VISUALIZATION AND ANALYSIS TOOLS

Sahara's goal is to help improve the daily workflows of production and reservoir engineer teams, by organizing the available information and providing the tools to efficiently analyze it and decide the best course of action.

In order to accomplish this, Sahara features global access to that information through several linked windows, which provide context while eliminating the need to browse through multiple databases/software.

Each of these windows is customizable, both in functionality and in style. Saving these different configurations as templates, each of these individual work configurations can be easily restored when needed, and also shared between users, for further streamlining the workflows when needed.

Whenever a well is selected in the map, all other visualization windows that are open will be updated to display the information associated with the new selection.
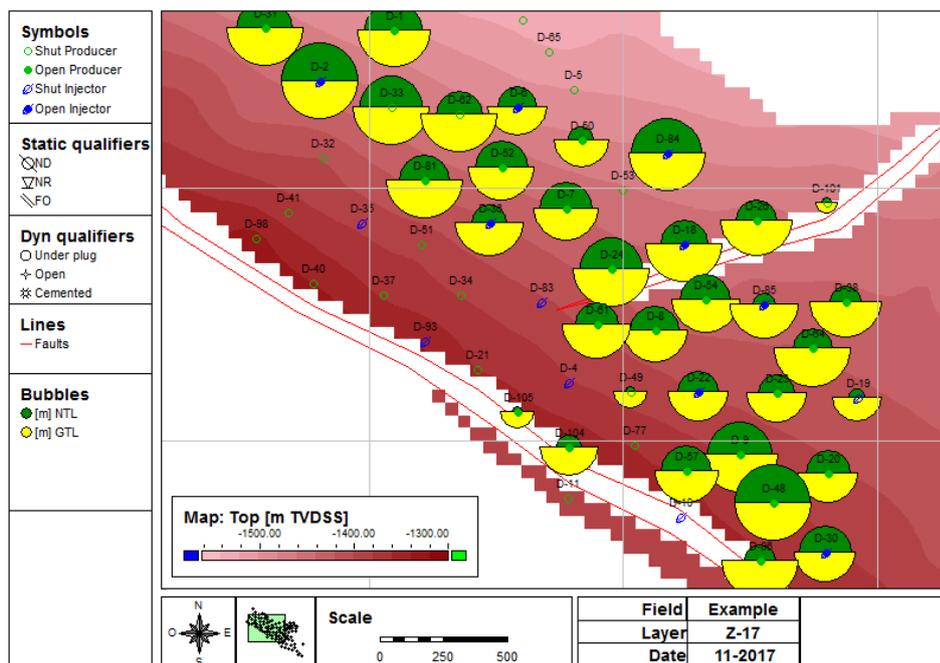
One of Sahara's main advantages is the link existing among its visualization windows. Selecting a well in the Map window provides instant access to its corresponding information in each of the open visualization windows.

Z-1	Z-2	Z-3	Z-4	Z-5	Z-6	Z-7	Z-8	Z-9	Z-10	Z-11
Z-12	Z-13	Z-14	Z-15	Z-16	Z-17	Z-18	Z-19	Z-20	Z-21	Z-22
Z-23	Z-24	Z-25	Z-26	Z-27	Z-28	Z-29	Z-30	Z-31	Z-32	Z-33
Z-34	Z-35	Z-36	Z-37	Z-38	Z-39	Z-40	Z-41	Z-42	Z-43	Z-44
Z-45	Z-46	Z-47	Z-48	Z-49	Z-50	Z-51	Z-52	Z-53		
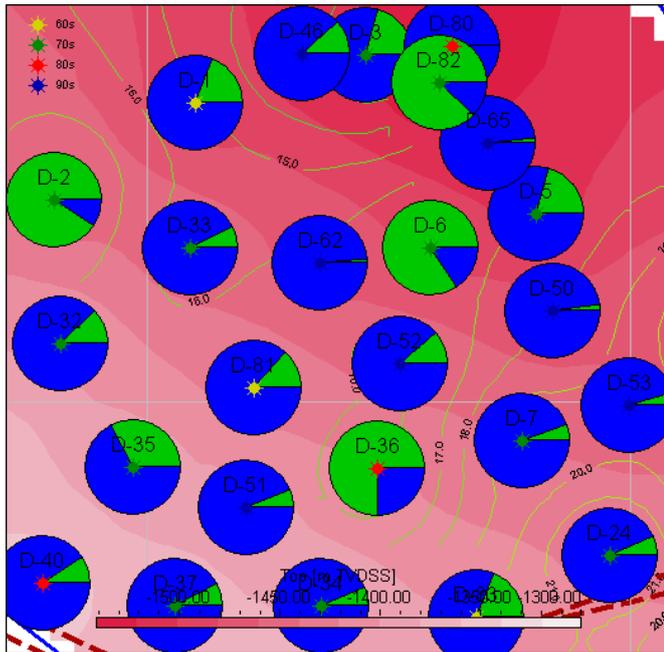
Map Window. In this example the structural map is displayed alongside the outlines for net thickness. Additionally, each well is displaying as a pie bubble its proportional water and oil rates for the active date.

