Challenges of Tar Mats & Heavy Oil Simulation using STARS

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Accurate modeling of the recovery process and the complex well completions used in heavy oil exploitation are important aspects to be considered in developing these types of fields. Two topics will be presented for discussion looking at the challenges faced in simulating the recovery processes required for tar mat and heavy oil recovery. The first topic will look at issues related to the process scale and model resolution in its relationship to the physical recovery process. The second topic will look at the completion systems that are being used to optimize process performance and how to effectively model them.

Length scales play an active part in geological models and also in the simulation of the geological complexity of the oil bearing structures. However, in order to effectively model certain physical processes it is not the geology that controls our scale of investigation but the process itself. Middle Eastern reservoirs already suffer from lack of detail due to the size of the oil bearing structures and this process requirement adds to the scale of the numerical problem to be solved. The process length scales and CMG's experience in solving these models through the combination of parallel solution and dynamic gridding will be discussed.

An example application of a gravity driven steam process at Qarn Alam in Oman led to a better understanding of the matrix-fracture relationship that reservoir simulators typically employ and shows how an understanding of both the geological setting and recovery mechanisms are important to prevent improper evaluations.

A second topic will discuss modeling of the complex well configurations routinely used in the Canadian Tar Sands. The use of multiple tubing strings; Limited entry perforations; and Inflow Control Devices, to control the placement of steam through long horizontal injection wells means that standard source sink wells that are found in most reservoir simulators are no longer sufficient for the task. A new well model will be discussed and how it allows the effect of these complex completions to be determined.