PHILLIPS CONNECT

Technology That Moves Us Forward®

OPTIMIZING EFFICIENCY AND REDUCING WASTE WITH SMART SENSOR TECHNOLOGY

Optimizing Efficiency and Reducing Waste with Smart Sensor Technology

Fleet managers are constantly seeking innovative solutions to enhance operational efficiency while promoting sustainability, especially in today's economic and regulatory landscape. Advancements in sensor technology are now enabling trucking fleets to leverage real-time data to proactively monitor and manage their assets, which ultimately reduces fuel consumption, maximizes the lifespan of equipment and increases efficiency, helping fleets meet their operational and environmental goals.

Optimizing Fleet Sustainability Through Sensor Technology

Phillips Connect's suite of smart sensors and connected solutions provide immediate, actionable data that give fleet managers complete visibility and control over their assets, from tracking trailers to monitoring tire pressure, door status and cargo. More importantly, the technology helps drivers, maintenance managers and fleets optimize tire management, improve cargo integrity and monitor assets to stay ahead of potential issues and get the most out of every mile.

Improving Fuel Efficiency

Fuel consumption is one of the most significant contributors to a fleet's environmental footprint. Multiple factors impact fuel efficiency, but one of the simplest and most effective ways to reduce fuel use is through proper tire pressure. Maintaining optimal tire pressure minimizes rolling resistance, extends tire life and enhances overall vehicle performance. According to the U.S. Environmental Protection Agency, properly inflated tires can save the trucking industry around 100 gallons of fuel per truck annually.(i) Additionally, the U.S. Department of Energy estimates that a tire underinflated by just 10% can reduce fuel efficiency by 1% to 2%.[ii]

Tire underinflation leads to about a 5% to 12% degradation in tire wear for an individual tire that is 10 psi underinflated, and a 0.5% to 1% increase in fuel consumption.[v] Underinflated tires create additional rolling resistance, forcing engines to work harder and burn more fuel. They flex more, which can increase stopping distances and cause a buildup of heat, increasing the risk of a blowout—a common cause of over-the-road failures. Underinflated tires also absorb more of the road shock, transferring excess stress to suspension components and leading to premature wear and replacement.

Tire Inflation Numbers Don't Lie

Proper tire inflation is critical to the optimal operation of a commercial vehicle, but inflation-related challenges persist within the trucking industry. The North American Council for Freight Efficiency's latest update to its Tire Pressure Systems Confidence Report found that fleets see increased productivity when tires are properly inflated and yet statistics show that only 46% of all tractor tires and 38% of all trailer tires inspected are within ±5 psi of their target inflation pressure.[iii] NACFE has reported that:[iv]

- About one out of five tractors/trucks is operating with one or more tires underinflated by at least 20 psi.
- About one in five trailers is operating with one or more tires underinflated by at least 20 psi.
- Nearly 3.5% of all tractors/trucks operate with four or more tires underinflated by at least 20 psi.
- 3% of all trailers operate with four or more tires underinflated by at least 20 psi.
- Approximately 3% of all trailers, and more than 3% of all tractors/trucks, are operating with at least one tire underinflated by 50 psi or more.

Overinflated tires create risks of their own. They lead to uneven tire wear, decreasing the lifespan of the tire. They also reduce grip, making a truck more prone to skidding, especially on wet or icy roads, and create a rougher ride, increasing stress on shocks and bushings and causing premature failures.

Phillips Connect takes a multi-pronged approach to tire sensors, combining a tire pressure monitoring system, an automatic tire inflation system that automatically maintains the correct tire pressure add to fleet's specification, and wheel-end monitoring to provide real-time insights into wheel-end temperatures, ensuring optimal fuel efficiency and safety conditions.

