

StudioVib

INSTRUCTION MANUAL

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1 PRESENTATION

StudioVib software is used for the acquisition and the analysis of the vibrations.

Its principal functions are as follows:

- Driving of acquisition boards to carry out measurements.
- Storage of time measurements (non limited time) in a data base.
- Realization of post processing analysis of the desired signal.
- Realization of automatic mode analysis of a whole of measurements points like the traditional data collectors.
- Visualization of the results.

TECHNICAL FEATURES

StudioVib	
<p><u>Environment</u> PC with Windows 2000 or XP Ram of 128 Mb, 40 Gb hard drive</p> <p><u>Compatible systems of acquisition</u> National Instruments diagnostic Instruments Sony HeadAcoustics Any standard audio board</p> <p><u>Importation of timel files</u> National Instruments, SD 390, BK 3550 Universal File Format (.uff), Sound (.wav), Matlab (.mat) Excel (.xls), ASCII, XML</p> <p><u>Laurina data base</u> SQLServeur ® base Adjustable arborescence from 1 to 7 levels Management of the measurements points Programming of the automatic analysis</p>	<p><u>Functions</u> HP, LP, BP filetring A,B,C Weightings Mathematical functions (Integration, Derivations, ...) Statistical functions (Kurtosis,...) Total level FFT spectral analysis (unlimited line numbers) Transfer functions Analyze by Octave, 1/3 Octave Detection of envelope on programmable filter Cepstre Hilbert transform Amplitude demodulation Phase and frequency demodulation Creation of personalized functions</p> <p><u>Visualizations</u> Time, total levels, evolutions, spectra Superposition of curves, 3d representation Exportation to Word for the reports</p>

DEVICE CONFIGURATION

StudioVib can be installed on any microcomputer which is PC compatible and having the following minimal configuration:

- Windows 2000 or XP
- RAM of 128 MB
- 40 GB hard drive
- Edition of report needs Word 2003 at least

Global presentation:

The software is presented with several windows which present:

- Tree diagram of the measurements points.
- Table to select the measurements points.
- History of acquisitions.
- Performed or programmed analysis list.
- Display windows of the analysis.

The screenshot displays the StudioVib software interface with several windows and annotations:

- Tree Diagram (NOUVELLE BASE):** A hierarchical tree showing measurement points for Usine 1, Usine 2, Usine 3, and Usine 4. A green box highlights the tree structure, with an arrow pointing to the text "Arborescence des points de mesure de la base".
- Table of Measurement Points:** A table with columns for Machine, Moteur, Arbre, P1, P2, and D. A blue box highlights the table, with an arrow pointing to the text "Tableau de synthèse des points de mesure de la base".
- History of Acquisitions (Historique):** A list of acquisition dates and times. A red box highlights the list, with an arrow pointing to the text "Dates de toutes les mesures du point sélectionné".
- Analysis List (Analyses):** A list of performed analyses, including FFT and ENV. A pink box highlights the list, with an arrow pointing to the text "Analyses effectuées sur le point sélectionné, à la date sélectionnée".
- Acceleration for FFT 0 -10 000Hz:** A graph showing acceleration (mg) vs. time (Hz). A green box highlights the graph, with an arrow pointing to the text "Arborescence des points de mesure de la base".
- Velocity for FFT 0 -1 000Hz:** A graph showing velocity (mm/s) vs. time (Hz).
- FFT 0 -100Hz:** A graph showing acceleration (mg) vs. frequency (Hertz). A red box highlights the graph, with an arrow pointing to the text "Fenêtres de visualisation des analyses".
- FFT 0 -1 000Hz:** A graph showing velocity (mm/s) vs. frequency (Hertz).
- Data Tables:** Two tables on the right side of the interface showing analysis results with columns for Hz, mg, and mm/s.

2 INSTALLATION

After having connected the licence key (25-pins parallel port or USB port whether the type of the provided key), one can set the installation of the software according to the following procedure:

Put the installation CD in the reader.

Wait the automatic starting of the installation or click on the CDSTART.exe file.

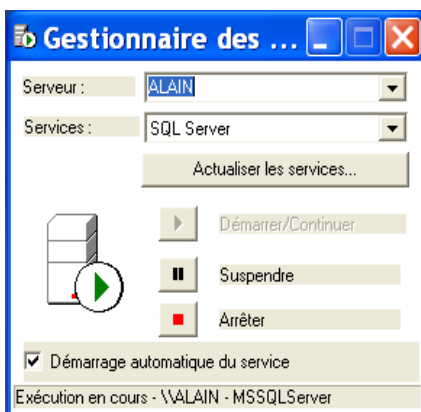


Run the phases successively:

- MSDE : SQL Server data base
- Sentinel : Management of the safety pin
- Studiovib : STUDIOVIB program



For each phase, follow the procedure of installation.

At the end of the installation, restart the computer and check the presence of the MSSQLServer icon in the tasks menu beside the clock. Click right on this icon and run "Ouvrir le gestionnaire de services". Check the adjustments as follows:



3 DATA BASE

It should initially be checked that the server works.

-  : Server in working
-  : Server stopped. Open the manager and start the server.



Run the Studiovib program while clicking on the following icon:

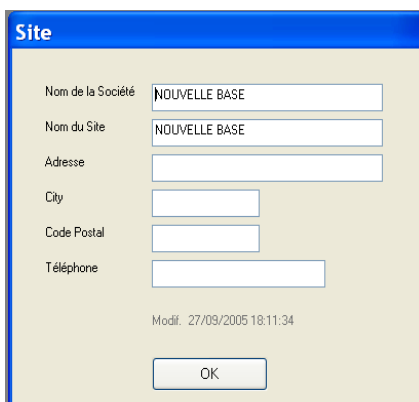
3.1 Open / Create a Data base

Click on the button "Open" and open the data base. To create a new data base, follow the following procedure:



- Write the name of the new data base in the window.
- Click on "New"
- Wait until the program creates the data base which opens automatically:

Notice: It is impossible to modify the noun of a data base once created.

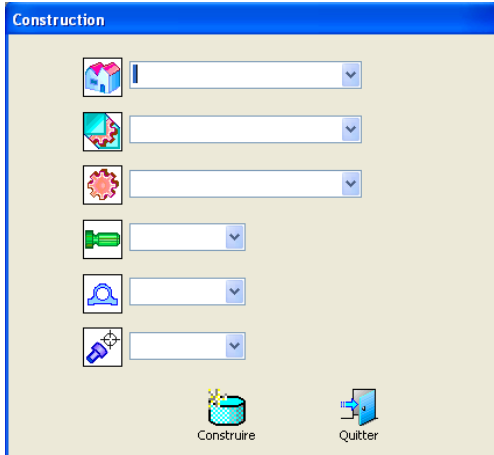


Fill in the following window. Data will be used for the presentation of the results.

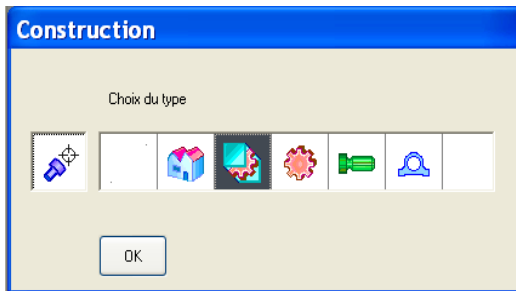
3.2 Construction of the measurements points

The base presents a tree diagram from 1 to 7 levels.

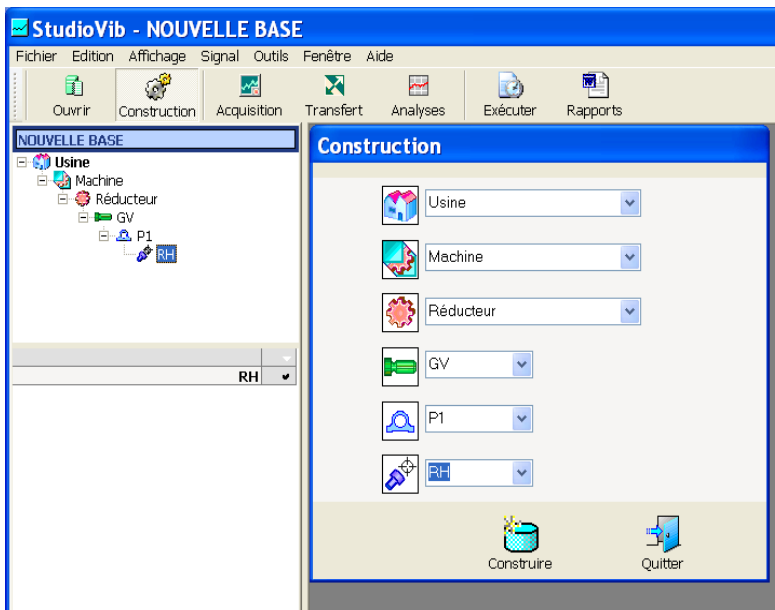
The default arborescence is as follows:



