

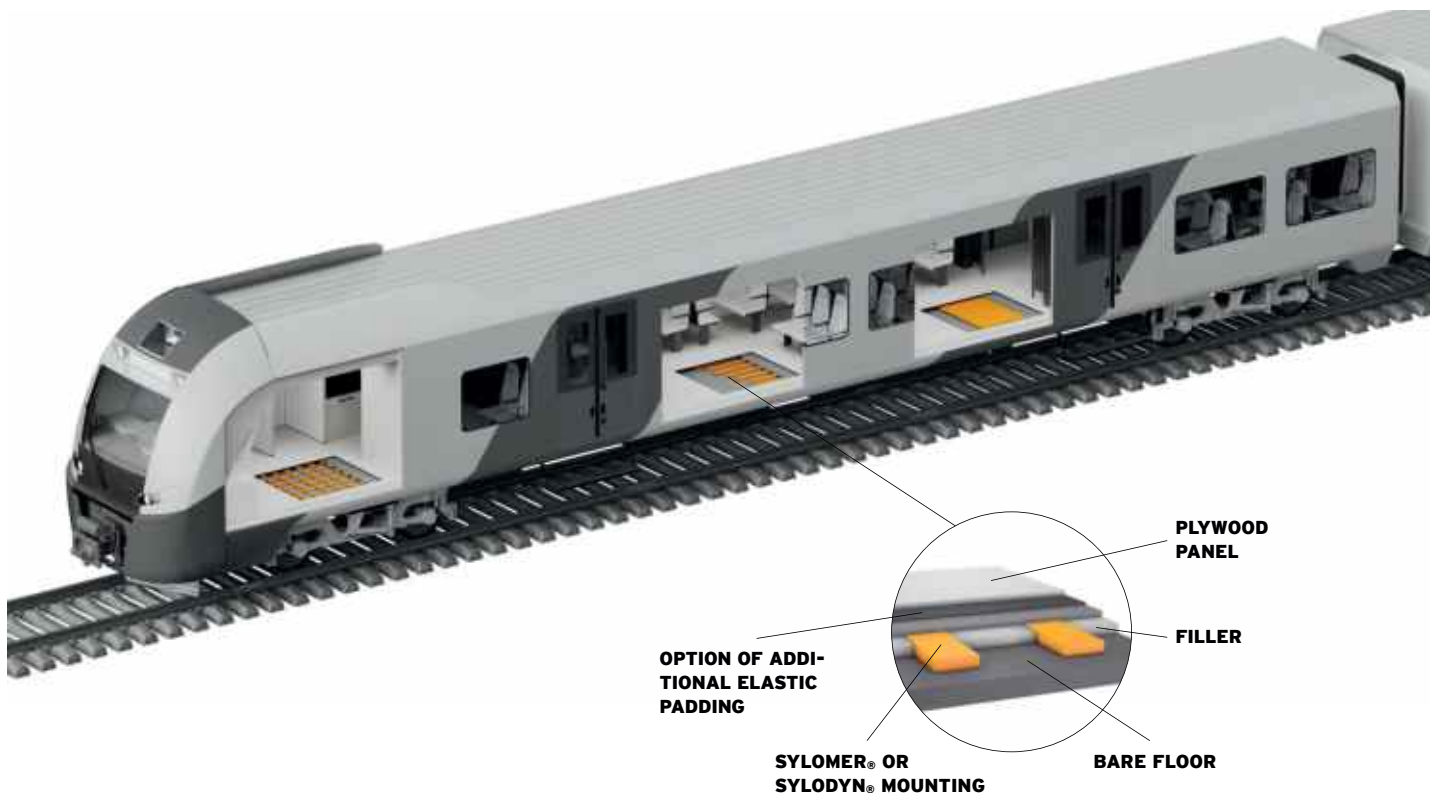
SYLOMER® AND SYLODYN® OPTIMISING ACOUSTICS IN FLOATING FLOORS FOR ROLLING STOCK

EXPERT ARTICLE

Sylomer® and Sylodyn® from Getzner for floating floors in rolling stock help to reduce vibrations. This, in turn, reduces secondary airborne noise, thereby ensuring a low noise level in the vehicle and greater passenger comfort. Sylomer® and Sylodyn® have been used as materials for floating floors in rolling stock since the start of the 1990s. They exhibit greater efficiency compared to other materials that are used for floating floors in rolling stock. The sound level inside the carriage in particular is significantly reduced. This also depends on the design of the carriage, the floor panel, the floor covering and the overall design, as well as the floating floors for rolling stock.