Beyond fuel savings, TPMS reduces uneven wear, minimizes the risk of tire damage and enhances tire longevity, reducing unnecessary replacements and minimizing waste. Producing a single Class 8 tire requires approximately 22 gallons of oil due to the raw materials and manufacturing energy needed. Plus, any tires that are worn but don't have excessive sidewall damage can be retreaded. A single tire can be reused several times through retreading, extending its useful life and keeping it out of landfills. Retreading a tire uses significantly less oil—just seven gallons—compared to creating a new tire.[vi]

Monitoring wheel-end temperatures—the heat generated around the wheel hub, bearings and brake system—as part of a TPMS is crucial for safety, performance and maintenance in Class 8 tractors and trailers. Wheel-end temperatures fluctuate due to braking, friction and road conditions. While some heat is expected, excessive temperatures can indicate serious issues, such as bearing failures or brake drag, that require immediate attention.

"Unfortunately, fleets have situations where the bearings fail on the trailers, especially the older these trailers get, and the conditions these trailers run in. It can be a problem," said Lawrence Bader, retired director of global automotive fleet systems for UPS and principal of Advanced Transportation Technology.

Bader added that it is difficult for drivers to identify a bearing issue without sensor technology. "He or she would have never known until it was too late," he explained. "This is one way we can determine well in advance for the safety of our drivers, for the safety of the public and for the safety of your goods traveling in a trailer, that we have a problem with a bearing."

Excessive wheel-end heat increases the risk of blowouts as well as fires, often referred to as thermal events.(vii) Both scenarios can damage equipment and cargo or lead to fuel spills or chemical leaks that may contaminate soil or water and require environmental remediation.

Tire-related problems are the leading cause of roadside failures, accounting for more than 50% of incidents.(viii) Roadside failures are not only more expensive than repairs done in a shop but also use more resources due to drivers idling—a major contributor to wasted fuel and increased wear on engines—and a repair truck being dispatched.

After UPS's initial deployment of trailers equipped with TPMS and ATIS, the fleet prevented tens of thousands of service failures. "That's approximately nine alerts per trailer annually," Bader said. "This proactive approach has improved safety and, unlocked significant cost-saving benefits across our fleet."

Bader said the granularity and quality of the data coming off the sensors makes a difference. "It is not only reading the pressure inside of each and every tire on the trailer, it's also picking up the PSI, tank pressure, and it's also reading the automated tire inflation system activation time," he said, adding that the system automatically fills the tires. "But, until now, we never took advantage of getting the data of the tire pressure. Is the automatic tire inflation system firing? If it is firing, how frequently is it firing and how long is it running?"

UPS also uses the data to create automated service requests.

Enhancing Safety and Efficiency Through ADAS and TPMS Integrations

Phillips Connect enhances Advanced Driver Assistance Systems—ADAS—by integrating TPMS through its DriverAssist platform. ADAS can use information about tires to enhance its safety features, such as adjusting braking distances or stability control based on the tire conditions. The integration also provides drivers instantaneous trailer insights directly in the cab, including continuous tire pressure and temperature monitoring. Immediate feedback empowers drivers to address issues early, enhancing safety and operational efficiency. Learn more at (INSERT WEBINAR LINK).

Extending Brake Life

Wear and tear on Class 8 truck brakes can lead to costly replacements, increased downtime and safety risks. The Federal Motor Carrier Safety Administration's Large Truck Crash Causation Study reported that brake problems were recorded in nearly 30% of trucks involved in crashes.[ix]

Besides that, during the Commercial Vehicle Safety Alliance's latest brake safety week, inspectors examined 16,725 commercial motor vehicle inspections, resulting in a 12.8% out-of-service rate due to brake-related violations. During the event, inspectors focused on lining and pad violations and found 382 lining/pad violations on tractors and 272 on trailers, for a total of 654 brake lining/pad violations.[x]

Proactively monitoring brake performance helps extend the lifespan of brake components, minimizing waste and improving vehicle efficiency. Phillips Connect's brake sensors monitor several key areas of braking systems, including brake lining wear, brake temperatures, air pressures and slack adjuster performance.

