

Considerations For Selecting TPMS Technology



TireStamp
The Leader in TPMS Innovation

1. INTRODUCTION

The trucking industry is in the process of transitioning into a new era. It is incorporating technology into every aspect of its business at an ever increasing rate that impacts driver behavior and retention, dispatching, gathers and disseminates documents to drivers, clients and business partners, and monitors freight as well as vehicle component performance and its maintenance. Mandated electronic logging devices (ELDs) have certainly helped push technology adoption to the “late majority” of fleets who are skeptical, conservative, and cost-sensitive as well as the technology “laggards” who are the last to adopt technology and are averse to change.

But there are more than just federal regulations that are motivating fleets to embrace these technologies. Total cost of ownership (TCO), downtime reduction, the driver shortage and equipment utilization are emerging as other primary reasons fleet managers are adopting advanced truck technologies. In addition, fleets continue to look to adopt fuel-efficient technologies that deliver value-added benefits. One technology that impacts fuel economy and also extends tire life, lowers TCO, and improves safety is the second generation of tire pressure monitoring systems also known as TPMS 2.0 solutions.

Recent consumer research performed by Research and Markets (researchandmarkets.com) showed that up to 35% of fleets surveyed in North America will adopt TPMS this year. Since tires are the second leading cause of roadside inspection citations after brakes, fleets are finding that they also need a technology to maintain their tires better, prevent enroute tire problems, and reduce the number of tick marks in the “Bad” column of their CSA ratings. With many TPMS available to choose from, fleets must now determine which TPMS is right for them. There is much to consider.



For decades, the transportation industry has been focused on “in-cab” technologies to advise drivers of tire problems and to keep tires properly inflated. Unfortunately, company drivers and leased drivers pulling company equipment are paid to deliver freight and have never had an interest in being tire technicians too. If left to their own devices without instruction from Dispatch, they have routinely disregarded the in-cab alerts until they got to their final destination to the detriment of the vehicles’ tires and the fleet’s expense.

Today, “out of cab” technologies have been developed that provide fleet managers with visibility of the health of their vehicles’ tires even when the units are hundreds of miles away. They can then ensure that the appropriate actions are taken to prevent tire failures, proactively maintain tires, and control costs.

Next TPMS Generation: TPMS 2.0

TPMS 2.0 is the next generation of tire pressure monitoring systems that picks up where TPMS 1.0 systems stop. Instead of just advising the driver of a tire problem, they send the tire data off the vehicle to a database

in the Cloud where the data is stored, analyzed, and compared to the fleet's alert thresholds. These remote diagnostic systems then send alerts and generate reports to fleet personnel that enable them to not only address developing tire problems on specific vehicles but maintain their entire tire fleet better. They also provide visibility of tires requiring attention and form the foundation of a good tire maintenance program.

The power of these systems is their ability to provide tire visibility across the entire fleet in addition to knowing when specific tire problems are developing. Tire status can be checked on demand through any Internet connected device. This enables fleet personnel to monitor tires using measurable, actionable and manageable automated tire processes to improve tire maintenance, reduce tire-related costs and improve fuel economy as well as safety.

Some TPMS 2.0 systems also track a vehicle's location so that the fleet knows where its vehicles are at all times and where tire service work occurred. As is common with any Software-as-a-Service (SaaS) solutions, TPMS 2.0 systems typically include a monthly subscription service that covers all costs required to generate alerts, reports and, provides fleet personnel with around the clock access to their tire and vehicle data.

Several TPMS 1.0 systems have been integrated with telematics service providers to transmit tire alerts off the vehicle in order to communicate them to the fleet. Most of these systems provide the fleet with alerts for inflation and extreme overheating problems but may have limited data storage and analysis capabilities so reports and a total fleet view of the fleet's tires may not always be possible.

