Product Features
AQWA Diffraction

Diffraction/Radiation
- 3-D panel method
- Multi-body diffraction and radiation
- Forward speed
- Full QTF matrix calculation
- Import of external data

Modeling
- Automatic generation of ship shape models from lines plans (offsets)
- Integrated data editor for model and data manipulation
- General hull modeling using ANSYS command utility to export ANSYS AQWA data from ANSYS geometric model

Visualization
- Model display for mesh checking including zoom, pan and rotation of the model, together with facilities to cut or exclude segments
- Display of diffracting/non-diffracting model components
- Extensive facilities for view manipulation, including:
  - Representation of water surface and seabed
  - Moorings and their components
  - Physical connections (articulations)
  - Hull pressures
- Animation sequence generation for time history motions analysis (in ANSYS AQWA Suite)
- Animation of wave height profiles for air gap/wave on deck studies
- Display of diffracted wave surface
- Powerful graphing functions

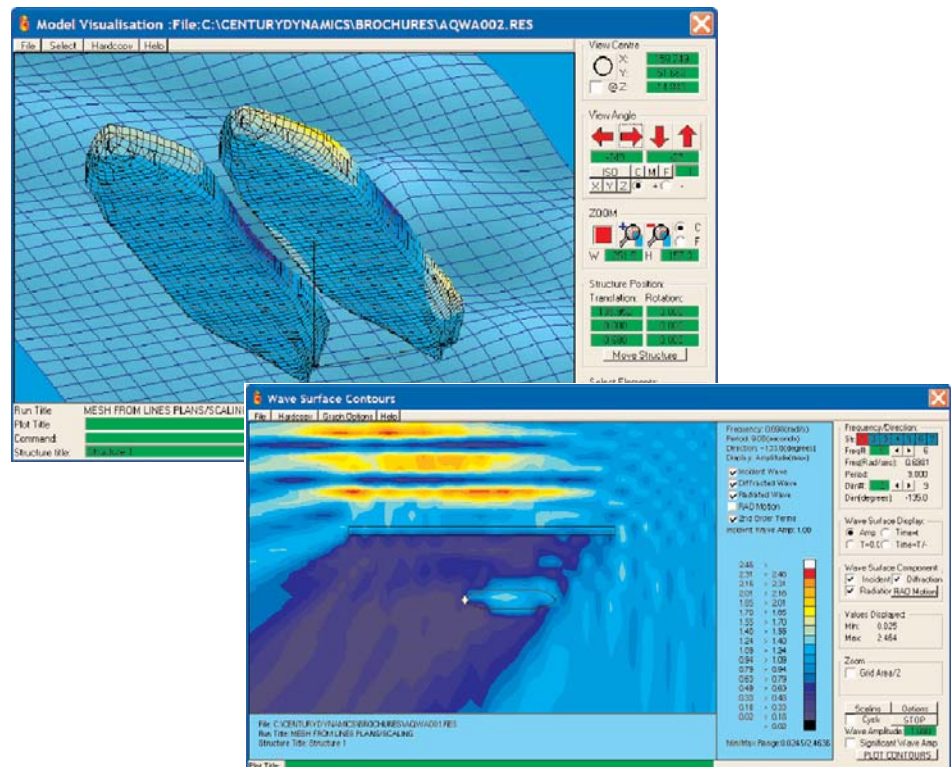# Floating Offshore Structure Solutions

Proven technology for design and analysis of mobile offshore structures

Projects today require that the design and analysis of offshore structures are performed efficiently in terms of time and money. Engineering simulation software must be powerful, fast and user-friendly. ANSYS® AQWA™ is the desired engineering hydrodynamic simulation tool for the offshore and marine community.