1. Installation

Sylomer® and Sylodyn® are usually installed under the floor panel of rolling stock as point or strip bearings. Full-surface bearing with material thicknesses of 3 mm and above is also possible. This reduces the impact noise to the greatest extent.



2. Tests by independent laboratories

The efficiency of the floating floor with Sylomer® and Sylodyn® strips has been confirmed by two external laboratories in Finland and Spain. Due to the lack of binding regulations for testing elastic floor components under varied load conditions, different standards (such as DIN EN ISO 3381:2011, TSI NOISE (EU), 1304/2014 and DIN 45635) were consulted.

During testing, different floor constructions were excited with an electrodynamic shaker and the vibration acceleration values were measured on the top and bottom of the construction.

3. Test results

In the test carried out in Spain, a phenolic resin floor panel, rubber-metal elements and Getzner Sylomer® as point and strip bearings

were compared with one another. The table shows the natural frequency of the bearing under different load conditions. The following applies: The lower the Hz value, the more elastic and efficient the bearing.

Sylomer® is considerably more efficient than the phenolic resin floor panel or the rubber-metal elements in all load situations. With a test load of 250 kg/m², the difference is up to 9.09 Hz (between the phenolic resin floor panel and Sylomer® FR 328). The natural frequency falls from 18.31 Hz to 9.22 Hz with Sylomer® FR 328. A look at the quality factor also reveals the outstanding damping properties of Sylomer® FR 328: The quality factor is a measure of the damping or energy loss in an oscillating system. The lower the quality factor, the better the damping of the system. The half-width is defined by the values f1 and f2. The further apart these frequencies are in relation to their natural frequency, the better the damping.

	Load	Tuning frequency	Q Factor	f1	f2
Phenolic Resin Panel					
	-	149.41 Hz	11.161	141.76 Hz	155.15 Hz
	250 kg/m ²	18.31 Hz	6.036	16.45 Hz	19.48 Hz
Rubber Pads					
	-	34.08 Hz	10.791	32.89 Hz	36.05 Hz
	250 kg/m ²	12.31 Hz	7.554	11.81 Hz	13.44 Hz
Sylomer® FR 3110					
	-	19.49 Hz	7.556	18.00 Hz	20.58 Hz
	250 kg/m ²	9.31 Hz	4.185	8.19 Hz	10.42 Hz
	50 kg/m ²	12.53 Hz	3.566	11.13 Hz	14.65 Hz
Sylomer® FR 328					
	-	16.57 Hz	5.495	15.07 Hz	18.09 Hz
	250 kg/m ²	9.22 Hz	3.849	7.89 Hz	10.38 Hz
	50 kg/m ²	14.74 Hz	1.232	9.88 Hz	21.85 Hz

The table shows the resonance frequency of the bearings under the load conditions "no load", empty waggon "50 kg/m²" and work load "250 kg/m²". The lower the HZ value, the more elastic and the more efficient is the bearing. Thus, Sylomer is significantly more efficient than either the phenolic wad or the silent block, in any load situation.

The diagram in Figure 1 shows the differences in performance for different load situations, which were determined during the tests in Finland. At a low working load (empty carriage), Sylomer® exhibits a lower performance than with service loading. At a high working load, the elastic isolation delivers good results, including over a wide frequency range.

