

Accurate marking maintenance

Road markings and retroreflective raised pavement markers (RRPMs) are important tools in securing efficient and safe traffic flow, and ensuring high visibility of both is an important task for those involved in road maintenance. This is achieved by periodically measuring the retroreflection with a retroreflectometer, enabling road owners to plan maintenance and replacement of markings and RRPMs. Visibility is characterized by their optical retroreflection properties.

Until recently, measurements of retroreflection were mostly conducted with handheld instruments such as DELTA's LTL-X. Despite the accuracy and ease of use of such systems for conducting a limited number of measurements, they are not the best option for monitoring over long distances and heavily trafficked roads. The retroreflection can vary greatly even over short distances and on bends, where visibility is especially important.

Furthermore, roads sometimes have to be partly closed off for measurements to be taken. But with increasing traffic, there has been a growing demand for mobile systems that can monitor retroreflective properties at highway speeds.

Existing mobile retrometers on the market have accuracy limitations. Tests performed by research laboratories comparing handheld and mobile retroreflectometers have shown measurement variations of up to 50%. International standard organizations such as CEN and ASTM have realized this and have established working groups to create standards for mobile retroreflectometers, in order to be able to describe instrument properties and performance criteria. The



(Left) LTL-M's in-vehicle display
(Below left) Measuring at highway speeds



Need to know?

The latest generation of road marking equipment and the benefits it brings to road operators

- > Responding to the industry demand for mobile systems that can work at highway speeds
- > One vendor has devised a new range of mobile retroreflectometers
- > The system provides information on how a driver would see the road markings in his headlights at night
- > Can measure white and yellow markings without the need for recalibration

limited accuracy of existing mobile retrometers is caused mainly by factors such as vehicle movement and changes in wind pressure and car load relative to the road surface. This movement changes the geometry of the measurements. This is why mobile retrometers have until now been used only for screening purposes.

The next generation

DELTA has recently introduced a new generation of mobile retroreflectometers, LTL-M. Highly accurate, they are very easy to mount, calibrate and operate. LTL-M uses a Xenon flash system, fast digital camera technology and digital image processing. In independent tests it has been shown to work with an accuracy comparable to handheld instruments, i.e. with repeatability of $\pm 3\%$ and reproducibility of $\pm 5\%$.

LTL-M measures the detailed cross-sectional retroreflection of markings. Many markings have strong transversal variation, so a measurement made with a handheld instrument with a 4-5cm-wide measurement field in the center does not represent the

true visibility. In other words, LTL-M provides information on how a driver would see the markings in a vehicle's headlights at night. The system measures the daylight contrast between the road surface and the marking. It also offers detection of missing or non-working RRPMs. Additionally, it measures white and yellow markings without the need for any recalibration.

Measurement data may be exported to GIS for mapping of markings and RRPM properties. Based on yearly monitoring combined with data such as traffic density, accident locations and weather conditions, it will be possible to develop models that can be used for planning of maintenance, optimizing safety and costs. can also be integrated with existing road survey systems, as has been done with ARRB's Hawkeye platform. ○



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