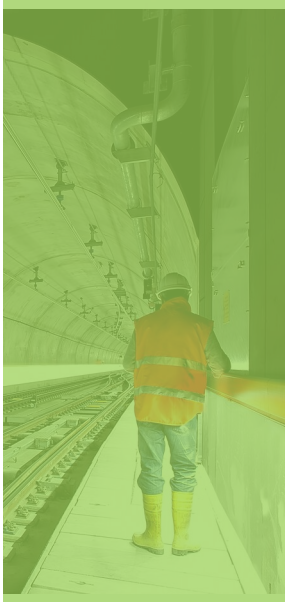


Tacuna Systems

ADVANTAGES AND APPLICATIONS OF WIRELESS LOAD CELLS

The ability to transmit data wirelessly has become standard in most technology applications today. Companies are opting out of landlines, Ethernet cables, and local servers in favor of wireless and remote options. As the reliability and speed of connections improve, many industries are seeing wireless technology incorporated into everyday tasks.Load cell applications are no exception.

WHERE TO GO WIRELESS

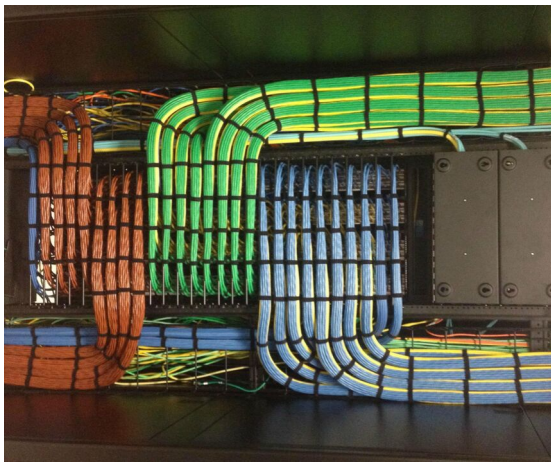
The best answer to the question, “where could I incorporate wireless load-cells?” is anywhere you use conventional wired connections, and some places where you cannot. Wired interfaces to load cells become challenging, if not impossible, where measurements are needed in environments that are distant, dynamic or dangerous. Wireless load cells expand the practicality of accurate measuring in these difficult locations.

Wireless connections can be outfitted to most load cell applications. For instance, they can be used for weighing applications on a moving vehicle such as a crane or forklift, in fixtures with tight clearances where wires and cables might be susceptible to damage, or in harsh environments that are difficult and dangerous for humans to access.

ADVANTAGES OF WIRELESS: GOING MOBILE

Often with large-scale or distributed systems, operators have a need to collect measurement data while maneuvering around these large fixtures or areas. Wireless networks allow the user to access real time data on mobile receivers or indicators without having to stay in a fixed location. This improves the efficiency of calibrating and testing load cells, running strain surveys, and performing routine maintenance.

USER-FRIENDLY EFFICIENT INTERFACES



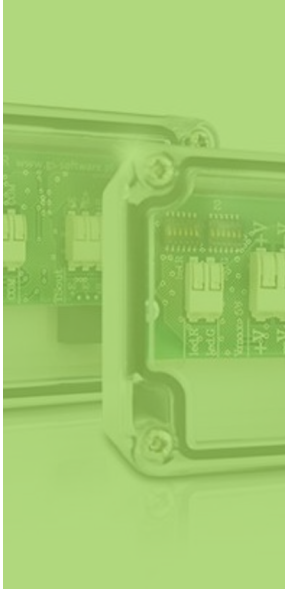
Wireless load cell data transmission permits smart phones and tablets to be the output user interface. This can streamline procedures and allows easier training of operators. Even when wired connections are feasible, wireless receivers allow operators to observe multiple load cells from a single workstation, further simplifying standard work procedures.

REDUCED COST AND COMPLEXITY: INSTALLATION AND MAINTENANCE

The most significant expenses involved in complex load cell or strain gauge measurement systems are in installation and servicing. Traditionally this would have been especially true of transmission cabling from the sensors to the user interface. Transmission cables and wiring harnesses can be tedious to install, and can become a safety risk by entangling equipment or personnel. Over long distances, wiring would have to be installed underground or hoisted in the air much like telephone transmission cables, to prevent damage from surrounding environments.

When instead, the signal from the load cell is transmitted wirelessly, standard wire runs become unnecessary. The initial installation of wireless transmitters and receivers is clearly more cost-effective in both equipment and labor hours. As mentioned above, wireless systems allow the consolidation of output user interfaces, further decreasing installation complexity and cost.

