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An Integrated Work Flow for Characterisation & Simulation of Fracture Corridors

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SUMMARY

Detailed reservoir characterization performed over the last decade in the major carbonate reservoirs of the Arabian Peninsula has consistently indicated one particular type of fracturing to be significant in defining reservoir behavior – sub-vertical swarms of fractures termed “Fracture Corridors.” Fracture corridors are mainly fault related fracture clusters that traverse the entire reservoir vertically and these clusters extend for several tens or hundreds of meters laterally. Most other fracture types (e.g. layer bound/bed bound joints, regional joints, and stylolite related fractures) do not appear to play a significant role in dynamic performance of the reservoir under production.

Most fracture corridors are below seismic resolution. Borehole image logs from horizontal wells provide the best sampling of fracture corridors, and dynamic data from the reservoir provides important indicators of the presence of corridor systems. The characterization of fracture corridors requires the use of all available and relevant information from both static and dynamic sources, for which an integrated workflow provides the best approach.

The first phase of the workflow starts with interpretation and data analysis from borehole images and proceeds to integrate open-hole and production logs with image logs. The second phase focuses on evaluation and integration of dynamic indicators interpreted from production and injection history data, Kh and PI maps. Reservoir simulation with multiple iterations between the simulator and the static model provide key feedback to tune the fracture corridor model in terms of orientation, length and conductivity. The goal is to reduce uncertainties and provide conceptual drivers for further mapping and modeling.