APT-WORM FOR WHEEL FLAT DETECTION

DESCRIPTION

The APT-WORM (Wheel Out of Roundness Measurement) is specifically developed for the detection of flats and out of roundness of wheels on heavy and light rail vehicles.

The system was developed under the SAFERAIL project, which was funded by the European Commission and is now commercially available for worldwide application.

The objective of the APT-WORM system is to provide a reliable, fast and affordable technology for the detection of wheel flats and out-of-roundness, using on-line vibration measurement technology.

TECHNOLOGY

Control Box

An industrial enclosure that contains the data acquisition module and an industrial computing unit. The box is installed in the vicinity of the track up to a distance of 150 m.

The control box should be installed in a water and wind proof construction (a nearby building or bungalow, a concrete basement, …).

All cabling runs directly from the vibration sensors to this box.

Electrical power and a regular internet (data) connection are required.

Optionally, a wireless data connection can be configured.

Vehicle identification

Vehicle identification is done using readings from existing vehicle identification loops or RFID tags. The loop or the TAG reader should already be present.

The measurements will be linked with the vehicle identification so that the results are assigned to a specific wheel.

Optionally a camera can be installed. However, this camera can not be used to identify the vehicles. The camera only functions when a vehicle is present.

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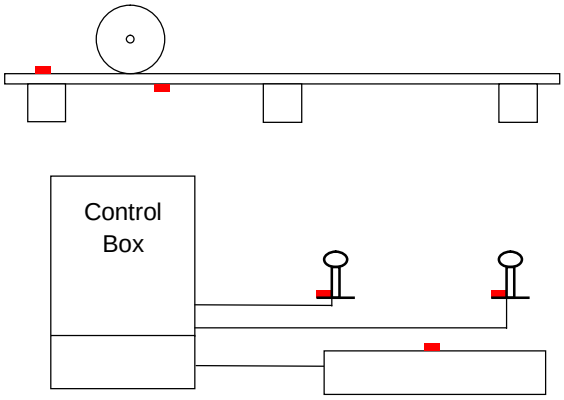
Data acquisition



The system uses three sensitive vibration sensors:

- one on the foot of the left rail in the middle of the rail section between two consecutive sleepers.
- one on the foot of the right rail in the middle of the rail section between two consecutive sleepers.
- one in the middle of one of the sleepers adjacent to the sensors on the rail.

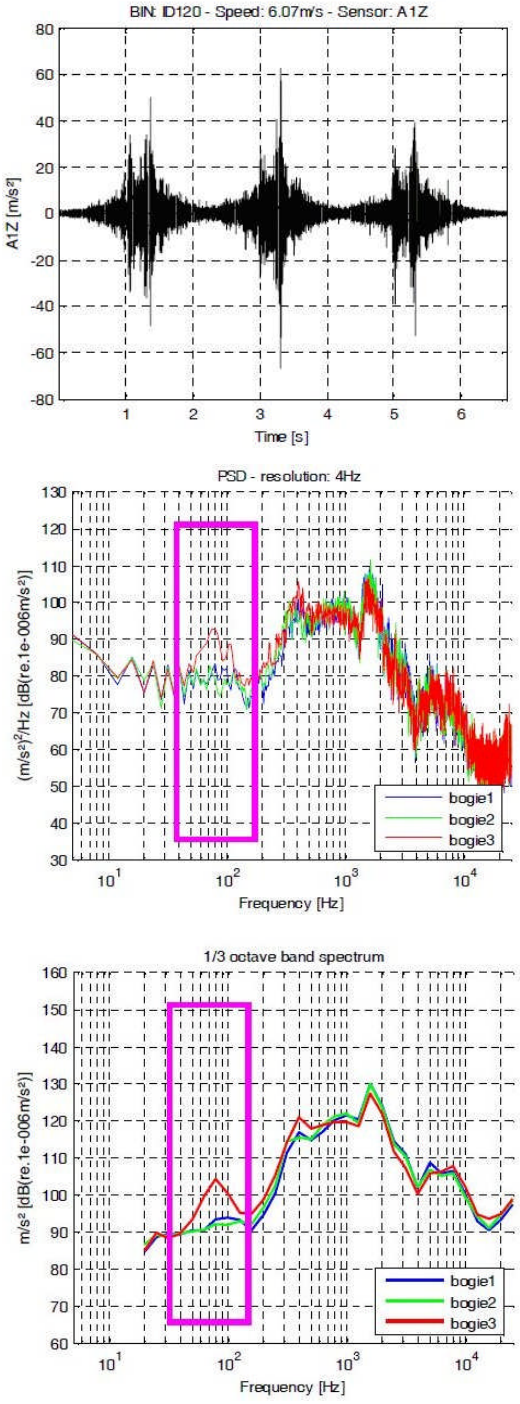
Sensor Installation

The sensors are glued to the rail and to the sleeper by means of a two-component epoxy that provides exceptionally high adhesion. The picture below illustrates the attachment of the sensors to the rail and the sleeper.

Vehicle detection

Wheel detection systems (Teifenbach or similar) will be installed at a given distance (in the direction of the track) before and after the vibration sensors to detect the presence of the vehicle and count the axles. Additionally, the two detectors enable the calculation of the vehicle speed for possible fine-tuning of the impact levels.

Data Processing



Time domain and frequency domain analysis is performed for each vehicle passage. The above example shows the time plot (top) of a vehicle passage, PSD plots and 1/3 octave band spectra plots for the three bogies of the vehicle. Both plots show a large wheel flat on bogie 3. The vibration levels for this bogie are clearly higher (more than 10 dB) than for the other bogie.

SOFTWARE

The standard software allows you to see the date and time of the measurement, read in the vehicle ID, the vehicle speed, identify a wheel flat or out-of roundness. The data can be viewed through a standard internet connection and browser (password-protected website). Email or text message alerts can be configured and sent automatically to the maintenance crew/responsible.

The information can be transmitted to a remote location for integration into a maintenance vehicle database or can be stored on the APT server.

The system itself can store up to 100 measurements (raw measurement data and processed results).