

# Case study

How to use the ReLog to measure the impact of trains, trams and heavy machinery on building constructions

## Background & the need for measurements

Studio D – akustika s.r.o. is a Czech engineering and acoustics company. Part of their work is to calculate the propagation of structure-borne noise and vibrations throughout building constructions. To be able to determine the construction response – and to precisely calculate the structure-borne noise in the interior of the building, Studio D measures the impact of the actual vibration itself (recorded vibrations from all sources: tramway lines, metro, railway, etc.). When performing the vibration measurements, Studio D was in great need of accurate and high precision devices.

Once the measurements are completed, Studio D provides the customers with the measurements and calculations along with a recommendation on how to lower the impact of structure-born noise and vibrations. Examples of their previous work are opera houses, shopping malls, hotels, and gyms.

Engineer Jan Dolejsi of Akustikad is currently working on a project of a residential complex in Prague and for this project, he is using the ReLog S.

*“We choose the ReLog vibration data logger and VibInspect as they met every one of our requirements when it came to measuring and analysing vibrations. And they lived up to our expectations.”*

- Jan Dolejsi, Engineer at Studio D - Akustika s.r.o

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They need to collect data – as much data as possible, to understand the amount of energy propagating through subsoil to the planned foundation of the whole building. And for that purpose, they place the ReLog in different spots on the construction, as seen below, and measure for up to 24h.



*The ReLog mounted on a building site with mountign magnets*

Since their main field of work is monitoring and calculate vibrations from linear sources – mainly railway lines, metro, and tramway lines, which means that the vibrations are not stable over time – Studio D needed to go through the entire recording during the evaluation and to look for significant events. From the recorded events, they then choose approx. 10-20 of the most dominant ones will be the base of the statistics and evaluation.

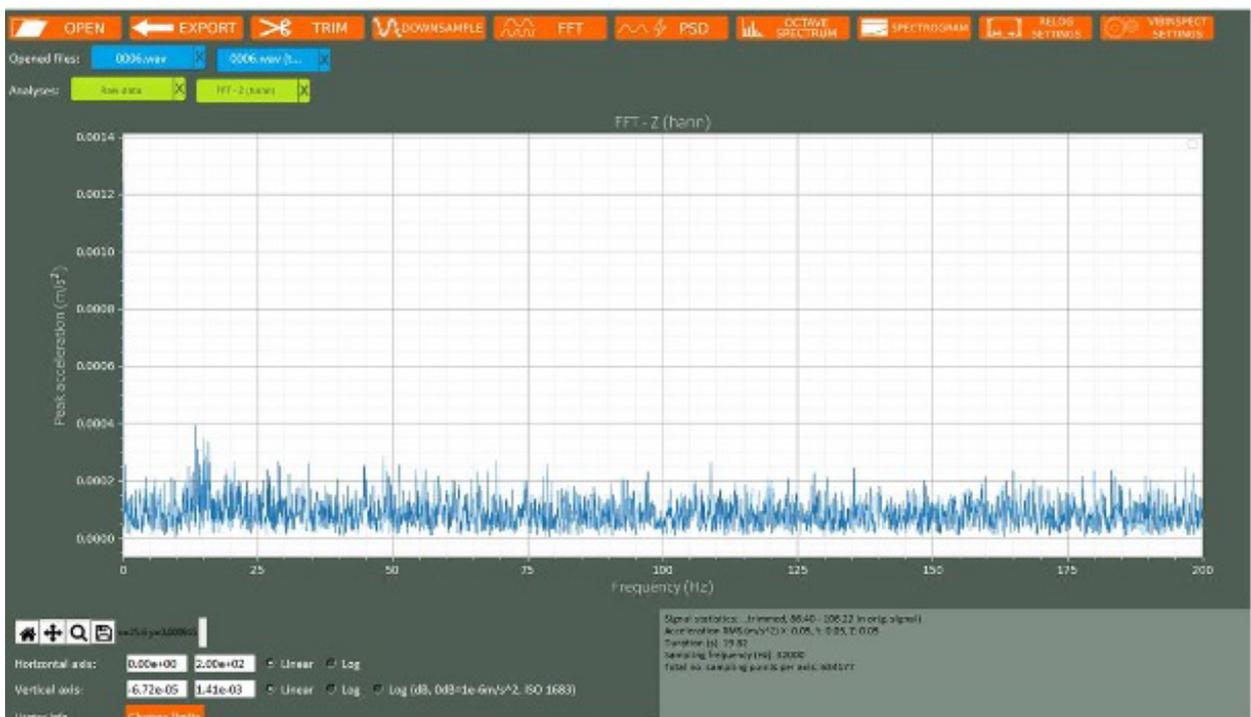
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## Analysis

Once back from the construction site, the ReLog is plugged into a computer, and VibInspect (analysis software from ReVibe Energy) is used to perform the analysis.

