HR Wallingford
Working with water

Data AcQuisition and analysis software

Key features

Specifically designed for wave analysis

Instrument calibration

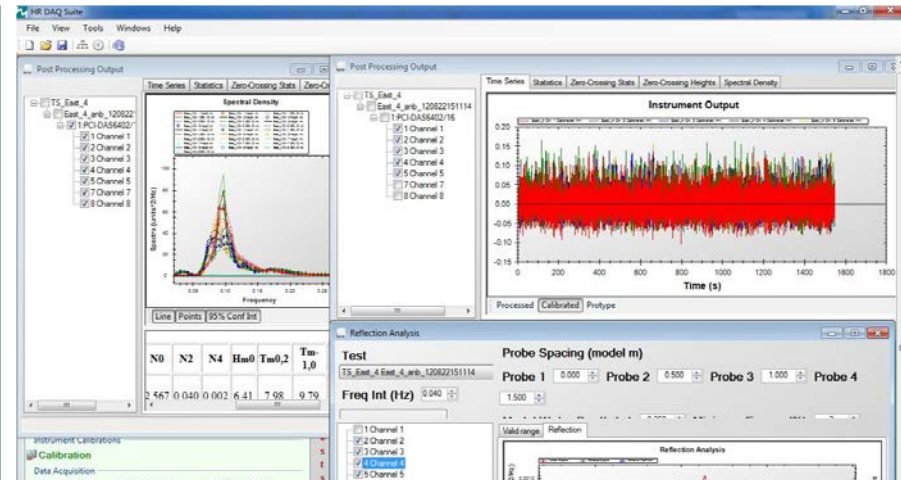**Data acquisition**

Spectral analysis

Statistical and wave counting analysis

Reflection analysis

The Data AcQuisition software (HR DAQ) is a comprehensive Windows based data acquisition and analysis program that is suitable for 64 analogue input channels. It is used to collect and analyse data from a variety of instruments used in physical models such as wave gauges, Acoustic Doppler Velocimeters (ADV) and pressure sensors.

The program is project based and is split into three sections:

> calibration and scaling of inputs
> data acquisition
> data analysis

Calibration of inputs

The calibration section allows the creation of instrument identification and specific calibration files for use with the acquisition and analysis sections. It provides a comprehensive set of facilities for setting up the calibration files that are used to convert the analogue voltage signals in the model, to data at full scale, assuming Froude or Reynolds scaling. Where calibration factors are already known, they can be manually entered for each measurement instrument.

If certain channels have to be calibrated for the specific test, such as wave gauges, then HR DAQ uses its own calibration routine. With this routine, the wave gauges are lifted and lowered and HR DAQ records the input voltage signal against the prototype or model value that is entered. After three calibration points have been entered HR DAQ will calculate the Goodness of Fit using the Least Squares Method.

The raw calibration data and the calibration scaling factors are saved to a file that is automatically named with the instrument, project title and the time and date it was saved, this allows full traceability of the calibration, acquisition and analysis data.

Data acquisition

Raw data is collected and stored in ASCII format. HR DAQ is set to collect data for a specified period of time at a specified frequency.

During data collection HR DAQ displays the time remaining for the test together with a graphical display of the channels being acquired in real time, giving the user confidence that the test is proceeding as expected. At any time the acquisition can be aborted with the data acquired so far being retained on the file. When collecting data for a large number of channels it is possible to select from any of the channels being acquired, however for clarity purposes usually only one or two are shown on the real time display.

The collected data set is saved to a file, which is automatically named within the project hierarchy.

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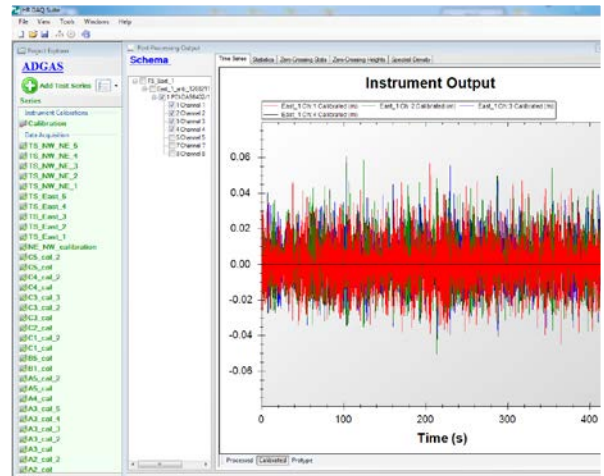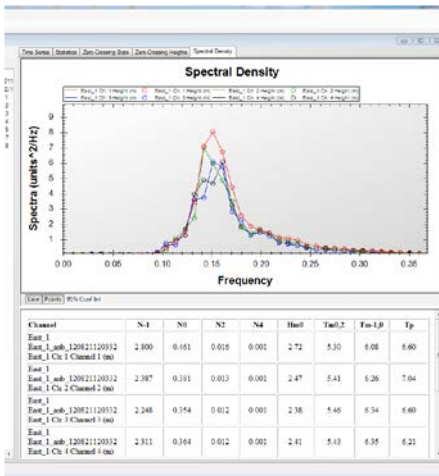
Data analysis

After the data has been collected, HR DAQ can be used to perform a number of analysis routines.

