# PRODUCTION FORECASTS

Sahara offers two tools with different features and purposes to help with the calculation of production forecasts.

The Declines window is oriented to the analysis of the production historical behavior of wells or groups of wells from which a forecast can be generated. For this purpose, Sahara provides a series of templates covering the curve configurations normally used for this type of analysis.

The Forecast Exercises window allows viewing and planning production forecasts for different drilling and/or workover schedule alternatives. These alternatives are grouped by exercises, containing type wells associated with well drilling and workovers.

Both tools give the possibility of saving production forecast results into several production scenarios, which can be later visualized for a global analysis in the Productions window.
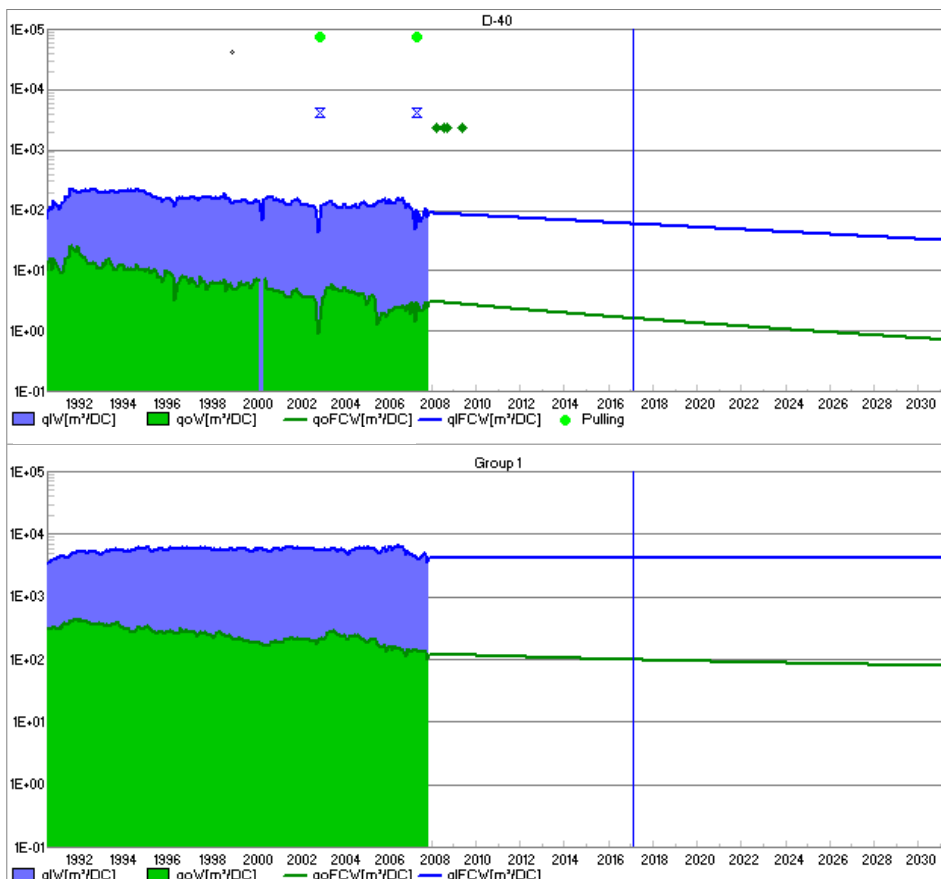
Multiple templates can be used to perform a decline analysis for the wells in a project or to generate type wells for drilling schedules.
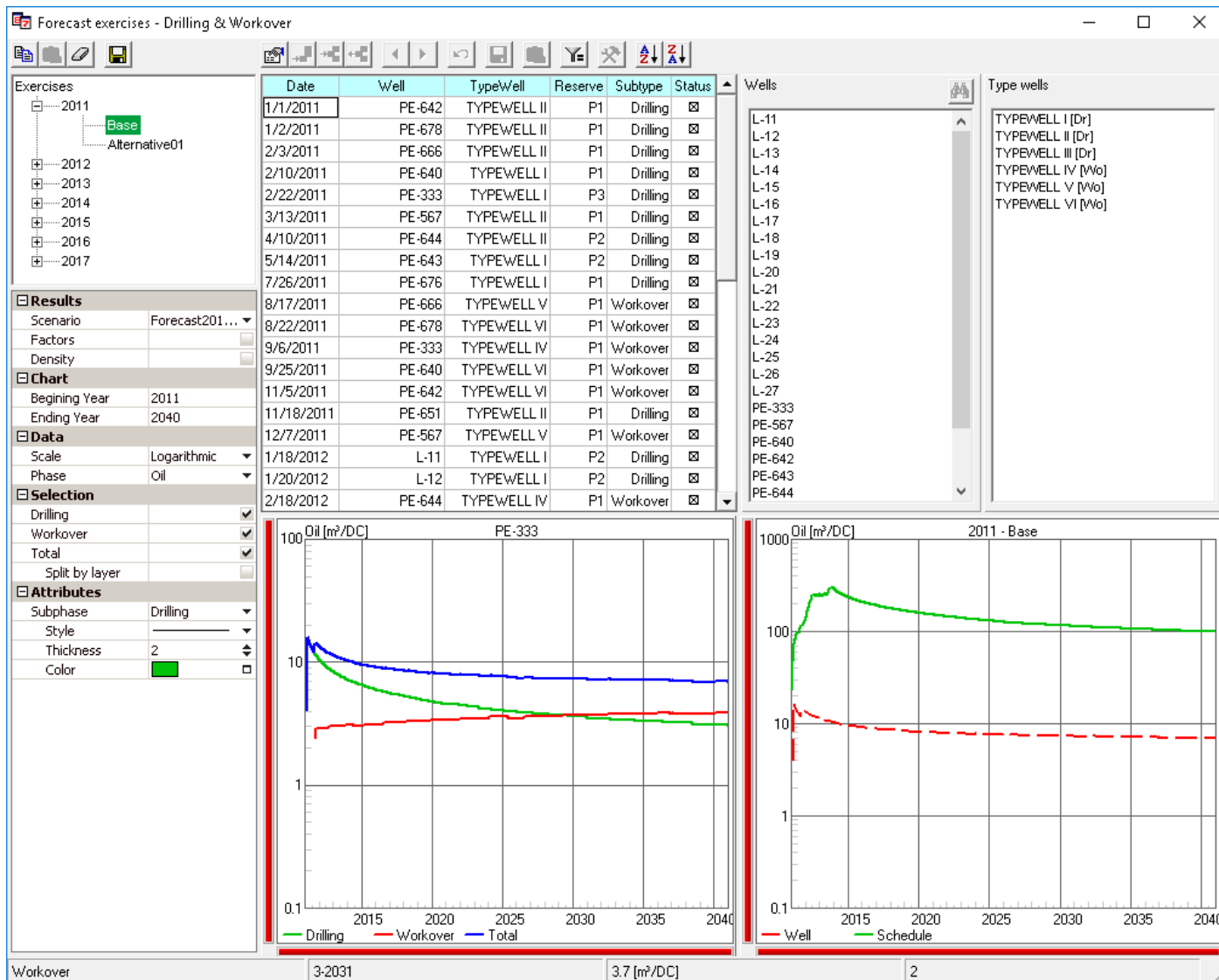
Forecast Exercises Window. A base schedule for a forecasting exercise is displayed with a drilling campaign designed in two stages.