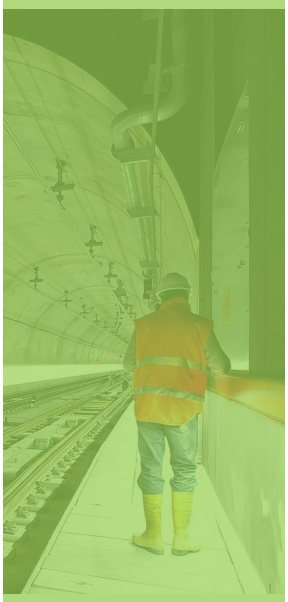
When it comes to maintenance, wireless systems are also the clear winner. Wireless measuring systems only require access to specific measurement locations or nodes, potentially saving thousands on inspections and upkeep.



SAFETY

When deployed in rugged terrain or on dangerous moving equipment, wireless technology adds a high level of safety to the installation, normal use and maintenance of a measuring system. This provides adds to the cost benefit of wireless technology.

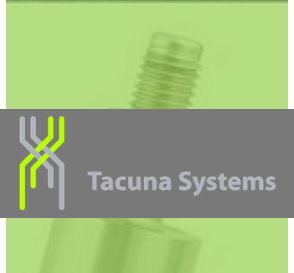
APPLICATIONS OF WIRELESS LOAD CELLS



The transmission of data or signals over long distances, often referred to as telemetry, is used to monitor remote and inaccessible locations. Wireless telemetry allows operators to gather accurate measurements in very large or distributed environments.

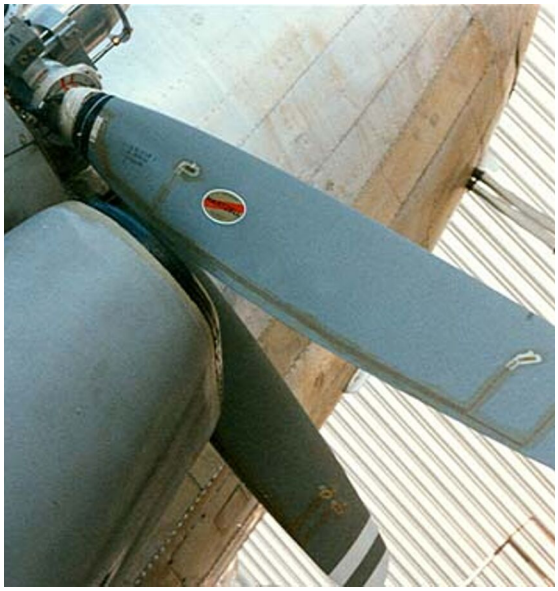
The advantages to wireless communication are many when a measurement application is at a remote distance. Unlike traditional wiring, wireless telemetry is less impeded by physical barriers. Signals can go through walls, piping, ducts, and most other materials with relatively little interference. Also, as mentioned above, wireless systems only require access to specific measurement locations or nodes. This greatly lowers the complexity of installing and maintaining systems applied over large-scale surfaces or regions of land.

For long-term civil structures such as bridges and buildings, remotely monitoring the loading of the structure can help pinpoint damage. Traditionally, visual inspections have been used to detect structural damage. These visual inspections are only effective as the frequency of inspection and the subjective judgment of the inspector. The use of grids of wireless load cells or strain gauges can eliminate much of this human effort and potential error. These grids create a matrix that allows the monitoring of large surfaces (see figure below). This in turn leads to earlier and faster detection of strain localization and prediction of structural damage.



One can easily conclude from this that wireless automation reduces inspection costs and the risks associated with accessing large structures and buildings for inspections. Automated monitoring of structures through wireless transmission can ultimately improve the life of the structure, regulate scheduled maintenance, and reduce inspection time.

DYNAMIC AND MOVING SYSTEMS

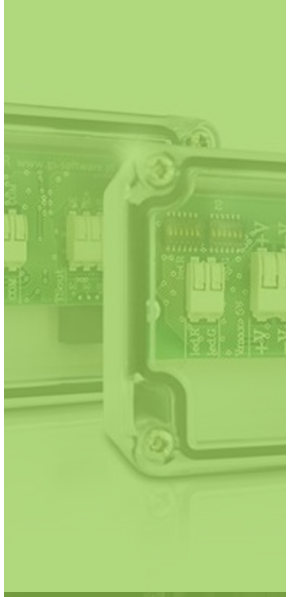


When the object or system being measured is fixed or static, connections to the measuring system can be simple. However, if the object being measured is mobile, monitoring becomes an increasingly complex challenge. Load cell wiring can interfere with the motion of the system and can be damaged in dynamic applications.

Some examples of mobile applications using load cell measurement are cranes, forklift scales, and other hoisting applications. Propellers, wind turbine blades, pumps, rotors, and engines are common applications of fast moving parts.

