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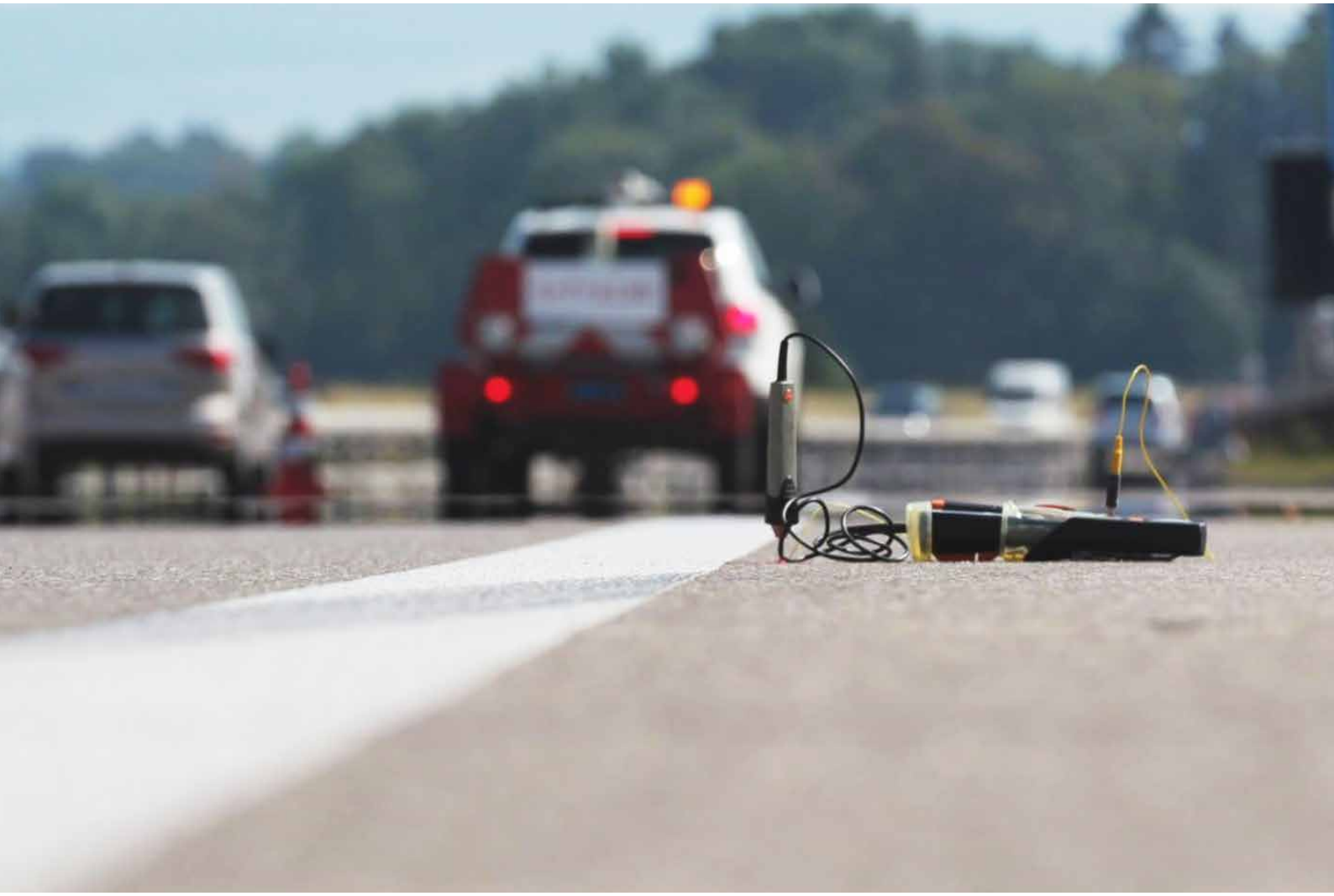

