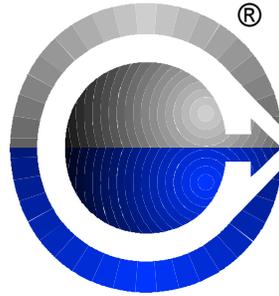


## **SAFE LOAD SYSTEM™ WIM**



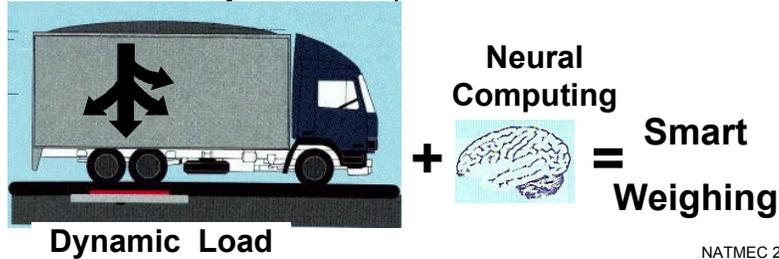
**OMNIWEIGHT CORPORATION**  
**OMNIWEIGHT CONTROL, LTD.**

Thank You for giving me an opportunity to introduce innovative WIM-Scale developed by Omni Weight Control of Finland. Omni Weight Corporation of Virginia represents this revolutionary technology in the United States. Since extensive testing in Sweden and Finland, the technology has been patented and is now commercially available worldwide.

OWC developed Safe Load System™ weigh-in-Motion (SLS WIM) scale for a purpose of measuring axle-loads and gross-vehicle weights accurately under all climatic conditions. SLS WIM is installed underground and literally forgotten. Once buried under pavement, scale is not designed to be maintained. The maintenance free operation is achieved through solid design principles and theory is based on fundamental research.

## Omni Weight Control (OWC)

- Invented sensor for **weighing w/o load-bearing** parts.
- Applies **Neural Networks** to analyze dynamic loads. Neural networks learn from examples and can spot complex interactions that may have escaped human notice.



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Traditional scales require load to be applied directly on them, making them susceptible to wear and impact. SLS WIM weighing element is constructed from heavy steel beams and uniquely placed under the pavement safe from traffic and weather.

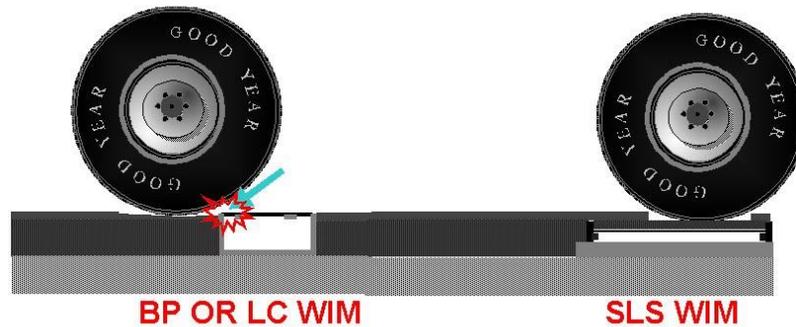
Smart programming and extremely sensitive sensors accurately measure each axle loads. Neural networks were found to be suitable for analysis of dynamic information and convert it in intelligible weighing data. Neural networks learns looking at examples and can spot complex interactions of multiple variables that may have escaped human notice (Business Week 8/7/00). Ultra fast computer and communication bus interprets the results several hundred times a second.

## Assembled, Shop Tested Unit



Above you can see preinstalled assembly, ready to be delivered to the site. Steel frame anchored firmly in its concrete base. Convenient lifting lugs make possible an effortless moving of the 2-ton assembly. The scale is pretested before shipping minimizing installation related complications. Cables are of predetermined length to reach remote traffic cabinet or scale house via waterproof PVC-conduit