The Map window is considered one of the main windows in Sahara's interface. It will display the wells and different objects in the project in their correct location. The symbol displayed in their position can be linked to either a static or a dynamic attribute, and its color and shape may be customized for each case. If the attribute is dynamic, the one displayed will correspond to the current active date. In addition to wells and objects, Sahara can display multiple variable maps, such as structural, porosity, thickness, saturation, HCPV or any other user generated map. Reference lines such as contract areas, roads, layer borders or faults can also be displayed for enhanced functionality. Since these data can be linked to a particular layer, whenever a layer is selected in the layer bar, all the information is updated to its position at that particular layer's top.

Additionally, other information can be displayed as flags, like perforation status or log availability. The log interval corresponding to the selected layer can also be displayed next to the well. Data from the analytical water simulator can be displayed. After performing a simulation, associated injection, distribution coefficients and saturations over time can be consulted in each flow element that connects the producer wells to the neighboring injectors. Lastly, bubble maps can be used to display multiple kinds of information, from production rates or cumulative volumes to reservoir properties, both static and dynamic. These have multiple formats available, from bars and pies to radar or annular.

The Productions window can be used to generate templates of up to 16 fully customizable charts, where the user can select which data to display from monthly or daily productions, tests, notes, wellworks, extraction systems and other data. It is possible to visualize individual wells or groups of wells, in different formats (added up, overlaid, averaged, etc.).

The configuration of these windows in Sahara can be saved as a template, allowing the users to have different setups for their workflows, and restoring them as needed with just a couple of clicks. These templates can also be shared across projects, so the workflows can be standardized throughout the company.

Sahara also provides 3D visualization, where well trajectories, their subsurface installation schematics, logs, structures and other information, like connection between injector and producer wells or fluid levels over time, can be displayed.

