

Designing the railway of the future:

Fire resistant composite materials and smart modular design

The rail passenger transport has experienced a steady growth ever since 2004, accounting for 7.6% of all inland passenger transport in the EU in 2014¹ and continued to increase during 2015.² Furthermore, UNIFE's World Rail Market Study shows that of a total average annual market volume of 159.3 billion Euros, the rolling stock segment (i.e. rail vehicles) accounts for 34 % of the total rail market in the 2013-2015 period, growing faster than any other segment in the market.³ The total market is expected to grow to an annual market volume of 185 billion euros in the 2019-2021 period with the highest growth rate of 3.1% in Western Europe. In addition to growing passenger demands, the railway sector is facing major challenges such as rising traffic demands, congestion, security of energy supply and climate change for the next few decades.

To this end, the Shift2Rail Joint Undertaking (S2R JU), one of the Public-Private Partnerships within Horizon 2020, was set up to coordinate and drive innovation in the railway sector, improving trains and railway infrastructure in terms of costs, capacity, reliability and punctuality. Shift2Rail comprises five Innovative Programmes, the first of which applies for Mat4Rail aims at improving performance and reliability, increasing capacity and energy efficiency, and reducing life cycle costs.

As one of 31 currently running projects under S2R JU, the Mat4Rail project has been granted 3.5 million euros to address these challenges and to initiate a step change in technologies and design for the next generation of rail vehicles to secure Europe's railway industries' global competitiveness. Key to success are innovative materials and modular design for rolling stock to which Mat4Rail will devote its efforts over the next 24 months. Within two work streams, this 2-year project takes a first step towards reducing train weight by replacing metal parts with Fibre Reinforced Polymers (FRPs) with approved fire- and mechanical performance and presents new innovations for increasing capacity and passenger comfort via built-in modularity of train interior design.

Mat4Rail will benefit several stakeholder groups such as the rail supply industry, rail operators, passengers, and the European economy. The project will enable introduction of new composites with improved performance to the market, making them available for the rail supply industry; it will reduce the weight of carbodyshell sections by up to 30% by developing lightweight FRPs, and optimise access door systems in terms of architecture and materials. Furthermore, new functions will be integrated in the carbodyshell, space for interior will be increased, and new joint concepts for composites developed. Moreover, innovations for seats and the driver's stand will improve capacity, performance and comfort, and over the long run, Mat4Rail will evidently create commercial opportunities for the rail supply industry.

¹ Eurostat: Statistics Explained. [Passenger transport statistics](#). April 2017

² Eurostat: Statistics Explained. [Railway passenger transport statistics – quarterly and annual data](#). December 2016

³ UNIFE/Roland Berger. [World Rail Market Study: Forecast 2016 to 2021](#). 2016

The consortium of the Mat4Rail project comprises leading scientists from five research institutions, and market leaders from ten relevant industries and highly innovative SMEs. It assembles experts in engineering and materials research, as well as industrial and product design from seven European countries and enables an efficient industry-academia collaboration to make a significant contribution to the railway of the future.



The Mat4Rail Consortium

Mat4Rail Facts and Figures

Mat4Rail is a research project that has received funding from the Shift2Rail Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No. 777595.

- Involves 16 organisations from 7 European countries
- Started on 1st October 2017 and will end on 30th September 2019
- Budget: 3.5 million euro
- Website: www.mat4rail.eu
- Email: ejubete@cidetec.es
- Goal: The overall aim of the Mat4Rail project is to lay the foundation for; (1) Reducing train weight by replacing metal parts with Fibre Reinforced Polymers (FRPs) and (2) increasing capacity and passenger comfort via built-in modularity of train interior design.
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