



# Ecofriendly elastomers development for railway application

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Civil Engineering

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# Content

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1. Project description
2. Work description and main results

# 1. Project description

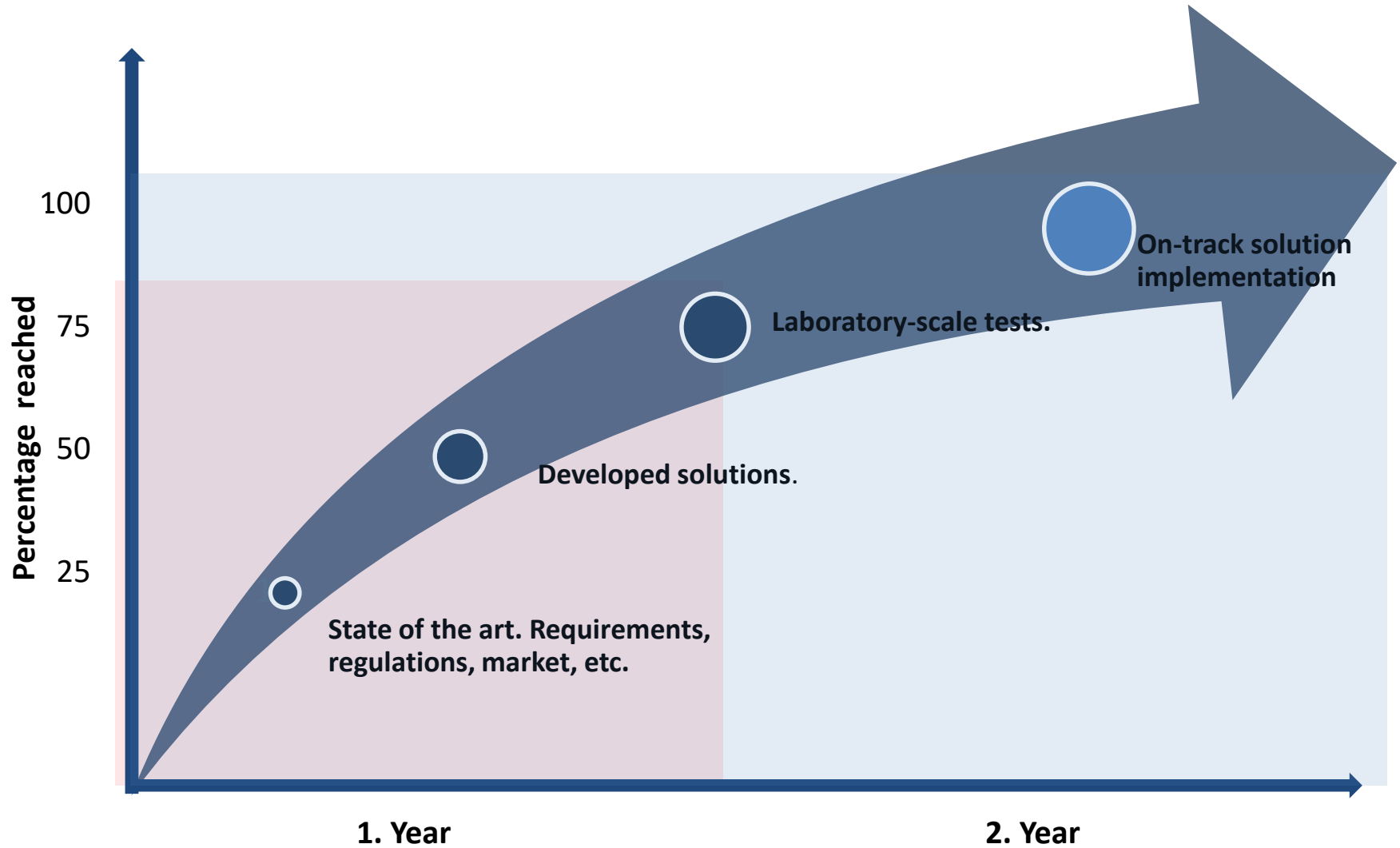
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# Overall objective