This integration of multiple types of information across many windows provides great quality control opportunities, resulting in a more organized access to data and better informed decisions.
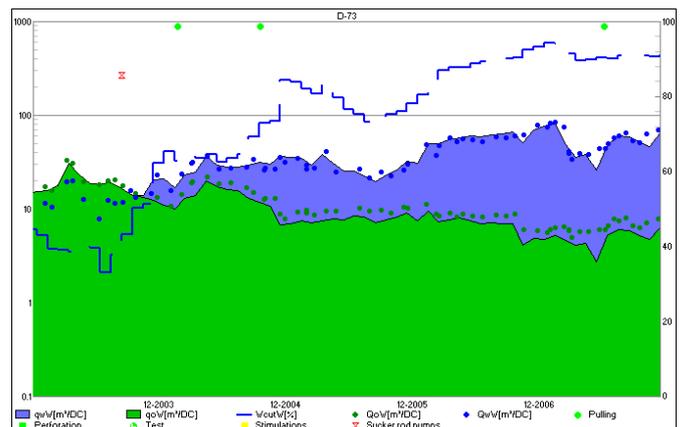
Productions Window. Oil and water rates are being displayed with their area painted in color, while the water-oil relationship curve is displayed with a discontinuous line. On top, several notes about events related to this particular well can be seen, and clicking on them provides information on that event.
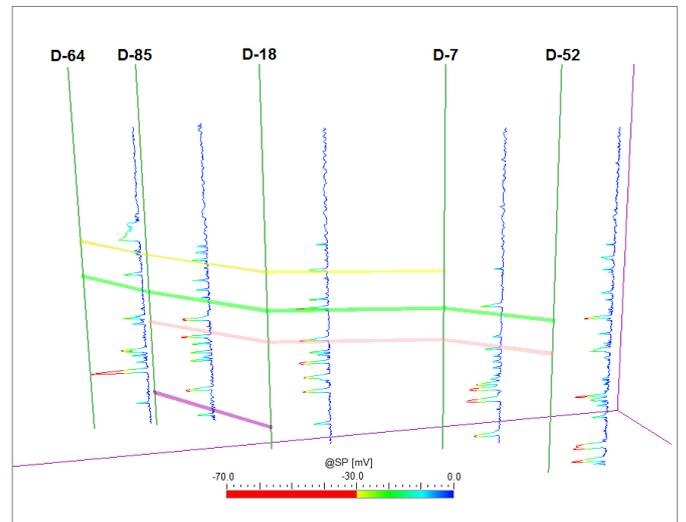
3D Window. In this simple display, you can see the spontaneous potential log displayed for each well, as well as connections amongst them. You can add lots of information to the 3D visualization for visually striking images.
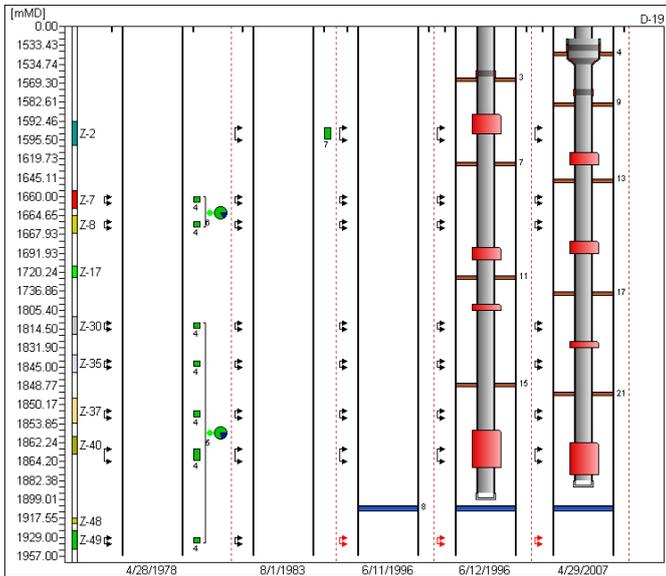
Wellworks Window. The wellwork and facility evolution is displayed for an injector well. Perforations, cementations, stimulations and test results can be observed for each date.
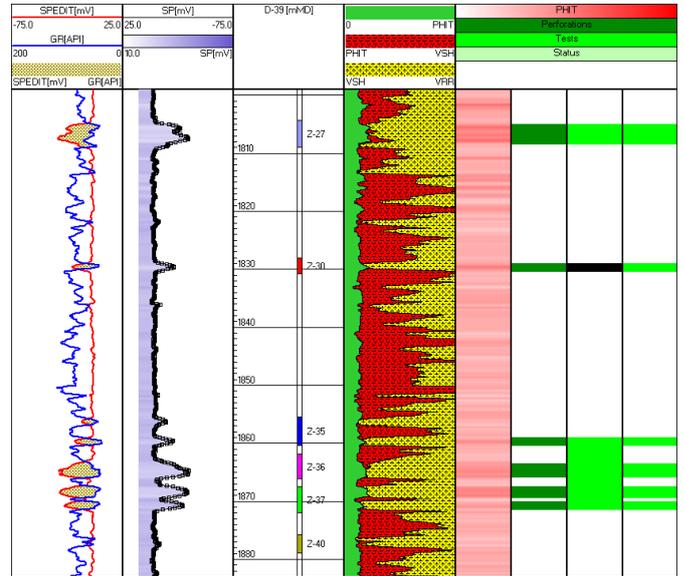
Logs Window. In different tracks, electric logs are displayed with highlighted zones, and flags indicating perforated, stimulated and tested zones. The central track shows layer tops and bottoms for the selected well.

Sahara's Wellworks window is where the user can visualize the entire historical data about perforations, tests, stimulations, fractures, squeezes and subsurface installations over time for the selected well. The information can be presented as a diagram, distorting the vertical scale to generate an easier to read display, or scaled correctly and displayed alongside any log template chosen.

The Logs window is specifically designed to create visualization templates for logs, coloring zones and highlighting interesting areas as well as special tracks displaying perforation, test and stimulation information. These log templates can be used in multiple places within Sahara, such as the Wellworks, Map and Cross Sections windows.

