Weighbridge Technology
Weighbridges- the workhorses of industrial weighing

Weighbridges play a vital role across a diverse range of industries. They provide valuable weight data for incoming and outgoing vehicles at quarries, recycling plants, energy from waste sites, ports & terminals, cement works and processing plants. Now a blend of versatile instrumentation, user-friendly software, peripheral control equipment and communication technology is rapidly increasing the scope of weighbridges, thereby expanding their operational, data collection and connectivity capabilities. In addition, weighbridges act as critical control points at many sites and can be used to improve on-site traffic flow and site security.

Weighbridge Choice

These work horses of weighing come in all different shapes, sizes and designs, manufactured from steel, steel-concrete composite and pre-stressed concrete. Designs include surface mounted, pit mounted, modular and transportable. Typical capacities range from 30 to 100 tonnes, in lengths of 9, 15 and 18 metres and widths up to 4.5 metres. The common factor for all these variants is that they need to be robust, accurate and reliable.

The choice for a particular application will depend on factors including maximum vehicle sizes and weights, available space, usage and, of course, budget. Most weighbridges are operated in a drive-through manner. In other words, the vehicles drive on at one end and off at the other. However in applications where space is at a premium, vehicles may go on and off from the same end. For plants where vehicles are weighed in and out, the obvious choice is to operate two separate weighbridges. Not only does this streamline traffic flow but it also gives the opportunity to service one bridge whilst keeping the other operational. However this is clearly a more expensive option and in many applications one weighbridge is sufficient.

Design

Most mechanical weighbridges have now given way to fully electronic versions where the weighbridge deck or deck sections are supported on a number of strain gauge load cells, connected to weight instrumentation.
Pit mounted weighbridges are flush with the ground. As a result they pose no restrictions to vehicular movement and are therefore particularly useful at sites where vehicle flow can be in multiple directions. Most mechanical weighbridges were installed in pits to accommodate the lever assemblies so when they are upgraded or replaced, new bespoke size pit mounted steel weighbridge decks and load cells provide a very cost effective answer. Weightron have developed special mounting assemblies to facilitate the use of existing pits, ensuring the new decks sit level with the surface. This approach removes the need for costly and disruptive foundation changes.

Surface weighbridges offer straightforward installation procedures and the side frames help to guide vehicles centrally through the bridge. Approach and departure ramps can either be of steel construction or pre-cast in concrete on-site. Removable steel ramps have the advantage of being able to be moved with the bridge if relocation is required, leaving the site level.

Weightron offer two main designs of steel weighbridge. The modular Eurodeck, which can be used in both surface and pit installations, provides a low profile solution for weighing normal size vehicles and is available up to 18 metres in length.

The Titan design (opposite) is ideal for weighing higher capacity vehicles, especially those that operate off road. The single steel structure has two main longitudinal beams and a varying concentration of cross beams to provide optimum strength at critical load points along the length.
**Portable weighbridges** have special load cell assemblies and feet, allowing temporary installation with minimum foundation preparation. Steel ramps usually provide access. Weightron offer a fully transportable weighbridge assembly, which can be transported complete with the load cells and wiring. The modular design is delivered to site and then folded out onto the ground. Large integral spreader plates provide stability for the load cells and two or more modules can be used to provide the requisite length.

**Concrete weighbridges** can offer advantages for certain applications. Pour on site composite versions provide a cost effective solution for low to medium use operations. These consist of a steel outer frame, inner strengthening beams and reinforcing mesh. Once the unit is assembled on site, the ready mixed concrete is poured in and when the deck has cured, the load cells are fitted. Alternatively the complete weighbridge can be constructed at the factory and delivered to site.

**Weighbridge surface coatings**
Weighbridges are expected to operate in the harshest of environments, fully open to the elements. Therefore a well structured finishing procedure is essential to provide optimum longevity. At Weightron all steel is shot-blasted to remove mill scale and surface imperfections prior to painting. This ensures maximum adhesion of the surface coating applications. In parallel sound design principles ensure a well drained deck and no hidden traps underneath where hidden corrosion can occur. The under-surfaces are coated with a special rubberised rust inhibitor coating. Special marine finishes can be applied for weighbridges operating at or near the coast.

**Foundations**
The foundations of any weighbridge are crucial to their performance. It is of little use having the most accurate load cells and well designed weighbridge structure if the foundations are unlevel or unstable. For pit weighbridges, adequate drainage is also important to prevent flooding. The fitting of "T" section rubber strip between the weighbridge deck and the edge of the foundations limits deck movement without impairing performance and prevents debris entering the weighbridge pit.
Significant end to end forces can be generated when vehicles drive on and off the weighbridge, especially if heavy braking occurs. Such forces can damage critical components such as load cells and can also cause serious damage to the surrounding structure. Built-in restraints to limit the movement of the weighbridge deck are therefore an important part of any weighbridge design.

