ARRoW and Wheel Monitoring System

Quieter rail traffic and lower maintenance costs
Modern, fully automatic acoustic monitoring of wheels and tracks
Rail traffic noise?
Loud vehicles? Loud tracks?

Rail traffic noise presents a great challenge especially in urban rail networks. Noise pollution influences the environmentally friendly image of trains and often leads to complaints by residents.

Generally, rail traffic noise is dominated by rolling noise which results from the contact between wheel and track and is caused by small damages and roughness of the track and wheel surface. In case of a deterioration of wheel and track treads, the noise increases considerably. But also aggregates such as fans or transformers have to be considered. Effective noise control begins at the noise source. Smooth wheels and tracks are essential for noise control. The key to quieter rail traffic is a good track in combination with good wheel treads. As an operator of rail-bound traffic systems you face major challenges. First, loud vehicles or poor track sections have to be detected before they can be maintained. For this purpose, a lot of staff is required.

The solution: fully automatic monitoring of wheel treads and track surface

For this purpose, the Müller-BBM Group has developed fully automatic measuring systems. The Wheel Monitoring System (WMS) is especially intended for the monitoring of wheels of rail-bound traffic systems. The airborne noise module also enables the monitoring of train aggregates. The track monitoring system ARRoW serves for automatic monitoring of the track quality.

Automatic vehicle monitoring:
Wheel Monitoring System

The WMS is modularly and clearly set up and can thus be expanded in any way. The system is highly qualified for the rough surroundings of the railway system and can smoothly be integrated into your company structure: WMS reliably identifies:
- tread errors of wheels such as runouts, polygonisation and wheel flats as well as
- loud aggregates.

The »acoustic fingerprint« of each vehicle is saved in a database. Thus, the wheel quality can be monitored and observed from any workstation. The database function makes an in-depth analysis as well as the display of the damage process possible. In this way, the vehicle maintenance can be adjusted to the actual demand and, if necessary, the vehicle can be included in the maintenance. Measurements with the automatic measuring system WMS show significant flats on a tram wheel (third picture on the left). The vehicle was examined, the wheels were measured with the high-precision measurement system m|wheel. (The second picture on the left shows the measurement results of the second axis’ left wheel.) The wheel flats can thus be verified.

1) Measuring point: Entering vehicles are identified by a vehicle detector. Sensors inside the track record the signals during vehicle crossing.
2) The measurement computer conducts the data analysis (autonomously).
3) Transmission of the analysis results via a network.
4) The SQL-based server database saves the determined parameters and enables the access to the analysis results from any PC-workstation.
5) Clearly arranged presentation of the vehicle condition, evaluation and analysis on any workstation-PC.
The advantages are obvious:
- Loud vehicles are recognised automatically and can then be maintained.
- The development of polygons becomes visible and can be repaired at an early stage.
- Thereby, you can match the rotational maintenance to meet your specific needs.
- Maintenance times and costs are minimised.

The WMS has been successfully used e.g. by the Berliner Verkehrsgesellschaft BVG for several years and contributes to the noise reduction in the city centre of Berlin.

... and track monitoring: ARRoW

ARRoW is the counterpart to the Wheel Monitoring System: it monitors the acoustic quality of the tracks reliably and automatically. ARRoW records the rolling noise of rail-bound vehicles via sensors at the bogie and then calculates the acoustic condition of the track. This information is stored together with the current position, so that maps can be generated automatically which show the acoustic quality of each metre of your rail network.

Through a regular measurement of your rail network with the assistance of ARRoW you will get a wide range of information, which will give you unique possibilities for the maintenance of your tracks:
- Instead of regular maintenances you can carry out selective maintenance based on the actual condition of your tracks.
- You can reduce costs as maintenance has to be carried out only when it is really needed.
- You receive direct input data for a noise mapping.
- You can detect noise hotspots in cities and take counter-measures before complaints arise.

A unique measuring system

The uniqueness of ARRoW is shown in its innovative measurement and analysis methods, which meet the current state-of-the-art in signal processing. The fact that the system uses four high-quality microphones instead of one increases both the system’s accuracy and reliability. Thereby, ARRoW can be used in a large speed range (40 km/h to 200 km/h). The system is flexible because it can be installed on any vehicle. Thus, a special measuring vehicle is not necessary. ARRoW operates independently from the vehicles’ energy supply or other signals.

Up to now numerous measurements could be carried out successfully. Thus, ARRoW has provided important information on the track condition of local traffic systems, conventional and high-speed networks in France, Belgium and the Netherlands.

Beside the measuring system, we deliver a software-based analysis system which automatically generates a map of the acoustic quality of the network.
Trust is good, measuring is better

The advantage of a continuous monitoring system is obvious: slowly-developing processes such as the development of wheel polygons or track corrugations become visible through continuous monitoring and can be repaired through maintenance in time without causing any interferences during operation. Severe damages such as wheel flats or track defects can be quickly identified and repaired.

This helps to minimise maintenance costs and time. Rail traffic noise will be reduced considerably. You will always have an overview of the condition of your vehicle fleet and tracks.

Wheel Monitoring System (WMS)

Automatic monitoring of the wheel quality and noise measuring point:
- Identification of loud vehicles
- Determination of the wheel condition during running operation
- NEW: Airborne noise components for the monitoring of engines, fans and other aggregates
- Optional: vehicle recognition system on the basis of RFID

ARRoW

ARRoW (Acoustic Rail-influence Recording on Wheels) enables you to
- map the acoustic quality of the network,
- locate noise hotspots,
- control maintenance activities.