

A Saudi Arabian Naturally Fractured Reservoir Modelling Case Study: Fracture Characterization and Dynamic Data Integration

¹ Aymen Alramadhan , ¹ mandefro woldeamanuel , ¹ Stig Lyngra , ¹ Mustafa suleiman , ¹ Shu Zhang

¹Saudi Aramco, Dhahran, SAUDI ARABIA

ABSTRACT

This publication presents a reservoir modeling case study from two communicating naturally fractured carbonate reservoirs located in a mature Middle Eastern oil field. In this oil field, systematic efforts have been exerted over the past years to collect data to characterize fractures, e.g. borehole image logs, pressure transient and advanced formation tester data, including mini-DST (Drill Stem Test) formation tests. These datasets have been complemented by other dynamic data like rate tests, pressure surveys and time lapse production logs, seismic and electromagnetic surveys. The presentation illustrates examples of the impact of fractures of different length-scales (micro-, meso- and macro-level) on fluid flow in reservoirs and well productivity, ranging from large scale fractures, previously often termed fracture corridors or fracture lineaments, to small-scale micro-fractures. As the large-scale fracture corridors constitute the communication channels between the two reservoirs, crossing approximately 500 feet of non-reservoir limestone, the identification of these features was particularly important.

The publication demonstrates how the fracture and dynamic data were utilized to develop a fracture model that was integrated with the matrix geological model as a stacked model for both reservoirs, the use of different data types of very diverse scale, ranging from sum-millimeter to kilometer scale and the use of small-scale core plugs and image log data that were limited in volume and needed to be supplemented with dynamic data.