It is a misconception to think that multiple network connections off fleet vehicles is unproductive, redundant, and/or expensive. The truth is that multiple connections by vehicle and component manufacturers have long been able to optimize data communications using their knowledge of their own particular systems to minimize communications costs. As data communications costs continue to plummet, these costs are negligible when compared to the value that fleets can gain from the visibility this data provides. Many leading TPMS 2.0 suppliers provide vehicle communications for free as they are focused on driving savings to their fleet customers through the visibility and data they provide 24/7.

2. FACTORS TO CONSIDER

Carriers should consider a variety of factors when considering the implementation of TPMS 2.0 solutions in their organizations. When researching these systems, be sure you understand the features, capabilities, limitations and flexibilities of each system so that you choose the one that is right for your fleet.

Sensors

One of the first things to consider is the type of sensor that is used with the TPMS. Is it external to the tire/wheel assembly or internal? External TPMS sensors usually are screwed onto the valve stem in place of the valve cap and can be damaged by curbing, stolen, forgotten to be reinstalled after adjusting inflation pressure, and are not very accurate in measuring temperature since they measure the pressure in the valve stem which is cooled as the vehicle rolls down the road and heated up when parked in the sun. Their advantage is that the tire does not have to be demounted to install the sensor which initially may save time.

Internal TPMS sensors whether mounted on the wheel, on the tire innerliner or attached to the base of the valve stem are protected from the outside environment and more accurately measure temperature. This enables them to more quickly generate overheating alerts that prevent axle end fires and wheel offs due to frozen bearings. They have the disadvantage of being mounted when the tire is off the wheel but in a normal tire maintenance program, this step can simply be added to the mounting/demounting process. As a general rule, liquid tire additives (sealants, balancers and coolants) should not be used with internal TPMS sensors.

Some sensors have non-replaceable batteries. They usually last between 5 and 7 years. Other sensors' batteries can be replaced and usually have shorter lifespans. The question you must ask yourself is whether you want to be replacing batteries periodically or simply replacing the sensor after several years of operation. It is important to remember that you shouldn't only be considering the sensor price but its total cost over its useful life. Some sensors appear expensive until factoring in the expected sensor life, replacement costs over the vehicle's life, level of effort to perform tire service and on-going maintenance costs. Looking at all operational costs from a longer perspective may change which sensors are truly the most cost effective for your fleet's operation.

Another big factor to consider is the degree of complexity in changing the wheel position to which a TPMS sensor is assigned. This is one of the biggest challenges fleets report with maintaining tire pressure monitoring systems. Tire/wheel assemblies in normal fleet operations can be rotated frequently on the vehicle and to other vehicles depending on the fleet's maintenance processes. If moving and reassigning wheel positions is complex and cumbersome, the risk of not properly assigning sensors to their actual wheel position increases greatly. If alerts are generated for tires in the wrong positions, confidence in the system is lost when these tires are checked and found to be fine.

Also correcting all the sensors' wheel positions on the vehicle can be aggravating and time consuming. Some sensors address this problem by permanently assigning a wheel position to each sensor. However, this can add another degree of complexity to tire maintenance. The easiest way to change sensor positions is in TPMS 2.0 systems that enable you to make changes through software. Sensor positions can be verified and changed as required quickly and easily.

Another key consideration is whether the sensors are permanently programmed for a specific target pressure. If, for example, a sensor is programmed at a target pressure of 100 psi and to send alerts at 85 psi, when the fleet wants to change its target pressure or alert setting, it will have to change its sensors. However, if the target pressure and alert thresholds are stored in the cloud rather than in the sensor, changes can be quickly and

There are many different types of sensors to choose from



easily made any time the fleet wants while the vehicles are on the road. Many fleets have found that as they become more comfortable with their TPMS 2.0 systems, they were able to tighten their alert thresholds and squeeze even more savings from their new, efficient and effective, tire management programs. Being able to change target pressures and alert thresholds easily makes this possible.

Another thing to consider is that if changes to target pressure and alert thresholds have to be made to the sensors, these changes can only be made to one vehicle at a time when the vehicle is on hand. However, if changes are made through the TPMS 2.0 solution's software, these changes can be made to one vehicle, a group of vehicles, or the entire fleet immediately with a click of a mouse and are accomplished over-the-air.