Development of  
ecofriendly elastomers  
for railway application



# Activities



## 2. Work description and main results

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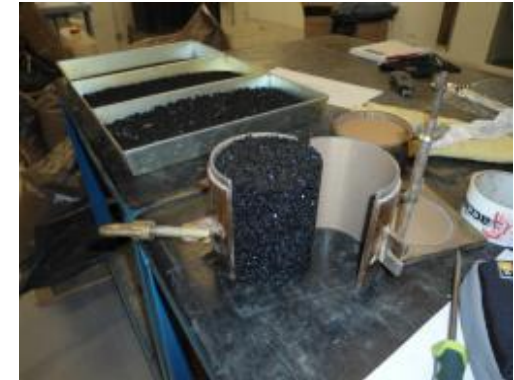
## 1. Design and characterization of the elastomeric material

- ✓ Obtaining the grain size
- ✓ Characterization of granulated tyres
- ✓ Blended of granulated tyres and resin
- ✓ Manufacturing of granulated tyres and resin specimens

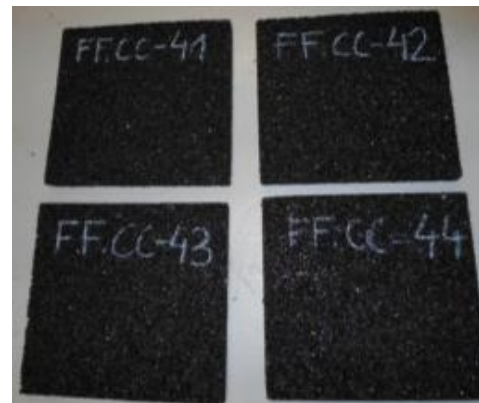


## 2. Design of the elastomeric mat and isolated block

- ✓ Simulation of railway load
- ✓ Determination of total deformation
- ✓ Determination of stress within the elastomeric material



## 3. Manufacturing of elastomeric mat and isolated block



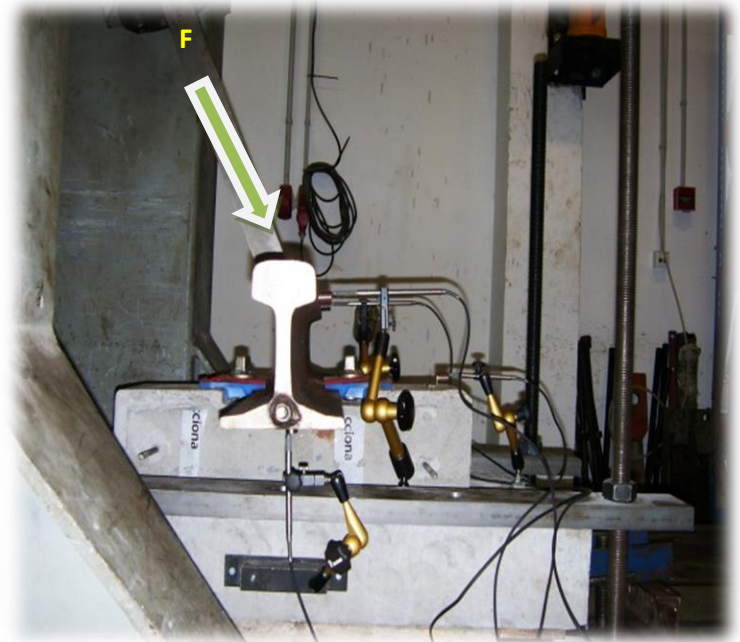
## Elastomeric mat

- ✓ Static stiffness modulus
- ✓ Dynamic stiffness modulus
- ✓ Dynamic coefficient (10 Hz)
- ✓ Energy loss factor calculation
- ✓ Static horizontal stiffness modulus
- ✓ Fatigue
- ✓ Frosting resistance
- ✓ Resistance to thermal ageing



## Elastomer-isolated block

- ✓ ELASTOMER-ISOLATED BLOCK
- ✓ Low frequency dynamic stiffness
- ✓ Static vertical stiffness
- ✓ Longitudinal rail slip resistance
- ✓ Resistance to cyclic loads
- ✓ Electric resistance.





