Saphir Guided Session # 5

A01 • Requirements

It is assumed that you have already studied the guided sessions # 1 and # 2 before continuing. In this session we will load the rate file and four different gauge channels.
The files are stored in the Example directory of the installation directory of Saphir stand alone or Ecrin workstation:
SapGS05_1.pre set at 5977 ft BKB.
SapGS05_2.pre set at 5954 ft BKB.
SapGS05_3.pre set at 5954 ft BKB.
SapGS05_4.pre set at 5977 ft BKB.

SapGS05.rat the flowrate file.

B01 • Objectives of QA/QC

The objectives of QA/QC is as the name implies to quality control the measured data in order to discount wellbore dominated measurements that cannot be used for pressure transient analysis, assess the quality of the tools and put a measure on this quality and finally choose the most appropriate pressure gauge(s) to use for the transient analysis.

C01 • Loading the data

Launch the application and create a new oil project with default parameters and the reference time 16 Feb 2001 19:05:50. Go to the QAQC Data panel and proceed to load the pressure gauges with a click on the  icon. During the load of the first gauge, SapGS05_1.pre you should take the opportunity after correctly formatting the file to save this format for the use during the load of the subsequent gauges. To enable this option you should format the first file in Column mode. To choose the columns date, time and pressure you click and drag in the display panel which then becomes highlighted, in this case by yellow, blue and green respectively. Once the format of the three field types is done click on the  to save the format with a name like QAQC format. Fig C01.1.
Proceed to load the next two gauges, recalling the saved format from the format droplist avoids setting up the format by hand for each load. The final file SapGS05_4.pre has a different format, choose the “Field” option and format line A as “Date”, line B as “ToD – Auto” and finally line C as “Pressure”, Load.

Proceed to load the flowrate file by a click on  in the Interpretation panel. Switching to the QAQC Data panel you should have a screen as that shown in Fig C01.2.

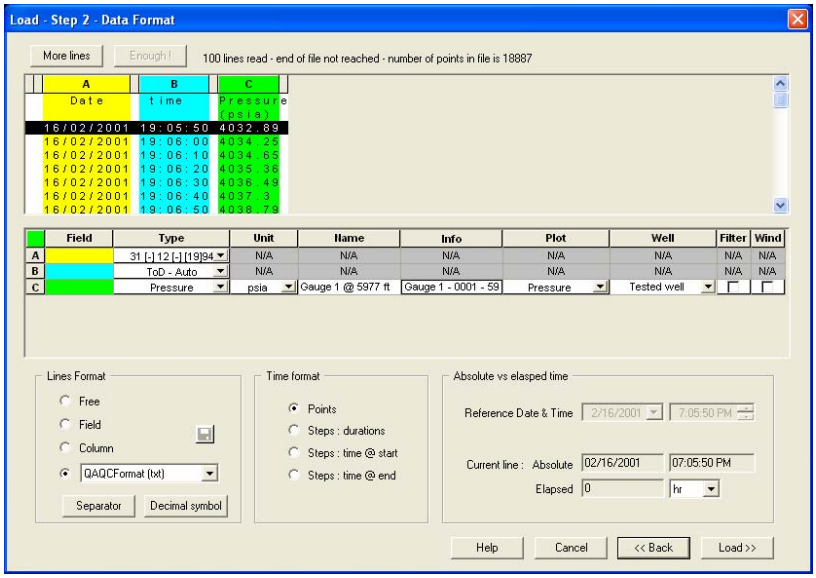


Fig C01.1 Pressure format screen



Fig C01.2 QA/QC panel after load of the gauges

C01.1 • QA/QC

The principle used by Saphir is basically the study of the changes in hydrostatic head between gauge sensing points. This is achieved by taking the difference between a reference pressure (gauge) and the other gauges. Any change in the pressure difference will indicate a change in the fluid phase between sensing points, thus indicating pressure sequences that are dominated by wellbore effects rather than the reservoir signal. The absolute difference will also indicate the quality of the tools used for the pressure and temperature recordings since the anticipated pressure difference can be estimated as long as you know the depth difference and expected fluid gravity in the well. Therefore the absolute value difference can be estimated between the individual tools and a quality indicator assigned.

Other anomalies such as sudden value shifts and drift can easily be detected and the more suspect tools can be eliminated from the pressure transient analysis.

The usual difference convention is to take the difference between the lowest gauge in the well and those above, thus forcing the pressure difference to show an increase in fluid density when the difference increases and a decrease of density when the difference decreases.