**Sloping Terrain**

Weightron have developed proprietary technology to make it is possible to install weighbridges on sloping terrain. This can be beneficial for installations at existing sites where finding suitable level ground is difficult.

**Load cells**

Load cells are the prime measuring sensors for weighbridges and therefore are one of the most critical components. Modern sealing methods and materials of construction provide excellent environmental protection, whilst well-designed mounting hardware ensures optimum load introduction.

Two basic types of load cell are used in weighbridges - analogue and digital. Although analogue load cells are well tried and tested, giving excellent service, digital load cells offer distinct advantages, especially during installation, calibration and troubleshooting. The capability of being able to communicate with individual load cells brings important benefits and in addition, each load cell stores pertinent weighbridge calibration data, which can be transferred to a new load cell if replacement is necessary.

Weightron’s **CPR** (analogue) and **CPD** (digital) canister load cells have an excellent reputation for performance and reliability. There are important design features within these load cells that set them apart from similar looking lower quality products. The CPD and CPR feature a specially designed centre column with eight strain gauges, together with special mounting cup assemblies all of which ensure optimum load
introduction, even when the angular alignment changes as the weighbridge deck expands under extreme temperature changes. The bottom section of the outer canister housing has a substantial thickness, thereby offering excellent mechanical protection. Special dust seals prevent debris from entering the lower part of the mount.

This compact canister design is superior to more cumbersome single ended and double ended beam designs.

Calibration and Certification

Weighbridges are classed as non-automatic weighing instruments (NAWIs) and if the weight data is used as part of any commercial transaction, they require approval to European weights and measures standards (or those applicable in the country where they are installed). This involves the bridges being tested with calibrated weights when first installed, and then re-verified at regular periods or when any critical components are replaced. Some companies insist their weighbridges are weights and measures approved even if they are not used for commercial transactions. This ensures that the weighbridges are maintained and certified for optimum precision.

Ownership options

There are a number of ways of ‘owning’ a weighbridge. These include outright purchase, lease purchase and hire. Portable weighbridges are ideal for short term usage or where the weighbridge has to be moved from one part of a site to another or to a different site. Purchasing weighbridges and support services on cost alone can be false economy. No-one likes paying more for their products than necessary, but a number of factors should be considered when choosing a weighbridge supplier. Cost of ownership may be an over-used cliché, but it is still very relevant when it comes to weighbridges.
Modern technology
Traditionally the weighing process in many weighbridge applications has been relatively slow and data collection has been confined to local printouts of tickets and daily tally rolls. Now more emphasis is being placed on developing key peripheral areas. This is aimed at speeding up throughput of vehicles, improving security and extending weighbridge operational periods, together with improving and simplifying data collection and distribution. Technologies employed include Ethernet communication for remote access, automatic vehicle recognition systems, smart card or key readers, wireless interfacing, the world wide web and GSM.

Driver operated systems
Driver operated systems (often referred to as unmanned weighbridge systems) have been one of the most effective developments for improving weighbridge operational efficiency and security. Such systems offer a number of advantages and remove the need to have permanently manned weighbridges. Not only does the system speed up weighing operations, but it also extends the available working period for weighbridges.

Weightron’s latest 2050 Diade colour touch screen driver terminal is the most advanced of its kind and brings a new level of control to unmanned weighbridge systems. It features a large colour touch screen that can be configured for specific applications with easy-to-use pictograms to guide drivers through the weighing operation. The voice activation feature further facilitates ease of use.

Operational access can be via a range of smart technologies including designated swipe card, key or bar code. This ensures the terminal provides a complete material handling management system, which is easy to use by both vehicle and site operators. The power of the 2050 is optimised when used in conjunction with Winweigh IV weighbridge software. This unrivalled combination brings the latest in industrial interactive touch control together with leading edge programmability.

Winweigh Weighbridge Software
Winweigh IV is the world’s most powerful and versatile weighbridge and vehicle management software. It has been developed to provide virtually limitless flexibility for truly future proof weighbridge management systems. With capabilities to interface directly with leading management systems, including SAP, J D
**Edwards, Navision and Sage**, Winweigh IV brings the ultimate in control. Whether you operate a single weighbridge or have multi-site installations, Winweigh provides the optimum solution. Not only is Winweigh capable of managing weighbridge operations and data collection, but it can also be used as a comprehensive vehicle management system, reducing on site bottlenecks and improving site security.

Winweigh IV can be used to control security cameras and automatic number plate cameras, providing digital records of each and every vehicle entering and leaving sites. In conjunction with this it can control entry/access barriers and interface with Weightron’s Safeweigh radiation detection system.

**Wireless weighbridge systems**

Fitting weighbridges at existing sites is normally straightforward, but in some applications, site logistics may mandate that the weight indicator be mounted remotely from the weighbridge at another part of the site. Normally this would involve time consuming and disruptive civil works to lay underground cables.