Locating the ideal Weigh In Motion site

New structural analysis service from Kistler ensures best WIM performance

SPEL

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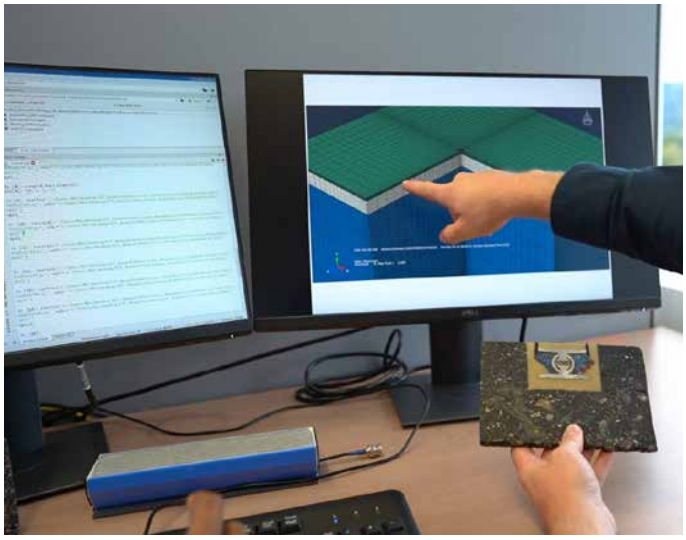
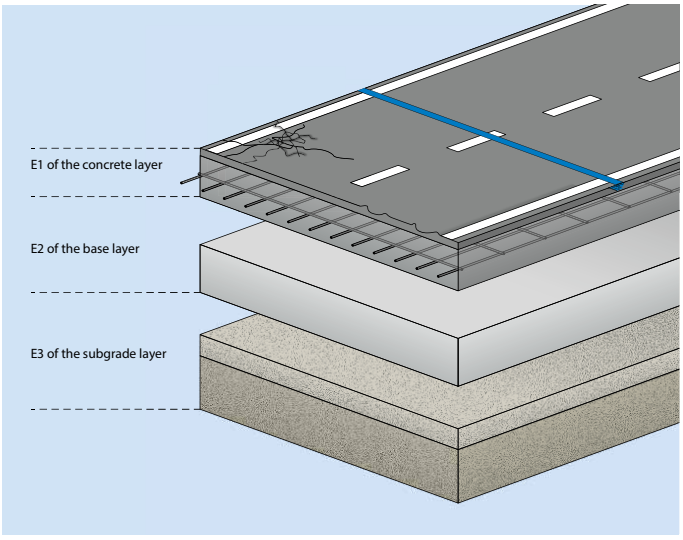


Data acquired from a Structural Road Analysis by Kistler is processed in simulations, leading to specific recommendations on the best sensor position and system layout for Weigh In Motion installations.



Road structure and quality have a significant influence on the accuracy of Weigh In Motion (WIM) systems: advanced methods integrated in a new service from Kistler ensure optimum WIM performance.

The road authority of the Czech Republic and SPEL, their local system integrator, were among the first customers to use the new Structural Road Analysis (SRA) service from Kistler. SRA helps to determine the right road location and the best sensor layout for optimum Weigh In Motion (WIM) performance: these two key factors ensure that direct enforcement applications deliver the required accuracy in all circumstances.

Automatic vehicle weight enforcement systems – or Weigh In Motion for short – are gaining popularity in numerous countries around the world. They can be used for many different applications: road monitoring, bridge protection, industrial weighing and (not least) direct enforcement of overloaded vehicles. But for this last application, the technology has to meet demanding requirements: the installed WIM system must ensure a reliable basis for legal prosecutions – and in purely technical terms, its performance must comply with the relevant standards. In many countries, an accuracy of at least 95 percent GVW (gross vehicle weight) is required for direct enforcement purposes – in any circumstances and at all times, regardless of environmental influences, time since installation and further factors.

