SPE 121801 Integrated Production Model with Stochastic Simulation to Define Teotleco Exploitation Plan

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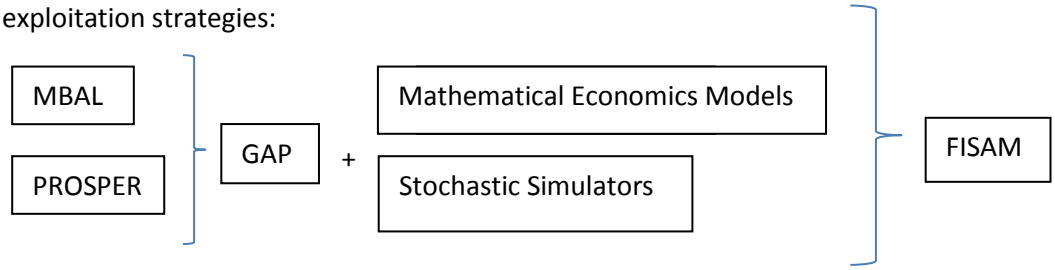
IPM models (MBAL, PROSPER and GAP) have been found to be very useful in the calculation of production forecasts and the optimisation of field developments which provide a single possible solution each time that they are run. FISAM (Fully Integrated and Stochastic Asset Model) was created to couple deterministic models with the stochastic simulation programs to obtain probabilistic results.

The workflow to integrating the reservoir, well and surface facilities with the economics model will be presented as well as the resulting; production profiles, economic evaluation and risk analysis which improved the managers' project decisions.

The Teotleco FISAM model evaluated 15 exploitation scenarios to review the Net Present Value (NPV) and associated risks as well as prioritising scenarios on top of the current base case. In this case, the IPM model is therefore used as an analytical simulation platform to evaluate the exploitation strategies:



A Front-End Loading (FEL) approach was adopted to evaluate multiple scenarios with uncertainty risk analysis through 3 stages: visualisation, conceptualisation and definition. The FEL approach was applied to 15 scenarios accounting for: geology, reservoirs, wells, facilities, environment and SIPAC. The following options were considered: use of multilateral wells, flooding with water, gas, N2 and CO2, locations to minimise environmental impact and different surface arrangements including the expansion of existing facilities over 15 years.

Conclusions:

1. The use of IPM models with stochastic simulators makes it possible to achieve probabilistic production forecasts accounting for reservoir conditions, well productivity and surface conditions.
2. 15 possible scenarios were evaluated regarding the exploitation of the Teotleco field with fully integrated and stochastic asset models.
3. Implementation of the FEL approach along with FISAM identified scenarios which provide greater value than the base case.
4. The scenarios which could be evaluated at the conceptual stage were: natural gas flooding, gas + CO2 flooding as well as the scenarios representing the base case.
5. The gas flooding scenarios resulted in NPV P50 which is 6000MM$ MN greater than the base case.

6. Uncertainties which would have had the greatest impact on the Teotleco field were found to relate to the STOIIP and prices of oil and gas.