Other hydraulic and coastal engineering programs available from Aalborg University:

WaveLab

WaveLab is a Windows® program for data acquisition and analysis in wave laboratories. WaveLab features a graphical user interface, which makes WaveLab very easy to use. WaveLab includes several useful tools for planning, performing and analyzing experiments.

Many tools are available in WaveLab here we want to highlight the following tools:

- Data Acquisition
- Time Series Analysis
- 2-D reflection analysis in time and frequency domain of regular and irregular waves.
- 3D Wave Analysis using the BDM or MLM method
- Filtering (Bandpass, Average, Dynamic Amplification Correction, user defined)
- Non-linear multi-parameter curve fitting using predefined or user defined models.

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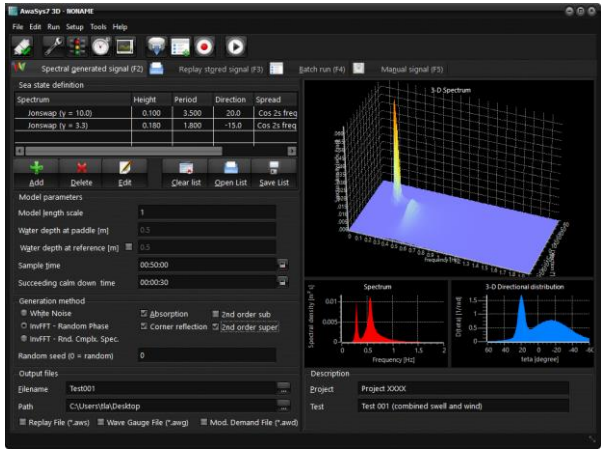
AwaSys 7

2-D and 3-D wave generation with active wave absorption



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AwaSys 7

AwaSys 7 is a program for long-crested (2-D) and short-crested (3-D) wave generation including active wave absorption. AwaSys runs under Windows® gives the advantage, that modern PC's and a variety of data-acquisition hardware are supported.

AwaSys 7 allows the user to perform wave generation synthesis as well as reflection analysis simultaneously with running active wave absorption.

Regular waves might be generated with linear, 2nd order, cnoidal or approximative stream function wavemaker theory.

For irregular wave generation synthesis four different techniques are implemented:

- The Random Phase Method
- The Random Complex Spectrum Method
- The White Noise Filtering Method
- Ad-hoc Unified Boussinesq Generation

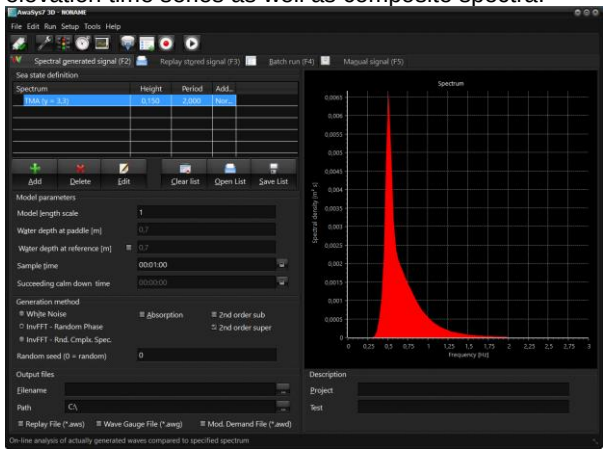
The Random Phase Method is a deterministic method simulating random waves in the frequency domain by assigning random phases to each frequency component. The Random Complex Spectrum method as well as the White Noise Filtering Method are non-deterministic methods. The White Noise Filtering method simulates random waves in the time domain by means of digital filtering of white noise. Filters are generated in accordance with the specified energy spectrum. For most applications, the White Noise Filtering method is preferred as it reproduce the natural variability of the spectrum. Moreover, the frequency discontinuities introduced by the InvFFT based methods are avoided which might be important for structures with sharp peaks in the frequency response.

Nonlinear interaction between individual wave components in the wave trains give rise to the so-called group bounded long waves, which are of 2nd order. In all wave synthesis techniques, a correct reproduction of the group bounded long waves is possible. Correction for 2nd order higher harmonics is possible for the InvFFT based methods. In the InvFFT method the 2nd order corrections are correct also for short-crested waves.

The Ad-hoc unified generation is the most advanced technique and makes it possible to generate highly non-linear irregular waves head-on to the wavemaker without spurious harmonics. The method leads to similar improvements over 2nd order generation as the stream function does for regular waves. The input for the method is calculated by a Boussinesq wave model running on the GPU. The numerical model is delivered with AwaSys and is autonomous controlled by AwaSys.

Two active absorption methods are included. 1) SIRW-method by Frigaard and Brorsen (1995) based on two gauges in the far-field. This method is only applicable to flumes and relatively linear waves. 2) One gauge in the near-field by Lykke Andersen et al. (2016) method, which is the preferred solution for most facilities with high performance for both linear and nonlinear waves. Results of online analysis are shown in real time which provides information about the target spectrum, actual generated incident waves and the reflection coefficient.

The main screen consists of four pages. The first page is used for wave generation, where a wave spectrum is selected and all relevant parameters and options can be set. In addition to linear and nonlinear regular wave generation, AwaSys 7 comes with 13 different predefined irregular waves spectra and the possibility also to generate user defined spectra and user defined surface elevation time series as well as composite spectra.

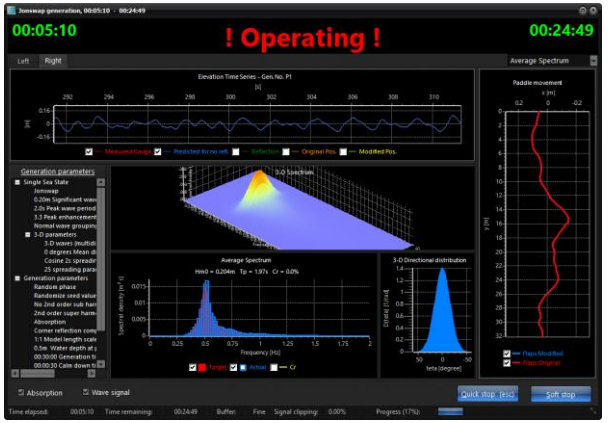


AwaSys 7 main form in 2-D mode.

The second page allows replaying the paddle signal from a previous stored generation. Hereby different model setups can be exposed to the exact same wave series. On page three one or more generation can be queued and run as a batch. On page four, all paddles can manually be controlled for static calibration and testing of individually paddles.

During wave generation, the progress can be monitored on a status screen with the following output:

- Elevation, measured by wave gauges.
- Paddle position(s).
- Settings and generation parameters used.
- Real time analysis showing target and actual incident spectrum as well as wave parameters.
- Paddle movement history.



Wave generation status window in 3-D mode

AwaSys 7 support data-acquisition hardware from DATATRANSLATION and National Instruments as well as digital communication with three types of servo controllers. Among these is the MadTTech wavemaker controller which is recommended for new installations. If preferred the configuration of AwaSys 7 can easily be altered according to individual demands

For additional information, please check web address and contact information on the back of this brochure.