The Weightron wireless system overcomes these problems by using robust and secure 2.4 GHz radio transmission to send bi-directional data between the weighbridge and the weight indicator at distances up to 1500 m. The installation comprises the weights and measures approved DIZIG/IP radio transmission system, in conjunction with their DIlink digital junction box mounted at the weighbridge and the Weightron D800 weight indicator. The DIlink and D800 are connected to their respective transmitter and receiver via a standard RS232 serial link.

**Automatic number-plate cameras, barriers and traffic lights**

Automatic number-plate cameras are increasingly being used in conjunction with driver-operated weighbridge systems. Weightron’s Visionweigh is fully compatible with the company’s powerful WinWeigh software suite and provides a secure method of identifying pre-registered vehicles entering and leaving site.

The system can be used to operate traffic lights and control security barriers at the weighbridge and any bypass lanes, making it an important asset to any driver-operated system.

Overall such weighbridge management systems streamline weighing procedures and remove the need for permanently manned weighbridges.
Safeweigh Radiation Detection Systems

The **SafeWeigh** system is specifically designed for the detection of radioactivity in vehicle loads entering or leaving industrial sites. As more and more materials are recycled, especially scrap metal, there is a growing need to monitor the waste material for traces of radioactivity before it is reprocessed or incinerated.

The system already has a proven track record at steel works, incineration plants, land fill sites and waste reprocessing plants. Weighbridges are critical control points at these operations and therefore the ideal location for monitoring radiation. As the loaded vehicle passes through the SafeWeigh detector plates, (positioned each side of the weighbridge,) it is scanned for traces of radioactivity. The system can be programmed for specific radiation thresholds and if it determines that a radioactive source is present, either in the load or the vehicle, the system actuates an alarm to immediately notify site security. SafeWeigh can also be linked to automatic number-plate cameras to capture vehicle identification.

SafeWeigh provides a full radiation profile of the vehicle load and the system can be successfully integrated with Weightron’s comprehensive WinWeigh software suite.

Multiple units can be networked via Ethernet and the powerful ANDREA software records full details of any radioactive profiles, clearly identifying the strength and location. This allows site management to take risk assessments in total confidence. Optional Geiger counters are available for detailed vehicle analysis.

**ATEX certified Weighbridges**

Special design considerations need to be given to weighbridges installed in hazardous areas. The weighbridge shown here is used for weighing liquid gas tankers and has multiple holes in the weighbridge deck and suitable clearance underneath to prevent the build up of gas should any leakage take place during the filling process. Special ATEX certified load cells and safety barriers ensure compliance with ATEX requirements.
**Exporting weighbridges**

The modular Eurodeck is ideal for export applications, providing a very cost effective solution for destinations where there are no indigenous weighbridge manufacturing facilities. The weighbridge sections including ramps, instrumentation and load cells fit inside a standard shipping container for easy, cost effective transportation anywhere in the world.

On arrival at site, the deck module sections are unloaded and bolted together before being lifted into place on the prepared foundations. The load cells and instrumentation are pre-calibrated prior to shipping, making onsite installation very straightforward and requiring only one Weightron engineer for commissioning.

**Service and support**

Service and support is a critical issue for weighbridge operators especially for equipment working in harsh environments. The new technologies are bringing important changes to the way in which servicing can be optimised and this is particularly useful at remote unmanned sites. Any weighbridge breakdowns have a rapid and major impact on daily operations and therefore effective servicing and trouble shooting is very important. However traditional methods of servicing do not necessarily cater for the changes in the working pattern of a particular weighbridge. Typically estimates are made to establish the frequency of servicing, often with the emphasis on minimising costs.

Most of us are familiar with the built-in service monitors on modern cars, which assess servicing requirements based on a combination of factors including time, mileage and how the car is driven. This technology is now available for weighbridges - advising, for instance, when the next service is due based on time, number of weighments or a combination of both. The system can also record a history of peak loads, which may be above normal operating capacity and detrimental to the working of the bridge. This information can be useful in determining why, for instance, a particular weighbridge is going out of calibration or suffering from excessive component failure.

Although regular servicing and maintenance can help to minimize problems, predicting what and when things will go wrong is very difficult with traditional weighbridges. Therefore the ability to offer remote
maintenance service support can save considerable time and effort especially for equipment operating in harsh, remote areas.

With such a system installed, any problems with the weighing equipment are automatically flagged up at the supplier’s offices. Details are immediately forwarded to the local engineer who can then dial into the weighing system remotely and make a risk assessment of the situation. In many cases the engineer can carry out a range of checks and where possible rectify the problem without having to visit the site. If not, then as appropriate, plans can be made to carry out any remedial work during the next scheduled visit, thereby minimising the disruption to the site operation.

Conclusion
Modern weighbridge systems can offer considerably more than weight information and their integration with other technologies is bringing dramatic changes to a wide range of industries. However the quality of the data they provide is still totally dependent on sound mechanical design principles and well defined installation procedures.