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Charging ahead

COMMERCIAL ELECTRIC VEHICLE PROGRESS REPORT

Electric trucks are the future, but how do early adopters feel about them now? We answer that and many other electrification questions inside!

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Cummins reaches engine milestone: 2.5M engines made at Jamestown plant

The engine maker marked the 2.5 millionth engine made at its New York plant, which will receive a \$452 million investment to retool for Cummins' new fuel-agnostic engines.

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Correction

In the May article "Curbing cargo and component theft with technology," a quote on trailer theft at the border was incorrectly attributed to Chris Corlee. Angela Shue, Orbcomm director of transportation enterprise markets N.A., made the statement.



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Navigating the messy middle

Electrification is complex business. Is trucking ready to meet the challenge?



By John Hitch
Editor-in-chief

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It's not even the middle of May and Mike Roeth, executive director of the North American Council for Freight Efficiency (NACFE), has already appeared at two major fleet shows this month, traversing from his Indiana home to ACT Expo in Long Beach, California, and National Private Truck Council in Orlando, Florida. The super advocate for sustainable transport spoke about how the industry is navigating the “messy middle” between proven diesel-powered trucks and fledgling electric ones.

His summer will be even more jam-packed, as NACFE, in conjunction with RMI, plans its fourth Run On Less Event—a real-world demonstration in which the non-profit closely monitors participating fleets’ truck efficiency metrics, primarily fuel and distance traveled, over a few weeks. NACFE analyzes the data and then writes up and publicly releases a detailed report of the findings.

The first ROL in 2017 revealed that with the right powertrain, aerodynamics, and driver, over-the-road Class 8 tractor-trailers could average above 10 mpg. That was followed by a regional haul demo, and then an exclusively electric vehicle trial. The upcoming Run on Less-Electric Depot, which begins on Sept. 11, might be the most important of all, as it dives headfirst into the messy middle muck and how early adopters are wading through scaling and operational challenges associated with the nascent technology.

Each of the eight volunteer fleets has at least 15 EVs, and the list includes major players such as Pepsi, Schneider, Penske, and UPS. Roeth’s now in the messy middle of planning visits to the eight depots and aligning all the relevant stakeholders to pull the event off.

“It’s herding cats,” Roeth said, referring to all the various moving parts that must align to even begin an electric deployment. “There’s the fleet folks, corporate and local site people, truck drivers—we’re trying to get the utilities there, the charging infrastructure, the truck OEMs.”

That’s for each depot. A logistics company may operate several and must go through the same process at each. And because of the push at the state and federal level, and from truck OEMs’ sustainability goals, zero-emission vehicles are likely headed to every fleet in the country. And each fleet will likely need infrastructure at most if not all of their locations.

In California, fleets have 13 years to figure it all out, as the state’s Advanced Clean Fleets regulation is poised to nix internal combustion engine sales by 2036. Can the industry scale to make this possible anytime soon?



» NACFE Executive Director Mike Roeth (center) takes a look at a vehicle charger.

NACFE

Allen Schaeffer, executive director of the Diesel Technology Forum, is skeptical.

“No question, it’s turning out to be a Jenga game—a teetering tower of rules and mandates built in an echo chamber,” he asserted. “It lives on a foundation of uncertain and shaky assumptions of cost, projections of timing, and feasibility. Among other things, it assumes a successful tripling of the power supply in California to fully renewable resources and that the power grid will be both ready and capable of supporting a mass switch to electric power for transportation, even as blackouts and brownouts are annual occurrences today.”

Roeth, who used to work for leading engine maker Cummins and has spent the last decade working with NACFE to increase carriers’ fuel efficiency and reduce emissions, isn’t sure, but is more optimistic.