Multi-body diffraction analysis: ANSYS AQWA Diffraction

ANSYS AQWA Diffraction provides an integrated facility for developing the primary hydrodynamic parameters required for undertaking complex motions and response analysis. Three-dimensional linear radiation and diffraction analysis may be undertaken with multiple bodies, taking full account of hydrodynamic interaction effects that occur between bodies. While primarily designed for floating structures, fixed bodies may be included in the models, such as breakwaters or gravity-based structures. Computation of the second-order wave forces via the full quadratic transfer function matrices permits use over a wide range of water depths.
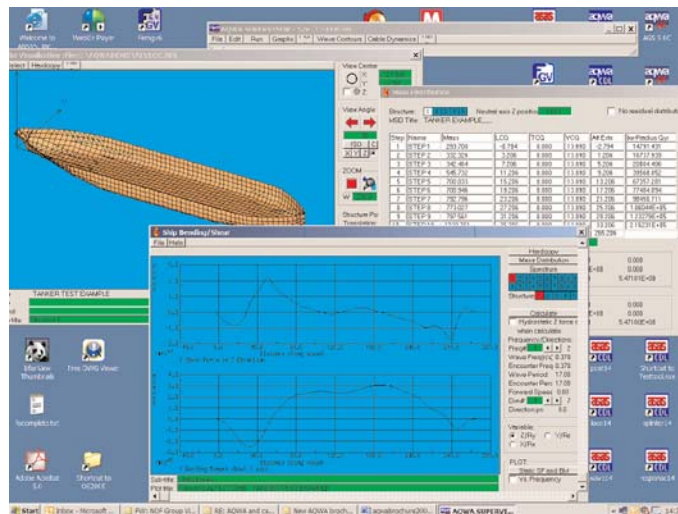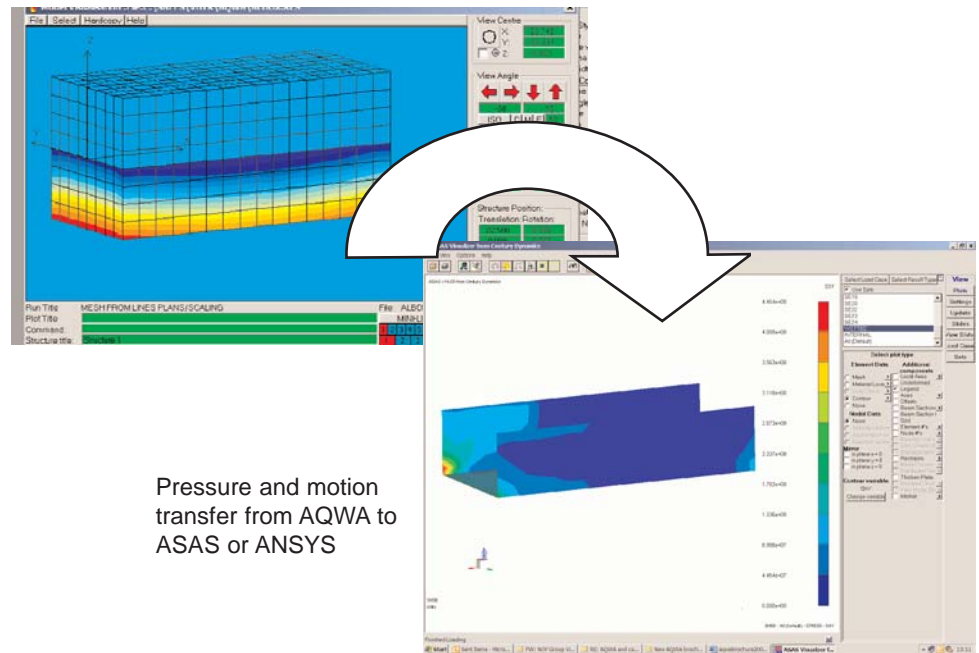
ANSYS

Product Features
ANSYS AQWA Suite

Analysis Options

▶ Static and dynamic stability
▶ Mean equilibrium position for multi-body assemblies
▶ Frequency domain solution of significant and extreme linear response due to first-order wave and second-order slowly varying drift effects
▶ Time domain simulation of extreme wave conditions including nonlinear hydrodynamic effects such as green water and impact forces
▶ Time domain simulation of slow drift motions due to irregular seas
▶ Coupled TLP-Tendon analysis including stress and fatigue
▶ Computation and utilization of full quadratic transfer function matrices for shallow water applications
▶ Panel, slender tube or mixed models facilitated
▶ Fully coupled cable dynamic feature enabling mooring line drag and inertial characteristics to be included in the vessel motions analysis

