Wireless Limit Switches maintain reliability while eliminating the cables

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Simply easy!

Telemecanique
Sensors

Typical hesitations to eliminate cables are based more on tradition than actual analysis

Installing limit switches over the past century has been a very common practice worldwide: the limit switch is mounted in its proper position and then the cable is attached to the Limit Switch. The other end of the cable is then carefully routed through the machine environment to the limit switch signal's ultimate destination. In some instances, the cabling system is routed first and then the Limit Switch is mounted and connected to the cable. Regardless of the exact sequence, the Limit Switch installation process is an extremely familiar tradition among most automation professionals.

Then came the advent of wireless [See Figure 1].

Suddenly, the Limit Switch did not necessarily need a cable connected to it. New Wireless Limit Switches were simply mounted in their position and the installation work at the point of detection was finished! The careful routing of the cable from the Limit Switch to the Limit Switch signal's destination was completely eliminated. The newly installed limit switch's signal requiring testing traveled through the *air* to the receiver...instead of through a cable.

And some of those experienced engineers who have routed miles upon miles of cabling over the years said to themselves…

..."*can we really rely on that?"*

Suddenly, the Limit Switch did not necessarily need a cable connected to it...

Analytics vs. tradition

As with any discipline, a proposed hypothesis only finds concrete acceptance when an honest, open-minded investigation bears out the advantages of the theory. Progress is made when the resulting analysis confirms the proposed concept increases efficiency and/or provides other tangible benefits.

Now that the revolutionary wireless limit switch has established a multi-year presence in the field, there is convincing data to show wireless limit switches can provide the same efficiency and profitability as wired switches. This can be illustrated by wireless switch performance levels, wireless switch damage risks that are at least equal to the damage risks associated with traditionally wired switches, the growing number of applications where wireless switches are clearly an advantageous solution, and the universal adaptability of wireless switch signals.

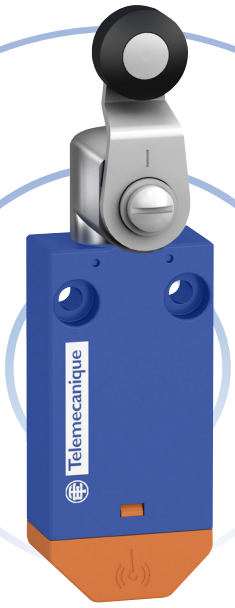

Figure 1

Telemecanique Sensors XCMW Wireless Limit Switch

Each of the above issues are discussed more at length in the sections that follow.

Wireless Limit Switches maintain cable-connected limit switch performance levels

One of the primary concerns about new wireless limit switch technology is the limit switch signal not reliably reaching its destination without a cable. While this concern is valid among those new to wireless technology, the 2019 forecasted growth of wireless data telecommunications worldwide was approximately 5%. In 2020, spending on wireless data communications was expected to increase by 7% over the previous year. Automation plants implementing wireless communications have reported overall production efficiency gains of up to 15%.

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So how have those making wireless a successful venture done so without compromising efficiency?

Proper implementation

Mastering any technology is predicated on maximizing its strengths and accounting for its weaknesses. Just as engineers have to account for the physical presence and pathways of connected cables, those working with wireless signals understand and account for the loss of a wireless signal that can happen when it passes through certain materials. Figure 2 gives examples of signal attenuation.

Signal attenuation by Material

Glass window	10-20%*
Plaster wall	30-45%*
Brick wall	60%*
Concrete wall	70-80%*
Metal structure	50-100%*

*Values for indication purposes only. Actual values depend on the thickness and nature of the material.

Figure 2

The engineers achieving significant gains in productivity have done so by respecting the inherent challenges of wireless technology and then benefitting from the lack of cable expense, installation, and replacement costs. When configured correctly, roughly only 2% of a wireless signal may be lost, making it very comparable to the loss of signal experienced through standard cable connection defects, breakage or wear.

This brings us to the next major point of comparison.

