



**BONATRANS**

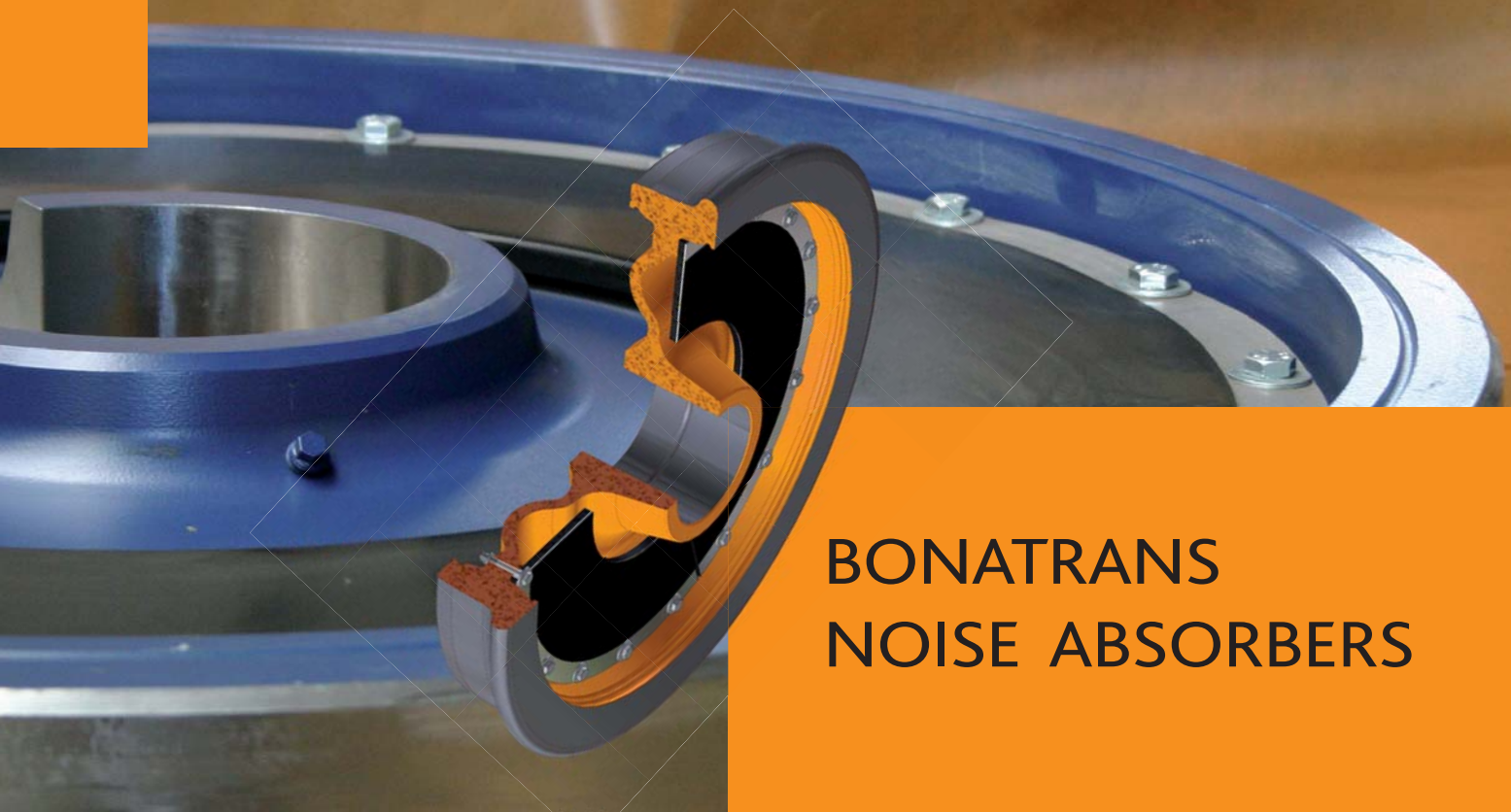
## Noise Absorbers BSW (Bonatrans Silent Wheel)

### The problem of noise in railway transport

Railway transport is well known and generally accepted as being more environmentally friendly than other modes of transport, especially in comparison with road transport. Nevertheless, railway transport has also environmental impacts that have to be solved.

These include especially the problem of noise occurring during operation of rail vehicles. The issue of noise is particularly significant if railway transport is run in densely populated areas or at very high speeds. That is why the problem of noise during operation of rail vehicles has to be addressed especially in Europe, where the most developed network of railways and urban public transport systems is located and close attention is being paid to problems of noise. However, the same problem relates to urban and suburban transport in all other major world cities.





# BONATRANS NOISE ABSORBERS

It is namely wheel-rail contact that is counted among the most serious sources of noise emitted by railway vehicle in operation. The noise can have a form of a rolling noise caused by rolling of the wheel on the rail on straight tracks or in large-radius curves, or particularly unpleasant screeching noise caused by skidding of the wheel on the rail in small-radius curves. In addition to these permanent major sources of noise there is also noise caused by tread braking if cast-iron blocks are used.