One of the biggest threats to brake longevity and fuel economy is dragging brakes. When brakes fail to fully release due to mis-adjustment, corrosion or air pressure issues, they create friction against the wheels, forcing the engine to work harder and burn more fuel.

Brake temperatures also play a key role in both safety and efficiency. Overheating is a top cause of brake deterioration. Excessive heat can lead to brake glazing, cracking and reduced stopping power.

Overheated brakes can indicate excessive use, improper load distribution or mechanical issues that increase fuel consumption. By continuously monitoring brake temperatures, fleets can identify patterns of overuse and take corrective action, such as driver training to promote smoother braking habits. Less aggressive braking reduces fuel consumption and extends the life of braking components.

Proper brake adjustment is essential for balanced braking performance. When brakes are out of adjustment, some wheels do more work than others, leading to uneven wear and increased fuel use as the driver compensates for inconsistent braking. Tracking the performance of slack adjusters ensures that brakes remain within their optimal operating parameters, which not only reduces wear and tear but also helps maintain fuel efficiency.

Wheel-end health is another factor that affects both braking efficiency and fuel economy. A failing wheel end can increase brake strain and rolling resistance, making it harder for the truck to maintain speed efficiently. Constantly monitoring the condition of hubs and bearings prevents issues before they get worse, allowing trucks to operate more smoothly and use less fuel.

Beyond mechanical benefits, real-time brake monitoring can reduce unplanned downtime and unnecessary idling. Brake failures or warning lights can force trucks to stop unexpectedly, leading to wasted fuel while waiting for roadside repairs.

Tracking the condition of brake linings in real time also enables fleets to schedule service based on actual wear rather than fixed maintenance intervals, ensuring that braking components are replaced only when necessary to maximize their lifespan. The data can also give fleets the insights they need to combine upcoming repairs to reduce the number of trips into the shop and miles traveled to take care of all needed repairs.

Increasing Communication with the EC47 Harness

Phillips Industries EC47 harness uses Controller Area Network (CAN) technology to improve data communication between the trailer and the tractor. Integrating the harness with trailer electronic braking systems and other monitoring sensors allows the system to actively identify and mitigate brake drag by ensuring optimal brake release when not engaged. Phillips Industries has partnered with Bendix, a manufacturer of advanced braking and safety systems, to enhance fleet braking efficiency through real-time brake performance and monitoring, predictive maintenance alerts and enhanced automation. As a result, fleets can optimize brake performance and reduce premature wear and fuel use while improving safety and reducing the risk of a roadside failure or violation.

Keeping the Lights On

Lighting violations are the most common roadside violations, with an inoperable required lamp being the No. 1 roadside violation in 2024 and accounting for more than 13,000 out-of-service violations.[xi] Even lights that worked perfectly during a pre-trip inspection can fail once a driver hits the road.

Real-time monitoring of lights and the entire wiring harness allows fleets and drivers to detect light outages immediately, reducing the risk of over-the-road violations or repairs. As noted earlier, every minute a truck idles on the roadside contributes to unnecessary fuel consumption and carbon emissions.

The root cause of a lighting issue can be wiring malfunctions, so it is also important to monitor the light circuit to identify faults. Wiring issues and electrical shorts are common culprits of thermal events, which can cause severe equipment and cargo damage, fuel leaks or chemical spills. Corrosion, loose connections and damaged wires can cause intermittent or complete lighting failures. Detecting voltage drops, circuit failures and potential shorts can help fleets schedule and streamline repairs to address wiring issues before systems fail.

Partnering with a high-quality lighting provider like Phillips Industries can increase the longevity of a light, further enhancing sustainability. LED-based lighting solutions last longer, and Phillips Connect's system detects whether individual diodes or entire lights are failing, allowing for targeted replacements instead of replacing full light assemblies to reduce waste. LED lighting solutions have significantly longer lifespans, reducing waste and improving efficiency. Phillips offers a limited lifetime warranty on its harness and lighting systems, ensuring durability and reducing corrosion-related failures.