Wireless Limit Switches pose an equally minimal damage risk as cabled switches

Performance levels of both cable-connected and wireless limit switches are adversely affected when damage occurs to the switch itself or to the means through which the limit switch signal is transmitted. Comparing the two limit switch configurations in relation to these damage risks is extremely enlightening.

Part 1: Risk of damage to the limit switch

Wireless switches contain a transmitter, while standard cable-connected switches do not. But the common assumption

The assumption that the body of the wireless limit switch is larger and more susceptible to damage is incorrect.

Figure 3

A miniature Wireless Limit Limit Switch (on right) compared to a standard size limit switch.

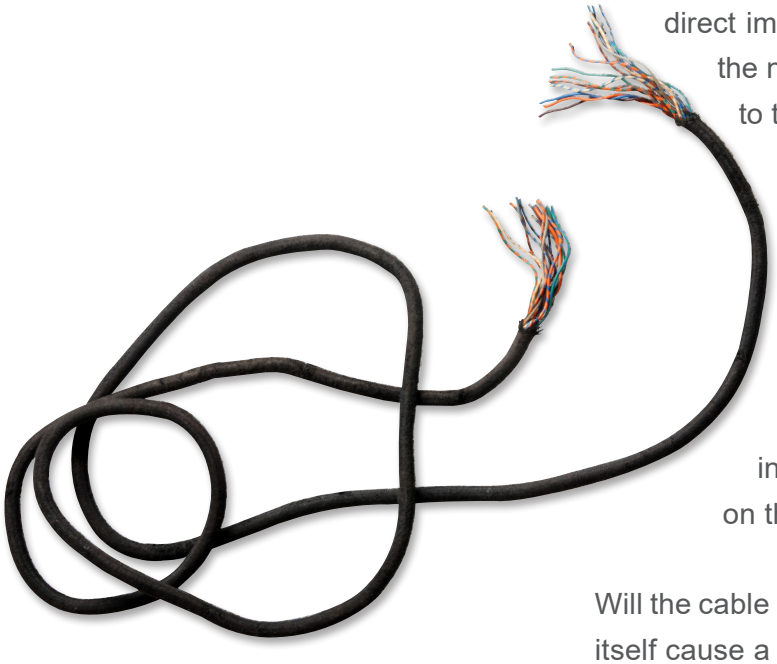
that the body of the wireless limit switch must be larger and, consequently, more susceptible to damage is incorrect. New wireless limit switches are actually manufactured in a miniature format [See Figure 3]! Thus, installing a wireless limit switch poses no more damage risk to the limit switch body than installing a typical cable-connected miniature limit switch!

Furthermore, because new wireless limit switches come in the exact same body formats as wired switches, updating existing limit switch applications to wireless is “Simply easy!”

A natural follow-up question would be, “Doesn’t the wireless switch’s transmission antenna extend outside the limit switch body, creating a bigger risk for potential damage?’

That question will be answered in the “Risk of damage to the signal method” section below.

Part 2: Risk of damage to the signal method



After establishing that wireless limit switches pose no additional direct impact damage risk than cable-connected switches, the next point of comparison would be the damage risk to the signal transfer methods.

2a: Damage risks to signals via cable

The major risk factor affecting the cable-connected receiver’s reception of the limit switch signal is wear or damage to the cable itself. This risk factor correspondingly increases as the length of the cable increases. The risk factor also increases based on the areas through which the cable must route.

Will the cable route through a high-traffic area? Will the machine itself cause a lot of cable movement? Do weather conditions or other environmental factors wear on the cables?

As the risk of cable fraying or breaking increases, so, too, do the advantages of wireless limit switches when comparing the two switch types.

On applications where movement is excessive, the advantages of wireless are magnified.

2b: Damage risks to wireless signals

A wireless limit switch must transmit the data it collects through an antenna. While some wireless limit switches have an antenna external to the switch body (increasing the antenna damage risk), there are wireless limit switches available with the transmission antenna incorporated inside the switch body. Telemecanique Sensors is an example of a brand that has implemented this innovative concept. The antenna cannot be damaged unless the body of the switch is impacted.

