

Modelling Update – 05/12/12

Model Update

Reverted back to OPERA 15R2 later last week. (Some Configuration settings needed to be updated and I needed Matt to do this.)

I still had some volume meshing errors but these were believable and it was not too much effort to fix these. Some of these had come about due to the tweaking in attempt to get the model working with 15R3, others were a result of trying to obtain thin sheets in the compressor rack walls.

As the code base has grown to a fairly significant size I reorganised the code into a more logical structure, this rearrangement meant I had some debugging to do.

I ran a 'base' model in 15R2 over the weekend, this is a model of the MICE hall with all the structural components in, but none of the racks. This solved ok.

Started running a model on Monday with the racks behind the North Shield Wall and the Compressor Racks included. These racks contain a reduced volume of iron where any mass of the rack not contained in the outer walls is presumed to be distributed throughout the volume of the rack. (Better approximation of total mass with compressors than with the racks behind NSW).

Model Update

This model is still solving...

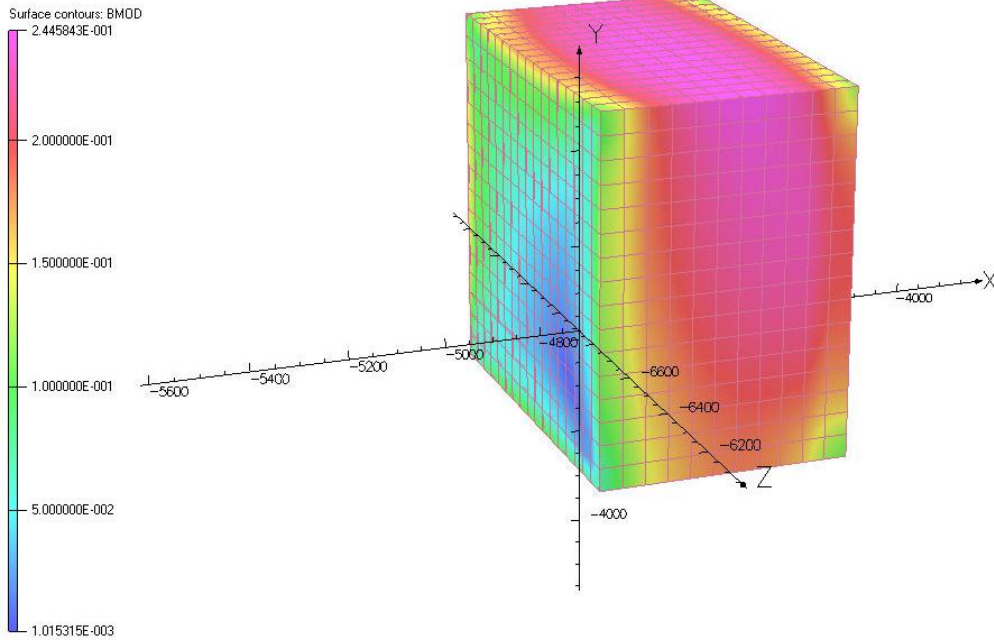
Part of the reason is that the compressors/racks have been meshed to a high resolution, this was due to my attempts to get them to mesh correctly with 15R3. I didn't reduce the resolution before running this model with 15R2. I would like to reduce the resolution and re-run as a direct comparison when this model has solved.

Next, after discussing with Mike, I would like to introduce an air gap between the internal reduced volume and the outer skin to see if the 2mm skin provides any shielding effect. Requires some more coding but the coding framework for building the racks should lend it self to doing this relatively easily.

Sub-Model Update

I sat with Mike yesterday afternoon and he did a few simple runs with his older model of the MICE Hall to demonstrate the sub-modelling technique. We used his model as he had already isolated a component to do a quick test with the 208V trench transformer.

