

Sayındere Reservoir Fracture Characterization (An Innovative Workflow for Fracture Analysis and Modeling)



Bora Yalçın¹, Atilla Aydın², Kadri Yapan¹

¹TPAO

²Stanford University

In 2008, Şambayat Field has been discovered as a new petroleum play in the west of Adıyaman. Unlike other petroleum plays in Adıyaman, in Şambayat field the reservoir is Sayındere Formation, which is a dark grey, tough, low porosity, highly fractured platform carbonate and it is classified as micritic limestone. The hydrocarbon production is generally from fractures. After the Şambayat discovery, in 2009 a 330 km² 3-D seismic survey has conducted and further exploration efforts have revealed several other field discoveries such as Doğu Şambayat, Altıntop, Dudere. The last 5 years following the Şambayat discovery, TPAO has had a need to understand the geometry and distribution of fractures from the fracture mechanics angle for better exploration and production results. To this end, an innovative approach utilizing available well, seismic and outcrop data has been taken, which is the focus of this presentation. The fact that faults perturb the surrounding stress field during slip events has important consequences for the orientations of higher order (secondary and tertiary in this case) structures such as smaller faults and joint zones. Using the orientation, throw, and abutting relationships among the fault sets or classes on the seismic as well as splay angle concepts, an innovated fault hierarchy method has been developed for the purpose of interpreting faults and the associated fracture systems. This detailed seismic interpretation step of the workflow brings a new insight for exploration and production practices. In addition, it is certain that there are more fractures beyond the seismic resolution which would be the higher order smaller faults and fractures. To determine the presence and the possible distribution of the higher order fractures we used the sense and strike/ dip information of fractures extracted from processed image logs. The association and the range of the intersection angles between the adjacent fracture orders, outcrop data from the same formation can be helpful. There are several reservoir analogs in Adıyaman where types and distribution patterns of faults and the related fractures can be studied on the outcrop and the information can be tied to the subsurface maps through geomechanical models. It is suggested that integrating well logs, seismic and outcrop data within the framework of a process-oriented workflow, the uncertainty of the natural fracture distribution and potential locations of sweet spots can be reduced.