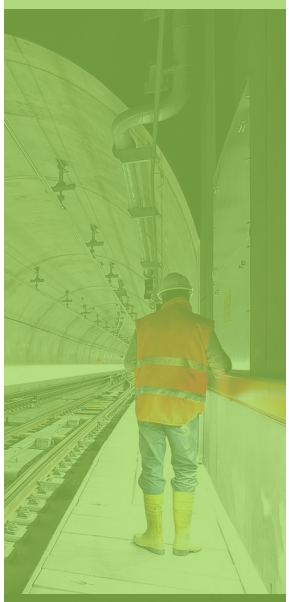
ROTATING SYSTEMS

Any rotating system that requires measurement creates a challenge when measuring.



Slip rings are electromechanical devices that transmit an electrical signal from a rotating system to a fixed system. Rotating objects cannot be restrained by connected wiring so a slip ring is used to transfer both power and data. Slip rings simplify systems and reduce wired connections that could be damaged during operations.

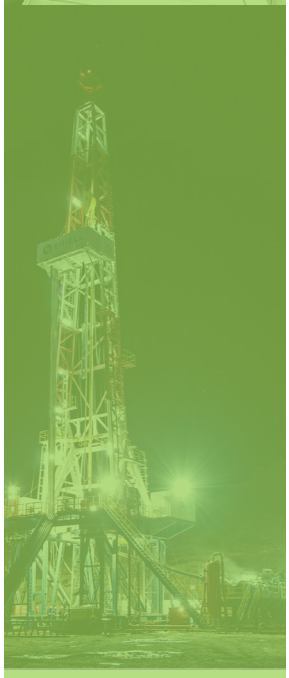
These devices do require frequent maintenance and struggle with reliability. Because they are subject to constant movement, slip rings need constant upkeep. They can degrade due to contaminants and constant abrasion if they are not properly maintained. Slip rings are difficult to repair and usually require replacement if they are damaged.



Reliability aside, slip rings are often preferred for high-speed or high-rpm data transmission. Market solutions exist that fully replace rotating gauges and load cells with wireless transmitters, but they become less accurate as speeds increase. This makes them impractical to use on applications like engines. Wireless technology is always improving; however slip rings remain the most feasible solution.

HOISTED APPLICATIONS

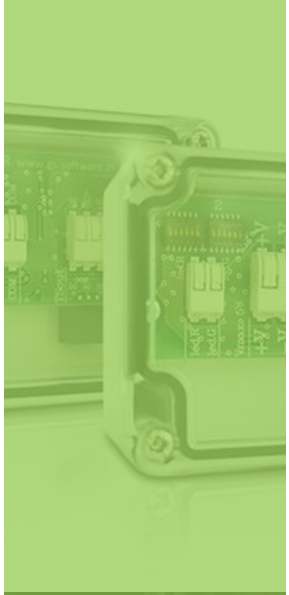
Cranes and other hoists are in constant movement during standard operations. At the same time, there is the need to monitor the loads they bear, for safe operations. Using wireless technology for these applications is especially useful around construction, as the load measuring fixtures are in constant movement.



Two load cell types used for these applications are crane scales and load pin load cells. These are described later in this article.

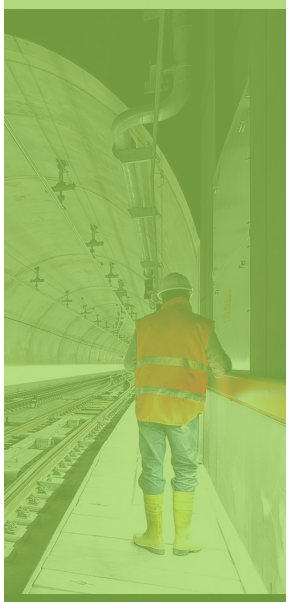
DANGEROUS ENVIRONMENTS

Many measurement applications exist that have inherent risk due to their location. Applications in harsh environments rely on load cells to collect accurate data. Reducing the amount of time required to install, inspect, and troubleshoot wiring or cables connected to load cells and other measurement devices in turn reduces the exposure of technicians to dangerous conditions.



Mining, oil refineries, furnaces, offshore and on-land oil rigs, and nuclear reactors are examples of hazardous environments where require load cells may exist. Any environment with higher than normal radiation, toxic or explosive atmospheric conditions, extreme temperatures, or subsea implementation can create risk to technicians and operators.

Wireless load cells help alleviate the exposure to these dangerous environments, reducing the overall risk and improving safety. While often times these conditions cannot be avoided, wireless telemetry eliminates several of the failure points and maintenance associated with wired connections.



