RELEASE NOTES FOR
AQWA version 5.6G AQWA-GS version 5.6G

1. CONTENTS

This intermediate release contains version 5.6G of AQWA and the AQWA-GS, together with supporting dlls and resource files. It also includes modified files for the AQWA-Excel interface, and a translator to write AQWA data files from an ANSYS model.

2. INSTALLATION

Before installing this version you **MUST** already be running version 5.6A or later.

2.1 Installation directory

The installation program is called setup_aqwa_56g.exe. When you run this you will be prompted to input the directory where this program is to be installed. This must be the \aqwa directory where the previous version 5.6A was installed. For example, if you have version 5.6A in d:\temp\aqwa\v56a, you should specify d:\temp\aqwa. The new version will be installed in d:\temp\aqwa\v56g. Previous versions may be uninstalled after this version is installed.

2.2 Security

There is no new security setup file.

2.3 AQWA to Excel interface

There are new files aql32.dll, aql32.xla and help files. These will be installed in the \aqwa\utils or \aqwa\docs directory as appropriate, overwriting the previous versions. The .xla file should be copied to your Microsoft Excel installation as explained in aqlref.pdf.

The .xla and help files are unchanged from version 5.6E.

2.4 ANSYS to AQWA translator

ANSYS users who have the preview version of ANSYS 11.0 will have a preliminary version of the macro “anstoaqwa.mac”. With this release we are including an updated version that is installed in the \aqwa\utils directory. If you wish to use it you should copy the file anstoaqwa.mac to the \apdl directory in your ANSYS installation. See also section 3.5 below.

This macro is unchanged from version 5.6F.

3. DEVELOPMENTS

The last version that was released as a full installation was version 5.6A. For completeness the major developments since then are summarised below. Details of all developments and bug fixes can be found in the PSR lists on our website; www.century-dynamics.com.

Ref	Description	Version
3.1	Comments anywhere	5.6B
3.2	'END' on blank card	5.6B
3.3	41 wave directions	5.6C
3.4	Hull drag directions independent of AQWA-LINE wave directions	5.6C
3.5	ANSYS to AQWA translator	5.6C
3.6	Addition AQL functions	5.6E
3.7	Print tension and reaction spectra	5.6D
3.8	Mesh transom stern	5.6D
3.9	Improved hydrodynamic calculations	5.6E
3.10	No interactive windows	5.6E
3.11	NPD wind spectrum	5.6E
3.12	Increased model size	5.6F
3.13	Increased number of mooring properties	5.6F
3.14	Generation of frequencies and directions	5.6F
3.15	"Lid" for prevention of irregular frequencies	5.6G
3.16	Removal of some modelling restrictions	5.6G

3.1 Comments anywhere in data file.

It is now possible to put comments anywhere in a data file. Comments must start with a * in column 1.

3.2 'END' on blank card

It is now possible to terminate a deck with a card having only 'END' in columns 2-4. As long as the card header is blank (columns 7-10) the remainder of the card is ignored and can be used for a comment. This should make editing of data files more convenient.

3.3 41 wave directions

The limit of 10 wave directions has been a restriction in AQWA-LINE for some time. This limit has now been raised to 41 directions when there is no symmetry. With one axis of symmetry (SYMX or SYMY) the limit is 21 directions, and with two axes it is 11. This allows wave directions to be spaced at 9° intervals, or 10° plus the quartering directions.

3.4 Hull drag directions

It is recognised that it would be inconvenient to have to input hull drag coefficients (CUFX in Deck 10) for all 41 directions, so the definition of hull drag has been separated from the AQWA-LINE wave directions. The directions for hull drag coefficients can now be specified with new cards DIRN, SYMX, SYMY in deck 10. See the reference manual for further details. The default is to use the AQWA-LINE directions, so existing files will still run.

3.5 ANSYS to AQWA translator

We have developed a macro that writes an AQWA data file from an ANSYS model. This allows all the model generation capabilities of ANSYS to be used to create an AQWA model, including CAD interfaces and advanced meshing.

See section 2.4 above for installation details. The translator should work with any version of ANSYS. Instructions for use are given in the file \aqwa\docs\ansys_to_aqwa.pdf. *Note that since the macro is in editable text form that the user can modify, Century Dynamics cannot be responsible for supporting the macro as part of AQWA Support Services.*

3.6 Additional AQL functions

Some new functions have been added to AQL, the interface between AQWA and Excel.

Function	Value returned	Version
aqlcogcoord	CG position in structure	5.6C
aqlnstructs	Number of structures in model	5.6C
aqlnfreqs	Number of wave frequencies for structure	5.6C
aqlndirns	Number of wave directions for structure	5.6C
aqlwavedirn	Wave direction corresponding to wave number	5.6C
aqlstatposcog	Position of CG after AQWA-LIBRIUM run	5.6E
aqlstatposnod	Position of node after AQWA-LIBRIUM run	5.6E
aqlrao2	Interpolated RAOs, given direction and frequency	5.6E

3.7 Print tension and reaction spectra

The PSD and significant values of mooring tensions and articulation reactions can now be printed in the .LIS file. This is switched on with a new option 'PRTS'.

3.8 Mesh transom stern

The mesh generator in the AGS could not close a transom stern, which meant that the .LIN file always had to start and finish with a line at y=0. In some cases this could lead to a poor mesh. The mesh generator has now been improved so that it will close the ends of the vessel with a flat surface at the stern or the bow.

3.9 Improved hydrodynamic calculations

The accuracy of the Green's function and waterline integrals has been improved. This leads to better near-field drift coefficients that now agree more closely with the far-field coefficients.

3.10 No interactive windows

The NOLL option now works in all programs. In addition a command line option /NOWIND has been introduced which closes all windows when the program finishes, which means that no response is required from the user at the end of a run.