“We don’t know if it’s too aggressive or not—it sure seems like it is too aggressive,” he pondered. “But on the other hand, we’re pretty early in the game. If you talk to any of the (ROL) fleets, they all say they’re farther along than they thought they would be with the vehicles, even with what’s needed from an infrastructure standpoint.” Driver satisfaction and maintenance simplicity are major selling points for fleets. And though you may see a picture of one of Pepsi’s new Tesla Semis getting serviced on the side of the road, that doesn’t mean electric trucks will be unreliable, Roeth asserted.

“Yeah, they’ve got a downtime issue here and there, but they’re really solvable things, and

not a cracked this or cracked that found in the diesel equipment, or the other things that come up that cause big downtime,” he said. “[NACFE] believes the trucks will work. We’ve got range and charging issues, but those can be worked out with faster charging and different operational characteristics of these trucks.”

Because of their simplicity, we see [successful adoption] as execution challenges, not TCO or functional challenges,” Roeth added.

Will the industry be able to execute, though? Roeth is again optimistic, because although electrification is new, the industry knows how to problem-solve and meet regulatory goals.

“We’ve got tons of tools that have been developed from great companies managing our routes, loads, drivers, and freight,” he said. “And we’re going to have to take advantage of connectivity and fleet management tools that have been created over the last years to execute these electric trucks.”

For real progress to be made, and within the given timeline, Roeth concluded fleets and other stakeholders must spend their energy on thinking through solutions, and not how to stall the inevitable.

“We’ve got to do it smartly, rather than throw up too much dust in our fighting over it to keep us from getting it done,” he said. “I worry about too much of our industry debating this rather than getting on with it.”

The debate, though, will likely rage on for years to come. As more fleets adopt and learn how to navigate the complexities (Pg. 20), we can only hope they get less messy. ■

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SHOP OPERATIONS

The hidden value of optimized
PM SCHEDULING



Preventive maintenance is routine and a little boring by nature, but a bit of extra attention to scheduling and execution brings some exciting benefits—and profits.

By Mindy Long

[PLANNING]

Despite all the changes and challenges to the commercial vehicle industry, there's still one thing that never changes for shops: preventive maintenance. And most importantly, technicians have to do it the right way at the right time. Oil changes, filter cleanings and replacements, tire checks, the list—and the intervals—go on and on.

PMs are the most fundamental part of vehicle maintenance, yet some need reminding of their importance, according to Kevin Clark, head of shop operations for Cox Automotive Mobility Fleet Services.

"A lot of folks forget that it isn't just checking a box to say it is DOT legal and they changed the oil," Clark said. "The goal is to identify wear items and safety items on the vehicle that won't make it to the next PM; it's to *prevent* component failures from leaving a driver or load down on the road—or putting them in a safety situation."

Dan Carrano, VP of fleet maintenance for A. Duie Pyle, agreed, adding the PM inspection process is all about catching that one part approaching their end of life "before it fails on the road."

"You want the truck to go from PM to PM with as few failures as possible," Carrano continued.

Yes, PMs are a bit mundane, and not at all glamorous. After all, who notices when a successful PM is completed? Fleet owners and drivers will notice, however, if the shop missed something that led to a suspension failure or an engine issue. Everyone else who must now spring into action will notice, too.

Scheduling PMs and monitoring that they were done can be a complicated process for maintenance management, especially when dealing with parts and labor shortages. But you can either make excuses or make changes. The maintenance leaders who spoke with *Fleet Maintenance* on the subject all think change is the better and far more cost-efficient option. And to help all fleets get on the same PM page, they have provided several ways to simplify and optimize this monotonous-yet-critical process.

Coordinating service

The most efficient way to perform PMs is to schedule as many at the same time as possible. That's easier said than done, though. Many moving parts have to come together to ensure equipment is seen at the appropriate intervals and the right technicians and parts are available.

"The objective is to try and schedule PMs when the driver is off and not going to be driving the

truck so it is not affecting their utilization,” said Kirk Altrichter, EVP of fleet services for Kenan Advantage Group.