One can change the icon of each level by clicking on and choosing in the following window:



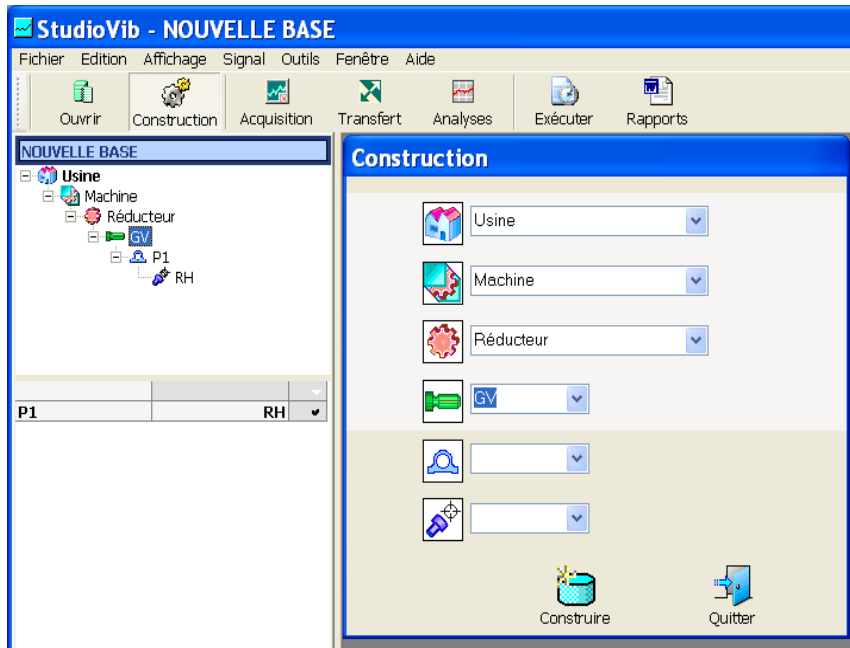
Caution: The principle selected is that a measurement can be fixed only to one level of "Sensor" type which is thus necessarily the last level.



Fill in the fields to define the measurement point and click on "Building" to validate.

The measurement point is presented in the tree diagram like opposite.

To create another measurement point, click in the tree diagram on its "parent" level and fill in the "child" fields in the window.



Example: create a new point on the GV tree.

Click on "build" to validate.

Direct creation by "copy/paste"

In the tree diagram click right on the point and "copy".
Point on the parent level of the future point.
Click right and "copy".

It is thus possible to copy points, machines, and workshops.

The "copy/paste" operation only relates to the measurements points. If the element "copy" contains data, the "paste" point will not contain any data.

Modification of the tree diagram by "slide" function

In "construction" mode, it is possible to move any element in the tree diagram. The operation is done by pointing the cursor of the mouse and by sliding the element at the desired place. The displacement relates to the pointed element like any « child » element, and is done obviously with all the data contained in.

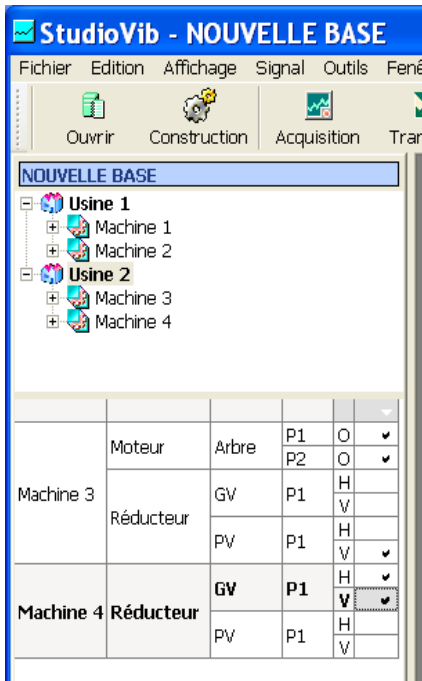
This operation can thus be done after having working out measurements and analysis.

3.3 Programming of the automatic analysis

For each point, it is possible to program analysis that will be carried out in automatic mode starting from completed acquisitions.

It will be also possible to do any analysis to any measure, upon request, in manual mode.

3.3.1 Table to « tick »



For much of operation such as:

- Choice of the automatic analysis
- Working of the automatic analyses
- Edition of results

One should choose the concerned points. This operation is done by the table to tick.

Elements present in the table are those located starting from the level selected in the tree diagram. This solution makes it possible to work only on the concerned installation.

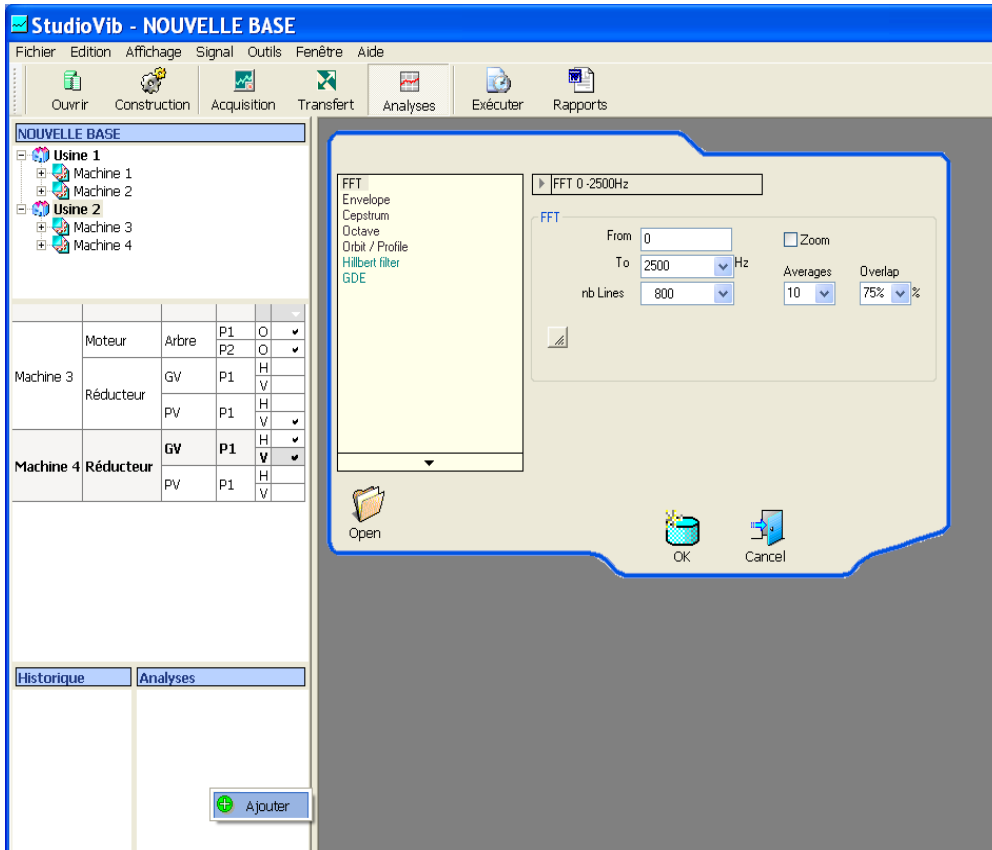
It is possible to select points with several methods:

- To select only 1 box, click on the box to tick.
- To select several points, click the different boxes to tick by maintaining supported the "Ctrl" key.
- To select all the points, click on the higher box to tick of the table

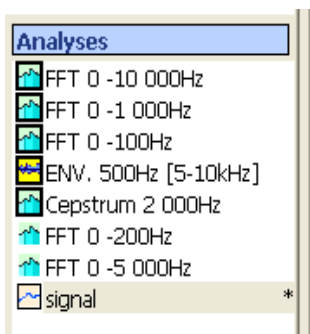
3.3.2 Programming of the automatic analysis

Select the points concerned using the boxes to tick.

In the "Analysis" table, click right and select "add". The analysis table appears:



Choose the analysis to be done on all the ticked points, define the parameters of the analysis (cf. paragraph "Definition of the analysis"), and click "OK".



The programmed analysis is added in the analysis table.