3.11 NPD wind spectrum

In addition to the three existing types of wind spectra it is now possible to use the NPD wind spectrum, as recommended by the A.P.I. This is achieved by using a new NPDW card in Deck 13.

3.12 Increased model size

The maximum number of defined nodes has been raised to 15000. The maximum number of defined elements has been raised to 12000, with 8000 of these diffracting. These limits are increased by a factor of two if one symmetry card (SYMX or SYMY) is used, and by a factor of four if both are used. Note that the diffraction calculation for a model with 8000 diffracting elements will take a long time.

Increased model size means larger node numbers, and it was felt that the node offset method is too cumbersome. A new NOD5 card has been added to simplify the input of 5-digit node numbers.

3.13 Increased mooring properties

The maximum number of non-linear mooring properties (CATN, COMP, ECAT, LE2D, POLY, SWIR cards) has been raised to 1000. The maximum number of composite line databases (sets of data headed by COMP or LE2D cards) has been raised to 100.

3.14 Generation of frequencies and directions

AQWA can now generate sets of frequencies and directions using modified FREQ and DIRN cards in deck 6. This should make data preparation a little easier for the large numbers of frequencies and directions that some users are starting to include.

3.15 "Lid" for prevention of irregular frequencies

So called "irregular frequencies" are a common problem with diffraction calculations. These are numerical problems that cause spikes in the diffraction and radiation forces and can severely affect the results. They can be removed by adding a form of lid on the water surface inside the vessel, and this method has now been implemented in AQWA. The lid can be calculated automatically by the program or modelled by the user, and is defined using a modified ILID card in Deck 2.

3.16 Removal of modelling restrictions

A number of improvements have been made recently to the hydrodynamic calculations in AQWA-LINE. These have allowed some of the long-standing modelling restrictions to be removed. In particular those listed below no longer apply:

a) Centroid depth > $0.5.R_f.\sqrt{nz}$. This may make modelling of bulbous bows easier.
b) Centroid depth > 0.000273.water depth.
c) Centroid depth > 0.0000132.wavelength.

4. BUG FIXES

Fixes to Grade 4 and 5 bugs are summarised below. These are bugs that produce incorrect answers: Grade 4 bugs give obviously incorrect results while Grade 5 bugs give errors that are not obvious to the user. Details of all the bug fixes can be found on our web-site.

Ref	Description	Fixed in version
4.1	Incorrect significant response for specified nodes with ZRWS	5.6B
4.2	Incorrect fender friction force	5.6B
4.3	Transposition of added mass and damping values	5.6B
4.4	Inaccurate results for AQWA-FER + full QTF matrix	5.6B
4.5	Hot start with .XFT or .WVT file	5.6B
4.6	Inaccurate QTF matrix	5.6C
4.7	Inaccurate mooring tensions with clump weights	5.6C
4.8	Non-linear roll damping for two structures	5.6D
4.9	Froude-Krylov force for Morison elements	5.6D
4.10	Mooring database interpolation	5.6E
4.11	Inaccurate QTF matrix for interacting structures	5.6E

4.12	Incorrect diffraction forces in stage 6	5.6F

4.1 Incorrect significant response for specified nodes with ZRWS

In AQWA-FER the motion relative to the water surface for nodes specified in Deck 18 was incorrect.

4.2 Incorrect fender friction force

The transverse friction force for fenders was incorrect. This did not affect the normal compression force. Friction forces are generally small and this bug is only expected to have a significant effect on small structures.

4.3 Transposition of added mass and damping values

When a .HYD file was imported (deck 6 FILE card + CPDB), some of the values of the structure to structure added mass and damping coupling matrices could be transposed, depending on the number of frequencies present in following structures. E.g. if structures 2 and 3 are interacting and structure 4 has fewer frequencies than structures 2 and 3.

4.4 AQWA-FER + full QTF matrix

When using AQWA-FER with full QTF matrix for the second order motions, the results can be inaccurate for very small difference frequencies (i.e. near the leading diagonal of the QTF matrix). This should affect deep water more than shallow water results.

4.5 Hot start with .XFT or .WVT file

When using an externally defined force or wind time-history in conjunction with a ‘HOTS’ card in Deck 16, the wrong values were extracted from the files.

4.6 Inaccurate QTF matrix

One part (of 4) of one component (of 5) in the calculation of off-diagonal terms of the QTF matrix was found to be incorrect. The error will generally be small unless the rotational RAOs are large.

4.7 Inaccurate mooring forces

When a mooring line has clump weights that are partially lifted off the sea-bed, the mooring line tension may be inaccurate.

4.8 Non-linear roll damping

When the NLRD card was used with more than one structure, and Deck 10 did not contain data for all structures, the damping coefficients were ignored.

4.9 Froude-Krylov force for Morison elements

AQWA-NAUT failed to include the Froude-Krylov force for Morison elements when the LSTF option was used.

4.10 Mooring database interpolation

The interpolation within the moorings database for composite lines (NLIN only) could be slightly inaccurate under some circumstances. The inaccuracies occurred when the mooring line lifted off the sea bed and were worse in shallow water especially for lighter lines.

4.11 Inaccurate QTF matrix

In the calculation of the QTFs for interacting structures, the 4th term of one of the 5 terms making up the coefficient was in error. This 4th term also has a further 4 components, one of which used an incorrect phase reference point for the RAOs. The error should normally make only small differences but will depend on the value of the rotational RAOs.

4.12 Incorrect diffraction forces in stage 6

When AQWA-DRIFT stage 6 (Morison element loads output) was run the diffraction forces were not consistent with those in the corresponding stage 5 run. This caused an imbalance in the total loads for the structure. The difference was due to the different phases of the wavelets used in the 2 stages.