Clark said a lot of customers prefer Cox Automotive’s mobile service for PMs. “They can leave the vehicle at home and not worry about drivers’ hours; it is more convenient,” he said.

Pyle has established time- and mileage-based PM intervals for its power units and uses a fleet maintenance software system to forecast PM needs based on utilization. Shops get an alert ten days before a truck’s PM is due.

“That 10-day window helps us get those vehicles in and set the priorities,” said Carrano, who added the fleet also regularly reviews PM intervals to ensure the fleet is on target.

Carrano also noted that though equipment manufacturers have been able to extend mileage intervals, that doesn’t mean equipment shouldn’t come into the shop.

“[The interval] changes when you change oil and coolants, but you might [schedule] a dry service and do everything except changing the fluids and the oil filters,” Altrichter said.

Initially, many fleets didn’t realize how extended oil drain intervals would affect equipment, said Daniel Mustafa, director of technical service for TravelCenters of America. “We definitely saw increased failures in those other lubricating components—clutches, U-joints,” he said, adding that the industry saw the trends and adjusted service needs.

Still, over the past five to ten years, TA has seen fewer chances to provide PMs due to extended intervals but is constantly looking for opportunities. TA now offers its base PMs and an extended drain PM that focuses on filters and other components. Shops also provide specialized air disc brake inspections. “They require a minimum of three inspections a year,” Mustafa said.

A. Duie Pyle tracks PM needs with a checklist for each vehicle type and the type of PM, including the annual PM.

There’s one final thing to consider: Before thinking how to sync service the right way, a fleet must first understand the worth of PMs. And to get into an efficient scheduling routine, you might have to spend a little money.

Chris O’Brien, chief operating officer of Fullbay, argued that a strong PM program is an investment.

“Preventive maintenance saves you more money than it costs,” O’Brien asserted. “If some-



» “Preventive maintenance saves you more money than it costs,” Fullbay COO Chris O’Brien noted.

Fullbay

one is shortsighted, they see it as an expense, but that is a disservice to highway safety.”

One option is to invest in fleet maintenance software, such as Fullbay, or one of the several other platforms out there.

The right software will not only ensure companies create a smart maintenance schedule, but also keeps them from bringing equipment in too often, noted Jessica Kim, head of marketing for Pitstop.

“[Routine PMs] can lead to over-maintained vehicles, over repairs, and over costs because it is tied to a static schedule and doesn’t take into account the vehicle’s health,” she said. “You bridge in a maintenance provider like Pitstop, and we pull data from multiple systems.”

Kim added that AI is getting smarter with every data point: “You pull this data together, and it spits out a smart maintenance schedule that fits into the calendar of what you currently have set up.”

Optimizing labor

Once you know what PMs need to be done and when, the next question to answer is who will complete the task?

And finding technicians can be among the top challenges shops face.

“Labor has been an issue for quite a while, not just internally, but externally with the dealerships and repair facilities,” Altrichter said, adding that

some techs are more skilled than others and shops may want them on more technical jobs.

Pitstop allows users to create a work order tied to a specific technician. “You can keep track of who is fixing what, so it keeps it automated,” Kim said.

TA has had success hiring dedicated lube technicians who focus on PMs. “Some people choose to stay in those job roles because they are more predictable. We have very long-term lube technicians at many of our locations, but we offer a lot of opportunities for people to grow,” Mustafa said. TA has focused on its recruiting and retention, adding bonuses and vacation benefits for field employees and providing tools to new hires.

“We’re about 5 to 10% up on our technician count,” he said.

The overall challenge is the rapid advancement in technology and maintaining the in-depth knowledge to service vehicles properly, making ongoing training for technicians essential, said Jason Richards, program manager II for TravelCenters of America.

Shops also want to optimize technicians’ time. Fullbay can build PM programs to measure technicians’ efficiency with the expected completion time, O’Brien explained.