According to whether the analysis is in "automatic" or "manual" mode, the presentation will be as follows:

- Framed icon : automatic analysis
- Non framed analysis : analysis done in manual mode

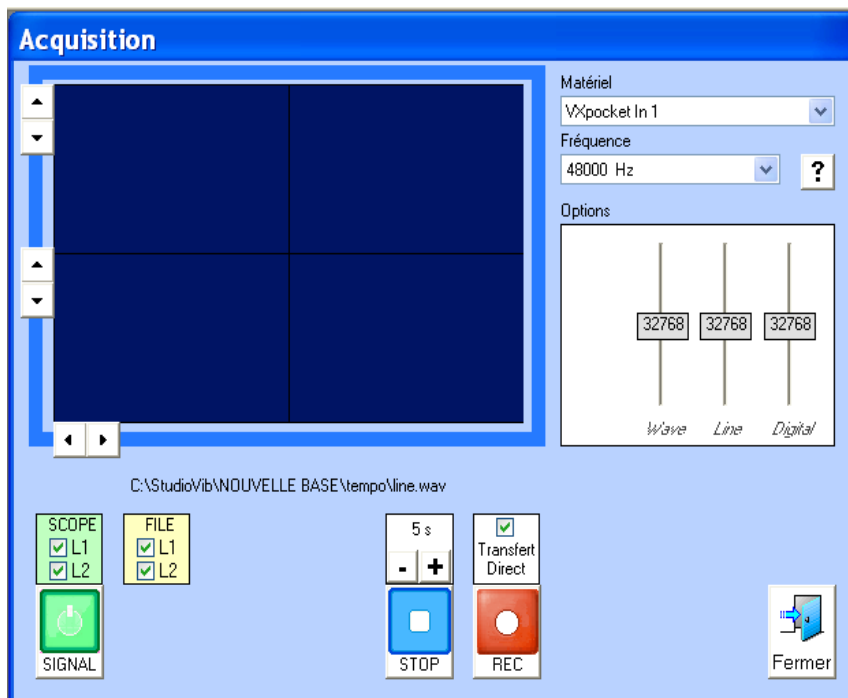
4 ACQUISITION OF MEASUREMENTS

Studiovib makes it possible to work with time files resulting from the following systems:

- "audio" files with the "wav" format
- Files resulting from the National Instrument board with the "bin" format

4.1 Acquisition with integrated audio board

Click on the "Acquisition" button. The following window appears:



Select the acquisition board in the "device" box.

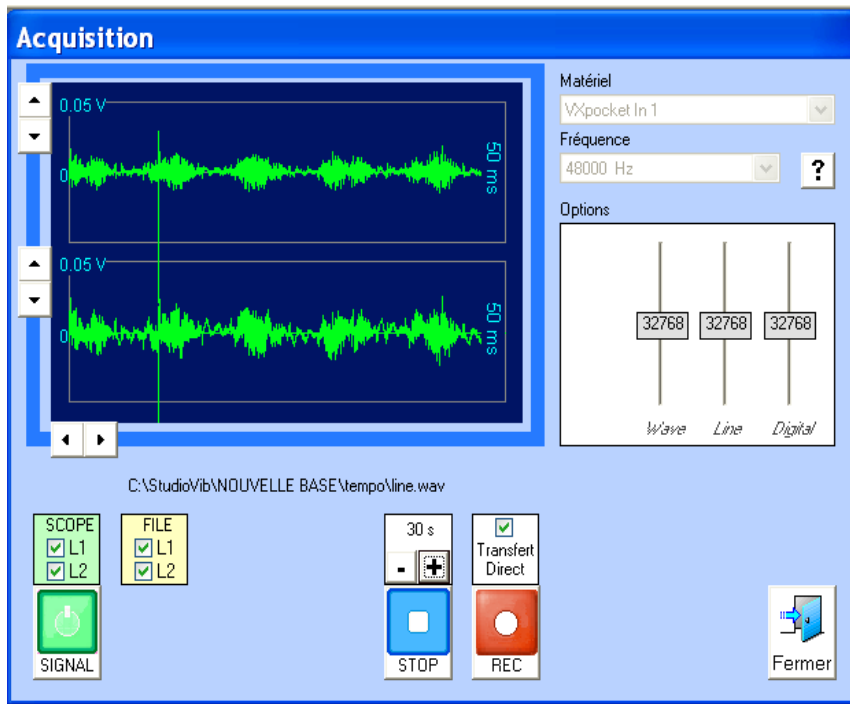
For the PCMCIA Digigramm VX Pocket board, choose: VXPocket In1.

Check that the sampling rate is well set to 48000 Hz.

The cursors of gain must be settled on the medium position (0 gain).

If the cursors are not in medium position, this adjustment can be made automatically by double clicking on the cursor.

Activate the scope while clicking on the green button: "signal"



Settings:

- Scope : visualization of the channels on the scope.
- File : activation of the channels for acquisition and recording. In the case of one channel acquisition, it is better to inactivate the channel not used in order not to create an empty file.
- Time : regulate the time of acquisition.
- Direct transfer :
 - If the option is activated, at the end of acquisition, the program moves directly on the transfer window to assign the time file to the measurement point.
 - If the option is not activated, the program stores the files in a temporary repertory after each acquisition. The transfer operation will be carried out thereafter for the whole of acquisitions.

ACQUISITION

Start the acquisition with the "REC" red button.

The progress button shows the progress of acquisition.

During the acquisition, one can constantly restart the process while pressing on the REC button.

One can stop acquisition before the automatic stop while pressing on the STOP button.

4.2 Acquisition with a National Instrument board

The module for the board driving is not integrated in StudioVib and must be started separately.

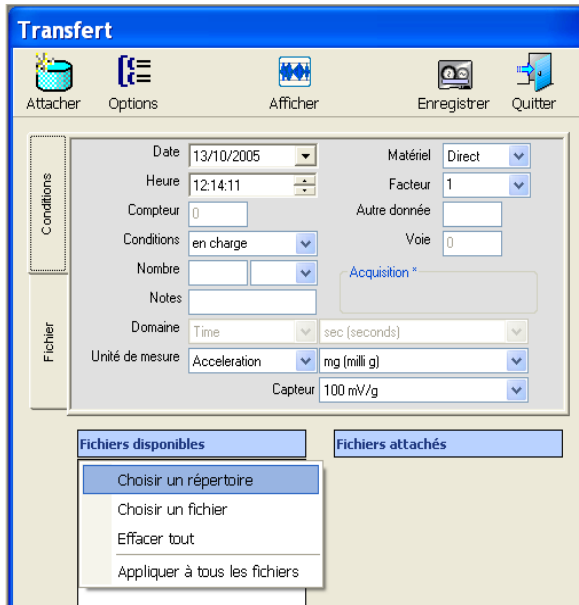
It is possible to program a "Function" key in the options menu to run automatically any external program.

5 TRANSFER

The transfer operation aims to assign acquisitions to the measurements points.

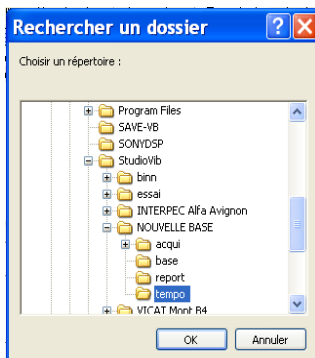
It is in this phase that all information concerning the types of materials is also consigned, the sensors, and their sensitivity.

It is possible to give comments that will be used in the presentation of the results.

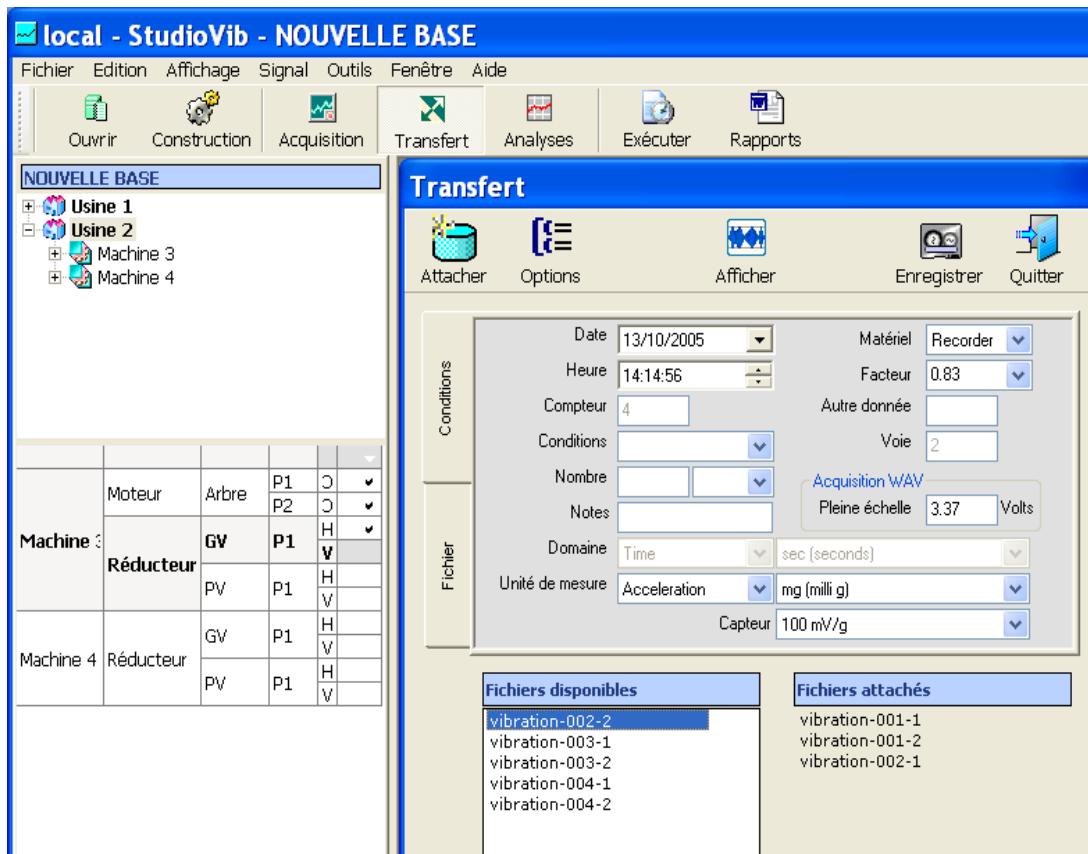


- Material: Possibility of inserting a recorder in the acquisition channel by specifying its Input/Output factor.
- Measuring unit : Acceleration / Velocity / Displacement / Pressure
- Sensor: Select the type of sensor and its sensitivity. It is possible to create a new sensor by clicking right on the "sensor" label.