Talking to the Trailer

Real-time visibility into the condition and performance of trailers ensures trailers remain operational, safe and efficient while on the road. It can also prevent a company from loading a trailer that isn't healthy, preventing unloading and delays. Phillips Connect's Smart Trailer and Trailer Health Sensors track critical data points, ensuring trailers remain operational, safe and efficient while on the road.

At the core of Phillips Connect's trailer monitoring technology is the Smart7 Gateway that aggregates multiple data points from various sensors mounted throughout the trailer, including tire pressure, wheel-end temperatures, brake performance, lights and cargo weight, to provide a comprehensive view of trailer conditions. Real-time information can predict and prevent failures, maximize uptime and allow fleets to consolidate needed repairs.

Monitoring Weight

Fleets interested in monitoring weight can use the technology and available integrations to track overall weight as well as individual axle weights, which prevents overloading—a major factor in increased fuel consumption and premature component wear. Overloaded trucks consume more fuel due to increased strain on the engine. They also lead to accelerated wear on axles and suspension that can require early replacements, generating unnecessary waste.

Weight violations can lead to roadside violations, including out-of-service violations, increasing downtime. As with other systems, remote diagnostics and real-time maintenance alerts improve uptime by predicting and preventing failures before they occur, minimizing over-the-road breakdowns and reducing idling and wasted fuel while ensuring smoother operations.

Tracking Assets

Fleets often struggle with inefficiencies, such as trailers sitting idle in yards or being underutilized due to lack of visibility. Tracking technology optimizes equipment utilization to improve productivity and extend the useful life of trailers by ensuring they are used more evenly across the fleet.

Detention time is another critical issue that affects both fleet efficiency and profitability. Delays at loading docks and customer sites can lead to excessive idle time, increasing fuel consumption and accelerating vehicle wear and tear. Sensors can help mitigate the problem by providing real-time alerts when a trailer is stationary for extended periods. This allows fleet managers to address delays, improve asset turnover and reduce wasted time.

"When you take 22,500 tractor movements a day, even if you just save two minutes of a driver's time or 10 minutes of a driver's time, that adds up in a hurry," Bader said.

With smart tracking, fleet managers and drivers can instantly locate available equipment, minimizing unnecessary trailer movements and repositioning, resulting in additional fuel savings. The visibility also reduced manual yard checks or the need to circle a yard looking for the right trailer, reducing fuel consumption and optimizing drivers' available hours. Knowing the exact location of a trailer can help drivers find it faster, increasing efficiency and reducing frustration.

Wayfair uses trailer location tracking to streamline both operational visibility and delivery workflows. With hundreds of trailers moving through various delivery lanes, real-time trailer tracking helps reduce idle time and accelerates access to available assets. "Leveraging the Phillips Connect CargoVision camera allows us to gain visibility into the status of every load during the critical points of delivery. Being able to see the load condition upon packing and arrival is key to being able to tell the story of the load journey to provide better customer support and supplier management." said Alec Matson, Sr. Manager of Procurement at Wayfair.

Monitoring a trailer's location also helps dispatchers identify the most efficient routes to minimize unnecessary mileage, directly reducing fuel consumption and cutting down on operating costs. "The quality of the GPS data matters. Philips delivers that data to us on time, consistently and with a level of granularity that we just don't see from other providers," said Jon Drohan, director with Charger Logistics, based in Brampton, Ontario, Canada.

Empowering Drivers

Drivers need to know what is happening with their equipment to ensure its performance and their own safety. Information is power, and getting drivers information quickly can help them have a better, more productive day. Smart trailer technology gives drivers immediate feedback on factors like tire pressure, brake health and cargo status.