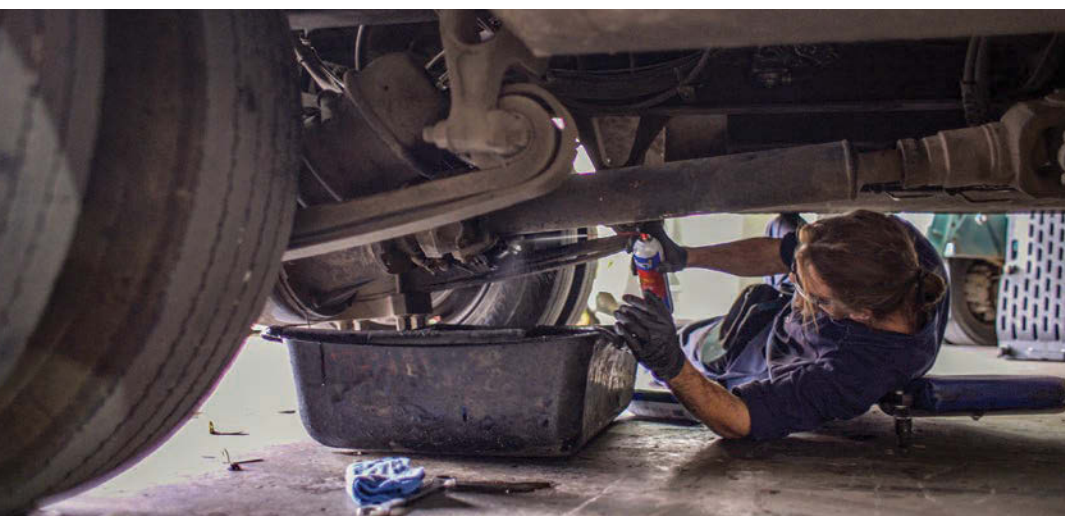
“It is very similar to warehousing, where everything is based on a throughput or KPI,” he said. “It is to look for areas where we have them standing around waiting, or doing clerical work rather than maintenance.”

Fullbay’s system can also identify technicians that are underutilized. “Maybe I’m 100% efficient, but I’m standing around waiting for work,” O’Brien said.

To help decrease clerical work in the shop, Trimble says its TMT Fleet Maintenance platform can automatically create “work pending” entries that can be converted to a work order to reduce the amount of manual work needed to sort through and enter data. In TMT, engine fault codes are automatically converted to work pending repairs, and assets are checked whenever

» Fleet maintenance management systems can help ensure the right technicians are assigned to the right PM intervals on time, with some shops dedicating certain techs to handle all PMs.

Fullbay



an order is opened for PM compliance, work pending, recalls, and warranty status. This increases overall efficiency, said Dave Walters, sales support engineer for Trimble Transportation.

TMT allows shop managers to set dependencies, also known as “nesting” certain repairs together, to create a dynamic schedule that is dependent on when the actual services occur.

“If you have a schedule set up for a chassis lube, an oil change, and a DOT inspection, managers can create dependencies that say ‘after you get the oil change, in a certain number of weeks the next repair will be a chassis lube, and then in another few weeks it’ll be a DOT inspection, and so on and so forth,’” Walters said.

Managing complexity

On the supervisory level, the issue is coordinating all the complexity. Their ultimate goal is to optimize PMs and repairs to make the most out of the time and equipment in the shop. But even when certain services, such as a DOT inspection, work well with a scheduled PM, they can add complexity by uncovering more unplanned work that needs to be addressed.

Walters said annual DOT inspections and repairing associated defects can be difficult to manage, as they are required and must be done in a specific time frame to avoid noncompliance.

“Annual DOT inspections are more comprehensive and complex, and, as a result, may uncover additional work that needs to be done,” he said. “They often take longer to complete than a quick ‘in and out’ repair.”

Mustafa added that DOT inspections also require a higher level of certification for the technician doing the work. TA’s system monitors techs who can complete DOT inspections and prevents them from logging into a work order if unqualified. “We might run into technician availability that would negatively affect completion time,” he said.