When choosing a TPMS 2.0 system, one should also think about the flexibility of the system and the ability to change sensor types if it is found that the sensors selected do not work well in the fleet's application. (For example, the external sensors originally chosen by a fleet are found to be prone to damage, exhibit a high replacement rate and an internal sensor is determined to be more appropriate.) Keeping this in mind, you should ask, "Does the TPMS only provide one type of sensor or does the user have the ability to change sensors without changing the vehicle electronics? If different sensors are offered, can the vehicle electronics read both types of sensors so that the sensors can be changed out through attrition or do all of the sensors have to be changed at one time?"

Vehicle Electronics

Most TPMS 2.0 solutions have an in-cab display (■) for the driver that provides audible and/or visual alerts and are usually mounted on the dashboard. The display may show schematics of the entire vehicle, require the driver to scroll through the schematic to find the problem tires, or be designed with driver distraction in mind and only provides lights indicating a problem which requires the driver to pull over and park to get more information on his/her smartphone or by calling Dispatch. Displays provided by truck OEMs may be built into the dashboard. Some other TPMS 2.0 solutions appeal to fleets that don't want their drivers alerted to tire problems since their in-cab displays can be hidden in glove compartments or overhead bins with their audible alarms turned off.

Beside the in-cab display, transceivers (●) may be required that pick up the radio signals from the TPMS sensors in the tires and transmit them into the in-cab display or control box which then sends the data off the vehicle.



Trailer TPMS 2.0 solutions require some kind of electronic box (●) that identifies them to the tractors they are hooked to so that the trailer tires are monitored by the tractors as well. They also usually have transceivers located near the tires to pick up the TPMS transmissions and forward them to the tractor.

Some TPMS 2.0 solutions also provide standalone systems for trailers that contain their own power supply and operate when the trailers are unhooked from tractors. Some of these systems are also integrated into trailer telematics to send the trailer tire data or alerts off the vehicle. Always make sure when you are considering a TPMS for your trailers that you ask TPMS vendors how frequently and how long tires will be actually monitored when trailers are both hooked to a tractor and also when dropped in your yard or at a customer’s location. Determine whether this limited visibility when unhooked provides additional value to your fleet or whether a TPMS 2.0 system that warns you ahead of time about tire-related issues before the trailer gets unhooked is sufficient for your fleet’s operations.

Alerts and Reminders

Almost all TPMS 2.0 systems provide alerts for underinflation and overheating. Many provide alerts for overinflation. Some systems also provide alerts for differences in dual tire pressure (which can cause irregular tread wear), and provide reminders based on vehicle mileage for checking the wheel nut torque after a tire change and for vehicle preventive maintenance (PM) inspections which the fleet can customize.

Another important quality of a TPMS solution is whether it calculates cold inflation pressure. Systems that do this use algorithms that leverage the hot inflation pressure reported by the sensors along with the ambient temperature to calculate the cold inflation pressure. This provides the benefit of sending accurate alerts for underinflation much quicker than systems that do not. This also eliminates most false alarms that occur due to ambient temperature swings during seasonal changes. The chart below shows that the TPMS solution issued an alert about 14 hours before the sensor realized there was a problem.



An advanced feature which some TPMS 2.0 solutions provide that is important to fleets with cross country coverage is the ability of the TPMS solution to send alerts to people at the closest fleet location to the vehicle who can respond to the alerts rather than spamming technicians at the vehicle’s original domicile who can’t do anything about them. Recipients can include the fleet’s own technicians, outsourced tire service providers located nearby as well as the fleet’s call center.

The information contained in a TPMS 2.0 solution's alerts is an important consideration. Some systems simply provide the current state of the problematic tire. Others also display the rest of the pressures on the vehicle. This data can prompt technicians while working on the vehicle to adjust pressure in tires that have not generated alerts yet but are approaching alert thresholds, enable them to be proactive in their tire maintenance, and prevent other alerts from being triggered in the near future. It gives them a view of the vehicle's complete tire health while it is in front of them which is the most cost-effective way to address tire issues.

