Some introductory remarks

Conversion of an IMEX black oil model to STARS is described in Appendix D.18 in the STARS manual, which should be the reference for any such conversions.

First, STARS uses *mole* everywhere. This way of thinking was alien to me, but found "Moles for dummies" on the net, which was somewhat enlightening:

A mole is simply a *number* ($6.02*10^{23}$); forget about the accurate and elaborate definition.

That means: One mole Carbon atoms is $6.02*10^{23}$ Carbon atoms.
One mole math students is $6.02*10^{23}$ math students.

mole weight is the weight of one mole of a substance, so   mole weight = weight / mole   (g/mole)

It's important to distinguish between *components* and *phases*. In a simple description as we'll use in this example, we have three phases: water, oil, and gas; and three components: water, oil, and gas – simple isn't it? (So we have to be careful to distinguish between the oil phase and the oil component, apart from that, refer to the STARS manual or text books)

An example may clarify: Oil compressibility in a black-oil model is the compressibility of the oil at current conditions, i.e. oil containing some dissolved gas. This mixture is likely to be more compressible than a pure liquid.
STARS doesn't relate to this "oil phase compressibility" at all, only the pure liquid compressibility is used (i.e. the compressibility of the oil as it would be with no dissolved gas). Hence the STARS oil compressibility cannot be copied from ECLIPSE or IMEX. The same goes for gas, but that one is more complicated…

I also made an interesting and revealing discovery during this work, which is obvious once you've seen it. STARS is based on physical principles of mixing of components by mixing rules, i.e. it can simulate anything that can actually happen in nature (more or less). A black oil model has no such "restrictions" – ECLIPSE or IMEX will happily simulate any combination of (permitted) PVT-table and e.g. GOR (Gas-oil-ratio) or R_s (Gas resolution factor). The first attempts at converting the PVT data to STARS failed miserably, and after some consideration I found that I was trying to simulate a non-physical situation, which of course, STARS didn't permit.
That raised the question of the validity of data we routinely use in dead-oil models, and hinted at being a bit more critical. See section on PVT conversion.