Click right on the «Available Files» label and select "Files choice".



Select the "tempo" default folder or the personal repertory in which the files of acquisition are stored.



For each acquisition file and after having set required information:

- Click on the file to transfer to make it active (on blue screen).
- Notch the measurement point of the table to tick.
- Click on the "Attach" button

The file comes in the right-hand window.

- Repeat the operation for all the files.
- To validate the operation, click on the "Record button", then "Quit".

Notes:

For a multichannel acquisition, the number of the channel is indicated as a suffix in the name of the acquisition file. For example the "vibration-002-1" file corresponds to the channel "1" of the "vibration-002" acquisition.

As long as the transfer was not validated, it is possible to retrogress in the event of error. Click right on the file in the "Attached files" right-hand window and choose the "Remove" option. The file returns in the "Available Files» left-hand window.

Where are stored the acquisition files?

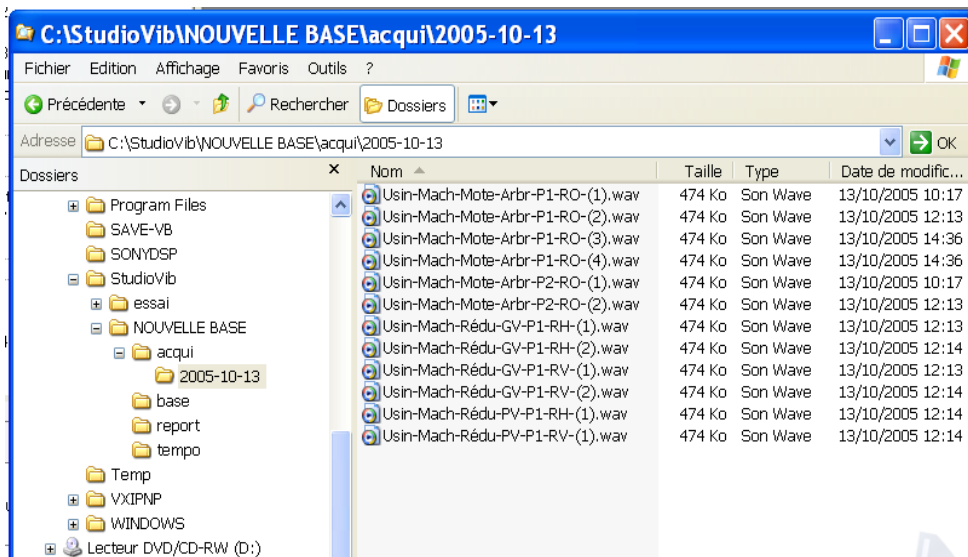
In a traditional use, the location where the files are stored does not have to be known. This information can however be useful if one wants to make copies of files, or transfer the files on other measurement points, especially in the event of error.

The time files of acquisitions are not stored directly in the data base. These files are stored on the hard drive or any other data-processing support. Only the emplacements are stored in the data base.

The storage emplacement of the acquisition files is given according to 2 possibilities:

1 – Default case: The original file (before the transfer) is located in the "tempo" folder of the data base, or in one of its sub-directory.

After the transfer, the file is transferred in an "acqui" folder located in the principal folder of the data base. The files are classified in sub-directories with as name the date of the operation.



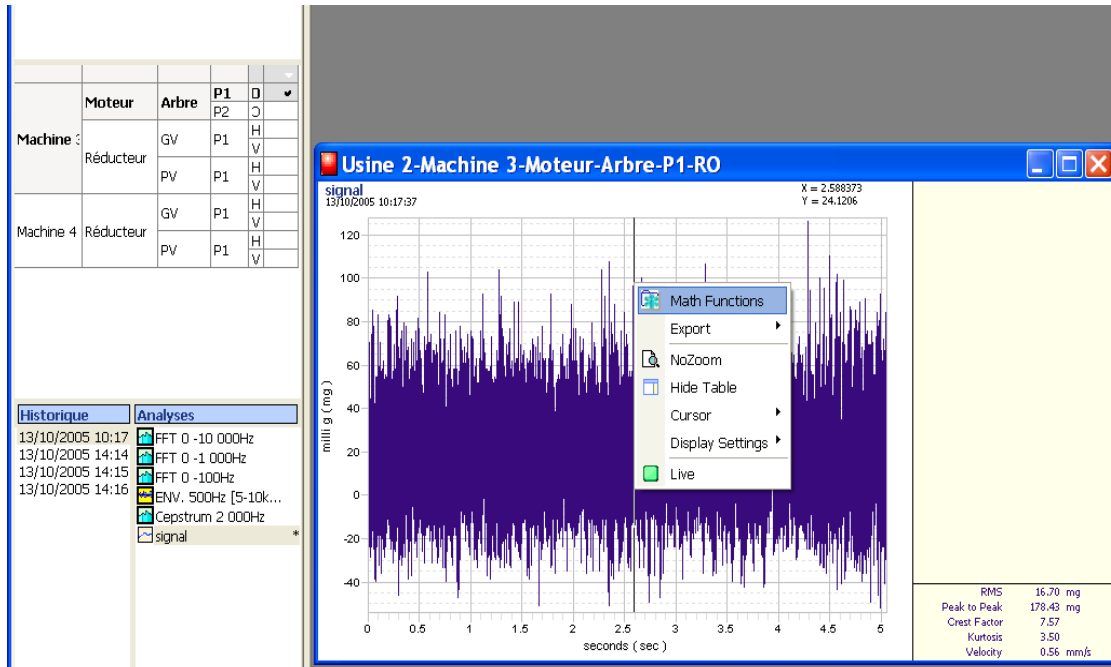
2 – Specify case: The original file (before the transfer) is located in an unspecified emplacement defined by the user.

After the transfer, the file remains on its original emplacement.

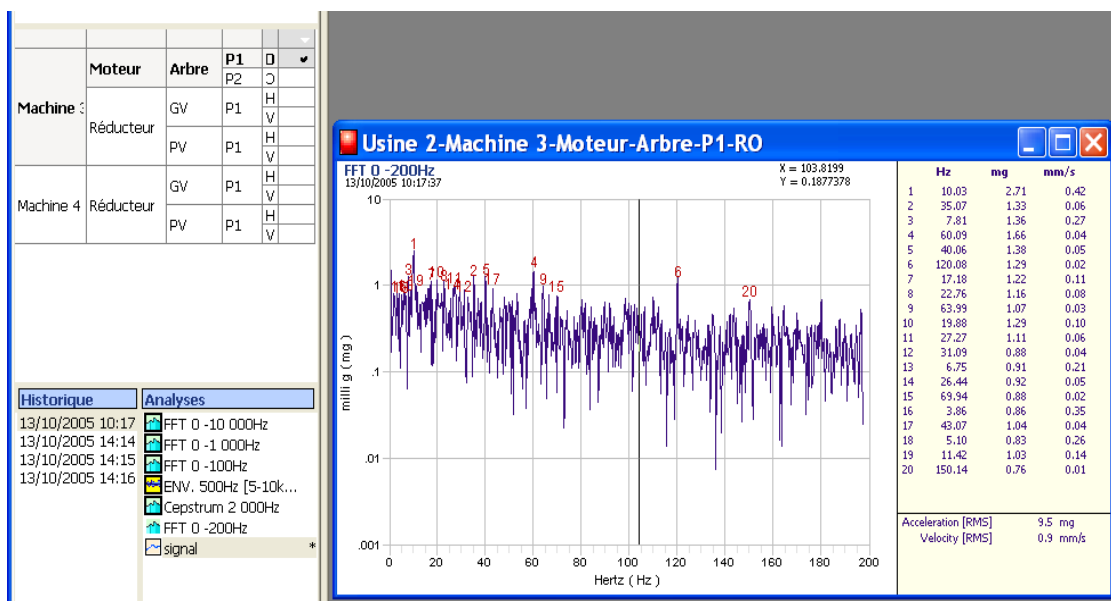
In this case, check that the files are accessible during the use of StudioVib, especially when the program will have to read the file in order to working out an unspecified analysis.

