

Strange, Unphysical Saturation Results

(Outside mobile range, oscillating with time)

After getting some “strange” results when interpolating relative permeability curves, the simplest possible model was made, including only the two components “water” and “DeadOil”. The residual oil was set to 0.29, but surprisingly STARS delivered results with oil saturation far below S_{or} . (Figure 1).

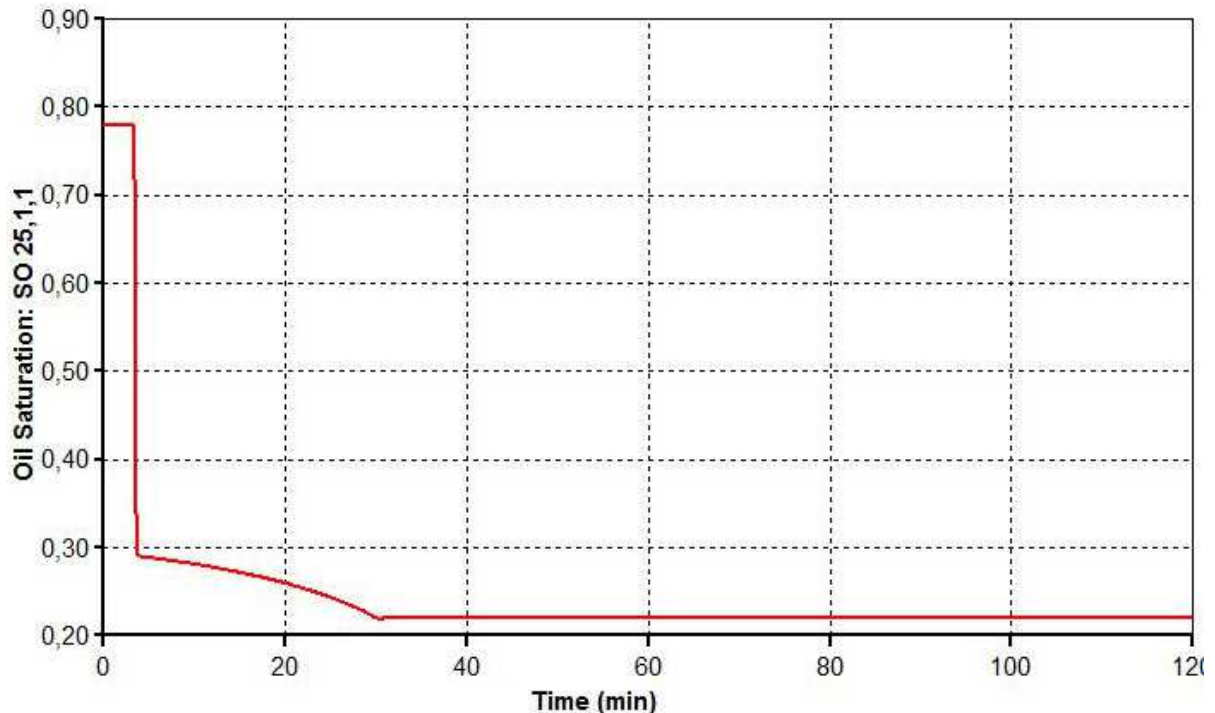


Figure 1. Oil saturation vs time in grid cell I=25 for a pure water flush problem.

The solution to this behavior was provided by CMG support:

- Use STARS’ default definition of water in lieu of defining water properties
 - Water to STARS is *pure fresh water*, with well-known properties. We are really not at liberty to choose freely here – the water I had defined was from my black-oil background, and admittedly resembled more a weak brine.
One example of difference between B-O and composite thinking!
- Use a smaller value of oil compressibility than I had done, suggested value 1E-6.
 - Again – STARS oil is the *pure liquid oil*, not the oil-including-some-solution gas used in B-O models.
Another example of difference between B-O and composite thinking!
- In addition, to avoid saturation oscillations which I had seen:
 - Use quadratic (or cubic) interpolation in rel-perm tables.
 - Use STONE1 in lieu of (default) STONE2
 - Surprising, as three phase rel-perm is never used in this model...

I still think that irrespective of how I’d defined the input, STARS shouldn’t deliver saturations outside the mobile range, but the advice worked, so all future runs will honor these principles.