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Advanced reservoir modeling and management of complex reservoirs

Rafiq Islam
Emertec Research and Development Ltd., Canada

The petroleum industry is known to be the biggest user of computer models. More importantly, unlike other big-scale simulation, such as space research and weather models, petroleum models do not have an option of verifying with real data. Because petroleum engineers do not have the luxury of launching a 'reservoir shuttle' or a 'petroleum balloon' to roam around the reservoir, the task of modeling is the most daunting. Today, practically all aspects of reservoir engineering problems are solved with reservoir simulators, ranging from well testing to prediction of enhanced oil recovery. For every application, however, there is a custom-designed simulator. Even though, quite often, 'comprehensive', 'All-purpose', and other denominations are used to describe a company simulator, every simulation study is a unique process, starting from the reservoir description to the final analysis of results.

Simulation is the art of combining physics, mathematics, reservoir engineering, and computer programming to develop a tool for predicting hydrocarbon reservoir performance under various operating strategies. This course familiarizes participants with steps involved in the development of a reservoir simulator, ranging from formulation to history matching. They learn about conventional approach as well as recently introduced 'engineering approach'. It is called the "Engineering Approach" because it is closer to the engineer's thinking and to the physical meaning of the terms in the flow equations. Both the engineering and mathematical approaches treat boundary conditions with the same accuracy if the mathematical approach uses second order approximations. The engineering approach is simple and yet general and rigorous.

e: president@emertec.ca