Practice in recent years has shown that the actual performance of an installed WIM system is significantly dependent on road quality. That is why Kistler is now offering its customers a new service to ensure that their WIM solutions deliver maximum performance. Its name: Structural Road Analysis (SRA). Three levels of service are available:

- SRA Standard: site evaluation based on customer documentation (e.g. drawings, maps, etc.)
- SRA Plus: site evaluation and analysis based on IRI data (International Roughness Index)
- SRA Full: site evaluation and analysis based on IRI and FWD data (Falling Weight Deflectometer)

Know your road thanks to in-depth analysis

One of the first customers to benefit from the new SRA service was SPEL, the local system integrator designated by the Road and Motorway Directorate of the Czech Republic (ŘSD ČR). For a planned extension to an existing WIM site at kilometer 8.3 of the D2 highway linking Břeclav and Brno, a full SRA was conducted over a length of 150 meters on both Brno-bound lanes. The goal: to identify the optimum location and best sensor layout to ensure optimum performance and maximum overall lifetime for the WIM system.

An earlier investigation had already highlighted the challenges presented by the road's condition, so a full-scale analysis was undertaken including road surface measurement, measurement of pavement bearing capacity (using FWD), and measurement of IRI and rut depth to determine the road's longitudinal and transversal unevenness. Based on the results, the pavement structure was modeled and the elastic modulus of each layer was calculated.

The final report from Kistler to SPEL included an in-depth analysis and evaluation together with practical recommendations on system configuration and sensor layout. Engineer Miroslav Kolda, Production and Technical Director at SPEL, comments: "Kistler handled the management of the entire project, including the IRI and FWD measurement services provided by two local partners. What's more, they gave us a full report on road quality along with specific recommendations on how to improve the WIM site. We were highly impressed by the results of their work."

Data-driven recommendations enable WIM optimization

What were the results of the SRA? First of all, the base layers of both lanes were found to be fairly heterogeneous: however, the soil contains significant amounts of water that could have a seasonal effect on measuring accuracy and even lead to road damage. Rutting values at some points actually exceed the levels permitted for monitoring applications, so the locations for

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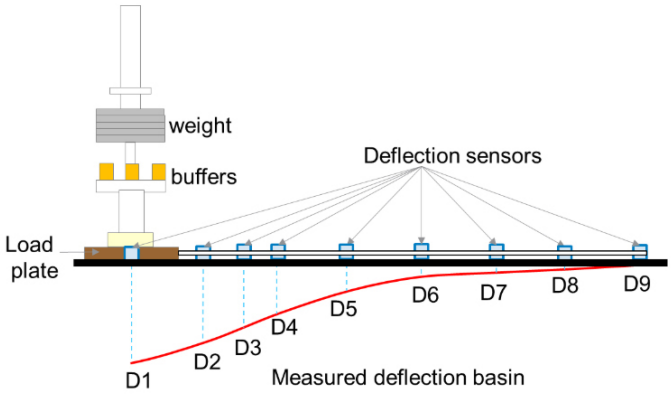
> Engineer Miroslav Kolda, Production and Technical Director at SPEL

installing the sensors must be chosen very carefully. Lane one shows better overall quality and is suitable for direct enforcement in its existing state, but three rows of WIM sensors (instead of two) are recommended here. On the other hand, the analysis showed that the WIM system on lane two does not meet the requirements for direct enforcement in its present state. Four rows of Kistler Lineas sensors are necessary to achieve the desired GVW accuracy here.

A simulation model was calculated to determine the best sensor layout, taking account of profile data from both lanes. The model comprises eight vehicles that are each simulated in both empty and fully loaded conditions. On this basis, a location between meters 68 and 84 of the highway section was determined as the best position for the sensor installation. Kistler also provided a detailed graphical layout recommendation, with different sensor arrangements and intermediate distances for lanes one and two (see image).

SPEL was so impressed by this experience of the Structural Road Analysis that the integrator has now decided to use it for every upcoming WIM installation. "All the information generated by these tests is very valuable for us: knowing the right number of sensors, the best location, ideal layout and intermediate distances saves us a lot of time and money later on," Kolda points out. In the meantime, SPEL has commissioned a second full SRA service. Discussions are now under way with ŘSD ČR about the possible introduction of a mandatory requirement for SRA, so the new service from Kistler could be specified for all WIM installations in the Czech Republic in the future.

Michal Izak, Sales Engineer Traffic Solutions Eastern Europe at Kistler, comments: "This is the best endorsement we could possibly get for our SRA service. We're glad to have shown in practice that these analyses are fully worth the effort. It's simply the right way to go for direct enforcement applications – both for large-scale systems and single WIM installations. We've already received a request from another system integrator in the Czech Republic – and I'm sure other countries will follow soon."