Phillips Connect created DriverAssist to bridge the information gap between drivers and their trailers by delivering up-to-the-minute critical data directly to drivers. By proactively alerting drivers to potential failures, the system enables them to make informed decisions about their equipment, work with dispatchers to get ahead of issues and take ownership of trailer conditions, further supporting sustainability goals. Added insights can also help drivers manage their day. For example, knowing the battery charge level of lift gates in real-time helps drivers plan their routes and avoid unexpected downtime, which also improves customer service.

Phillips Connect also has available REAR-VU, a new rear-view backup camera, giving drivers a clearer, more comprehensive view of their surroundings than with mirrors alone. Improved visibility can reduce the risk of damaging equipment, extending its lifespan and reducing the need for replacement parts.

DriverAssist also offers real-time tractor-trailer pairing validation, ensuring correct connections and reducing the risk of mis-pulls resulting in unnecessary miles and wasted time. [ML3]

Maximizing Load Efficiency

Smart trailers' advanced cargo monitoring capabilities—such as cameras, volumetric sensors and real-time analytics—are streamlining load planning and trailer utilization. By reducing empty or partially loaded trailer movements, fleets can minimize fuel consumption, lower emissions and improve overall operational efficiency.

Optimizing Trailer Space

Phillips Connect's CargoVision technology, which can be wired or use 100% solar power, goes beyond simply reporting if a trailer is empty or full. The system gives fleets a visual image to confirm what's in that trailer and the floor space and volumetric data, enabling dispatchers to make informed decisions about trailer assignments and maximize every cubic foot of trailer space.

“PHILLIPS CONNECT IS DEDICATED TO REDEFINING WHAT’S POSSIBLE IN FLEET TECHNOLOGY, ENSURING THAT EVERY MILE, EVERY LOAD, AND EVERY DECISION IS POWERED BY CONFIDENCE AND SAFETY.”

Getting more freight into a shipment reduces the number of underutilized trips and can result in fewer trailers needed to transport the same amount of goods. Eliminating miles translates into lower fuel consumption and fewer carbon emissions. The system can also report on whether a trailer is full or if it just has some dunnage that needs to be removed, keeping the equipment in rotation.

Beyond efficiency, cargo monitoring improves safety and reduces the risk of damaged cargo. Load shifts during transit can create serious hazards, but smart sensors detect potential shifts in real time, allowing for proactive intervention before they lead to accidents or cargo damage. In addition, trailer monitoring keeps products safe and establishes safeguards for perishable goods, preventing spoilage and reducing product waste, supporting operational and sustainability goals.

Making the Perfect Match

Mismatched tractor-trailer pairings, also referred to as mis-pulls, can lead to wasted fuel, unnecessary mileage and hours-of-service violations. Phillips Connect's T/T Pair technology ensures drivers connect to the correct trailers, reducing the risk of hauling the wrong unit and optimizing overall fleet performance. The verification goes to drivers via DriverAssist and fleet management and staff in the back office through the Connect1 user interface.

When all trailers look similar, it can be easy for drivers to connect to the wrong one. "We have trailer IDs on the corners of each of the trailers," Madura said. "The numbers are like 296000, or then there could be a 290000. Sometimes, the drivers misread the six as a zero. Instead of going to Jacksonville, it's now going to Houston."

Charger Logistics ties the connectivity information into its TMS, so it automatically reports if the truck is hooked to the trailer, eliminating the need for a driver to update the system manually. "We know that the driver has started their trip right. Now, everything else starts to fall into place behind that status update," Drohan said. "We use that data to see where they are in that route and start to get to route optimization."

Fleets can enhance productivity by eliminating inefficiencies in communication and equipment utilization while minimizing environmental impact.

Wayfair Boosts Loading Visibility with Smart Cameras

Wayfair's operations team is leveraging CargoVision cameras and door sensors to enhance visibility into trailer loading and condition tracking. Alec Matson, Sr. Manager of Procurement at Wayfair, sees cargo visibility as critical for preventing load damage and improving efficiency. Proper trailer loading is a top concern, and in one example, Matson's team encountered a trailer with four improperly stacked pallets—each nearly six feet tall—that collapsed during transit. The result: repacking time tripled, and unloading efficiency dropped. The CargoVision camera gives Wayfair the opportunity to identify issues early, engage with vendors, and prevent costly delays in the future.