Warranty repairs, which need to be done by OEM-approved techs, can also add complexity when found during

a PM, as scheduling dealer capacity can be tricky, Walters said.

Altrichter said DPF filter cleanings take longer because shops have to coordinate not just removing the DPF but where they will get it cleaned and how long it will take to clean it.

“The objective is to keep the same filter with the same truck,” he said.

Findings from PM inspections can turn into larger jobs, which makes managing the throughput of the shop and meeting commitments a challenge, said Ben Johnson, director, product management, Mitchell 1.

Follow-up work also increases as equipment gets older. “As the vehicle ages and accumulates miles, the amount of follow-up work increases,”

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Carrano said. “You address the safety and reliability issues first—brake issues, power trains—versus a squeaky seat. The lesser priority issues may not get done at that time and you’ll schedule it in.”

As part of its PMs, A. Duie Pyle checks the DPF soot level and does a forced regen to burn it off if the soot is at a set level. “The goal is to help alleviate drivers doing a parked regen, and it has helped,” Carrano said.

Optimizing drivers’ time is one of Carrano’s top priorities. “If you do a thorough, comprehensive inspection and follow-up repairs, it will reduce the number of things a driver finds during a pre- and post-trip,” Carrano said. “If drivers find a lot of defects, it affects the amount of yard time and creates a lot of extra unproductive time.”

Failures over the road can create significant delays for drivers and inconvenience for clients. “The quality of your PM program is extremely important to your profitability, your drivers’ satisfaction, and customer satisfaction,” Clark said.

Increasing communication

To truly optimize scheduling, communication is critical among all the various departments. PitStop’s Kim said technology can ensure accurate information is transmitted between the fleet and the shop.

“You’re counting on the fleet manager to communicate that vehicle’s needs to the shop,” she said. “They may not be getting the exact pieces that the fleet manager is getting from that vehicle.”

Fullbay has a customer portal that gives the end customer direct access to all maintenance records so they can review costs and analyze data. “There is an expectation now. If you want a relationship with a customer, you have to provide these analytics,” O’Brien said.

TA has an online platform that allows fleets to coordinate with locations directly. It also interacts with TA’s POS. “They can read service rider and technician comments and approve and deny work very quickly,” Richards said.

Mustafa added that increasing transparency can help build trust. “We bring the customer into the process so they understand what is being done or not being done on their vehicle,” he said, adding that technicians can even take customers into the pit to show them the work.

Technology can also help shops manage other risks, such as credit card disputes, which O’Brien said are rising. “There is a lot of nefarious activity where truckers are crossing state lines, getting services at 3 a.m., using a credit card to pay, and then disputing the charge,” he said. “Depending on how that process is handled, shops can lose out. Do signature capture and get vital information from the trucker.”

O’Brien also recommended shops evaluate their terms of service.

“You write something that says ‘satisfaction guaranteed,’ and that can be your archnemesis,” he said. “Make it very clear that you’re providing your services and not that satisfaction is guaranteed or warranty is implied.” ■

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Six best practices to optimize PMs

Preventive maintenance is a crucial aspect of fleet management that helps fleets minimize downtime, improve safety, and get the most out of their equipment. These best practices can help fleets optimize their PM programs.

1. Establish maintenance intervals:

Creating a schedule ensures equipment doesn’t go too long between services. “You need to have a schedule, and you need to stick to it and not just for oil changes and filter changes but for other things that should be checked regularly,” said Kirk Altrichter, executive vice president of fleet services for Kenan Advantage Group.

Fleets typically take either a time- or mileage-based approach, but Daniel Mustafa, director of technical service for TravelCenters of America, said determining which is best can turn into a “fine science,” especially because a vehicle’s application can alter needs. “If you drive in a dusty environment, you’re going to have to change your air filter more often than somebody in the Northwest, whereas that person in the Northwest is going to have to change their air dryer more frequently,” he said.