6 ANALYSIS EXECUTION

6.1 Analysis in manual mode



- Choose the measurement point by notching the corresponding box.
- Choose the acquisition date and double-click on the "signal" icon in order to observe the time signal.
- Click right on the time signal window and choose the "Math Functions" option.
- Determine the desired analysis (cf. the "Definition of analysis" chapter)
- The analysis is observable instead of the time file.

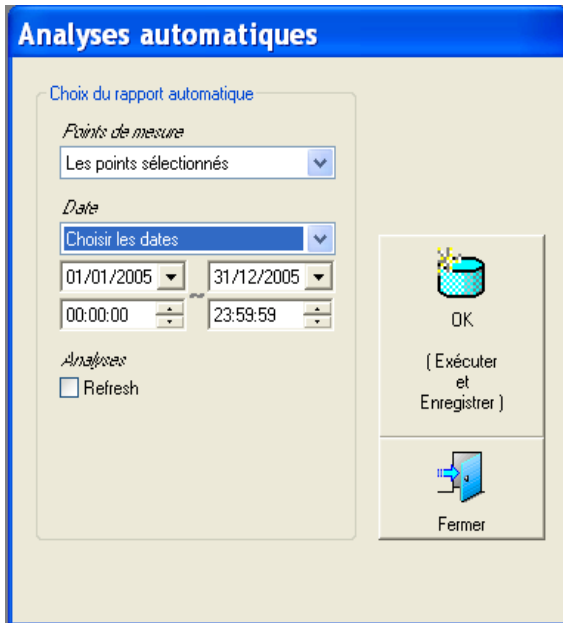


This analysis appears in the "Analysis" list. The icon is not framed because it is not automatic.

6.2 Analysis in automatic mode

To carry out all the automatic analysis which were programmed:

- Notch the measurements points on which one wants to make the operation.
- Click on the "Execute" button.



Choose the options for the points:

- All points of the base
- The current point
- Selected points

Choose the dates for which it is necessary to carry out the analysis:

- Last acquisition
- Define the dates

Click on "Execute"

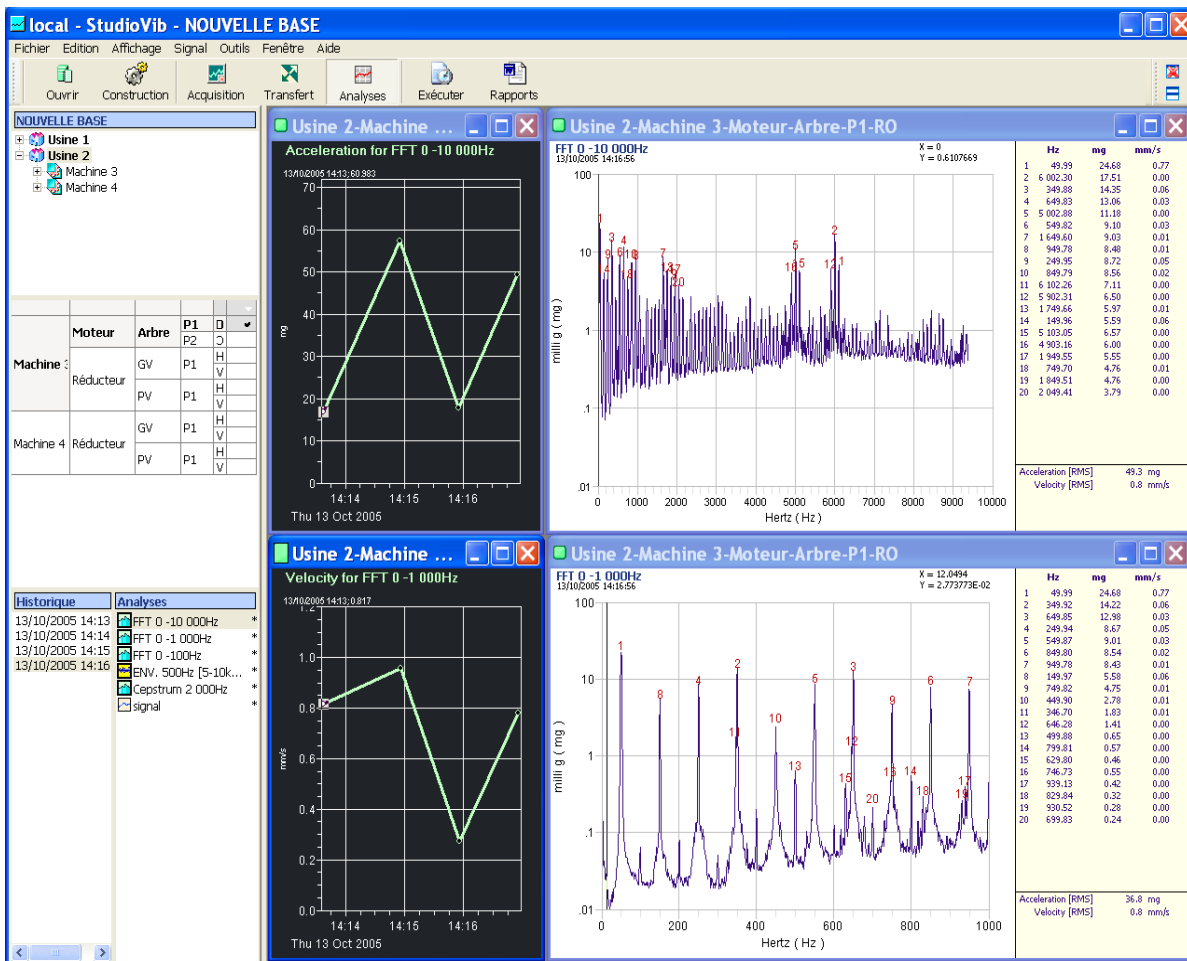
Historique	Analyses
13/10/2005 10:17	FFT 0 -10 000Hz *
13/10/2005 14:14	FFT 0 -1 000Hz *
13/10/2005 14:15	FFT 0 -100Hz *
13/10/2005 14:16	ENV. 500Hz [5-10k... *
	Cepstrum 2 000Hz *
	signal *

The "*" indicator means that the analysis was well done.

7 VISUALIZATION OF THE RESULTS

7.1 Visualization of the screen

To visualize an analysis, one must double-click on the corresponding analysis. One can visualize several curves in the reserved space and organize the windows according to its choice.



Button : Automatic organization of the open windows according to the Windows procedure.

Button : Close all the windows.

"Fixed" mode / "Live" mode

Usine 2-Machine Fixed mode. The curve is fixed on the selected point.

Usine 2-Machine Live mode. The curve is put automatically up to date when one clicks on another measurement point.

Click on the red or green button to pass from a mode to another.

Types of curves

- Time : double-click on the "Signal" icon
- Analyze : double-click on the "Analyze" icon

History

Several histories in term of total level are accessible according to the analysis done:

Spectrum:

- Total level in acceleration (g) in the bandwidth of the spectrum.
- Total level in velocity (mm/s) in the bandwidth of the spectrum.

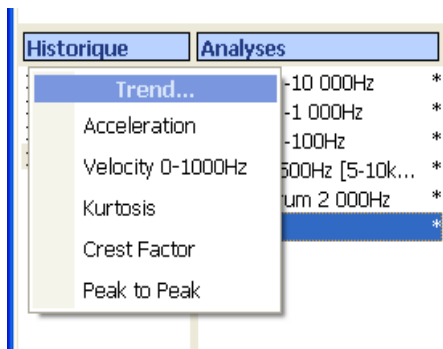
Envelope:

- Niveau global en accélération (g) dans la bande passante du spectre.

Time signal:

- Total level of non filtered acceleration (g).
- Total level of velocity (mm/s) in the 2 Hz – 1000 Hz bandwidth.
- Kurtosis
- Peak factor (Peak / Effective)
- Maximum peak to peak amplitude of all the acquisition.

To make a history visible:



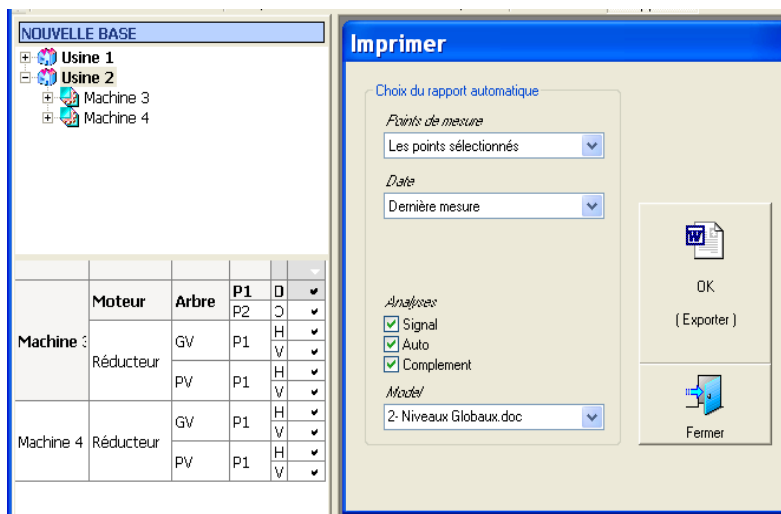
- Click on the desired analysis (spectrum, signal, etc...) to activate it
- Click on title frame of the "History" window and select the suggested option.