## Bonatrans noise absorbers

BONATRANS GROUP a.s., the leading European manufacturer of railway wheelsets and their components, pays close attention to the issue of noise, and Bonatrans research and development department has developed a number of solutions reducing noise caused by railway wheel operation.

In addition to application of rubber-sprung resilient wheels, Bonatrans achieves reduction of vibrations (and thus also noise) of wheels in operation by application of specially developed noise absorbers mounted on wheels.

Application of a special steel ring embedded in the groove of the wheel is the more simple noise reducing solution. Such solution is cheap, however, its noise-absorbing effect is moderate and it is suitable only in cases when slight noise absorbing is sufficient for meeting noise limits.

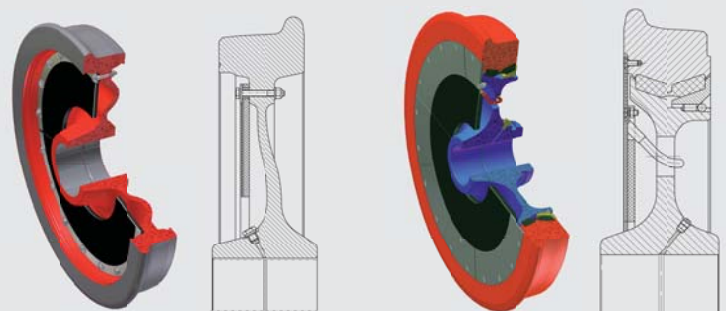
A substantial noise-absorbing effect is achieved through application of special Bonatrans composite noise-absorbers mounted in the transition area between the web and the rim of the wheel. These absorbers consist of several layers of various materials (steel, polymers) that are designed and "tuned" for the greatest possible reduction of vibrations in a particular wheel. The absorbers can be fixed to the wheel by bolts. The absorbers are divided into more

segments, so if needed they can be dismantled easily without necessity of removing wheelset bearings. The absorbers do not need to be replaced by new ones in case of replacement of worn railway wheels (unless they have been mechanically damaged during operation), which reduces the life cycle costs.

Repeated measurements carried out on wheels with noise absorbers even after several years in operation (for example in MBTA Boston, MA, USA) proved lasting high absorption of noise by Bonatrans noise absorbers.

The noise absorbers made by Bonatrans are able to achieve absorption of the rolling noise (on a straight track) by up to 5 dB(A), while the most unpleasant screeching noise (during tread braking or in curves) of wheels equipped with Bonatrans noise absorbers is up to 30 dB(A) lower than that of wheels without absorbers, especially in the significant frequency bands.

Noise absorption effect of Bonatrans noise absorbers may be intensified by their combination with Bonatrans rubber-sprung resilient wheels.



*Scheme of the Bonatrans noise absorber mounted on a wheel*

*Scheme of the noise absorber mounted on a rubber-sprung resilient wheel*



# DEVELOPMENT OF BONATRANS NOISE ABSORBERS

## Development of Bonatrans noise absorbers

- In the development of noise absorbers, Bonatrans cooperates with many research centres and universities
- Design development: AutoCAD, Inventor, ProEngineering
- Vibration characteristics are verified through finite element method (FEM) calculation: ANSYS, COSMOS
- Laboratory tests of noise and vibrations (simulation of operating conditions)
- In-service measurements.

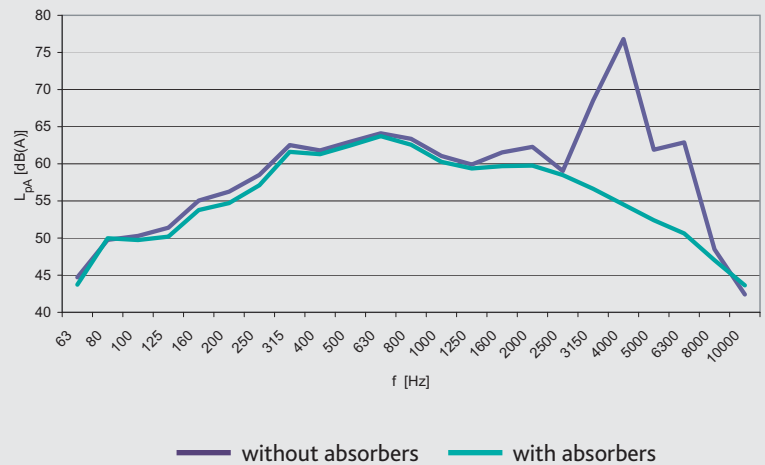
## Major advantages of Bonatrans noise absorbers

- High absorption effect – up to 5dB(A) rolling noise, up to 30 dB(A) screeching noise,
- Applicable in all types of rail vehicles
- Service life is not limited by the service life of the wheels
- Low weight (approx. 10 kg)
- Easy maintenance
- Specific design tailored to the customer's needs.

## References

Bonatrans noise absorbers are in operation in the Czech Republic, Slovakia, Spain, USA, Switzerland and Norway, especially in passenger and metro trains. The absorbers are used in combination with monoblock wheels as well as in combination with rubber-sprung resilient wheels.

## One-third-octave chart of characteristic levels



Results of noise measurement in MBTA Boston, USA; microphone in the passenger compartment (screeching noise).

Noise measurement on trains in operation





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