Cross sections can be built just by clicking on wells on the Map window. The cross section line will be displayed in the map and the information for each well will be shown in the Cross Sections window, alongside with the log information selected and other data available, such as well test results. Specific tools for correlating layers between wells are available, and the top and bottom of each layer can be easily defined with just a couple of clicks.

A full set of tools, including reports and charts in two and three dimensions, helps quickly generate reports for the daily production monitoring and project global analysis
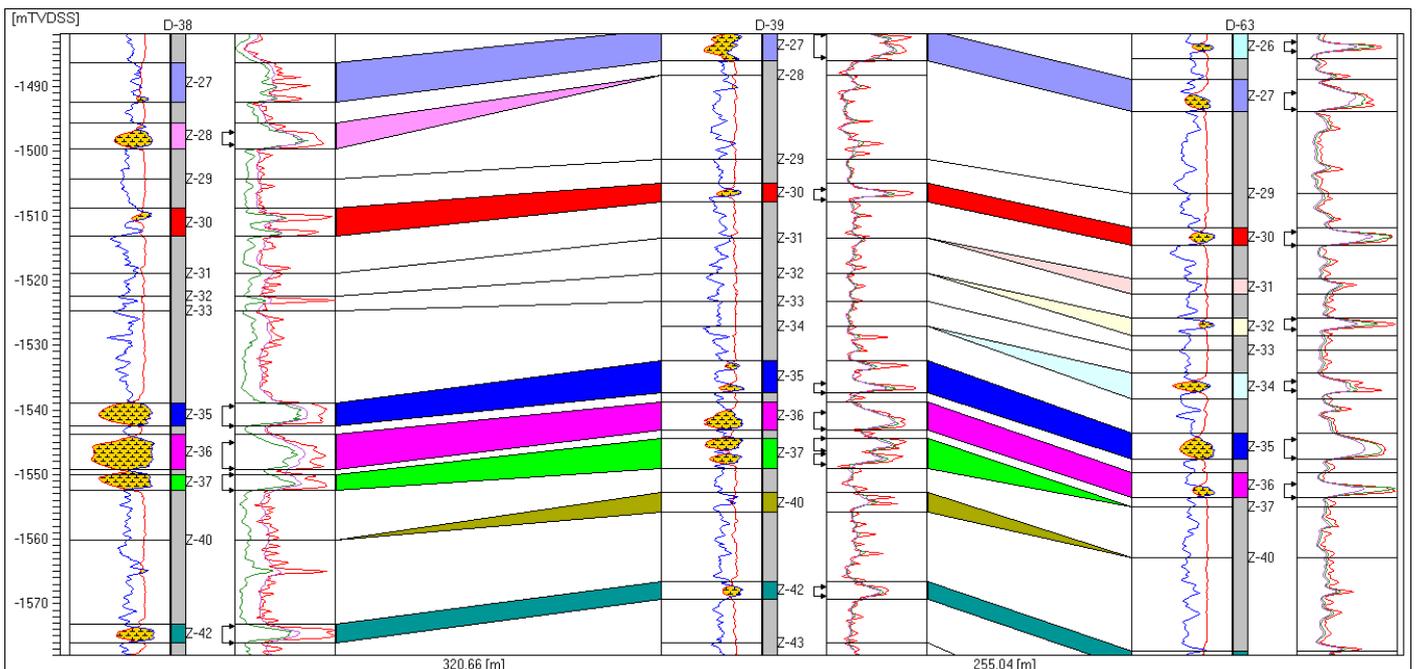
Cross Sections Window. A 3 well structural cross section is displayed. For each well, SP and GR logs can be seen, showing productive sands with a shaded area between both curves and the resistivity logs. Additionally, the correlated layers showing their tops and bottoms are visualized. The perforated intervals in brackets give access to the results of the tests performed.
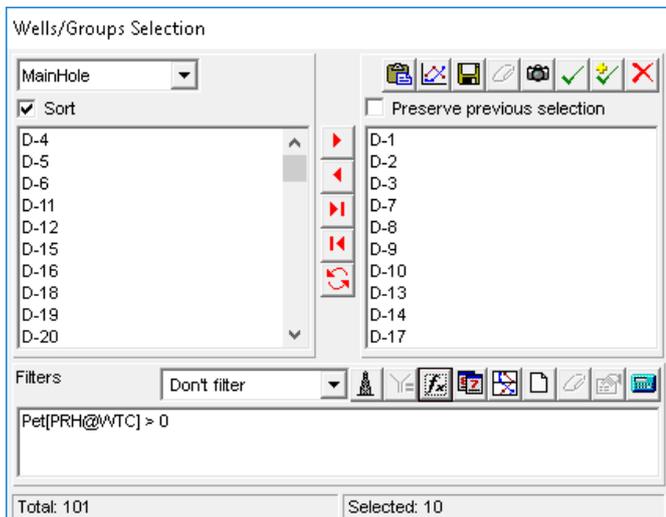
Groups/Wells Selection Tool. Accessible from multiple places within Sahara, will help the user focus on the wells needed for the analysis.