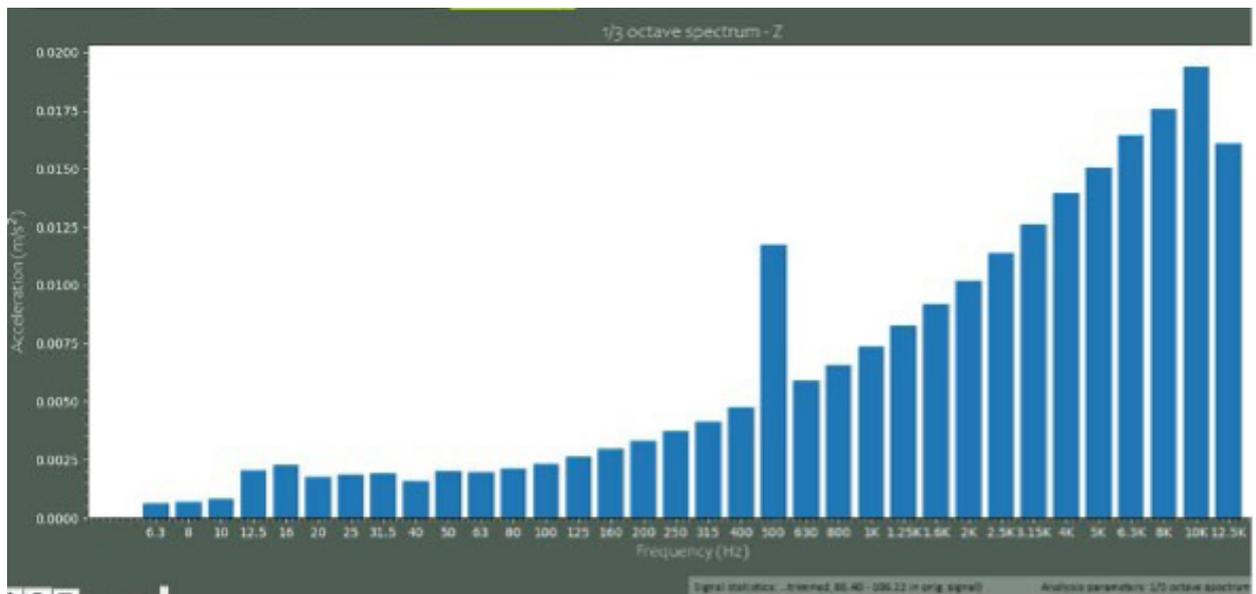
The first analysis that is being performed is an FFT where each of the three-axis (Y, X, Z) is being analyzed. In the image below, the results from an FFT analysis for the Z-direction are shown.



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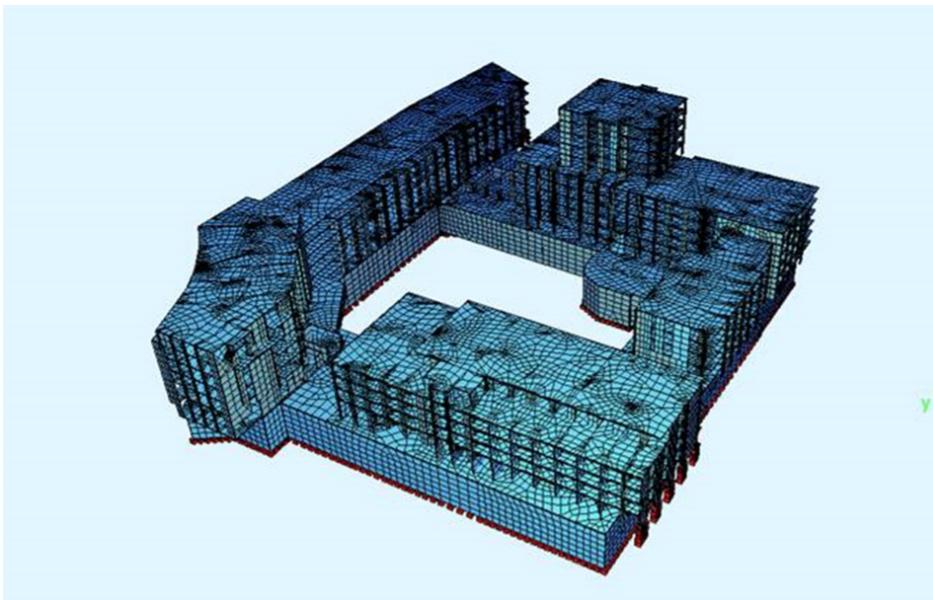
The next analysis to be performed are the main calculations, by performing a third-octave spectra, a newly added analysis filter in VibInspect. This analysis is an easier way to identify different structure-borne noise levels, as can be seen below where there is a clear event at 500 Hz.



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With all the data that was collected through the ReLog, Studio D could assemble the data. The virtual model is being used to do an element analysis where they expose the structure of the foundation with a measured time function of vibrations to get the dynamic load of the whole construction.



From the dynamic response of the load-bearing elements of the whole construction, Studio D can calculate the vibration levels in areas that shall be protected from vibrations (such as apartments). And from that response also calculate the sound power and maximum noise level of structure-borne noise in each room/each floor.

Based on the conclusion of this analysis, they decide whether there is a need for vibration insulation or not and set the requirements for potential insulation so their customer can act accordingly.

In the end, by using the ReLog S and VibInspect to perform the analysis, Studio D could deliver results to their customers in a much more efficient way.