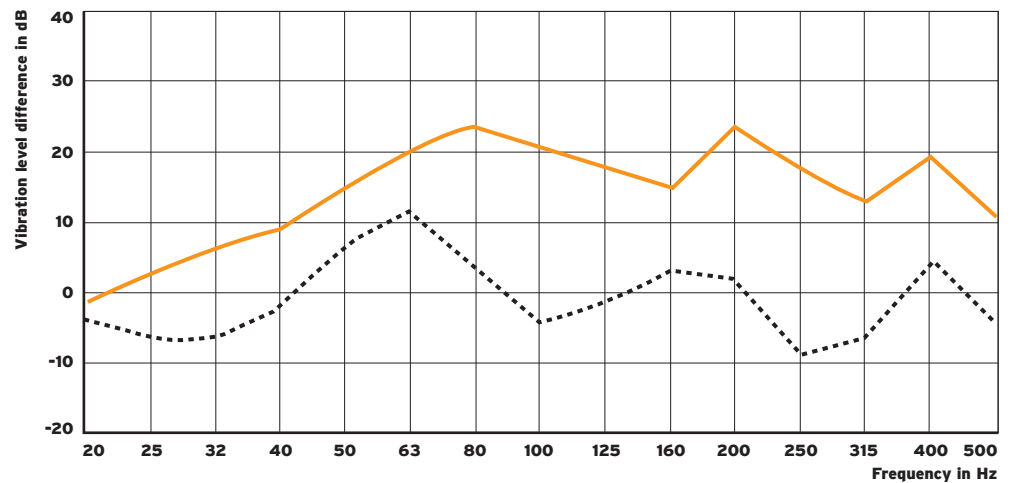


Figure 1: At full load, good damping performance is achieved over a wide frequency range

— Birch Plywood 18 mm 230 kg/m² load Sylomer® FR 328
 - - - Birch Plywood 18 mm 38 kg/m² load Sylomer® FR 328

Polyurethane exhibits non-linear behaviour: The static load has a strong influence on the dynamic behaviour. Unlike other products, polyurethane becomes softer, not stiffer (see Figure 2), in the calculated dynamic range (service loading). This enables high-grade, efficient vibration mitigation and therefore a lower sound level.

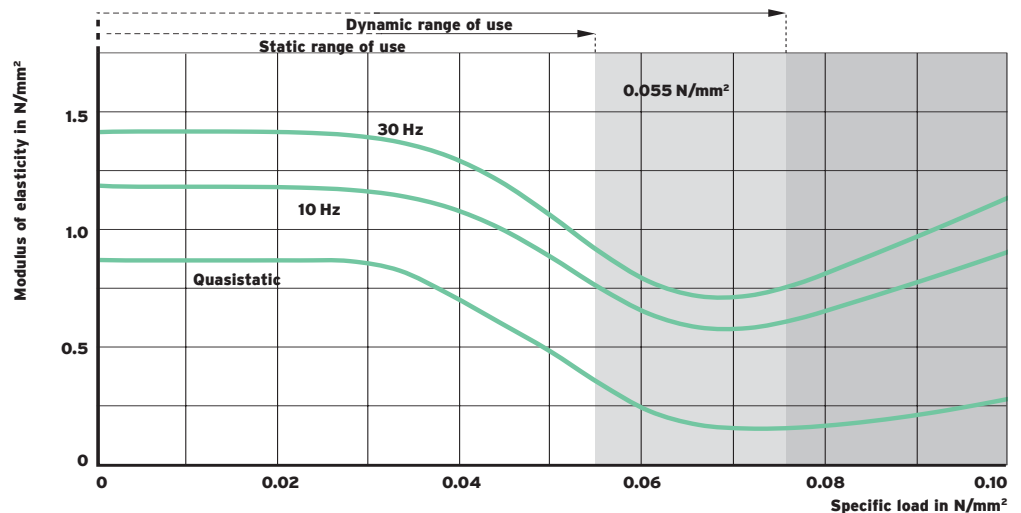


Figure 2: Modulus of elasticity Sylomer® FR 355 - Polyurethane becomes softer under dynamic load and therefore dampens vibrations better

SOUND LEVEL REDUCTION:

- 2 dB (A) to 7 dB (A) when replacing a rubber solution
- Up to 12 dB (A) when replacing a rigid connection

3. Summary

The importance of vibration isolation for floors to reduce the noise level and increase comfort in rolling stock is frequently underestimated. Taking elastic polyurethane floor bearings in the form of Sylomer® and Syldyn® into account during the design phase helps to lower the floor level and reduce the sound level and life cycle costs for the entire service life of the rolling stock. Furthermore, our light PU foams can be quickly installed as part of the floor system, helping to reduce process costs.



Getzner Werkstoffe, Bürs

ENGINEERING A QUIET FUTURE

We are proud to be the leading global specialist in vibration isolation and vibration protection in the railway, construction and industry sectors.

Our innovative products are based on our own in-house developed materials such as Sylomer®, Sylodyn® and Sylodamp®, and are complemented by spring elements such as Isotop®.

Our applications effectively reduce noise and vibrations. They reduce wear, extend the service life of bedded components and improve application suitability, quality and comfort.

We specialise in integrated solutions and targeted services for sustainable vibration isolation. Our work is based on intensive research, climate-friendly production and decades of experience.

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