## Why Hide WIM Scale?



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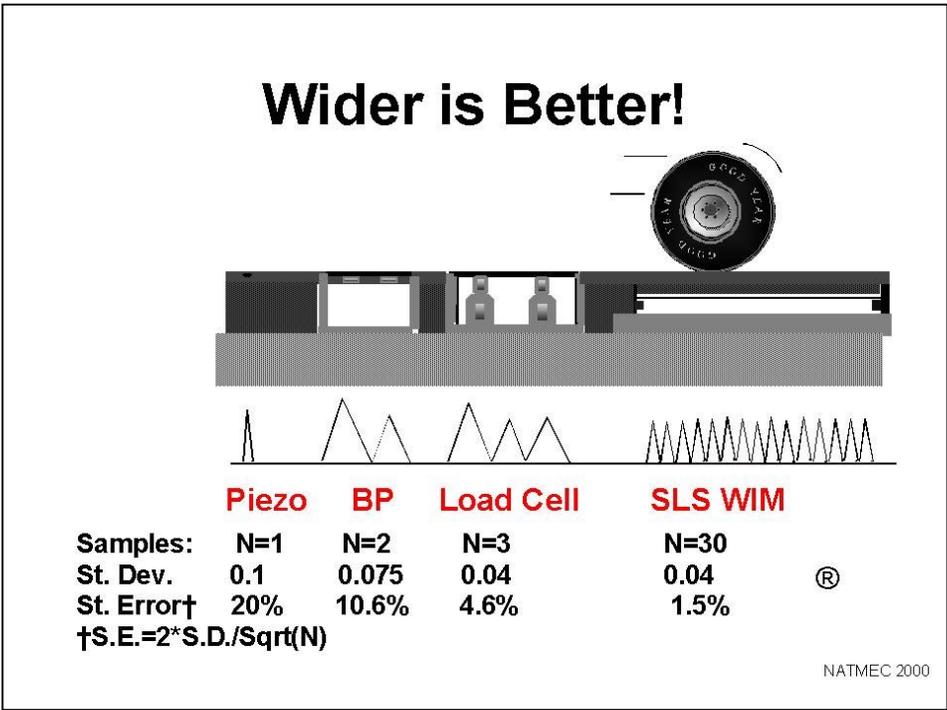
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Besides the obvious benefit of hiding the scale from traffic and weather, there is more fundamental reason to hide the weighing element. Scale edge located flush with the pavement can cause an impact in case of the slightest unevenness.

Secondly, pavement layer deflects slightly in front of the plowing tire just as water does in front of the boat. When this ripple suddenly stops due to change of material, scale or the frame is hit by its force. This typically causes preliminary peak in piezoelectric cable or in the frame of the scale.

Better way is to hide the scale underneath of the pavement. SLS scale is located at least two inches below pavement surface safe from impact. Additional benefits from the location are safety for motorists. The scale itself is safe from salt, snows studded tires, and any normal maintenance on the road, including pavement overlay.

Omni Weight designed the scale hat can addresses concerns of WIM safety, durability, accuracy, site selection, and road preparation. This design of Safe Load System Dynamic Scale was guided by 3 principles; Scale had to be Simple, Durable, and Intelligent.



It was previously suggested by Pratt and Bushman (NATMEC 1998) that wider scale resulted better measurement. The implications of wider scale and higher data acquisition rate is clear in the case of SLS WIM.

At speed of 70 mph, vehicle travels 100 feet/second. Typical analog acquisition rate of 50 Hz yields only few sample points. Given the erroneous first reading, and sample size of just few, the accuracy of the traditional scales decreases drastically at higher speed.

OWC has approached this problem by converting all data processing in digital format. The result is that the scale can perform data processing up to ten times faster. Wider platform yields comfortable number of data points to increase confidence of the results, even if a single measurement was assumed to have the same standard variance than a load cell WIM.

Table presents a simple statistical analysis using ASTM 1318 accuracy for WIM at 95% confidence level (2 x standard deviation). This hypothetical calculation was performed to show the power of the averaging large sample. Ten-fold increase in sample size yields 3-fold increase in accuracy, although individual measurement was standard deviation was assumed the same.

# Maintenance Free

- Shop assembled
- Pre-tested
- No recurring calibrations
- Redundant

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Simplicity means that there should be minimum numbers parts. In fact, SLS WIM comes in one piece. SLS WIM system does not utilize induction loops, multiple piezos, or axle sensors. All functions are performed in a single instrumented frame. This enables single excavation to place the scale under the pavement. After laying the scale on gravel, the scale simply paved over by regular means. Because the scale is away of wear and weather, and without moving parts, there is no change in calibration or service required. All sensors are 100% redundant, to increase system lifetime. So far not OWC has yet to test automatic fault correction because no sensor failure has occurred yet.

# Robust Design

- Suitable for all weather conditions
- No exposed parts or joints
- Hermetically sealed
- No moving parts
- Impact resistant

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Nordic weather exposure and related distress on roads added additional condition for rugged design. Because there is no exposed parts or sealed joints, ice, snow, salt, studs, snowplows, sand, etc. do not get into the scale. None of the parts wear, even under heavy traffic extending the scale lifetime.