Some systems' alerts also provide service technicians with instructions for servicing problem tires and advises them of the exact number of pounds of pressure to adjust so that the proper pressure is attained even if the technician's gauge is uncalibrated or he doesn't know what the tire's target pressure is. This is another feature that not all TPMS 2.0 systems provide but could be of great benefit to your fleet.

It's also handy for you to know from the alert where the vehicle is so that you and Dispatch can determine the best course of action to address the problem based on the vehicle's location.

An advanced feature that is being demanded by more and more fleets lately is "predictive analytics". The advent of big data is enabling the development and implementation of predictive analytics for a range of applications including tires. This feature leverages collected tire data from the past to predict and prevent future catastrophic events. Predicting component failure is becoming more relevant to vehicle maintenance especially in the case of tires which can be replaced or properly maintained before they result in unscheduled downtime. Some TPMS 2.0 systems now have the capability to predict when tires will become damaged due to underinflation and/or overheating and provide the amount of time you have to address these problems before a catastrophic situation occurs. This capability uses advanced algorithms that mine tire data to forecast when tire pressure will reach critical levels. This enables Operations and Maintenance to work together to operate more efficiently to avoid disruptions and meet delivery schedules, decide how to most cost-effectively address problem tires before they are damaged, and prevent emergency breakdowns.

Data Storage and Access

Another major consideration is how your fleet will access tire data and in what format will the fleet obtain tire data. Does the TPMS 2.0 solution store all tire data so that fleet users can see data for your entire fleet, a specific group of vehicles, one vehicle, or even down to a specific tire? Or are tire alerts simply transmitted off the vehicle and stored without any additional analysis? Does the TPMS 2.0 solution provide automatic tire recordkeeping in addition to keeping track of tire mileage in various inflation states?

In the past many TPMS companies delivered reams of Excel spreadsheets loaded with raw tire data to fleets and asked them to make sense of it all. This overloads most fleets and is not helpful to anybody. Some TPMS 2.0 systems provide useful reports that can be delivered to various users at their specified dates and times. You should determine if the reports the TPMS generates really do provide your fleet personnel with the information needed for your operations and without requiring you to mine the nuggets of information you require to proactively maintain your fleet's tires. Ensure that the reports are useful and actionable. Some reports should also provide information on the level of maintenance for the whole fleet and provide

measurable data that can be used to monitor and improve the quality of the fleet's tire maintenance. Some TPMS companies will also customize reports for fleet clients, if required.

Another feature in some TPMS 2.0 systems is your ability to customize alert thresholds and target pressures to match your fleet's requirements in real-time and over-the-air. Changes should be made quickly and easily without having to physically touch the vehicle and data should also be available on demand so that fleet personnel can see where a vehicle is and the status of its tires' pressure and temperatures at any time. In addition some TPMS solutions enable service personnel to use their app to record tire service work even after the vehicle has left the fleet's yard.

Another consideration is the peripheral hardware required to use the system. Some tire pressure monitoring systems require the use of special hand-held readers to access data while other systems can be accessed using smartphones and/or tablets. This really boils down to whether you want your technicians to use devices they already use personally and are comfortable with or use more expensive one-task specific devices that are an additional expense.

Should you want your fleet's tire data integrated into your company's fleet management software for additional analysis and processing, consider TPMS 2.0 solutions that facilitate automated transfer of tire data easily via an Application Programming Interface (API). Your fleet's IT department will appreciate this feature and because it knows how to interact with APIs and your fleet will quickly leverage tire data more efficiently and effectively.