# Worksite alternatives



## 1. Elastomeric mat

- ✓ Apeadero de Tolosa (Guipúzcoa)
- ✓ Sabadell Tunnel (Barcelona)
- ✓ Sans Tunnel (Barcelona)
- ✓ Príncipe Pio Station (Madrid)
- ✓ Álora Tunnel (Málaga)
- ✓ Colina Tunnel (Málaga)
- ✓ Torremolinos Tunnel (Málaga)
- ✓ Aranda de Duero (Burgos)

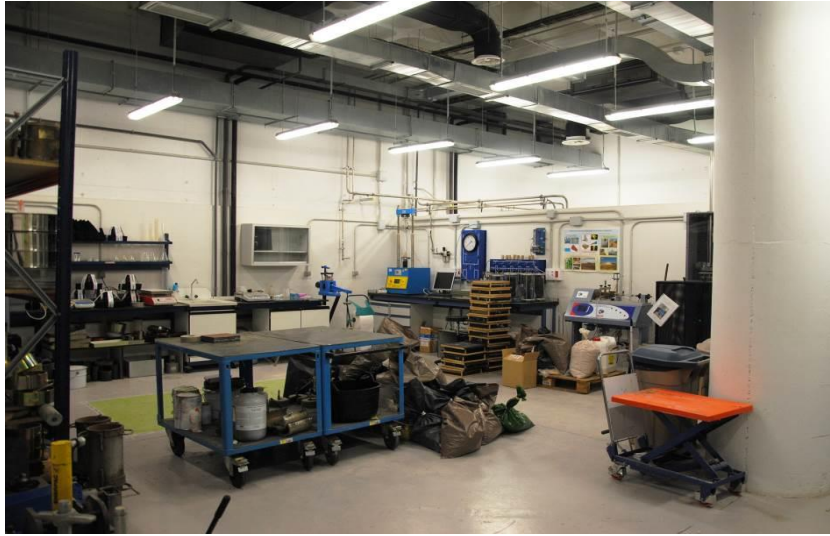


## 2. Isolated block

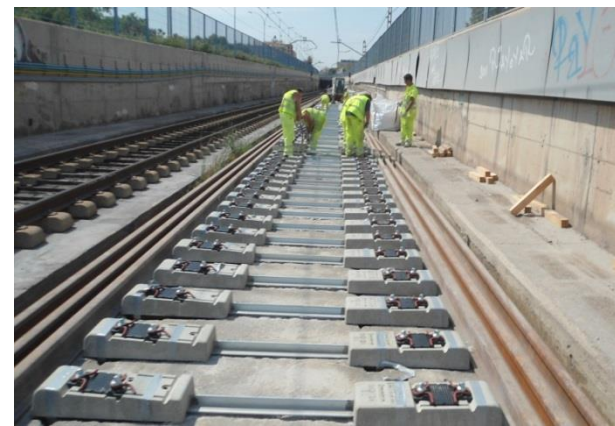
- ✓ Príncipe Pio station (Madrid)
- ✓ Tunnel in the Francia station (Barcelona)
- ✓ Cabanyal Tunnel (Valencia)



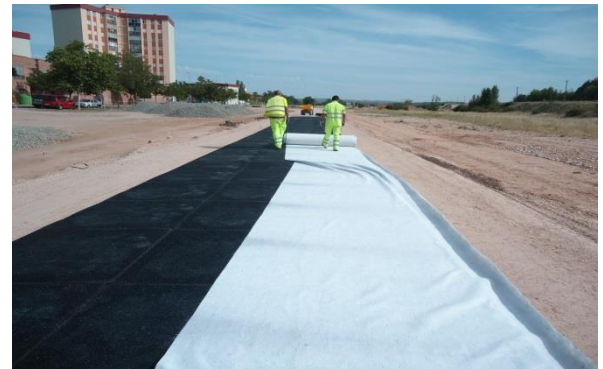
# Manufacturing of elastomeric solitions



