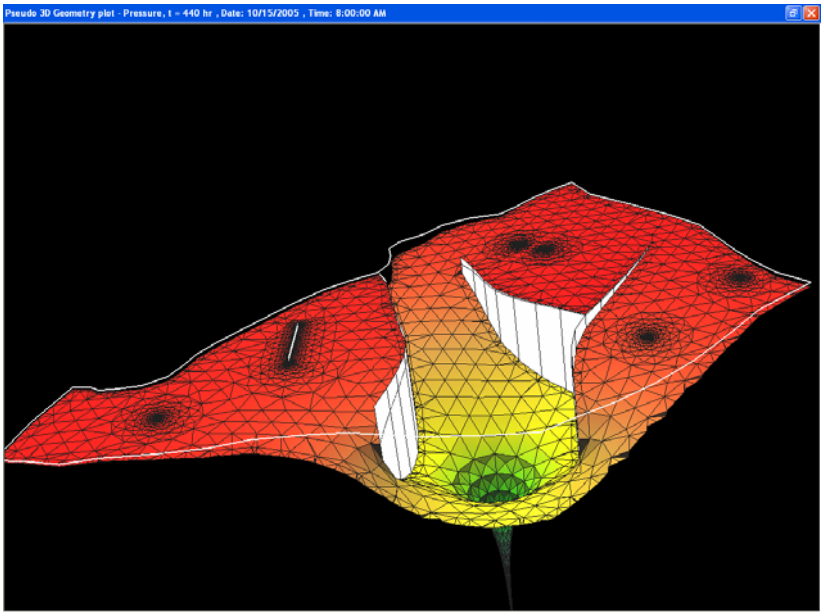


Fig. B02.7

Click on  to switch back to 2D.

Double click on the Analysis tab name “Analysis 1” and change the name to “Single Well”
Return to the 2D-map. We will enter a production history for a second well only, the producer in the “left” compartment P05.
Double click on this Well, select its Production tab, then Load. Choose “Keyboard - spreadsheet” and enter the following history: 500-3000; 500-5000, specify as “Steps: duration”.

Generate a new analysis by clicking on the ”new…” tab. Accept the default to start from the current analysis and name it “2 wells”.

Go to Model. The “add other wells” button is now offered. Select this option and Generate, Fig. B02.8.

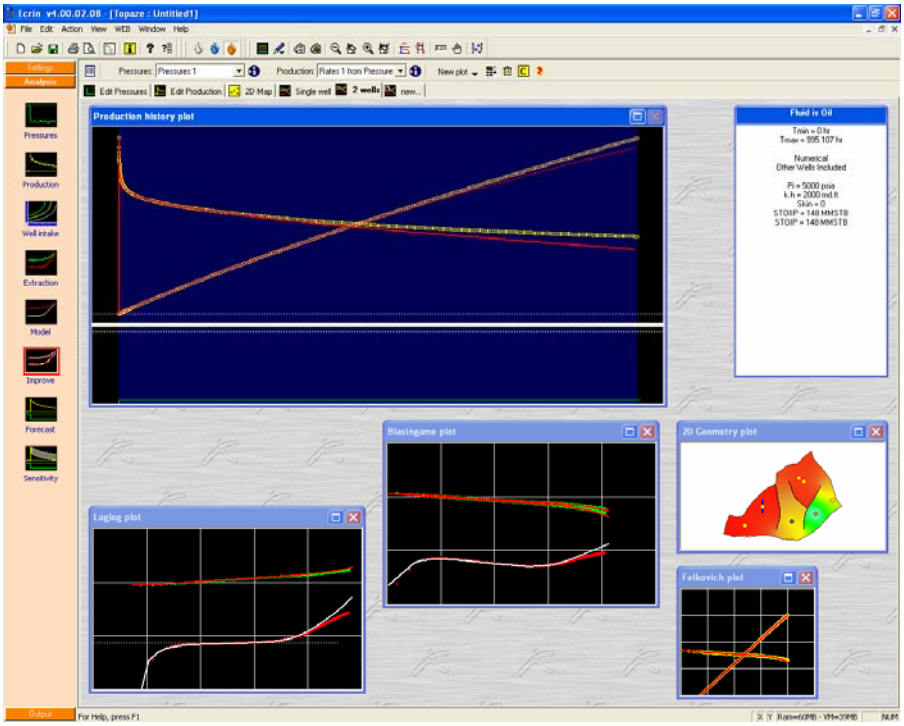


Fig B02.8

Except on the geometry plots the influence of the additional well is not clear.

