Building a Discrete Feature Network Model of Fractures Within the Reservoir Property Model: Humma Field, PNZ, Kuwait and Saudi Arabia

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Fractured reservoir models can be built from static properties or from properties derived from a restoration of the interpreted structural history of the reservoir. Strain-based fracture models ideally require some knowledge of the rock properties at the time of deformation in order to predict fracture orientations and intensity. In order to evaluate the importance of the geologic history relative to measured and known reservoir attributes related to fractures, a Discrete Feature Network (DFN) fracture model was generated from properties defined within the reservoir geocellular model. Fracture orientation properties obtained from selected wells were distributed through the reservoir away from well data locations using an interpolation algorithm. Key wells were withheld from the distribution calculation to test the validity of the distribution of the final DFN. Other properties in the geocellular model, porosity, density, and seismic coherency, were used to constrain fracture intensity and were combined with the fracture orientation properties to generate fractures throughout the reservoir model. Properties calculated from the DFN are output directly into the reservoir property model as properties in addition to existing matrix properties to create a fracture permeability property model ready for input to a flow simulator. Because the calculation is fast, and can be done within the property model, it allows adjustments to be made where needed by using the well production data to constrain the fracture length and aperture values. A fracture model was developed that honors well data that can be used to further develop a field or plan enhanced recovery methods.