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Michael D McGuire, Saudi Aramco, Dhahran, Saudi Arabia

Sequence Stratigraphy of the Hanifa Reservoir in Berri Field, Saudi Arabia

The Hanifa Reservoir is one of seven Upper Jurassic carbonate reservoirs in the Berri Field of eastern Saudi Arabia. Development drilling in the Hanifa Formation spans 40 kilometers of carbonate ramp-to-basin profile. The reservoir straddles a ramp margin which dipped gently (less than 1 degree) from the Rimthan carbonate platform in the north to the Arabian intra-shelf basin in the south. Facies changes reflect the paleobathymetric gradient. Skeletal/peloidal grainstones and stromatoporoid/coral boundstones predominate in the north and give way in a southerly succession to packstones, wackestones, and finally to basin mudstones.

Detailed correlation of over 200 well logs reveals the geometries of systems tracts. A prograding highstand comprises the main portion of the reservoir. It is onlapped by a shelf margin wedge at a type 2 sequence boundary. The shallow boundstone facies progrades south through late highstand and then, after the drop in sea level, ''jumps'' to a position much farther south within the shelf margin wedge. Transgressive backsteps composed of carbonate grainstones represent the final reservoir deposition with continued transgression laying down the basinal mudstone caprock.

The Hanifa Reservoir has been undergoing peripheral water injection since 1973. The sequence stratigraphy has had a profound effect on fluid movement through the reservoir. The water flood has ''roared'' through the most permeable facies of the highstand, under-riding the relatively less permeable facies found along the sequence boundary. As a result, most of the oil within the transgressive backsteps at the top of the reservoir has not been swept by the waterflood.