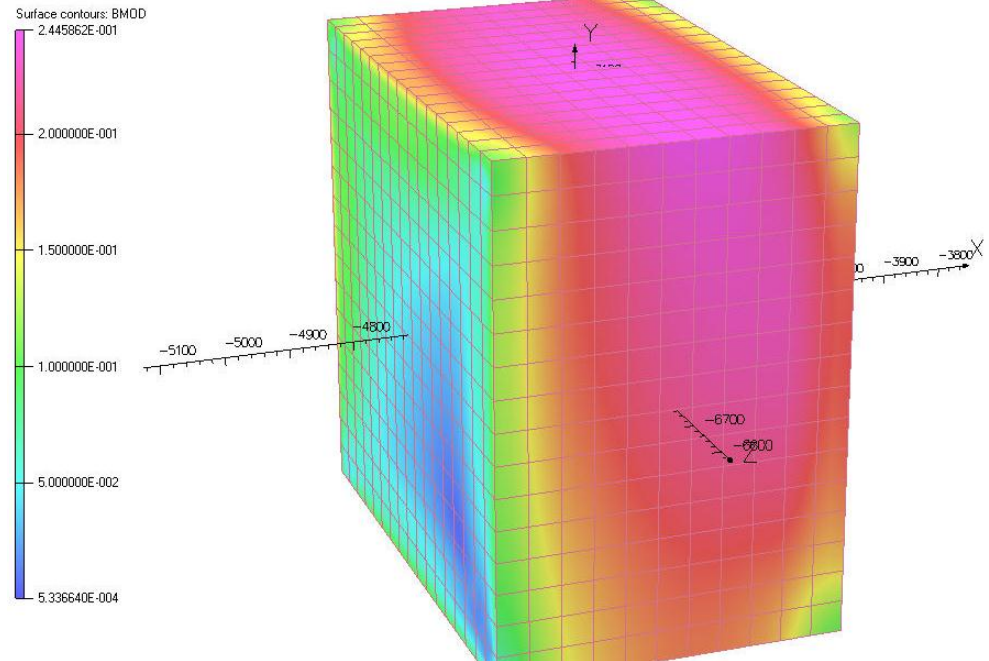
- 1) Mike already has a solved hall model, this includes the transformer in the trench.
- 2) He's created a simple sub-model with just the transformer. (Hollow cuboid with a solid cube in its interior, this isn't visible in following screenshots)
- 3) First Test: Map the field from the solved model onto the sub model (surface of metal to surface of metal) and check to see that sub model will solve ok – yes.



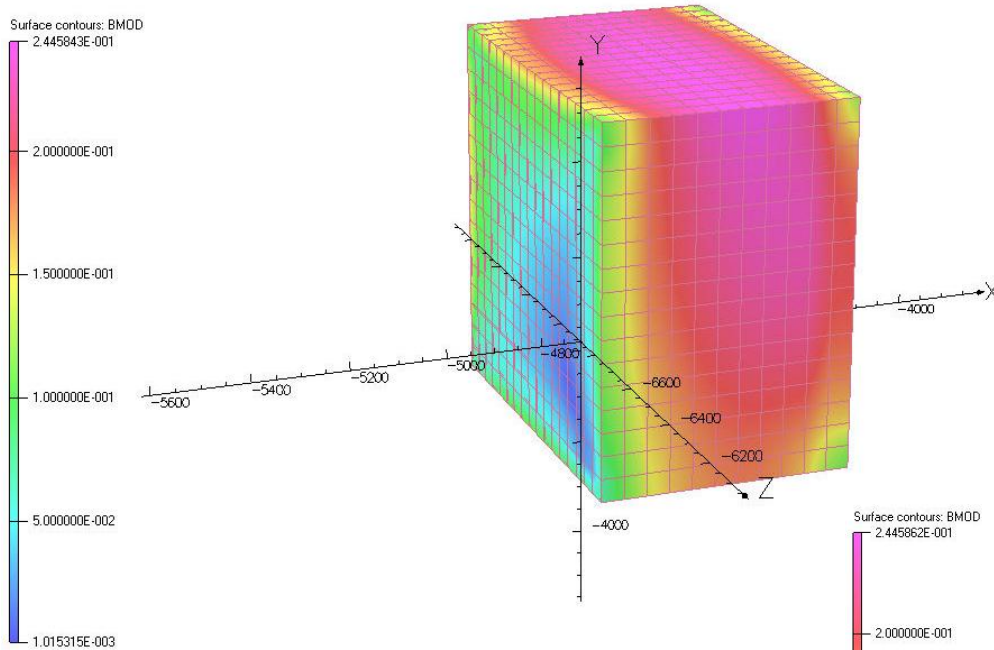
Boundary conditions successfully transferred from original model (left) to submodel (below). So it is effectively the same image!

The submodel subsequently solved, i.e. the transfer of boundary conditions appears to work.

Note that the submodel is at the same meshing resolution as the original, so trying to solve for a higher resolution has yet to be tested.