The Forecast Exercises tool helps to assess different scheduling alternatives in a quick and easy way in order to optimize the project activity.

The Forecast Exercises window allows viewing and planning multiple drilling and workover schedules. The different alternatives are grouped by exercises, containing type wells associated with well drilling and workovers.

Each exercise has a group of type wells associated, identified by name, level (i.e., whether the production is at well level or layer level), and production flow rates of each phase, in a normalized time scale at time zero. Within each exercise, multiple scheduling alternatives can be considered, where each new well or workover will be associated with a type well at a given date. Having more than one alternative makes it possible to evaluate different schedules considering different budgets, equipment availability, various stages of the same project, or any other contingency that may require evaluating different proposals for the same exercise.

The tool allows working in a simple and comfortable way to generate the schedule. Once the type wells have been associated with the exercise and the list of wells to be drilled or repaired is complete, generating the schedule is very straightforward. The schedule table can be completed by simply double clicking on the list of wells and type wells or using the drag & drop option from any of both lists to a row in the table. Then the production start date for each well can be changed at one-month intervals o removed temporarily from the schedule in order to run sensitivity analysis.

Once the desired schedule has been defined and set, the production curves can be saved in a forecast scenario, which may use the reserve categories or type of activity as sub phases. In this way, the predicted curves for the drilling and workover activities can be visualized independently in the Productions window, as well the proved, probable and possible reserve curves. At the same time, the type well flow rates may be affected by a factor depending on the reserve category to which the well belongs.

The Control Panel tool offers a category of charts specially designed to monitor the perforated wells during a drilling campaign. The available charts are used to:

- **Treemap-Type Wells**: Identify the type wells that have been used in the campaign schedule, with the possibility of arranging them according to their initial flow rate or their associated activity.

- **Treemap-Wells**: Identify the actual drilled wells associated with each type well, with the possibility of arranging them according to their initial flow rate or their cumulative production.

- **Production-Type Wells**: Compare the well actual productions or cumulative production with the production or cumulative production curve of the corresponding type well in a normalized time scale.

- **Production-Wells**: Compare the well actual productions or cumulative production with the production or cumulative production curve of the corresponding type well as from the actual start of production date for each well.

- **Campaign**: Compare the actual production curve with the estimated one and the estimated production start dates with the actual start of production dates. This chart shows three curves: estimated flow rates and estimated start of production date, estimated flow rates and actual start of production date, and actual flow rates and actual start of production dates.

- **Schedule**: Compare the scheduled activity with the activity performed thus far on a bar chart for each month of the campaign.

- **Wells**: Compare the total scheduled activity with the activity performed thus far.

A special function within the Declines window offers the possibility of creating type wells, and with the standard time axis, production curves associated with type wells that will be part of a forecasting exercise.

Any of the templates available in the window can be used to create a type well with production curves associated with any production or injection sub phase. A group of wells can be selected to calculate their production average, which will serve as the regression basis resulting in the production curves for the various type well sub phases.

For each sub phase, multiple regression sections with different parameters can be used to simulate a production curve with different declines for different periods.

As one of its several functions, the Declines window can be used to generate the production curve for a type well associated with a forecasting exercise.

Declines Window. Three charts are displayed, one for each production phase, with the regression period adjusted to generate a new type well in an existing forecasting exercise.
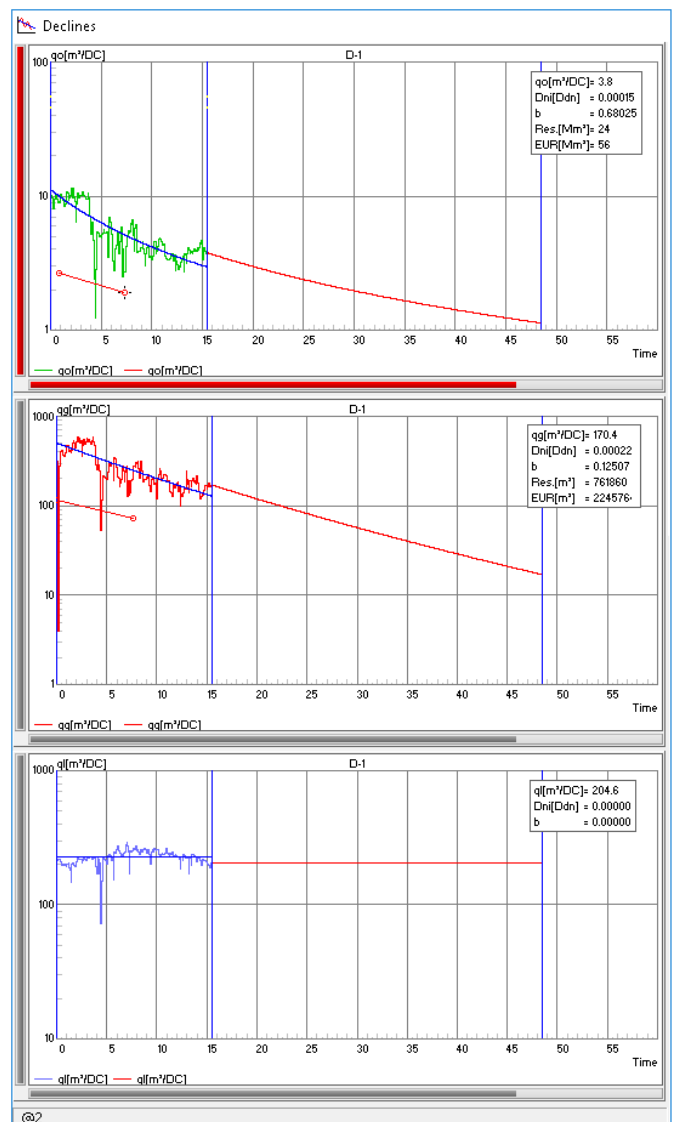