7.2 Edition of report

Several Word-format reports are proposed:

- ⇒ Table of the total levels;
- ⇒ Spectra and other analysis.
- ⇒ Table of GDE coefficients.
- ⇒ Summary table of measurements.

Procedure:



- Select the measurements points in the “table to tick”.
- Click on the "Report" button.
- Choose the options.
- Click on the "OK" button.

StudioVib creates automatically a Word-format document.

The Microsoft Word Xp-2003 software at least must be installed on the computer.

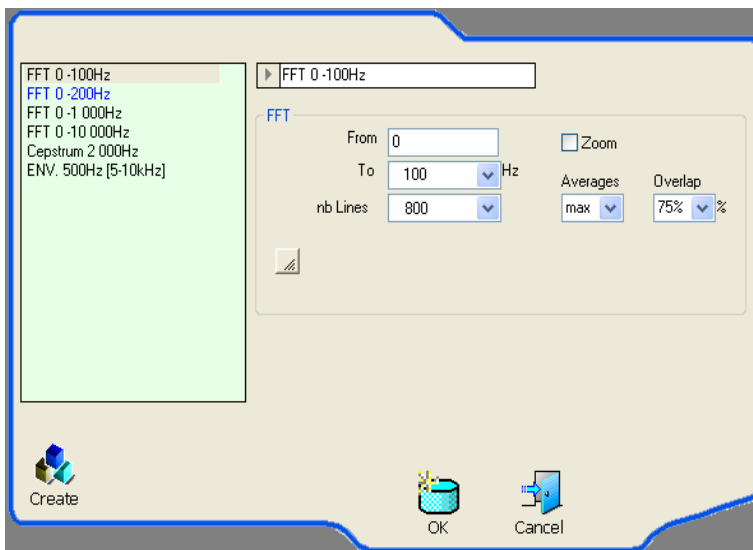
8 DEFINITION OF THE ANALYSIS

The window of the analysis is accessible by the following actions:

- ⇒ Adding an automatic analysis.
- ⇒ Doing a manual analysis on a visible curve.

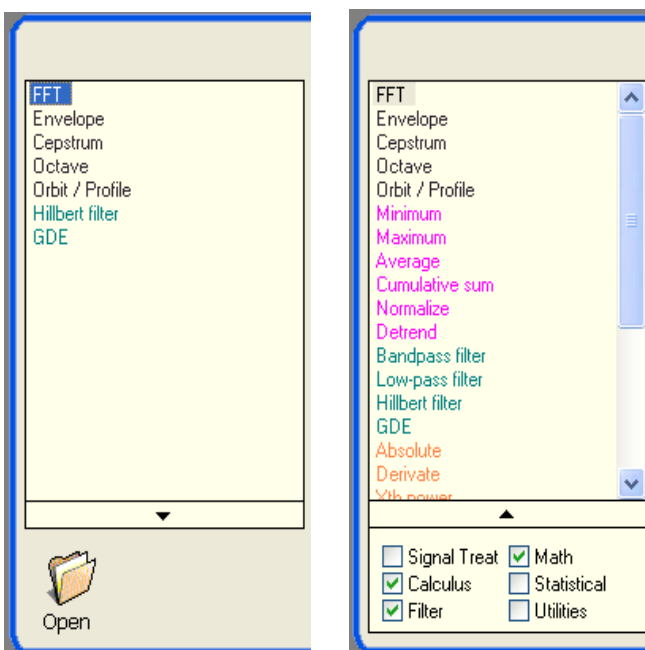
8.1 List of analysis

In the first time, the window opens by proposing the analysis which was already defined.



- Choose the analysis to be done and click on "OK".

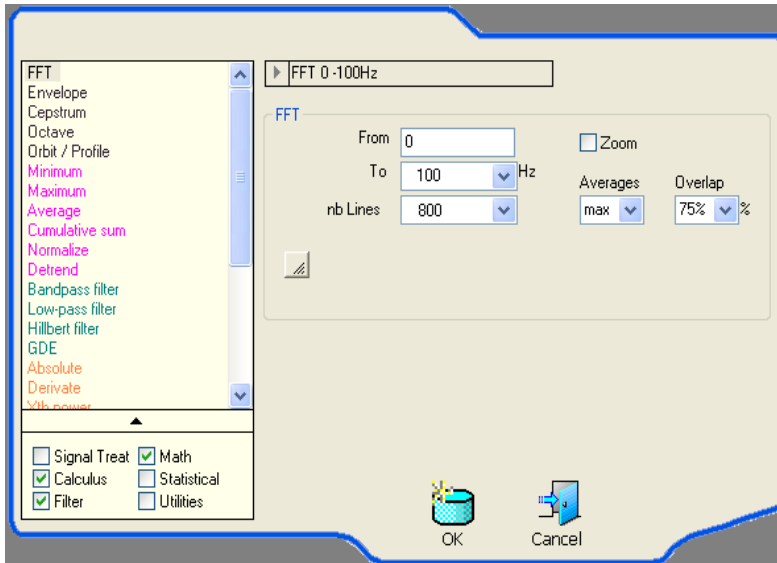
To define a new analysis, click on "Create". The window proposes a list of possible functions.



The default list presents the most used functions.

While clicking on the arrow in bottom of the list, one can define the types of functions to be visible in the list.

8.2 Recording an analysis

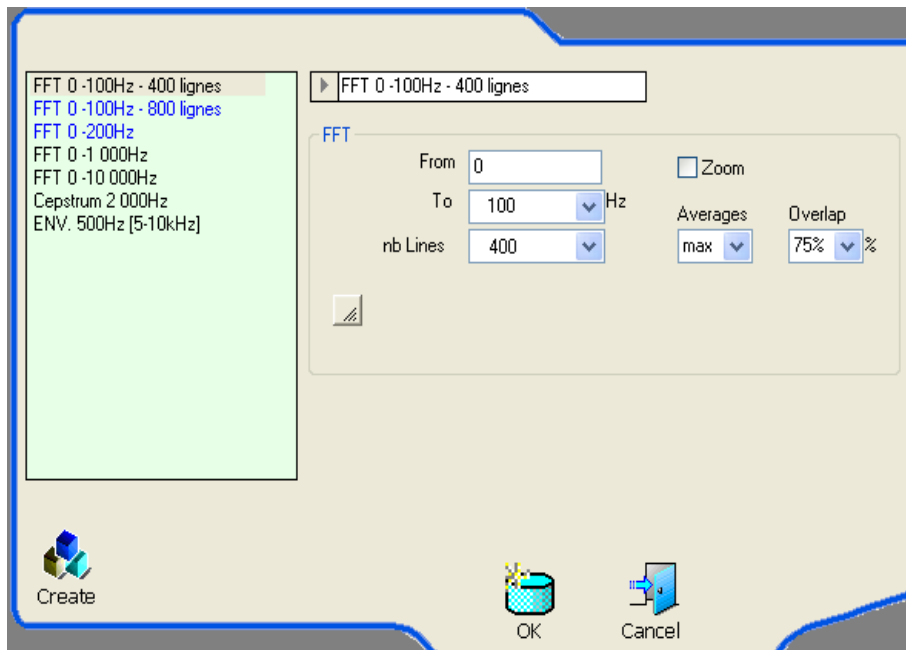


When an analysis is chosen, the program assigns a name to him that will be used in the table of the analysis and on the curves.

The default name is given according to the type of analysis (FFT, Envelope, Cepstre...) and the adjustments which are selected.

Example: "FFT – 0-100 Hz" For a spectrum in the 0-100 Hz band.

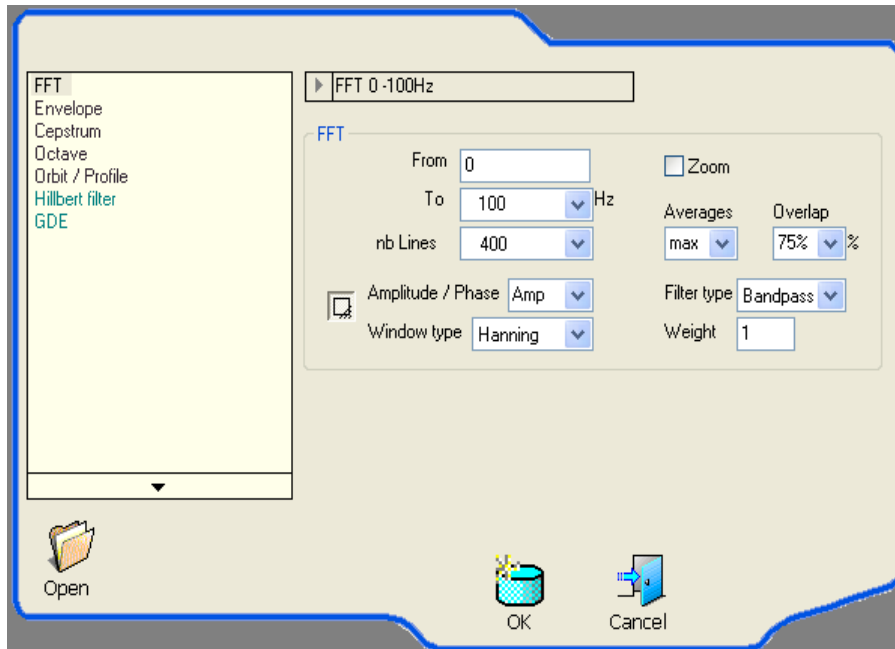
This name can easily be personalized while clicking in the zone and by writing the desired name.