In our case the anticipated difference between Gauge 1 and 4 and Gauge 2 and 3 can be estimated from the depth difference of 23 ft with a fluid gradient 0.34 psi/ft which amounts to some 8 psi.

C01.2 • Generating the difference channel and analysis

Click on the difference  icon and declare Gauge 1 as the reference gauge as this (and Gauge 4) is the lowest gauge. Accept other defaults. The difference channels are generated automatically but because of the spikes in the pressure the difference the scale is much to coarse to see any trend or to make any qualitative analysis. These spikes are caused by a de-synchronization in time between the gauges. Fig C01.3.



Fig C01.3 QA/QC after first generation of difference

This requires synchronization and proceeds as follows: Zoom in on the beginning of the main buildup and observe the gap between the gauges, Fig C01.4

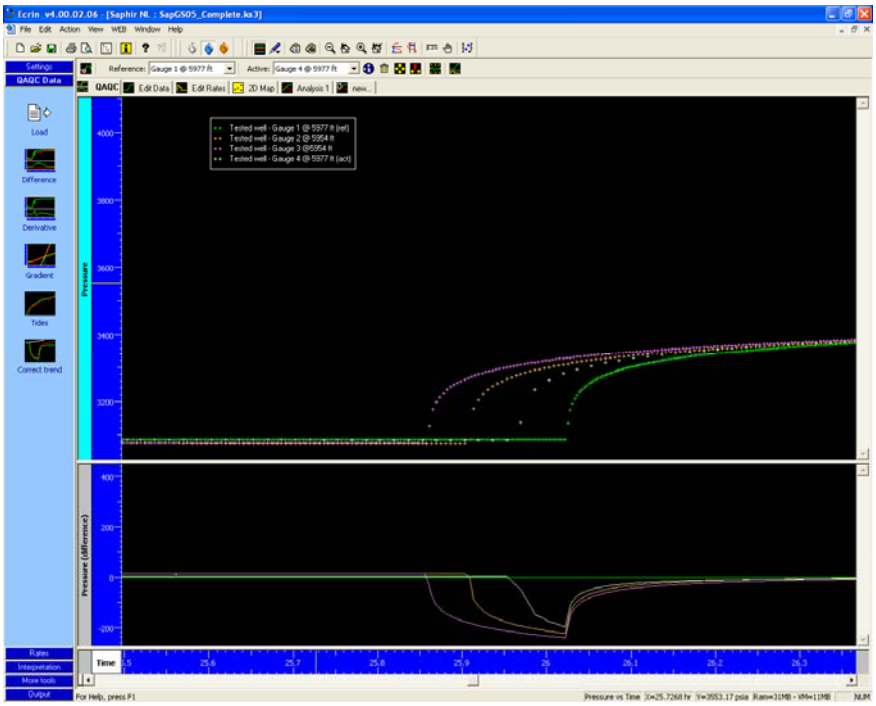


Fig C014 Zoom on beginning of main buildup.

Maintain Gauge 1 as the reference gauge and maintain the active gauge in the active gauge droplist as Gauge 4 (top toolbar). You can make the synchronization between the active and reference gauge manually using the icon but we will use the automatic feature . Click on this icon and Gauge 4 and Gauge 1 are synchronized automatically. Proceed to change the active gauge to Gauge 2 and repeat the process. Change to Gauge 3 and repeat the process, this time the regression does not manage to synchronize because the two gauges are too far apart, thus it is necessary to move Gauge 3 manually using . Click on the icon and hold down the Ctrl. Key and move Gauge 3 closer to Gauge 1 with the mouse, then finish with , all gauges are synchronized. Reset the zoom with the icon, now the difference channel is much smother, Fig C01.5.
Note, the fact of holding the Ctrl. Key kept the pressure at the same level.



Fig C01.5 After synchronization

In order to see the character of the difference channel it is necessary to maximize by a double click in the plot, and then zoom on the vertical scale. Use the  icon. Fig C01.6.