Should water seep under pavement, the steel parts are painted for corrosion prevention. All electronics are shielded per IP67. In addition steel frame is filled with polyurethane to provide hermetic sealing. The roads on Scandinavia wear fast due to studs and heavy vehicles. Rutting does not result exposed edge to bump and to pose safety hazard. The pavement over the scale in Sweden was milled and reapplied without affecting the scale. Recently, the same operation was inadvertently performed in Finland. Affected scales continued performing normally. An adjacent weather station did not fare as well.

# Intelligent Software

- Pioneer in applying neurocomputing
- Learning replaces calibration
- Compensation for ambient effects
- Software driven measurements
- Operated from remote location

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Unique, patented sensors are used to measure fatigue change in steel structures. Five sections measure load for each wheel and axle. All sensors are redundant with automatic fault correction. Even after two redundant sensors fail, adjacent sensors continue to calculate the loads. The scale has automatic temperature compensation and auto-zero for pavement changes.

Omni Weight is the only known manufacturer to apply neural networks for interpreting the measurement. The vehicle detection and converting weighing results are done within the scale utilizing ultra fast data bus. This enables several hundred results being analyzed every second for accurate output. Speed, vehicle dimensions and classification are further determined in the software within fraction of second.

Vehicle records can be viewed remotely in real-time via modem or Ethernet. No special software is needed in part of user beyond standard terminal emulation, telnet or web-browser program. Daily report is automatically sent to selected recipients. Vice versa, new analyzing program can be uploaded from remote location.

## Easy to Install



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Here is an installation picture. Scale is leveled on compacted gravel base regardless of the road slope. Sides and top of the scale are filled with pavement and compacted. Pavement bonds with grid on the top of the scale to make firm installation. After that, final 2-3 inches are paved as normal pavement. Asphalt roller does not pose problem for the scale, although classification of the roller may be a problem.

# Life Cycle Analysis (**SLS-WIM**)

<b>FACTOR</b>	<b>Acquisition</b>	<b>5 yrs.</b>	<b>10+ yrs.</b>
<b>Safety</b>	Ease to install <b>Preinstalled</b>	Threat to public <b>None</b>	Road degradation <b>No weakening</b>
<b>Environment</b>	Site preparation <b>12' resurfacing</b>	Operation & maint. <b>No impact on road</b>	Abandonment <b>No harmful materials</b>
<b>Data Validity</b>	Accuracy <b>&lt;4 %, any speed</b>	Drifting <b>None/auto-zero</b>	Uptime, longevity <b>&gt;95%. 10+ years</b>
<b>Cost</b>	Furnish & Install <b>Moderate</b>	Repair&Calibrate <b>Very low</b>	Replace & remove <b>Not necessary</b>

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Everybody has an unique criteria for WIM acquisition. With SLS WIM you will be getting overall value for most applications. I would like to point out shortly SLS WIM's advantages in a life cycle analysis:

Installation does not require special tools and experienced crew can perform it in matter of day per lane. Over its lifetime, no further road closures are required. Scale does not raise any other safety or liability issues, even after its useful lifetime.

Typically only 12 ft by 12 ft excavation is required to place the scale. No concrete slab is needed to achieve required smoothness. There are no changes to normal road maintenance All materials used are environmentally safe.

From the initial calibration, consistent results will be delivered. Should there be significant road wear or repaving, SLS will continue supplying reliable data for its expected lifetime of over 10 years.

This system is especially cost effective, when concrete slab is required for installation. In the long term, we believe SLS-scale to be the lowest cost alternative.

Before selecting any specific technology, I urge you to consider overall performance requirement for your system. Only after then define performance and cost criteria that suits your application.

# Benefits for Data Acquisition

- Safety
- No maintenance
- Long lifetime
- Consistent good quality data
- No recurring calibrations
- Simple interface

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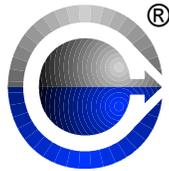
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Increased safety for state employees and traveling public. No maintenance means less lane closures. Trucks and cars cannot avoid the hidden scale and cause hazard to other motorists.

System maintenance is largely divided on different group than data collection. With SLS WIM, there is nobody but OWC to blame on maintenance issue. Lifetime beyond the rest of the program period warrants that no interruption in the data collection occurs due to scale replacement.

Instead of losing of data because of maintenance or calibration drift, data is always available for real-time spot check, quality assurance, and long term data analysis. Scale automatically Emails messages daily from WIM stations, in the format that is useful for the analyzers, which can further reduce the program cost.

# VISIT US BOOTH #7



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Questions?