

Sustainable technologies for rail transport

It will save and recycle energy: the eco-train is on its way

How science of measurements and railway systems are complying with the EU directives

Saving energy, reducing carbon dioxide emissions, providing more reliable measurements of energy consumption, making different countries' railway systems compatible, fostering market liberalisation. Having set these targets, the partners of the **European Project MyRails**, coordinated by the **Istituto Nazionale di Ricerca Metrologica (INRiM)**, are about to get to Torino for their first **meeting on September 12-13, 2017**.

With a budget in the order of **EUR 2.5 million**, MyRails, standing for "**Metrology for Smart Energy Management in Electric Railway Systems**", is a project financed by **Horizon 2020**, the European Community's programme for research and innovation, and by **EURAMET**, the European Association of the Metrology Institutes. Delegates from **sixteen partners** will meet at the Hotel Concord, located in the city centre, to start their three-year collaboration tomorrow in the early morning. **From 10:40 am**, the **meeting will be open to the public**.

Not only the Metrology Institutes of Czech Republic (**CMI**), France (**LNE**), Switzerland (**METAS**), UK (**NPL**), Netherlands (**VSL**), and Spain (**LCOE-FFI**) are cooperating with INRiM. The Italian **Università degli Studi della Campania**, the British **University of Strathclyde**, the **Universidad Pontificia Comillas** from Madrid, and the French research centre **Railenium** are also participating in this project.

Furthermore, key contributions come from industrial partners from the rail sector, such as the Italian State Railways (FS) - through the **Italian Rail Network (RFI)** and **Trenitalia - Hitachi Rail Italy** from Naples, the operator of the Madrid Metro (**MM**), and the Swiss company **Analysis, Simulation, Test and Measurement SAGL (ASTM)**.

The train able to reduce energy consumption stops at the reversible substations

It may not be common knowledge that trains produce electricity during braking. However, this is what happens. So far, only another train coming in the same moment can use this energy. If no train is showing up, dedicated resistors - called rheostats – convert the electrical overload into heat. "It's an energy loss, a complete waste," INRiM's researcher **Domenico Giordano**, coordinator of the MyRails project, said. "In order to recycle this excess energy, innovative reversible substations providing a two-way energy transfer are now available: the energy get transferred from the railway grid to the train, as well as from the train to the railway grid. So energy gets recovered and returned to the energy provider".

This new technology would produce a double benefit: it could reduce by 20% the energy consumption and avoid the release of two million tons of carbon dioxide into the atmosphere.

“MyRails aims at developing reliable procedures of quantifying how much energy reversible substations could save, by measuring how much energy gets dissipated by now. The Madrid metro, which will shortly be using this power supply system, is providing the opportunity to perform measurements *ante* and *post operam* in order to evaluate costs and benefits in terms of future actions”, Domenico Giordano added.

Looking for a low-cost speed

The project is also studying how to reduce energy consumption by identifying the most efficient speed profile. We are talking about the eco-driving, the driving speed that trains and metros should maintain in order to reduce economic and environmental costs. Accurate and reliable measurements will permit to reduce uncertainties and mistakes.

Energy saving starts with the awareness of energy consumption

From 2019 flat fees for energy will be banned. In order to foster energy saving, Europe will require payments to be based on actual consumption. Therefore, MyRails is developing new calibration systems for train energy counters, allowing to ensure a more accurate measurement of the amount of energy consumed.

Today’s calibration systems don’t take into account current and voltage variations occurring on railway lines. In short, calibrations take place under laboratory conditions that are too different from the situation on the ground, where counters will be working.

“Besides ensuring a correct accounting of energy consumption, the adoption of the same calibration and testing tools at European level will guarantee compatibility and interoperability between locomotives and rail networks of different countries”, the INRiM researcher pointed out. “Thus, for instance, French high-speed trains will be able to maintain their velocity in Italy as well and vice versa Italian high-speed trains in France”.

An increasingly free market

The European Union is going to promote a free railway market shared by many actors with different expertises: one is providing the means of transport, another the rail network, a third one the power supply system.

The occurrence of many operators with different tasks and functions requires an impartial referee, which, in case of malfunctioning, can safely identify the responsible. “MyRails is taking care of this issue too. Besides, the participation of Metrology Institutes in this project guarantees a neutral and incontrovertible judgment, based on measurements and algorithms” Domenico Giordano said in conclusion.

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Infrastructure supporting the MyRails project



The diagnostic train Archimede for the conventional railway lines

Credits: RFI



The diagnostic train Diamante for the high-speed railway lines

Credits: RFI



Locomotive ETR 500 in a test phase

Credits: Hitachi Rail Italia



INRiM laboratory for the calibration of voltage transducers

Credits: INRiM