Reservoir simulation with MUFITS code: Extension for double porosity reservoirs and flows in horizontal wells

Andrey Afanasyev

Institute of Mechanics, Moscow State University, Moscow, Russian Federation (afanasyev@imec.msu.ru)

Numerical modelling of multiphase flows in porous medium is necessary in many applications concerning subsurface utilization. An incomplete list of those applications includes oil and gas fields exploration, underground carbon dioxide storage and geothermal energy production. The numerical simulations are conducted using complicated computer programs called reservoir simulators. A robust simulator should include a wide range of modelling options covering various exploration techniques, rock and fluid properties, and geological settings.

In this work we present a recent development of new options in MUFITS code [1]. The first option concerns modelling of multiphase flows in double-porosity double-permeability reservoirs. We describe internal representation of reservoir models in MUFITS, which are constructed as a 3D graph of grid blocks, pipe segments, interfaces, etc. In case of double porosity reservoir, two linked nodes of the graph correspond to a grid cell. We simulate the 6th SPE comparative problem [2] and a five-spot geothermal production problem to validate the option.

The second option concerns modelling of flows in porous medium coupled with flows in horizontal wells that are represented in the 3D graph as a sequence of pipe segments linked with pipe junctions. The well completions link the pipe segments with reservoir. The hydraulics in the wellbore, i.e. the frictional pressure drop, is calculated in accordance with Haaland's formula. We validate the option against the 7th SPE comparative problem [3].

References

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