The Wells/Groups Selection window is a very important part of Sahara, which provides multiple filter tools to help focus on the wells relevant to the current task or analysis, optimizing the workflow. There are two panels showing a list of the objects present in the project. Any objects on the right list may be selected. Drag and drop objects or move them with the arrows to alter the selection. Whenever a filter is applied, the number of objects displayed will get smaller, since only objects that fulfill all the requested conditions are displayed. Some of the available criteria to filter the wells are static attributes, dynamic attributes, logs, relevant dates like perforation or completion date, and finally, an equation builder with the capacity to use any variable stored in Sahara and logical operators, for maximum flexibility.

In Sahara, variables are grouped according to the type of information stored in them. In each of these variable groups, Sahara has pre-defined variables covering the most frequently loaded data for them, set as default with some built-in functionality that helps save time. If a variable not available by default is needed, the user can easily create it. New variables can be created to store imported data, or defined as calculated variables using our Equation editor and all its operators (logical, arithmetical and geometrical) to input the equation. All the other variables available in the project can be used when creating the equation, and the resulting values are available instantly whenever the new variable is selected.

In each of Sahara's windows you will also find options for specific reports referred to the information displayed in that window in particular, as well as camera icons that will capture the graphic display to the clipboard, enabling pasting to any other software with no effort.

An extensive set of tools reduces the workload by easily grouping wells according to their characteristics, obtaining statistical values and generating reports to analyze any particular aspect or property.
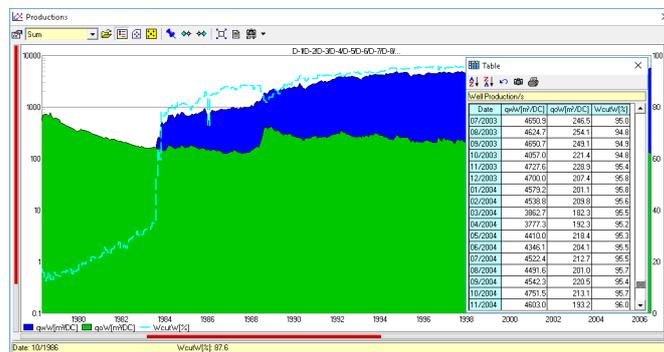
Production Window Report. All the information used to generate the chart being displayed can be easily accessed in a tabular form.
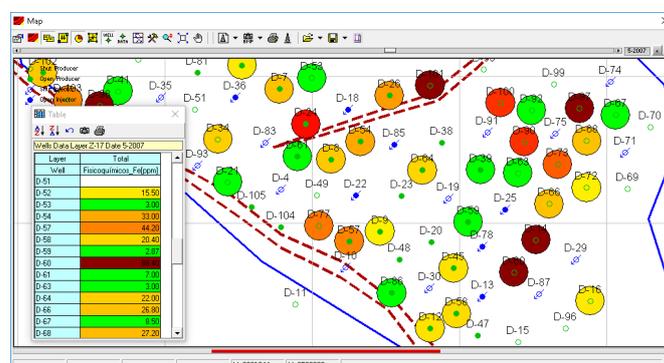
Map Window Report. The image shows the data displayed in bubbles in a tabular form for easy export to other applications. Other type of reports allows visualizing information regarding maps and flow elements displayed in the map window.

Additionally, there is a dedicated Report window with more advanced options to generate customized reports for the user's needs.

Report Window. Specific reports are available for the different types of information stored in the project.

interfaces