Double click on the history plot and in the toolbar select  and chose “All”: all the analyses are displayed together on the plot, and once again we see –for this particular case – the small influence on the active well caused by well P05.

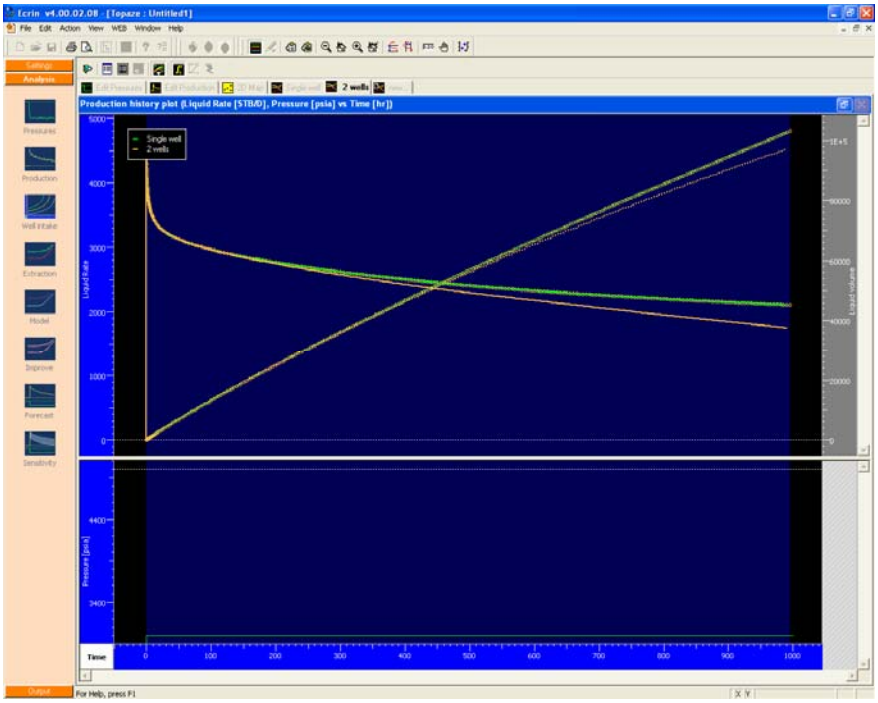


Fig B02.9

As a final step we can go back to the 2D-map and this time change the leakage factor of the fault between our P01 and P05 wells from 0 to 0.5. Double click on the fault and change the leakage.

Once again, click on the “new …” analysis tab, select copy from “2 wells” and name it, “2 wells + leakage”. Re-generate the model, maximize the history plot and compare “All” analyses, Fig. B02.10. Clearly, the influence of the nearby well is bigger, as expected.

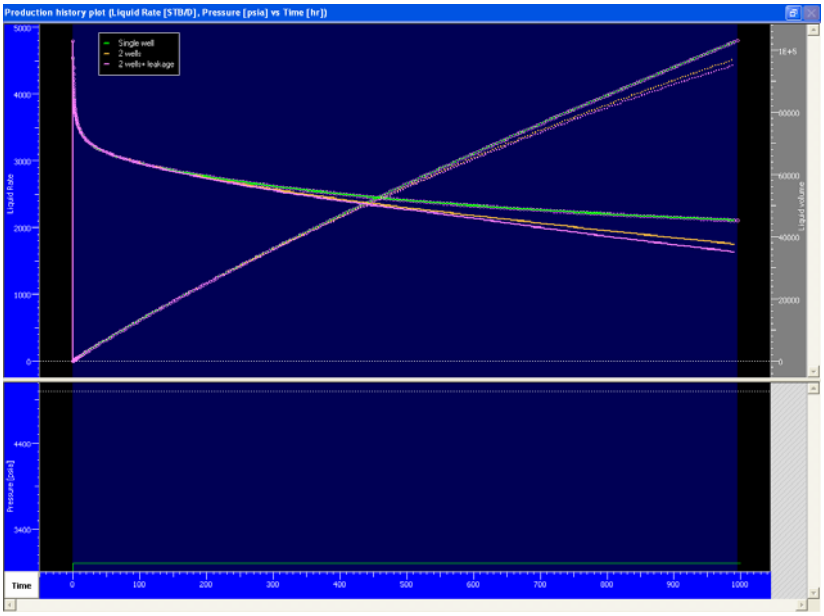


Fig B02.10

End of this guided session.