

PROJECT

## NEOBALLAST

### New high-performant and long-lasting ballast for sustainable railway infrastructures

**Funding:** National (Spain)

**Duration:** Apr 2012 - Apr 2013

**Status:** Complete with results



#### Background & policy context:

NEOBALLAST emerged as a high-performing, long-lasting and eco-friendly ballast aggregate solution designed to overcome two of the most important drawbacks of railway tracks: track degradation and noise and vibrations (N&V). Whilst the former is the main trigger of maintenance and eventually renewal works, thus representing one of the main cost drivers for IMs, the latter has become an issue of paramount importance not only to IMs but the whole EU, since according to the European Environment Agency rail noise affects around 12 million people during day time (55dBA) and 9 million at night (50dBA).

#### Objectives:

The overall aim of the NEOBALLAST project was to develop an enhanced and cost-efficient ballast technology able to drastically increase the service life of railway tracks as well as to minimize annoyance caused by noise and vibration.

Ballast durability, and so that of the overall track superstructure, is strongly related to the generation of fines caused by the friction between ballast aggregates, which wears their contact surfaces. In some countries, the number of fines in the ballast layer is main decision parameter for undertaking renewal works (e.g. Infrabel –Belgian IM- carries out ballast renewal when fines exceeds 30%) (Godart, P., 2013). NEOBALLAST aggregates sought to improve wear resistance of aggregates by means of an advanced coating that includes rubber particles, which at the same time is able to increase the elasticity of the ballast layer. According to recent studies conducted by Deutsche Bahn (Fonseca, P., 2005), reducing vertical stiffness of ballast aggregates results in reduced velocity of vibration, proving the potential of vibration mitigation of NEOBALLAST aggregates.

The project was structured in three stages, according to the level of technology validation. The first two stages are related to the laboratory characterization of NEOBALLAST aggregates, whilst the third one is related to a field test demonstration.

#### Methodology:

**The first stage** consisted on undertaking the following laboratory test in order to characterize the enhanced performance of NEOBALLAST:

- Abrasion and impact resistance tests
- Test of density and water absorption
- Resistance to degradation by abrasion in the Micro-Deval apparatus
- Magnesium sulphate soundness test
- Vibration mitigation test

**The second stage of validation** refers to the assessment of the NEOBALLAST aggregates, not as individual aggregates, but as a whole. This stage involves the testing of NEOBALLAST in large-scale tests, namely:

- Large scale direct shear tests
- Cyclic loading tests

Neoballast has been tested in a real track section of the Musel Port rail network (Gijón, Spain) in 2015. Around 1,000kg of Neoballast aggregates were employed in the tests, which aimed at assessing its performance under simulated working conditions. Vibration propagation were significantly reduced (around 6-10 dBv) as well as its abrasion resistance, which again shown an excellent performance (no

degradation after 15 tamping cycles).

**The third stage of validation** included comprehensive laboratory campaign carried out evinced the enhanced performance of NEOBALLAST aggregates, which have shown abrasion resistance ten times higher than granite ballast aggregates used for high speed lines. Improved performance against weathering and higher capacity for vibration mitigation are other benefits demonstrated in the first stage of the project.

**Other programmes:** INNPACTO 2012

**Other funding sources:** NEOBALLAST is a research project funded by MINECO (Spanish Ministry of Economy and Competitiveness) carried out by COMSA, MAPEI, UPC and ADIF.

## Partners:

The partners are:

- COMSA Corporacion (Lead Partner),
- DYNAMICS, STRUCTURES AND SYSTEMS INTERNATIONAL NV,
- MAPEI,
- TALLERES FELIPE VERDES SA,
- SORIGUE S.A.

**Organisation:** COMSA

Edificio Numancia 1 c/ Viriat

**Address:** 47

**Zipcode:** 08014

**City:** Barcelona

**Contact country:** Spain

**Organisation Website:** [COMSA](#)

## Key Results:

The test measured the stiffness offered by NEOBALLAST and natural aggregates before and after the application of one million cycles. The results of the test show that the overall stiffness of the ballast layer made of NEOBALLAST can be reduced by 90% with respect to conventional ballast.

Further validation is undergoing, but the promising results obtained so far are encouraging and show a huge potential for the European railways, taking into account the urgent need of increasing cost-effectiveness of rail assets.

Documents:

 [NEOBALLAST: new high-performance and long-lasting ballast for sustainable railway infrastructures](#)

**STRIA Roadmaps:** Infrastructure

**Transport mode:** Rail transport

**Transport sectors:** Passenger transport, Freight transport

**Transport policies:** Environmental/Emissions aspects