The only other “damage” risk to the wireless switch signal are external factors that may affect the signal itself. Assuming the wireless solution is implemented taking into consideration the attenuation factors previously covered, wireless signal disruption rates are virtually the same as the rate of cable signal failures. Even in instances where short, reliable cables outperform a wireless signal, the miniscule difference in the performance levels of the two switch types usually do not warrant the extra expense of installing, maintaining, and risking the damage to physical cables.

Figure 4

A Ski Lift application using Limit Switches to detect the position of the safety lever.

On applications where movement is excessive, the advantages of wireless are magnified. An example of this type of application is a Ski Lift [Figure 4], where a limit switch detects the position of the safety lever. Any cable extending from this limit switch would not only be subject to the constant movement of the lift car and safety lever, but to the outside weather conditions as well. The wireless switch eliminates potential cable damage and the costs associated with maintaining the frequently frayed and worn cables.

It is the *independence* and *mobility* of the wireless limit switch making it the most advantageous solution for this Ski Lift application, and those same qualities make it the most advantageous solution for many other applications.

Wireless Limit Switches ideally serve many existing applications ...and inspire new ones

Figure 5

An automatic guide vehicle.

Example applications which demonstrate the advantages of wireless limit switches abound. Automatic Guide Vehicles, transport tracks, linear robots, rotating components, and other mobile devices are all better served with having *mobile* wireless limit switches attached to them.

In the case of Automatic Guide Vehicles [Figure 5] the wireless limit switch can detect the presence of objects on the vehicle without attached wires interfering with the vehicle's mobility. Each of the above example applications benefit from utilizing wireless limit switches because the regular replacement of worn wires is also eliminated.

As with any new technology, the more end users perceive and take advantage of the strengths associated with wireless, the familiarity will generate ideas. New possibilities will emerge.

At this point, one might say, "O.K., it meets wired performance levels, has the same risk of damage, eliminates wires, and opens up new, mobile possibilities...but can I use it?" The next section answers this question.

Wireless Limit Switches are adaptable globally

Ideally designed Wireless Limit Switches will emit a signal at a 2.4GHz frequency using Zigbee universal communication protocol, a standard that gives it worldwide acceptance. Sending a signal at this frequency allows the signal to transmit over a larger coverage area and gives more flexibility to the places wireless limit switches can be installed.

This type of wireless communication is ideal for distances of up to 100 meters in the line of sight or 25 meters in a factory

environment. This distance can even be increased by installing repeating antennas.

Those new to wireless switches should also source wireless networks that are cost effective, small in size, and low power, made of just enough hardware and firmware to transmit intermittent data at a low speed rate (250 kb/s maximum).

The path to wireless

The comparison of wireless limit switches to cable-connected switches reveals the present and ongoing change in the industry. In cases where the wireless switch comes in a miniature version, contains an internal antenna, and uses the globally adaptable 2.4GHz frequency, the wireless switch clearly equals its cable-connected counterpart.

One brand of wireless limit switches including all these features is Telemecanique Sensors. A global leader in limit switch technology for over 100 years, Telemecanique Sensors has applied its extensive knowledge of traditional limit switch applications to modern technological advances in wireless technology.

No battery replacement means less maintenance time, less maintenance cost, and less battery waste in the environment.

Another significant advantage to the Telemecanique Sensors wireless switch is that it does not use batteries. The energy from the switch's plunger movement converts into the power necessary to transmit the wireless signal. No battery replacement means less maintenance time, less cost, and less battery waste in the environment.

Cut the cabling expenses. Cut the battery expenses. And cut the maintenance time involved with both...all while maintaining the reliability and efficiency of traditional limit switches.

Find out more at www.tesensors.com/XCWireless

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12/2020 9006BR1904 R12/20