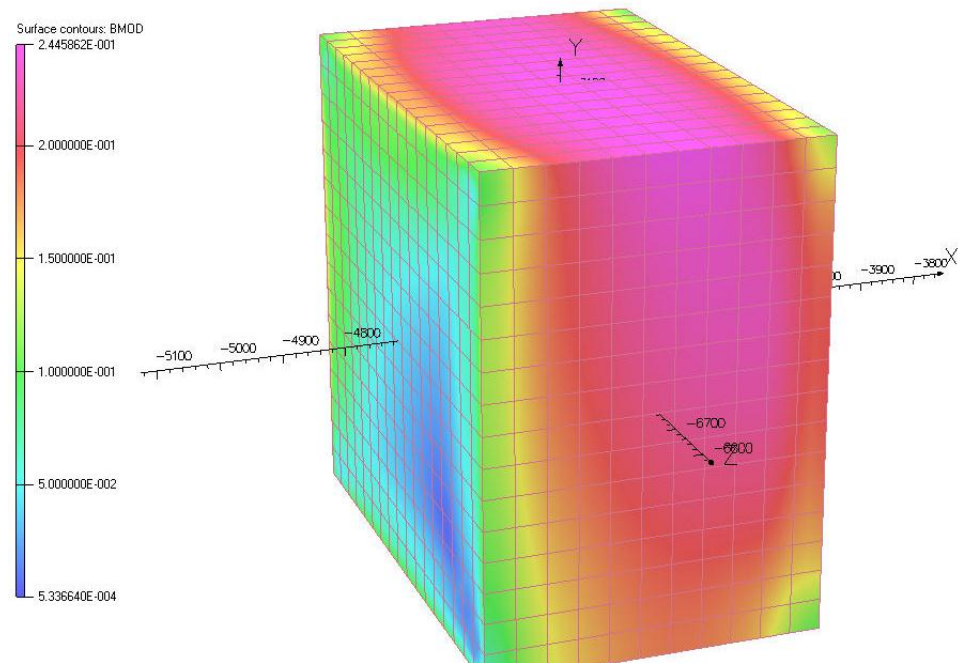
Mike then demonstrated transferring a boundary condition from a cuboidal 'air' surface that was a distance out (~roughly cube width) from the surface of transformer and then allowed the sub-model to solve.



This is the surface of the transformer again (Not the air surface where the boundary conditions were transferred) They look the same but are subtly different. Bmod max is 2.44584 in original, 2.44586 in sub-model.

These were quick tests and so were done at the same meshing resolution. Needs to be repeated with the sub-model a) at a higher resolution, b) with more detailed geometry.

05/12/2012



Sub Model

To reiterate, the process now needs demonstrating by transferring the boundary conditions to a model that contains more detail and is meshed at a higher resolution.

It's not currently high on my priority list (although I can make it high if needs be?)
I'm presuming that Mike will follow this up.

So what do we want to use this sub-modelling technique for?

Sub Model

1) Substation

Real concern over this, particularly with regards to the PLCs on the front panel but see 2)

2) Racks behind NSW - what can be done to improve the situation

- Mike thinks that a sub model will give a lot of useful information

3) Compressors on the west wall - Better model of compressor detail.

Lightly populated WW vs highly populated?

4) Trench

Better model

Holger's model - > magnetic loop will probably go thorough trench...

5) Quads - Not sure how this fits into the scheme of things - difficult area.

Sub Model

6) Better model of a rack?

Dependent on studies to determine whether this is a problem...

7) RF model -> Need to be represented in hall model first (Not high on list at moment)

Probably learn a lot from racks behind NSW.

8) Roof - No feel at the moment. Maybe not worth pursuing.

9) Linde Fridge - Includes compressor and controls rack.

10) Tracker Controls and Cryostat....

Good Candidate for a close look at controllers in close proximity to field

Cryostat - pumps and circuit boards and cold

Conclusions

Model is now running again after rolling back to Version 15R2. Unfortunately we've lost a lot of time from this hiccup. I'd still be opened minded about trying future updated versions of opera because of the improvements in the solve algorithm could buy us this time back in the future, but obviously I'd be a bit more careful...

Mike has demonstrated the transference of boundary conditions from a hall model to a sub model on both a metal and an air boundary. I would still like to see this demonstrated on a sub-model where the sub-model component was different to the component in the original model (both detail and meshing resolution.)

We have a list of sub-model candidates to consider.