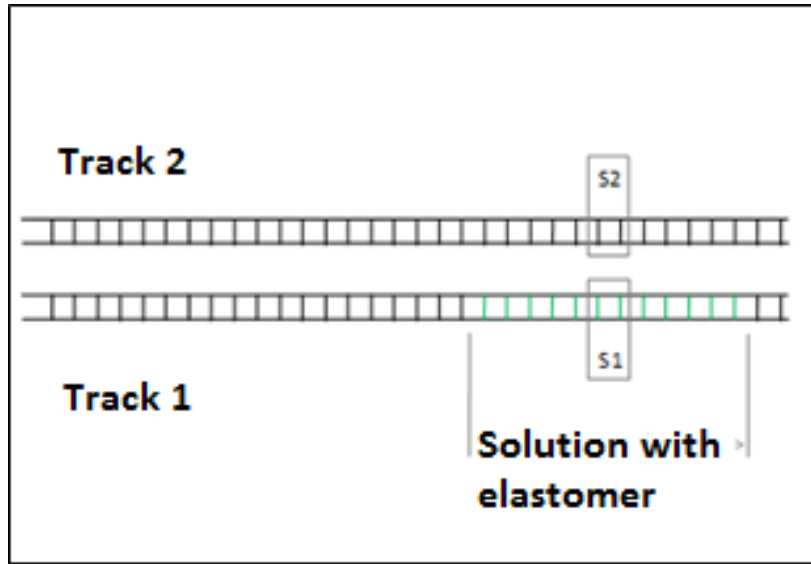
# On-track solution implementation (Isolated block)



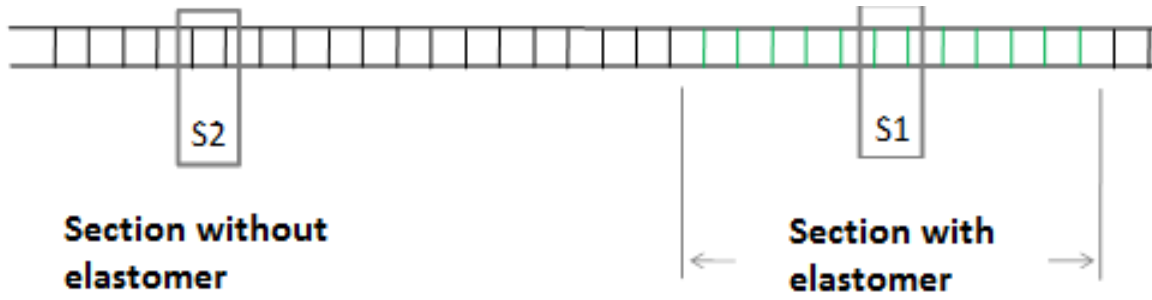
# On-track solution implementation (Elastomeric mat)