Reducing E-Waste

Electronic waste, also called e-waste, is becoming more and more of an environmental challenge as the number of electronic devices discarded increases each year. One of the most effective ways to reduce e-waste is to design longer-lasting products that require fewer replacements.

Phillips Connect prioritizes sensor longevity with devices lasting seven to ten years. Creating devices that last keeps them out of landfills and also uses less raw material needed for manufacturing.

To further promote sustainability, Phillips Connect's SolarNet 4G-LET solar-powered solution incorporates solar recharge capabilities and can operate for up to 180 days between charges, ensuring equipment is constantly connected and sharing insights. Solar power extends the lifespan of the device and eliminates the need for frequent battery replacements, and comes with a 10-year battery life.

Working Together for a Sustainable Future

Phillips Connect's cutting-edge sensor technology drives measurable sustainability gains by reducing fuel consumption, optimizing asset use and extending component lifespans. Through real-time data insights and intelligent diagnostics, fleets can achieve greater efficiency while minimizing their environmental footprint.

Download our **Sustainability Report** to learn more about how Phillips Connect can help you achieve emission reduction goals while improving uptime and driver convenience.

[i] U.S. Environmental Protection Agency. *Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 2*. Retrieved from https://19january2017snapshot.epa.gov/sites/production/files/2016-06/documents/420f16035.pdf.

[ii] Commercial Carrier Journal. *Maintaining Proper Tire Pressure to Maximize Fuel Economy*. Retrieved from https://www.ccjdigital.com/maintenance/service-and-repair/article/15293819/maintaining-proper-tire-pressure-to-maximize-fuel-economy.

[iii] North American Council for Freight Efficiency. *NACFE Updates Tire Pressure Systems Confidence Report*. Retrieved from https://nacfe.org/news/nacfe-updates-tire-pressure-systems-confidence-report/.

[iv] North American Council for Freight Efficiency. *Tire Pressure & Inflation*. Retrieved from https://nacfe.org/research/technology/tires-rolling-resistance/tire-pressure-inflation.

[v] FleetOwner. (n.d.). *Tire Pressure Systems for Fuel Efficiency Make Sense as an Investment*. Retrieved from https://www.fleetowner.com/perspectives/ideaxchange/article/21251526/tire-pressure-systems-for-fuel-efficiency-make-sense-as-an-investment.

[vi] California Department of Resources Recycling and Recovery (CalRecycle). *Retread Tires*. Retrieved from https://calrecycle.ca.gov/tires/products/types/retreads.

[vii] Transport Topics. *Thwarting Thermal Events*. Retrieved from https://www.ttnews.com/articles/thwarting-thermal-events.

[viii] FleetNet America. *Common Causes of Semi-Truck Breakdowns*. Retrieved from https://fleetnetamerica.com/blog/post/common-causes-of-semi-truck-breakdowns.

[ix] Federal Motor Carrier Safety Administration. (n.d.). *Report to Congress: Large Truck Crash Causation Study*. Retrieved from https://www.fmcsa.dot.gov/safety/research-and-analysis/report-congress-large-truck-crash-causation-study.

[x] Commercial Vehicle Safety Alliance. *CVSA Releases 2024 Brake Safety Week Results*. Retrieved from https://cvsa.org/news/2024-bsw-results/.

[xi] Federal Motor Carrier Safety Administration. (2024). *Inspection Violations*. Retrieved from https://ai.fmcsa.dot.gov/EnforcementPrograms/Inspections?type=AllViolations&time_period_id=2&report_date=2024&vehicle_type=2&acute_critical=0&state=NAT&domicile=ALL.

Technology That Moves Us Forward®

Phillips-Connect.com