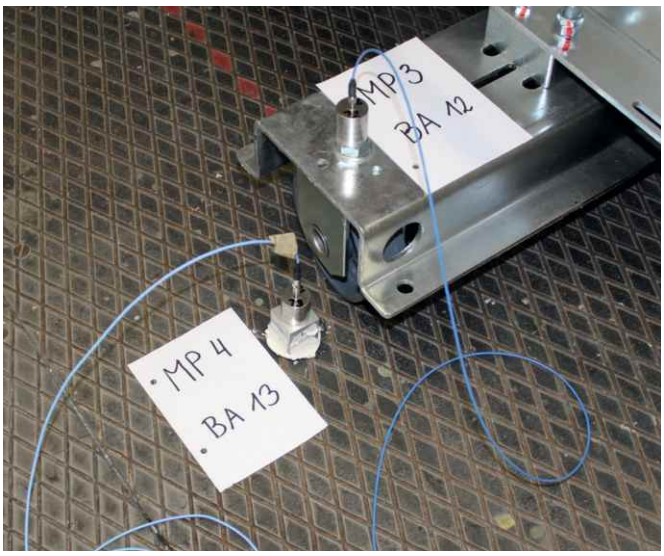
Measurement report: Elastic transformer bearings

Isotop® TR reduces floor vibrations in a wide frequency range

1000 KVA transformer in the testing laboratory



Arrangement of the acceleration sensors

Description of the project

The extent to which the elastic bearing of transformers can contribute to a reduction in vibrations transmitted into the floor was investigated using structure-borne noise measurements on a 1000 KVA transformer. The measurements were taken in the testing laboratory of Netzdienste Rhein-Main GmbH in Frankfurt. The transformer was placed on steel plates that were firmly embedded in the floor of a room with a basement underneath. The floor itself was constructed of reinforced concrete.

Commercially available rubber bearing

Isotop® TR

Measurement setup

On two opposite transformer feet, an acceleration sensor was attached to the transformer bracket (above the elastic bearing) and another to the floor, next to the transformer foot.

After the measurement was taken at rest, the vibrations that occurred were recorded while the transformer was in idle mode.

To assess the effect of the elastic bearings, the following installation situations of the transformer were measured:

- Without elastic bearing
- On commercially available rubber bearings
- On Isotop® TR from Getzner Werkstoffe

Key transformer data

- AC voltage: 50 Hz
- Mass: 2450 kg
- Power: 1000 kVA
- Operating voltage: 6 kV, 3 phase

Measurement results

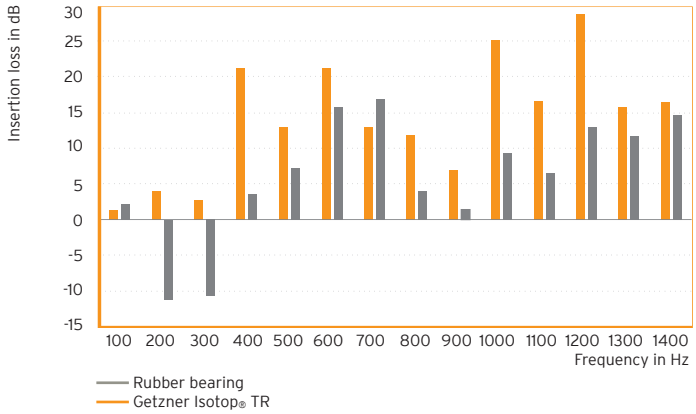
The spectrum of acceleration only shows significant vibration amplitudes (harmonic spectrum) at multiples of the basic frequency of 100 Hz.

The measurements clearly showed that at frequencies of 200 Hz and 300 Hz, the commercially available rubber bearing examined caused a significant increase in floor vibrations. On the other hand, with the elastic Isotop® TR bearing, floor vibrations were reduced throughout the entire frequency range under consideration (graph 1).

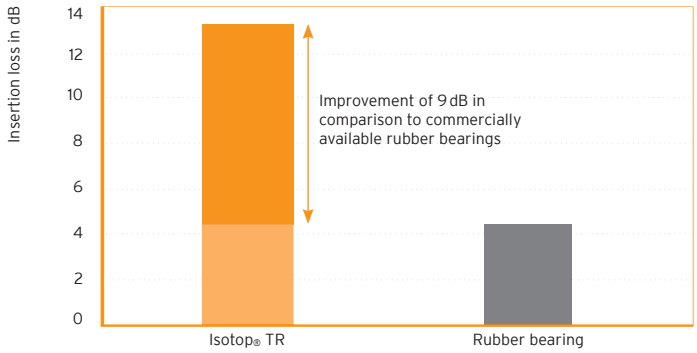
In the individual harmonics, an insertion loss of up to 29 dB (1200 Hz) could be achieved. The effect of Isotop® TR surpassed the rubber bearing by up to 17 dB (400 Hz).

Compared with the effective value of the acceleration of the elastic bearings examined, Isotop® TR shows an improvement of 13 dB in comparison to a rigid bearing and of around 9 dB in comparison with the rubber bearing (graph 2).

Graph 1: Insertion loss in the frequency range under consideration



Graph 2: Insertion loss in comparison to a rigid bearing



Benefits

- Measurable reduction in vibrations in the audible frequency range and consequently a reduction in secondary airborne noise
- Significant reduction in floor vibrations
- Easy and convenient installation
- Durable and maintenance-free