

Effective Multipoint Geostatistics Applied to Mature Fields for Optimized Model Update, Monitoring and Forecasting

Mahmoud Mersal¹ and Jorge Nieto¹

¹Saudi Aramco

ABSTRACT

Multipoint Statistics Geomodeling algorithm helped in the optimization of fluid-flow simulation by minimizing time required for history matching and leading to improve reservoir understanding, development, and forecasting. Multipoint Geostatistical method capture the heterogeneity by simulating the shapes, relationship, and patterns of the geo-bodies with practical computational speed. The effectiveness and reliability of simulation results are fully dependent on the consistency of the training image in relationship to the sedimentological record of the reservoir.

Classical geostatistical methods to populate facies assemblies as Object based and Sequential Indicator Modeling represent the extreme considerations between complexity and simplicity. They are commonly used for conventional fields with limited amount of data compared to the overall field size. Unfortunately, none of these methods are suitable for building reliable models for fields with very complex stratigraphic and sedimentological architecture with abundant among of data.

Many problems and pitfalls in Object based Models and Multipoint Geostatistics are the wrong considerations of the erosion rules, facies assemblies, and the final output in the geological record. Hence, the selection of training images for multipoint analysis has become a challenge of major effect in results. Proposed here, the conceptual model and realistic output built from logs and core data in type-wells, plus the implementation of regional geometrical relationships, are the inputs for reliable training images generated by Object based Modeling approach.

In this case study, well data, facies definition and regional geological understanding have been analyzed to develop best scenarios of facies distribution that controls petrophysical properties distribution. All of the model realizations generated follow geological principles and honors facies proportions. An optimized history matching task was achieved with a very good quality in record times without the need to upscale the geological model.