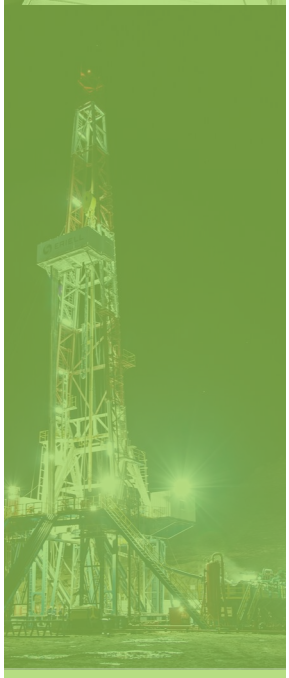
IMPLEMENTATION OF WIRELESS LOAD CELLS

As described above, wireless load cells can provide many advantages over wired connections. But there is more than one way to implement wireless transmission.

Conventionally, electrical wires or fiber-optic cables are the physical link between measurement devices and readouts. Optical transmission is usually only preferred in cases where electromagnetic interference may affect electrical signals. When using wireless telemetry, information may be transmitted optically or by radio; the latter being more common.

There are several ways to implement wireless transmissions to load cells through radio technology. The three main ones are:

- load cell devices designed with standard wireless transmitters that can be paired with any receiver
- wireless indicators that can be connected to most load cell devices
- bridges that act as the transmitter and receiver between any current or customized measurement system.



CONVERTING CONVENTIONAL LOAD CELLS TO WIRELESS

Often the easiest implementation is to outfit current analog load cells with wireless transmission. This provides minimal up-front investment in new measurement devices, while upgrading existing systems with minimal impact to the load cell frame or fixture.

With Tacuna Systems' TBX Wireless Load Cell Bridge, any standard load cell application can be converted to wireless. The TBX wireless bridge replaces any physical wire or cable connection between load cells and measurement indicators. It can easily be outfitted to existing systems or designed for new applications.

The TBX transmitter is connected directly to the load cell and paired with the TBX receiver in conjunction with either a weight indicator, or with the TBX app on any smartphone or tablet. The TBX-T transmitter can also be paired directly with software that makes storing and displaying data more user-friendly. The TBX-T transmitter utilizes Bluetooth low energy 2.4 GHz radio connections.

SPECIFIC HOISTING APPLICATIONS

As mentioned before, wireless technology is highly advantageous for cranes and other hoists as they are in constant motion during use.

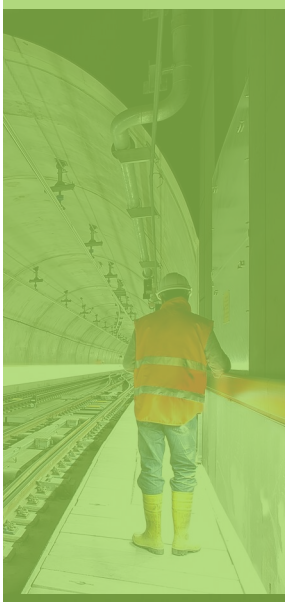
Tacuna Systems offers the AnyLoad 110ES-WL wireless crane scale with standard wireless transmitters for measuring crane loads of up to 100 tons. It is designed to withstand harsh conditions with salt and waterproof stainless steel casting and a silicone-enclosed antenna. It can also be used in other hoisting and lifting applications.

Another wireless hoisting option offered by Tacuna Systems is the Anyload TBX Shackle. This can be placed wherever pinned shackles are used as a primary load path. If a load is borne by a pin, this pin can be replaced by a load pin load cell. For additional information on suspension load cell systems, see the Tension and Suspension Applications section of our article Load Cell Mounting and Installation Best Practices.

WIRELESS DEVICES TO IMPROVE PRODUCTIVITY

At times, wired connections are still viable for a measuring system, but mobile readouts will increase efficiency or improve ease-of-use for operators. In these cases, Tacuna Systems recommends the use of a wireless display or indicator as the output interface.

Handheld indicators are are simple, single-point, devices that interface with most load cells. Tacuna Systems offers the AnyLoad 805HP-WL Wireless Hand Held Indicator and the AnyLoad P180 wireless display.



CONCLUSION

With the rise in cloud computing, internet incorporation, and big data analysis, wireless systems will increasingly be critical to business innovation. As the reliability and speed of wireless technology improves, companies will continue to swap physical connections for digital and wireless.

Wireless transmission of data in load cell measurements likewise continues to improve. Wireless technology can be outfitted to most load cell applications. It allows operators to gather accurate, real-time measurements in distant, dynamic or dangerous environments. It can be used for weighing applications on moving systems like wind turbines, in fixtures with tight tolerances where wires could become damaged, or in inaccessible environments. It gives operators increased mobility and maneuverability, improving their speed and efficiency in both operating and maintaining the load cell application. Utilizing wireless load cells can ultimately improve safety for operators and technicians, and reduce the cost of installation and maintenance.References

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