

New standard for safer, greener roads

The EU has committed to cutting its greenhouse gas emissions by at least 20% by 2020 compared to 1990 levels and to improving energy efficiency by 20%. With 14% of the EU's total electricity consumption used for lighting, more efficient lighting technologies can make a significant contribution towards meeting these targets.

Europe's National Measurement Institutes working together

The European Metrology Research Programme (EMRP) brings together National Measurement Institutes in 23 countries to address key measurement challenges at a European level. It supports collaborative research to ensure that measurement science meets the future needs of industry and wider society.

Challenge

Solid state lighting (SSL), which uses LEDs as the light source, is the most energy-efficient lighting technology available, and offers better quality light and visual performance. SSL's extremely long lifetime and low maintenance costs promise savings for consumers and public authorities, and, unlike fluorescent lamps, it does not contain toxic mercury (EU directive 2002/95). All of these properties make SSL an ideal candidate for safe and efficient road lighting.

Italy has one of the largest road tunnel networks in the world, with some 1,500 kilometres of tunnels, all requiring illumination, and the ongoing upgrade to LED lighting will significantly reduce Italy's electricity consumption. However, when conventional tunnel lighting is directly replaced with LED lighting, the resulting glare can reduce a driver's visual performance and increases driver discomfort, creating a driving hazard.

Lamps and luminaires used for tunnel lighting are characterized under daylight (or photopic) conditions, according to current standards. However, our eyes work very differently under the low light (or mesopic) conditions experienced in road tunnels and many other important lighting applications. Improved lighting design, tailored to mesopic conditions, could have a significant economic and environmental impact in such areas.

Solution

The EMRP project *Metrology for solid state lighting* aimed to improve the accuracy of light intensity measurements under mesopic conditions. As part of the project the Italian National Measurement Institute, INRIM, developed a novel mesopic luminance meter and accompanying low light measurement method. These enable industrial testing laboratories to perform traceable measurements of the luminous intensity of LED lighting and to characterize the LEDs performance under low light conditions too.

Project researchers, together with Autostrade per l'Italia, used the INRIM instrument to study Italian highway tunnels with LED lighting and determine safety critical design parameters. They found that by reducing LED lighting intensity to a specific level compared to traditional lighting, induced glare could be minimised and comparable safety conditions for moving traffic maintained but with reduced energy consumption.

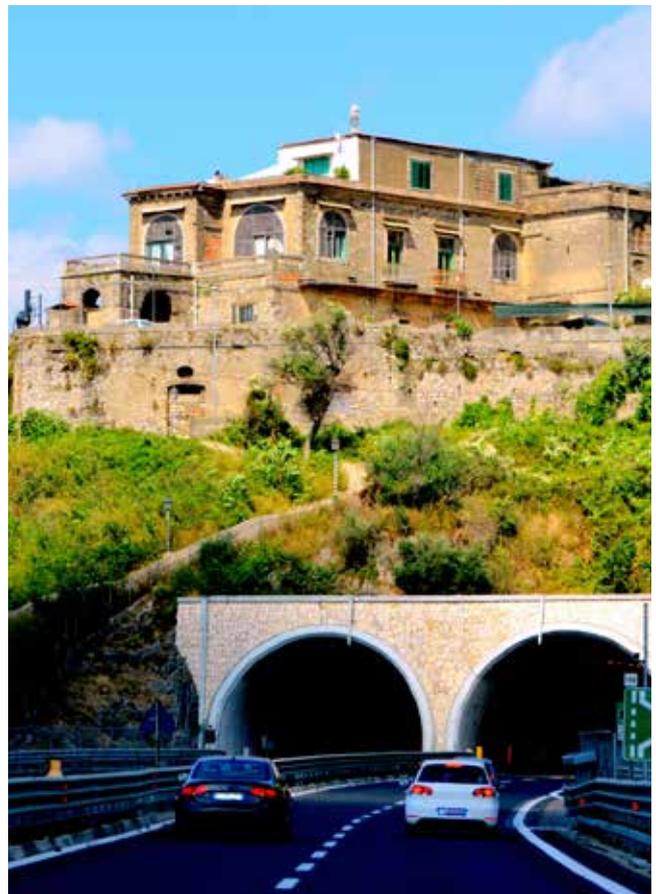
Impact

The Italian standards organisation, UNI, has incorporated this research into a new standard for the illumination of road tunnels. The new standard enables the safe introduction of LED lighting into Italian road tunnels through operation at the reduced light levels identified within the project. In addition to the energy savings introduced through using LEDs over conventional lighting, the reduced operating power leads to a further 33% reduction in electricity consumption.

With LED lighting already introduced into approximately 95% of Italy's 1,500km road tunnel network, this standard will lead to safer roads with significantly reduced power consumption and associated CO₂ emissions.

Metrology for solid state lighting

The EMRP project *Metrology for solid state lighting* aimed to encourage uptake of energy efficient lighting in the form of SSL by providing user confidence in performance claims through good metrology. The project focussed on four interconnected objectives, which provide the foundations for a reliable SSL measurement infrastructure across Europe: definition of suitable quality metrics in which to properly express the performance of SSL lighting systems; investigation of the correlation between proposed physical quality metrics and the human perception of light; development of measurement methods for the reliable measurement of the relevant quality metrics; and the establishment of traceability for SSL measurements through dedicated facilities, instruments and calibration methods.



©iStock.com/Scharvik

EMRP

European Metrology Research Programme
► Programme of EURAMET



The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

www.euramet.org/project-ENG05

Marijn van Veghel

VSL, Netherlands
+31 15 269 1517 | mvveghe@vsl.nl