Management Tools

Those systems that send all tire data to the Cloud can also provide you with useful tools required to improve tire maintenance on a fleet-wide level. Since instead of just looking at one vehicle at a time, these systems enable you to get the "big picture" view of your entire fleet and see the quality of your fleet's tire health quickly. It provides you with a measure of the quality of tire maintenance at each fleet location and can identify locations that need improvement. It can also identify types of vehicles prone to overheating axle ends, tire service providers who are not meeting fleet expectations, and many other factors that you may want to know about your fleet's tires and their maintenance. The possibilities are endless with the right TPMS 2.0 solution.

Installation and Maintenance

Installation of TPMS 2.0 systems can be done at the factory in some cases or as a retrofit on existing equipment. Some OEMs offer TPMS along with their own telematics package while some telematics companies have partnered with TPMS 1.0 companies to provide TPMS 2.0 solutions that can be installed at the factory along with their telematics boxes. Installations of standalone TPMS 2.0 systems are usually done in the aftermarket and are fairly easy and quick to do. Installing the vehicle electronics on a tractor or truck usually takes a vehicle technician about an hour to do and about 30 minutes on a trailer. Sensors are installed by tire technicians and the time to install them is dependent upon the type of sensor that is used but internal sensors that attach to the wheel or base of the valve stem take about 1-2 minutes to install prior to mounting the tires.

Tire technicians must be trained to properly install sensors, mount and demount tires with internal sensors to prevent damaging them, and to move sensors to new wheel positions so that the TPMS solution recognizes the new wheel positions on which the sensors are installed. Detailed system and sensor maintenance instructions and training should be provided by the TPMS 2.0 manufacturer.

Outside service providers can also be contracted to install as well as maintain TPMS 2.0 systems.

One of the most overlooked features of TPMS 2.0 solutions is providing the knowledge that they are working correctly 24/7. The more advanced TPMS 2.0 systems monitor themselves and generate alerts for TPMS equipment-related issues. If vehicles are on the road with missing or inoperable sensors or have electronic components such as transceivers or the in-cab displays that are not working, how would you know that you have lost visibility of this unit or its tires? Having a TPMS solution that actively monitors and advises you when the loss of tire monitoring capabilities on a vehicle has occurred is a very important consideration.

3. A TPMS EVALUATION DOESN'T NEED TO BE AS LONG AS YOU THINK

Before deploying TPMS 2.0 systems in your fleet, you should thoroughly research the products available on the market, the features and benefits they offer, and select the best one(s) for your fleet's operation. It may be foolish to think that just because a TPMS comes on a truck from the factory that it will meet your fleet's needs. Is your fleet like every other fleet?

Then evaluate the solutions on a few vehicles to see exactly how they perform, are accepted in your fleet, and the actual savings they provide. A TPMS 2.0 solution that does not provide the visibility your fleet needs to get ahead of its tire problems or is difficult to use and maintain in your operation could ultimately be a wasted expenditure. However, the TPMS 2.0 solution that can be customized to your fleet's operation and needs could save it millions.

You may think that you need to evaluate TPMS 2.0 solutions over many months or years. Testing of these systems is not the same as testing tires which requires many months or years in most fleet operations to provide accurate tire wear and durability data. However, TPMS 2.0 systems provide total tire visibility and can answer all your questions within just a few months. This means that your fleet can begin benefiting from these systems even sooner than anticipated.

Access a checklist of things you should consider when selecting a TPMS 2.0 solution by clicking [here](#). This checklist will help you in determining what your fleet needs in a TPMS system and ensures you consider all the factors when selecting one.

TireStamp: A Leader in Commercial TPMS Technology

TireStamp is the leading developer of innovative Tire Pressure Monitoring Systems (TPMS) for trucks that meet the TPMS 2.0 standard for commercial, construction, industrial and passenger fleet operators. Our TireVigil Cloud Service is available directly to commercial fleets, leading tire dealers and commercial tire OEMs. As an asset intelligence company utilizing a Software-as-a-Service (SaaS) business model, TireStamp provides expertise on truck tires and their effects on fleets' operating costs, tire program management, asset management and other critical performance data that enable fleet users to reduce tire and fuel costs in addition to improving productivity and safety. Visit www.tirestamp.com for more information.