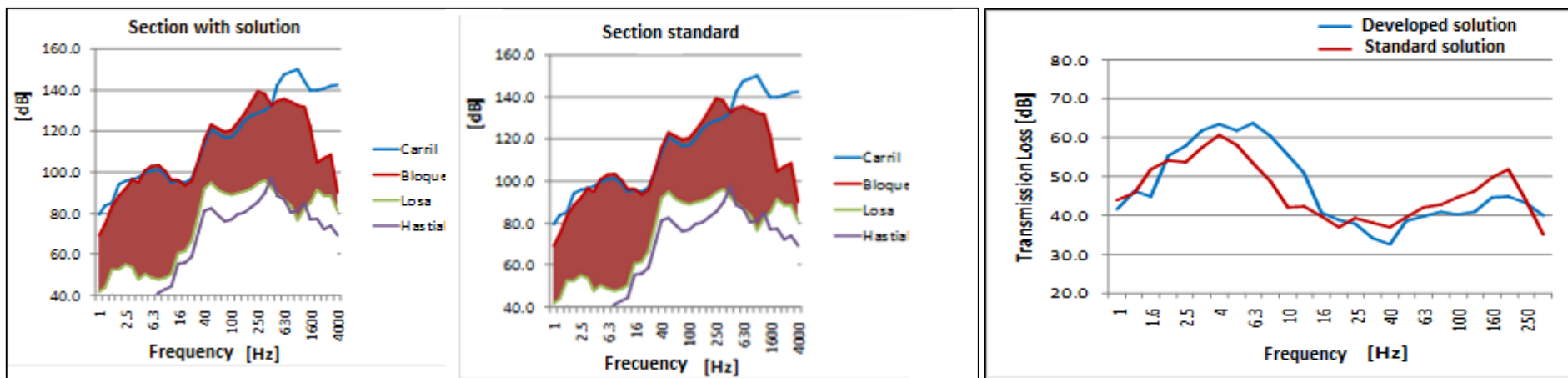
# On-track solutions implementation (Isolated block)



# On-track instrumentation (Elastomeric mat)



# Results



Vibration spectra in the four control points

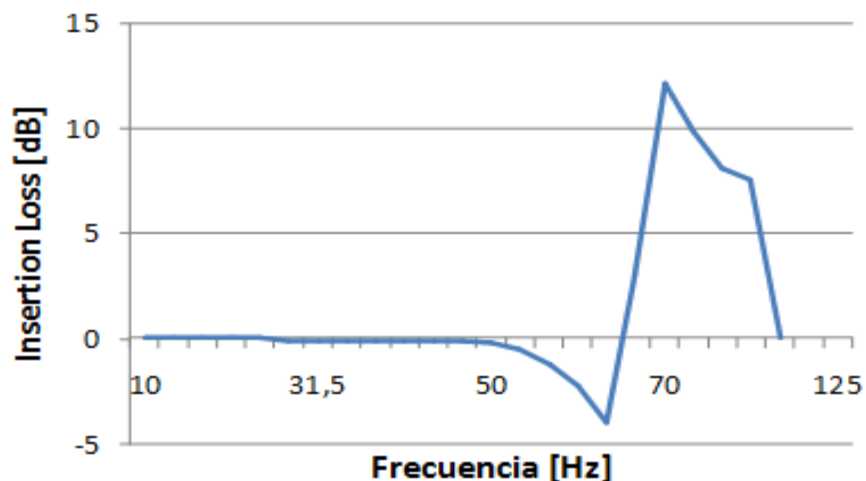
Transmission Loss rail-sidewall,  
developed solution and standard

For global **vibration** values,  
**attenuation** between block and  
slab is placed around **40dB**

For global **Transmission Loss** values,  
**the solution developed**  
surpasses the standard solution by **5dB**

# Results

Insertion Loss UBM



The Elastomeric Mat achieves **vibration attenuation** in the **65-80Hz** frequency range with a **maximum attenuation level of 12dB** at 70Hz.

## Other benefits

**17%** of **savings** in **CO<sub>2</sub>** emissions

compared to the **use** of tyres as **fuel** for cement furnaces

0,5

Tyre / m of track (block)

2,5

Tyres / Elastomeric mat m<sup>2</sup>



# Capacities & personal skills

Capacities & personal skills	
1. Science & Technique (literature review)	■ ■ ■ ■ ■ ■
2. Technology (tools and instruments)	■ ■ ■ ■ ■ ■
3. Training activities(courses-seminars)	■ ■ ■ ■ ■ ■
4. Results (scientific publications)	■ ■ ■ ■ ■ ■
5. Scientific critique (SWOT analysis)	■ ■ ■ ■ ■ ■
6. Work Plan	■ ■ ■ ■ ■ ■
7. Mobility	■ ■ ■ ■ ■ ■
8. Funding	■ ■ ■ ■ ■ ■
9. Ethics	■ ■ ■ ■ ■ ■

# EIDEIC

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