The analysis facility processes the data based on a number of options. The principal analysis program includes two routines; one is a Fast Fourier Transform spectral analysis and the other a statistical one.

The analysis results file includes a summary of the test conditions, data validation checks and the statistical and spectral parameters in addition to a table of the following parameters:
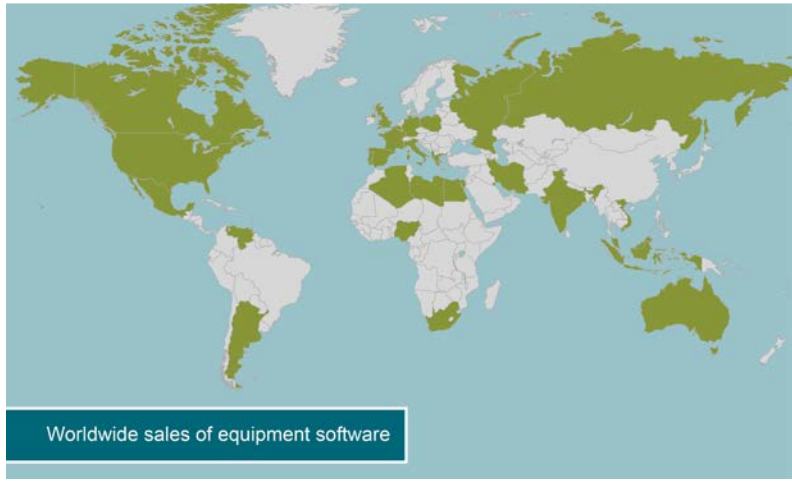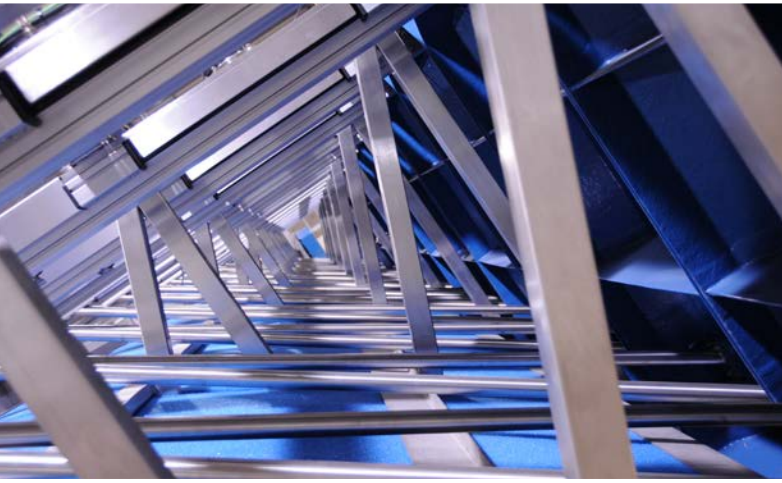
> frequency or period

> energy density

> m0, m2 and m4

> H1/3

> Tm

During the analysis, trends can be removed and the data filtered (low pass or high pass).

Various options exist for determining how the spectral analysis is performed. For example, the amount of smoothing that is applied to the spectrum can be varied and the number of frequencies can be truncated. It is also possible to perform statistical analysis based on a threshold which can either be the mean or a user defined value.

HR DAQ can also perform a reflection analysis on the data from four wave probes. The Reflection Analysis module also allows the user to determine the best spacing of the wave probes for a given frequency range and also performs a reflection analysis with the incident and reflected spectra and reflection coefficient as outputs.

Besides outputting the analysed results, HR DAQ can export the calibrated time series data as .csv text file for analysis by other proprietary programs.

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Worldwide sales of equipment software

Specifications

Input channels / voltage / frequency limited by PC and acquisition hardware specification, but typically 64 channels at 3 KHz/channel

Calibration routine

Labelling of input channels

Automatic calibration with Linear Least Squares fit shown for each channel

Automatic setting of zero levels

Data collection

Sampling frequency	1-500Hz
Monitoring of channels during data collection	Trace of all channels displayed or turned off as necessary
	Elapsed time and time to completion

Data analysis

Spectral analysis	Energy density Hs m0, m2, m4 Tp
Statistical analysis	H1/3 Tm Standard deviation Variance
Reflection analysis	Bulk reflection coefficient Incident and reflected spectra