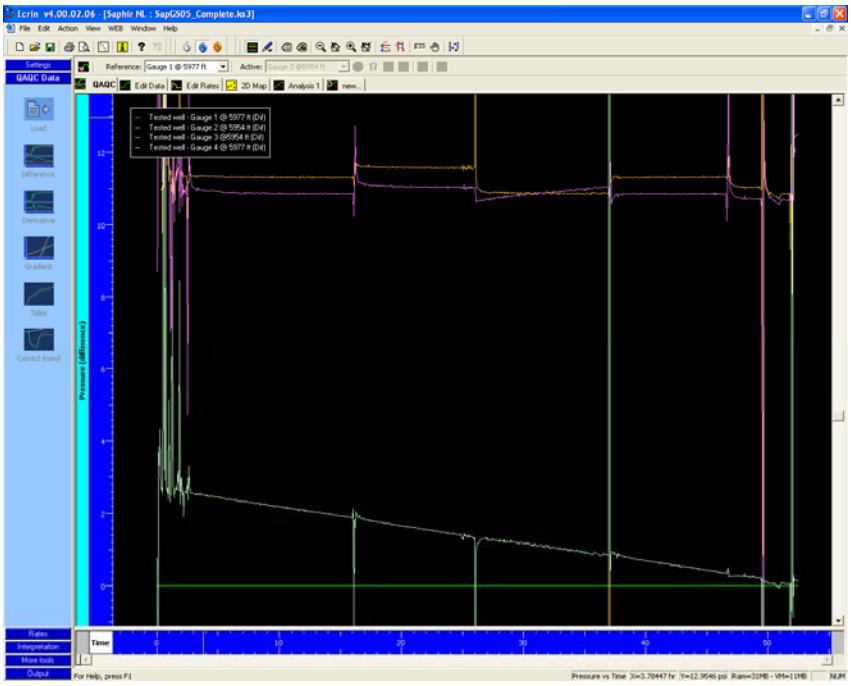


Fig C01.6 Difference channels

The gross difference between Gauge 1 and Gauge 2 and 3 is some 11 psi, discounting the hydrostatic head this makes an overall gauge difference of some 3 psi which is perfectly acceptable for medium accuracy gauges. This difference is also in line with the over all difference between Gauge 1 and 4 set at the same depth. There are no apparent anomalies in Gauge 2 and 3, but Gauge 4 is drifting heavily and can therefore be discounted from the transient analysis.

Gauge 1 being the deeper (closer to sandface) should probably be used for the pressure transient analysis, but in fact in Saphir all gauges can be extracted and compared in the diagnostic plots.

D01 • Extracting multiple gauges

Click on the 

tab and extract the main buildup. In the analysis Gauge droplist, choose list 

and all gauges.

The resulting loglog plot containing all the extracted gauges shows that they overlay perfectly and in fact all the gauges can be used in the analysis including the drifting gauge as this drift is negligible. Fig D01.1.

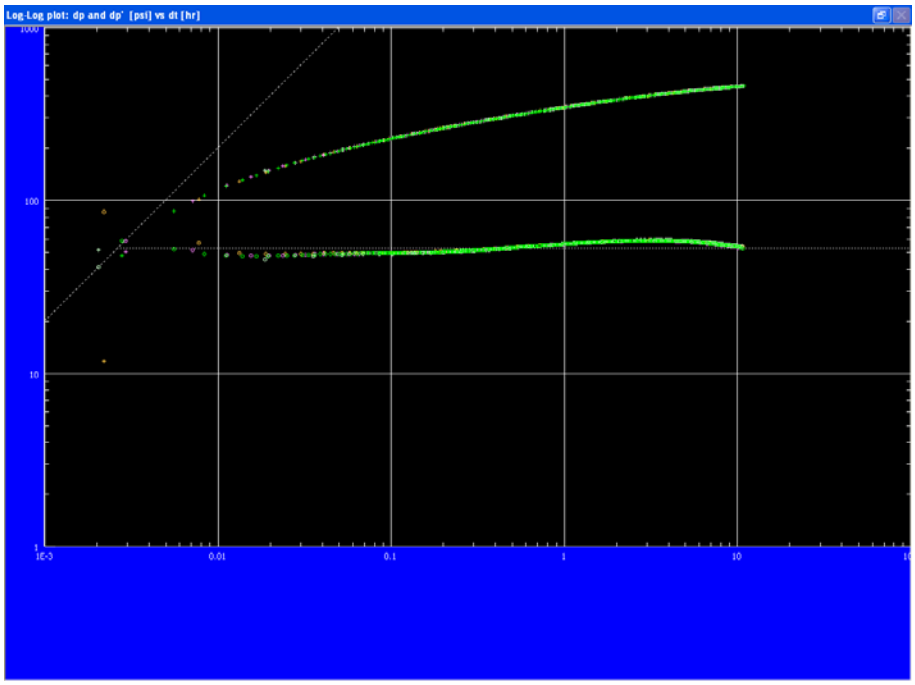


Fig D01.1 Loglog plot