ANSYS AQWA Diffraction and Hull Design

ANSYS AQWA Diffraction can generate pressure and inertial loading for use in a structural analysis as part of the vessel hull design process. A facility exists to transfer the pressure and motion results from a diffraction analysis and map them onto an ANSYS or ASAS finite element model for structural assessment, detailed design, etc. Since the mapping function automatically accounts for mesh differences between the hydrodynamic and finite element models, they do not have to be topologically identical.

Pressure and motion transfer from AQWA to ASAS or ANSYS
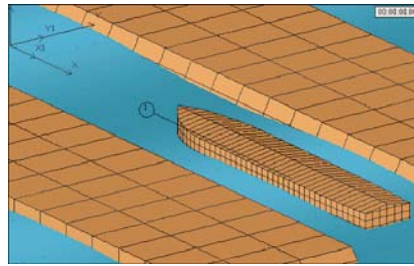

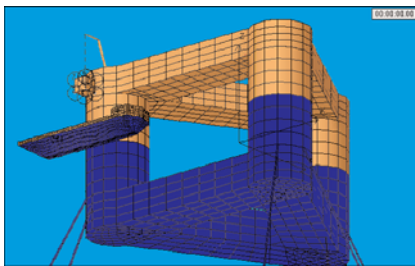Bending moment and shear force calculation

Multi-Body Global Hydrodynamic Analysis: ANSYS AQWA Suite

ANSYS AQWA Suite includes the ANSYS AQWA Diffraction package plus comprehensive dynamic analysis for undertaking global performance assessment. The generic nature of the program enables the hydrodynamic simulation of all types of offshore structure including spars, FPSOs, semi-submersibles and ship shaped structures. Specialist tether elements permit idealization of tension leg platforms.
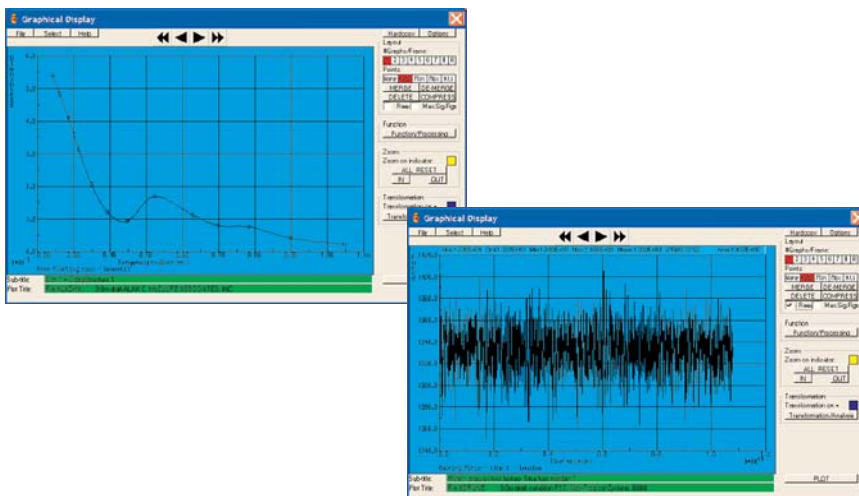
Frequency and Time Domain Options

ANSYS AQWA Suite provides the flexibility to undertake simulations in either the frequency or time domains, thus combining the speed of frequency domain solutions for screening and initial studies with the rigorous and more general time domain capabilities. Slow drift effects and extreme wave conditions may be investigated within the time domain, and damage conditions, such as line breakage, may be included to include any transient effects that may occur during this event.