Example to define a 0-100 Hz spectrum with respectively 400 and 800 lines of definition.

8.3 Configuring an analysis

8.3.1 FFT analysis



Basic parameters:

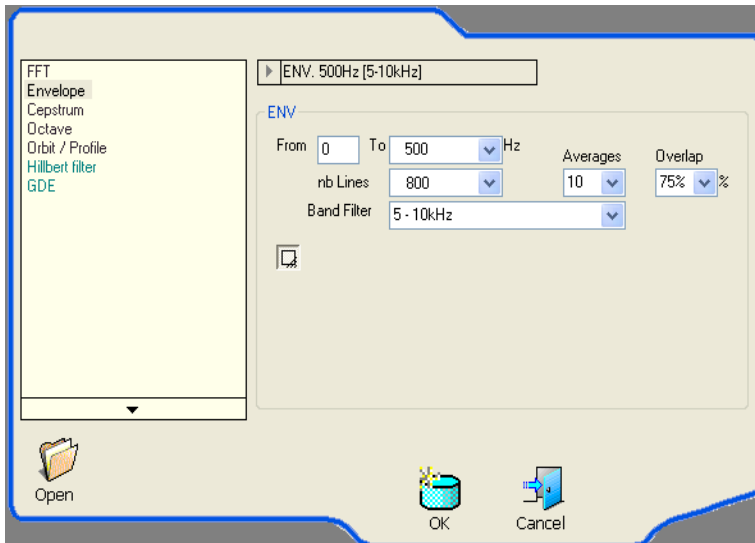
- Frequency band of the spectrum.
- Zoom: allows to define a band of analysis on both sides of a middle frequency.
- FFT lines number.
- Number of averages.
- Overlaps: Rate of recovering of the time blocks on

which the spectrum are calculated, which are then working out. Overlaps of 75% are classically used for an analysis on a continuous signal (working machine).

Advanced parameters (knowledge in signal processing recommended):

- Amplitude: Define the representation of the spectrum (modulus, phase, real, imaginary). Default adjustment: Amplitude.
- Windows: weighting window for the calculation of the FFT. Adjustment by default: Hanning.
- Weight: default weighting: 1.

8.3.2 Envelope analysis

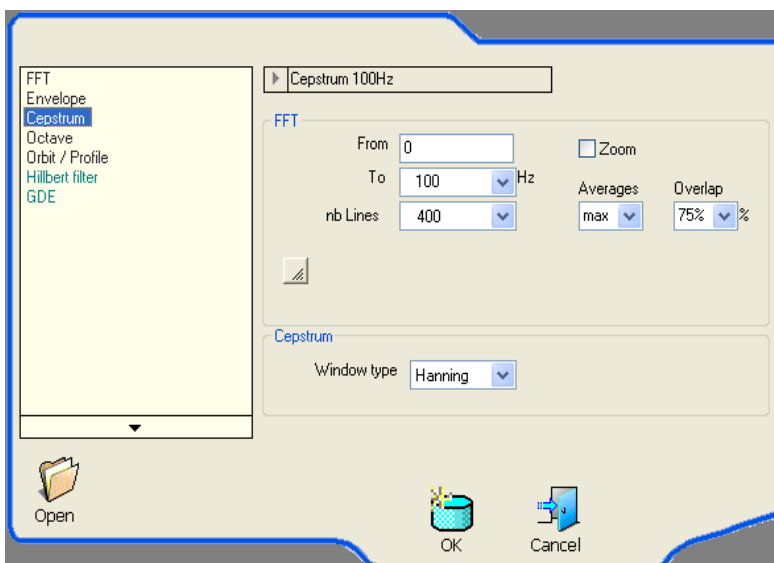


Basic parameters:

- Band Filter: Frequency band for the filtering of the time signal.
- FFT band: Frequency band of the spectral analysis carried out on the signal of envelope.
- Number of averages.
- Overlaps: Rate of recovering of the time blocks on which the spectra are calculated, which are then realised. Overlaps of 75% are classically used for an analysis on a continuous signal (machine under operation).

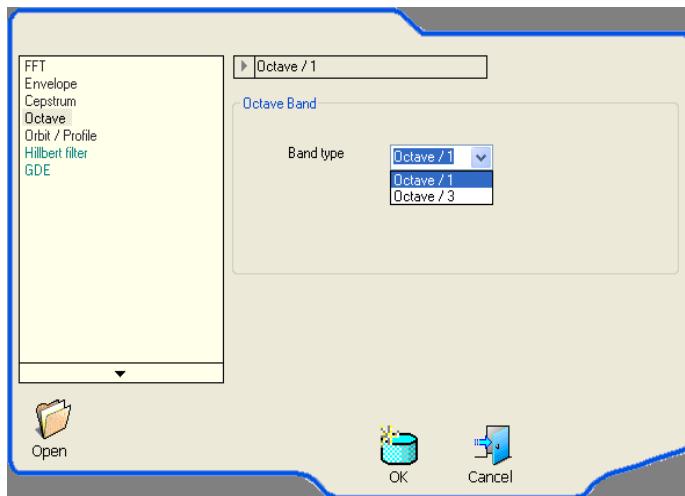
Advanced parameters: The modification of these parameters requires to control the aspects of signal processing.

8.3.3 Cepstre analysis



The operation of Cepstre being done starting from a spectrum, one finds all the adjustments of the spectrum to carry out.

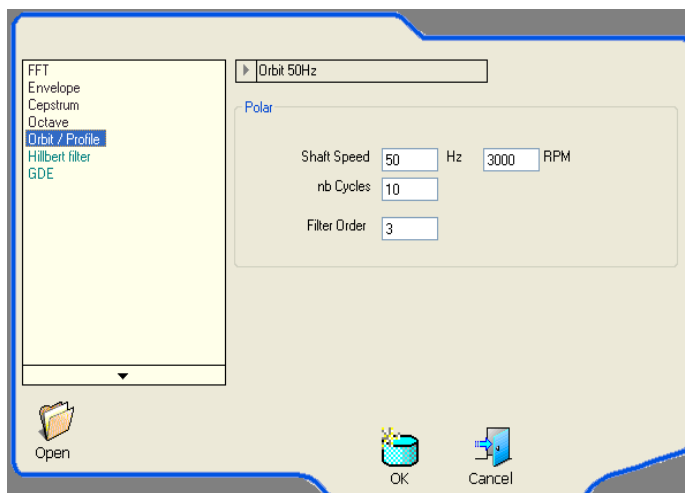
8.3.4 Octave analysis



2 possible choices:

- Analysis of Octave type : 4Hz - 16000 Hz band
- Analysis of 1/3 Octave type : 3.15 Hz – 20000 Hz band

8.3.5 Orbits analysis

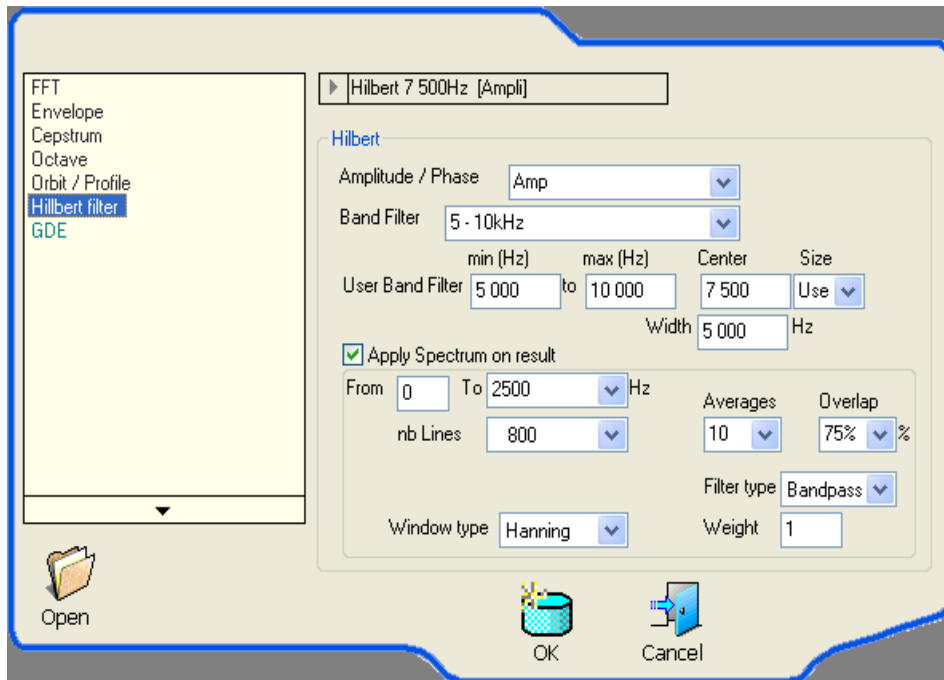


Before starting this analysis, it is necessary to set couples of points on which the orbit will be done. Generally this analysis is carried out on smooth bearings with 2 inductive displacement sensors in a 90° position.