Control Panel. A set of different charts from the Type well category allows evaluating the performance and results of the proposed activity for a forecasting exercise.

Declines Window. Template with 2 charts showing oil data (upper chart) and liquid data (lower chart).

The Declines window offers the classic options for adjusting production data, and a variety of tools to generate production forecasts through different templates. Most of these templates are composed of two or three charts, where the historical behavior of the different production phases can be adjusted simultaneously. A special functionality auto adjusts the sections taken for the regression, maintaining the same period for all the charts in the template.

The configuration provides a time-saving default option for calculating declines for a large group of wells. Since, in general, the template, equation and economic limit used for a zone are the same, these values can be set by default for successive well analysis.

As a common feature within Sahara, the Declines window is linked to the Map window, which allows selecting wells to perform the decline analysis from the Wells/Groups Selection window, or by simply clicking on the desired well in the Map window.

The analysis can be performed with different data sources – monthly productions, production controls or daily productions – being possible to visualize production curves in the background as an aid. These curves may be from other phases of the well under study or from another well or groups of wells within the project.
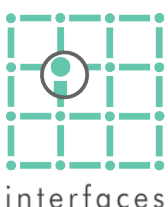
Multiple declines can be used to compare the different methods available. Sahara offers the possibility to choose, for each decline, the desired equation, so as to calculate the parameters according to the best fit over the historical data. It also allows the user to enter the equation parameter desired values. A supplementary option gives the possibility of removing unwanted points from the analysis, by clicking on such points, or removing multiple points, using lower or upper limit sections.

Using well notes as a guide in the Declines window is an additional feature that helps to establish stable production periods. These notes are categorized and it is possible to activate only those that may be of interest for each case, such as changing the extraction system, opening new layers or closing layers in production.

When saving the results of a decline, Sahara will save the actual forecast flow rates along with the history in the selected result scenario and the parameters used to generate those flow rates. These parameters can be viewed in the Forecast Declines window by filtering by scenario or by well. It is also possible to preserve the analysis that refers to the general configuration set in the Declines window to get the best fit and consequently the desired forecast.
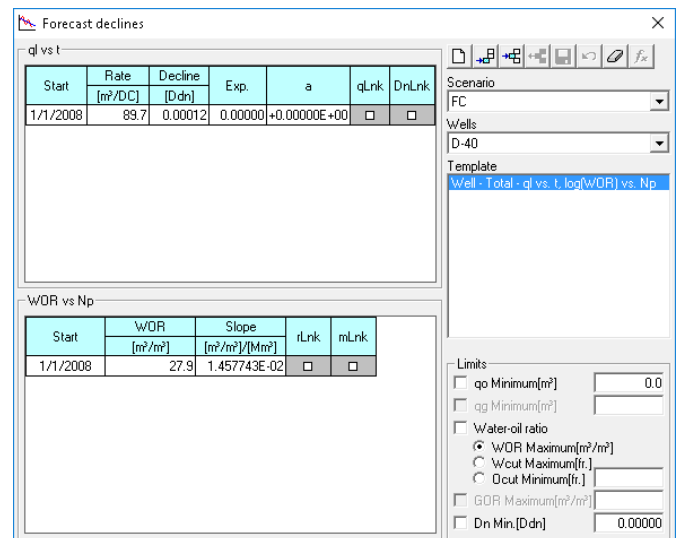
Forecast Declines Window. The parameters used in previously stored declines can be displayed, sorted by result scenario