Results Interpretation

ANSYS AQWA provides extensive tools for results visualization and manipulation. A powerful graph plotting utility provides an environment for processing of results including:

- Graph merging
- Graph statistics, such as mean, peak and significant values
- Zooming
- Transformations from time history to frequency domain and vice versa
- Time history filters
- Algebraic functions and combinations

Product Features
ANSYS AQWA Suite

Environmental Loading
▸ Constant wind and current forces
▸ Regular and irregular (spectral) waves
▸ Wave surface time history
▸ Wind time history
▸ Current profile
▸ Wind spectrum

Mooring capabilities
▸ Linear elastic lines
▸ Intermediate pulleys
▸ Linear drum winches
▸ General nonlinear polynomial
▸ Nonlinear composite catenary
▸ Thrusters
▸ Constant force lines
▸ Fixed or floating fenders
▸ Line break facility
▸ Quasi-static or dynamic catenaries

Articulations
▸ Physical rigid connections between two or more vessels or to ground
    ▸ Fully fixed
    ▸ Hinged
    ▸ Universal joint
    ▸ Ball joint

Cable Dynamics
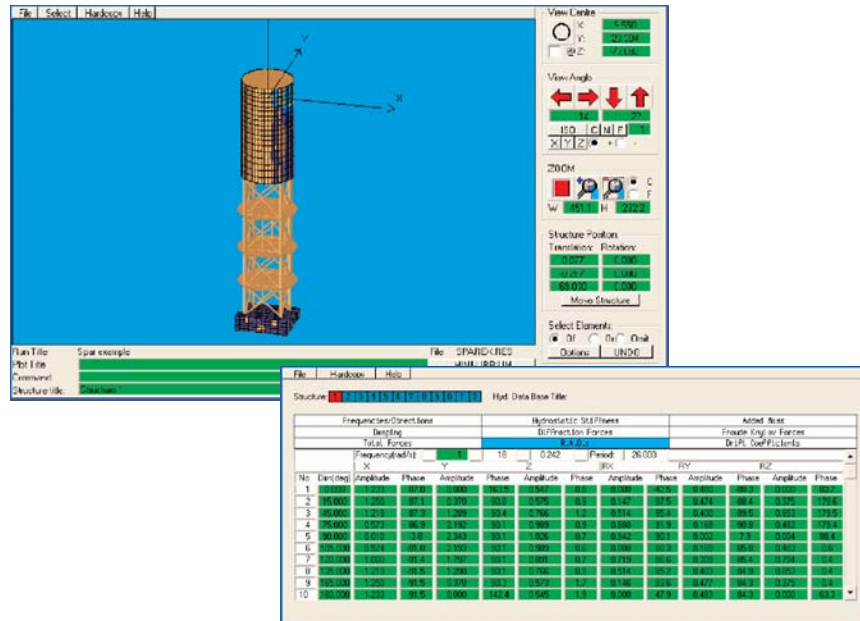- Frequency domain
- Time domain
- Fully coupled
- Stand alone
- Intermediate buoys and clump weights
- Composite cables

Special features
- General external force time history
- User defined external dynamic link library enabling general load generation e.g. Dynamic Positioning Systems
- Ability to directly access and retrieve AQWA results using Microsoft® Excel®
- High order Morison elements to permit dropped object simulation and dramatically simplified modeling

ANSYS AQWA Benefits

The ANSYS AQWA Suite provides an integrated solution for hydrodynamic analysis enabling engineers to meet the demands presented by the offshore and marine industries.

ANSYS AQWA is a software package that forms part of ANSYS Offshore, a comprehensive range of applications that collectively satisfy the demanding engineering and design requirements of the offshore industry. Other software packages include ANSYS® ASAS™ for advanced structural assessment of all types of fixed and floating structures and ANSYS® AutoReaGas™ for the simulation of explosion and blast effects on topside modules. The ANSYS Offshore suite is supported by ANSYS® Mechanical™ simulation tools and ANSYS® CFX® computational fluid dynamics package. Taken together, ANSYS now offers the most complete range of solutions for the offshore industry from FEED studies through global analysis to component design. Solutions are available for contractors, consultants, fabricators, certification authorities, operators and equipment manufacturers.