ANSYS TO AQWA MODEL TRANSLATOR

1. INTRODUCTION

It is possible to use classic ANSYS to create an AQWA radiation/diffraction model. Any of the tools available in Workbench or ANSYS can be used to create the model. Once the model is created an AQWA input file can be written out using a macro supplied with ANSYS.

2. MODEL DESCRIPTION

The model must be meshed with the mesh that you wish to use for the AQWA analysis. If you are working from a model created for a structural analysis, it will probably be necessary to re-mesh the model as the structural mesh is likely to be finer than is need for a diffraction analysis.

There should be a line of nodes at the waterline, although these nodes do not need to coincide with nodes on the structural model. The translation macro will only make diffracting those elements that are entirely below the waterline. If there are no waterline nodes there will be no diffracting elements at the waterline, which will severely reduce the accuracy of the diffraction analysis.

All the panel elements below the water must have their normals pointing outwards.

In AQWA the vertical axis is always the Z-axis. The translator can convert a model with either Y or Z-axes vertical, but the X-axis must be horizontal and preferably should be along the fore/aft axis of the vessel.

If the structure is symmetric and you wish to use the SYMX or SYMY cards in AQWA, you must only select ½ or ¼ of the model as appropriate. If you model a complete vessel and specify X symmetry, the AQWA model will contain two sets of coincident elements.

3. ELEMENT MAPPING

The translator maps SHELL41, PLANE42, SHELL43, SHELL63, SHELL181 elements to panels, and PIPE16, PIPE20, PIPE59 elements to TUBEs. It does not recognize any other ANSYS element types. Any material or geometric properties can be used for the shell elements as AQWA does not need any properties at all and the translator does not use them.

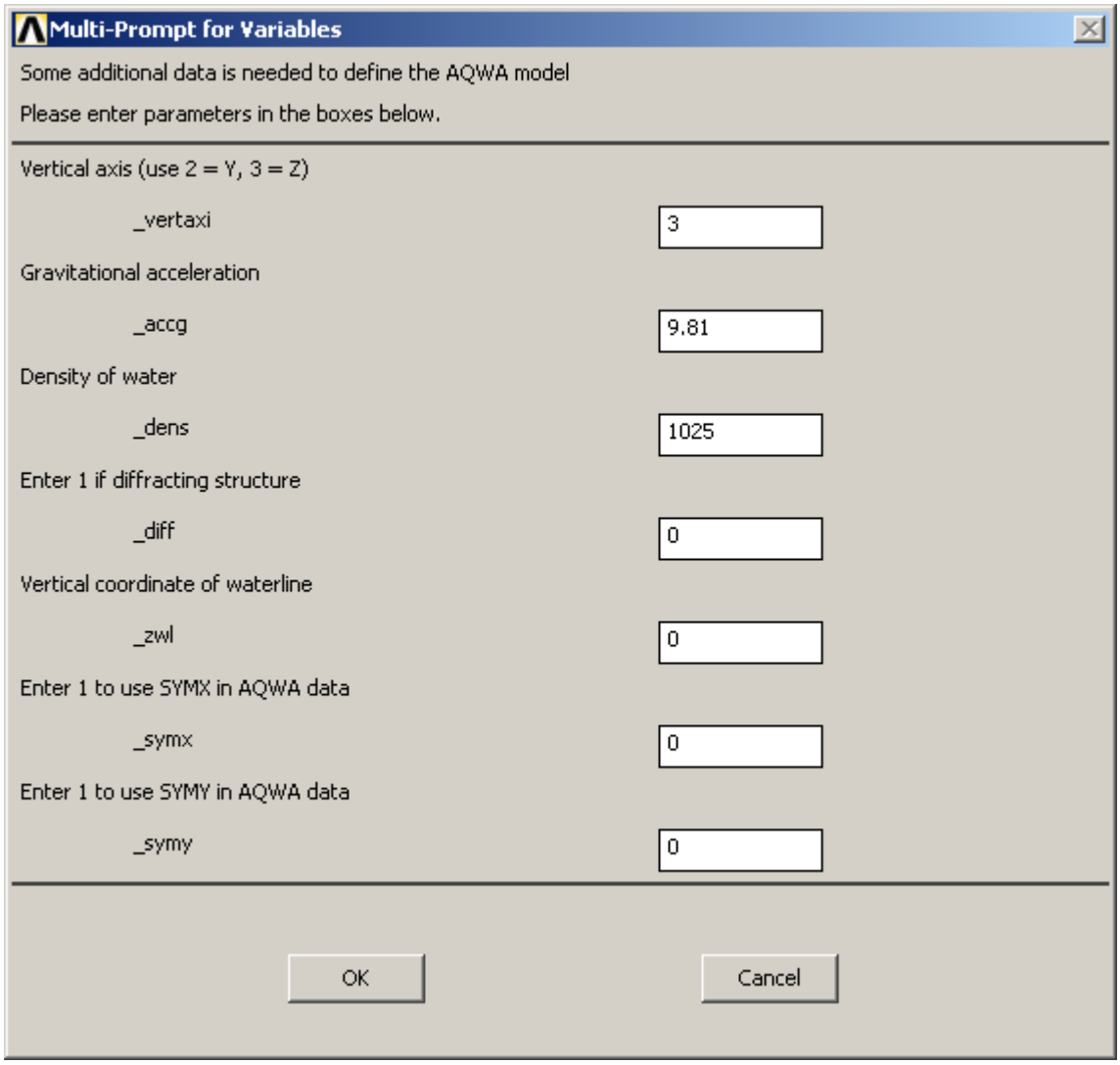
TUBE elements in AQWA have material density, outside diameter, wall thickness, added mass and drag coefficients, so appropriate properties should be used in the ANSYS model. PIPE59 elements can have added mass and damping coefficients, and these will be transferred. Note that ANSYS uses the inertia coefficient C_M, whereas AQWA uses the added mass coefficient C_A, where $C_M = (1+C_A)$. This correction is made automatically by the translator.

4. RUNNING THE MACRO

When you have created and meshed a model as described above, you can run the macro to generate an AQWA input file. First select the elements that you want to include in the AQWA model.

At the command line type “anstoaqwa” optionally followed by a filename. The AQWA input file will be called “file.aqwa”, where file is the name of your database or the filename you have input.

You will then be prompted to input a number of parameters in a window as shown below.



The translator will then create a complete AQWA-LINE ascii data file that is ready to run in AQWA. However, read the following section carefully.

5. AQWA-LINE DATA FILE

The file will specify restart stages 1-2 only. It has no options except REST, so AQWA may fail if any of the elements are badly shaped.

The total mass is obtained by integrating over the wetted surface area and adding the TUBE masses, so it should be reasonably accurate. However, the integration used is not as accurate as that in AQWA so there may be a small difference between the weight and buoyancy, particularly if tubes represent a large portion of the model.

The position of the CG is unknown. A point mass is placed at the water-line above the CB, but you should change this to the correct position.

The moments of inertia are estimated based on the overall dimensions of the model and using standard formulae for a ship. You should change these to the correct values.

The maximum frequency is calculated from the maximum side length of the underwater elements. The range of frequencies runs from 0.1Hz to the calculated maximum, in steps of 0.1Hz.

The directions are in steps of 15°, over a range that is determined by the symmetry you have specified, in accordance with the requirements of AQWA.