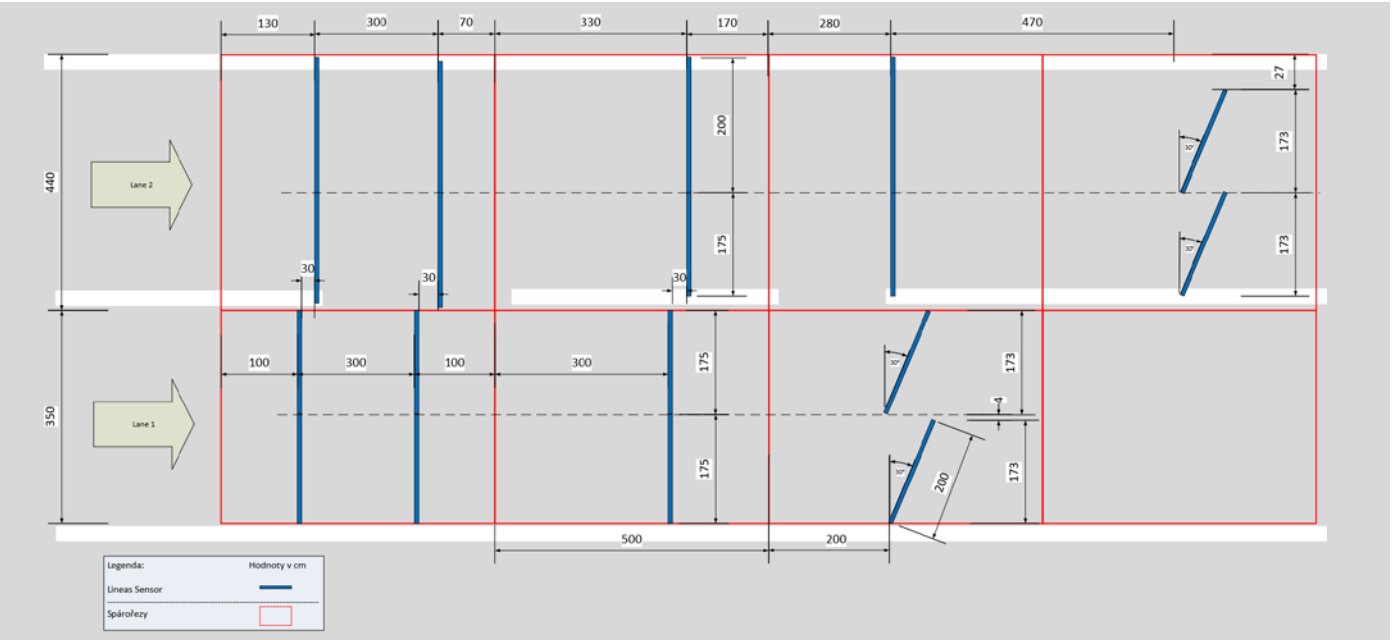


An analysis based on measurements with a Falling Weight Deflectometer (FWD) – part of the SRA service from Kistler – delivers key data on road pavement structure and the quality of the different layers.

Advanced measurements deliver insights into road quality
For an in-depth assessment of road structure and surface, Kistler with its partners will conduct two different analyses:

- IRI and rut depth: a special vehicle carrying three different measurement devices collects the required data and combines it with a mathematical model simulation running at 80 km/h. Calculations indicate road quality both vertically and horizontally.
- FWD: in this measurement method, a dynamic load is applied to simulate a moving vehicle. Pavement response is measured by geophones. With the help of a special algorithm, the deflections are taken as the basis for back-calculating the elastic modulus of the different layers.

Both services were provided by Kistler in cooperation with two different local partners.



Recommended sensor layouts for Weigh In Motion on lanes 1 and 2 of highway D2 in the Czech Republic (km 8.3, Brno-bound) – generated by the new Structural Road Analysis service from Kistler.

Weitere Informationen finden Sie unter:
www.kistler.com/de/loesungen

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