

Press release

Making roads and bridges safer

Infrastructure stress is caused by vehicle weight, not vehicle numbers:
keep track of increasing axle loads with Weigh In Motion systems

Winterthur, 21 March 2019

Dilapidated roads and bridges cost taxpayers billions every year, and they cause traffic jams stretching for kilometers. In the worst-case scenario, continuous stress gives rise to real risks. Bridges in particular are severely impacted by increasing traffic volumes. Heavy vehicles are the main cause of damage, because vehicle weight is one of the critical parameters that determine an infrastructure's lifetime. Cutting-edge technology now makes it possible to monitor traffic loads on roads and bridges more accurately than ever before. Weigh In Motion systems can weigh vehicles while they are actually traveling: this means they can supply precise information about loads on heavily used routes, so overweight vehicles can be directly excluded from traffic.

The number of heavy semitrailers on Swiss roads has almost quadrupled since 1980: growth in this vehicle category alone is placing undue demands on the infrastructure. Experts identify heavy truck traffic as the decisive factor that causes wear on roads and bridges. The "fourth power law" explains why this is so. According to this law, the increase in the force acting on the road is not linear, but exponential – an increase to the fourth power, in fact. Load per axle is the critical parameter here. A comparison between a truck with a weight of ten tonnes per axle and a passenger car with an axle load of one tonne makes this clear. According to the fourth power law, the impact of the truck's axle on the asphalt and bridge materials is not ten times greater than the impact caused by the car – but no less than ten *thousand* times (10x10x10x10) greater! In other words, one 30-tonne truck causes just as much damage to the road as 7 500 cars.

Numerical recording of traffic is one method that helps operators keep track of infrastructure damage inflicted on bridges and roads by growing traffic volumes. Roadside count stations or detection loops embedded in the asphalt can transmit the numbers of trucks that drive past (or over) the equipment. However, these methods cannot answer the most critical question: how much do the trucks actually weigh? According to the fourth power law, unladen trucks have a much lower impact on road surfaces and bridge statics than fully loaded vehicles. Weigh In Motion systems – such as those offered by Kistler – provide the ideal solution for collecting data that is genuinely meaningful. As well as recording the numbers of vehicles, systems from this Swiss company capture reliable

data about axle and axle-group loads – as the vehicles travel past, with no need for drivers to interrupt their journeys, and with no other adverse effects on traffic whatsoever. The statistics acquired from this comprehensive data collection process can then be used to predict and schedule the actions needed to refurbish roads and bridges.

Switzerland's Federal Roads Office (FEDRO) already operates a number of Weigh In Motion measuring points with special Kistler force sensors that weigh vehicles while they are traveling. The results are alarming: up to 4.5% of trucks passing these measuring points exceed the permitted 40-tonne limit. That adds up to 75 000 overweight vehicles every year! In other countries, too, Kistler's system is already in widespread use as a practical measure to prevent overloading. On the El Carrizo highway bridge in Mexico, for example, trucks are weighed before they drive onto the bridge; if they exceed the defined weight limits, they are prohibited from crossing. Hungary and the Czech Republic make similar use of this technology for speed monitoring, to ensure that those responsible for overloaded trucks have to pay the price. Measures such as these deliver dual benefits: they protect the infrastructure, and they also improve safety on the roads. Other European countries are likely to waste no time in learning from these examples, so Weigh In Motion systems will contribute even more directly to the safety of bridges and roads in the near future.

Image material (please name the Kistler Group as picture source)



The driver of this truck is completely unaware that his vehicle is being weighed.



Weigh In Motion systems collect precise data about the loads exerted on roads and bridges.



It only takes a few hours to install Weigh In Motion technology: a narrow strip is sawn out of the asphalt to accommodate the sensor technology.



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About the Kistler Group

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