Parameters:

- Shaft Speed: spin rate of the shaft.
- Nb cycles: Number of shaft rotation on which one assembles the orbit.
- Filter Order: Number of harmonics to be taken into account for the filtering of the signal.

8.3.6 Hilbert filtering analysis



Parameters:

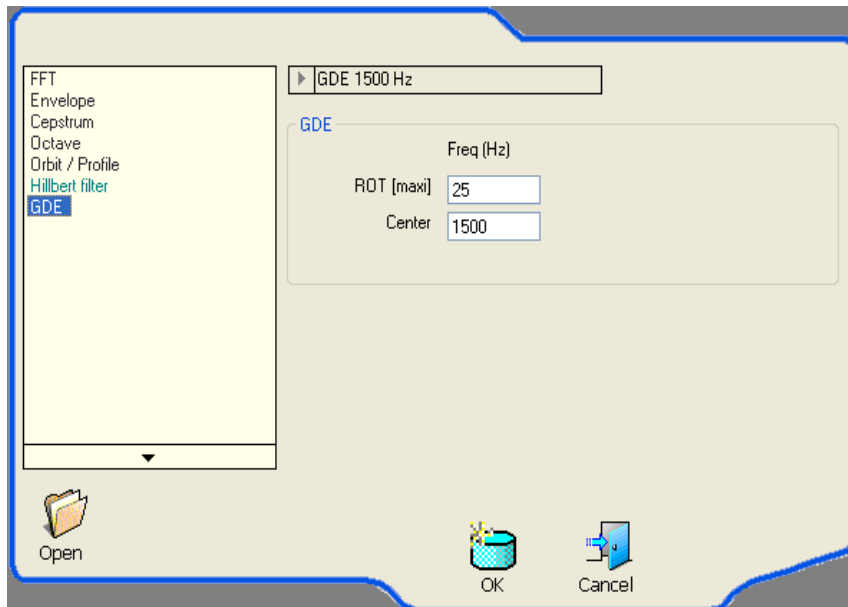
- Characteristic of the central filtering (width band or personalized).
- Type of demodulation (amplitude, phase, frequency).
- Characteristics of the spectrum to be realized on the filtered signal

8.3.7 GDE analysis

(Gear Default Evaluation)

This analysis is intended to diagnose the reducers' gears:

- State of teeth.
- Non normal clearance in the bearings
- Anomaly at the dowel pin.



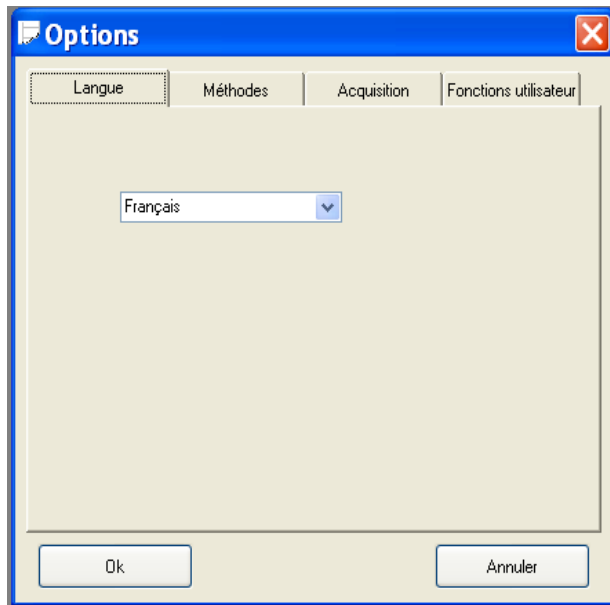
Parameters:

- Rotation frequency of the fastest shaft.
- Frequency of engaging of the considered train.

Results: 2 values (GDR and GDA) ranging between 0 and 1

9 OPTIONS MENU

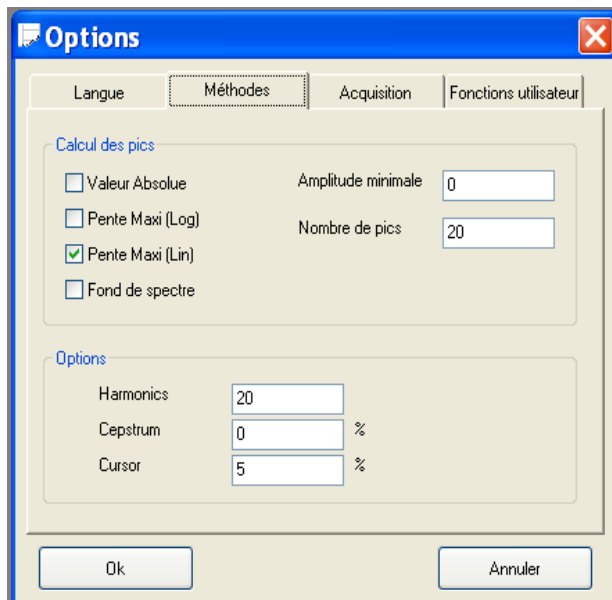
9.1 Language



Allows to select the languages:

- French
- English

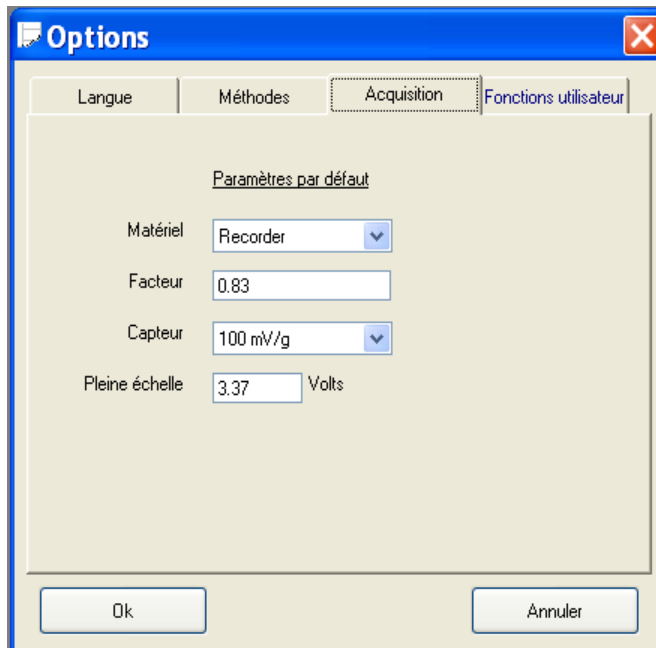
9.2 Methods



Set the following parameters:

- Method for the automatic determination of the spectral lines.
- Number of visible harmonics.
- Suppression on the screen of the first lines on the left.
- Frequency band around the cursor to trace an evolution on a spectral line.

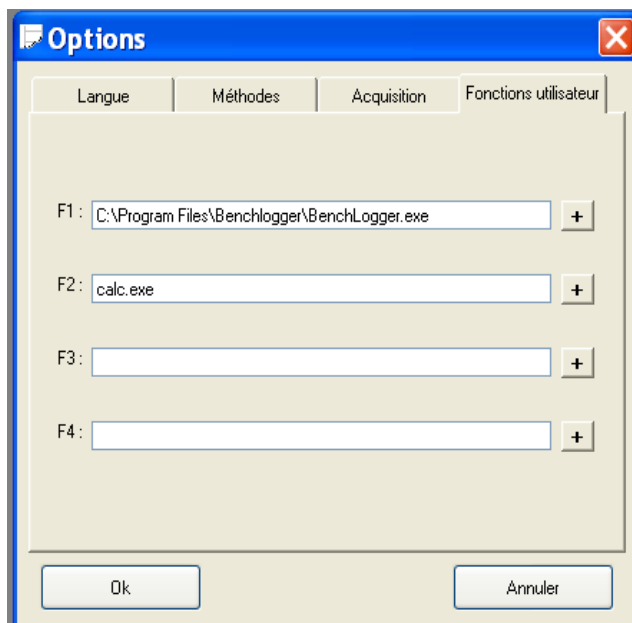
9.3 Acquisition



These adjustments are chosen by default in the window of transfer.

They can be modified at the moment of the transfer.

9.4 Programmed keys



Allows to program the function keys of the keyboard.