Ben Johnson, director, product management, Mitchell 1, advised fleets to combine OEMs’ recommended maintenance schedules with their applications. “It is blending that information with the actual use of the vehicle, types of payloads it hauls, regions it operates in, and more,” he said.

A. Duie Pyle uses a combined time- and maintenance-approach for its power units. “Trucks on a highway application have a higher mileage interval versus the ones in a more urban environment. For the lower mileage, it acts as a safety net,” Carrano said, adding that trailer and converter dolly maintenance is on time while forklifts go by operation hours.

At Cox Automotive Mobility Fleet Services, performance managers help clients navigate interval changes as new lubricants, equipment, or applications come into play, said Kevin Clark, head of shop operations for the company.

2. Draw on data:

Onboard technology monitors the health of most major sys-

tems today, including engines, transmissions, body, exhaust treatment, and trailers. “Incorporating this data flow into your preventive maintenance program can be key to solving issues before they become breakdowns,” explained Dave Walters, sales support engineer for Trimble Transportation.

Johnson said data can reveal patterns in vehicles equipped with the same engine, transmission, braking systems, etc., helping fleets get ahead of problems before they occur. “If a vehicle comes in at 150,000 miles for an oil change and brake job but, historically, we know the engine alternator fails about the same time, consider if you’d rather go ahead and replace that alternator during a PM scheduled maintenance event rather than wait for an unscheduled event,” Johnson said.

While data is valuable, shop managers frequently oversee multiple assets and may receive hundreds of fault code alerts daily. “This can easily become a data overload if you don’t have a system in place to help manage the volume,” Walters said.

3. Track critical KPIs:

Tracking key performance indicators related to maintenance can help fleets optimize maintenance operations, make data-driven decisions, and maximize performance. Mustafa said unscheduled maintenance is the ultimate KPI used to determine if preventative maintenance is effective. “You should see your unscheduled maintenance trending down,” he said.

Walters recommended fleets monitor KPIs related to the frequency of service repairs that occur between PM service events and PM completion rates. Other important KPIs include PM compliance, employee productivity, and cost per mile.

A. Duie Pyle also monitors driver write-ups. “If we have a location with a high number of driver write ups, we’ll see if we have a problem with the PMs or if we need to re-train techs,” Carrano said.

4. Sync services:

Syncing maintenance needs with scheduled PMs can help minimize downtime. “Any related work that isn’t necessarily needed can be done at the PM as well. It isn’t affecting the driver’s ability to do the job, so if they wait for the time to do the PM, you aren’t doing extra things in between,” Altrichter said.

Fleets often schedule DOT inspections to coincide with a PM. “That is what we see most often together,” said Jason Richards, program manager II for TravelCenters of America.

Johnson said that as predictive analytics becomes more prevalent, items can be added to PMs, so they are addressed during scheduled maintenance events.

5. Monitor inventory:

Fluids, filters, grease, and any other products needed for PMs should be on-hand to minimize equipment downtime. “Those items should all be captured in the PM itself and, as a vehicle is being scheduled, those items should be determined to be on-hand or ordered [and arrive] by the time the truck arrives,” Johnson said.

With supply chain issues still impacting the heavy truck parts availability, planning for and keeping the right inventory of PM-related parts can be challenging. Mitchell 1 has an interface for connected vehicles to be able to communicate to their preferred shop to advise when a service is needed. “The further ‘upstream’ we can understand a need at the shop, the better they’ll be able to be ready for that vehicle with the correct parts and talent to address the need,” Johnson said.

6. Test the oil:

Richards recommended taking an oil sample at every oil change, which can identify the presence of wear metals and contaminants in the oil. “Oil analysis and the KPIs, viscosity, oxidation, and iron levels are the driving force behind how far to push the equipment. They can also help get ahead of a major failure,” he said.

Plus, by analyzing the oil over time, maintenance providers and fleets can identify trends in wear and contamination levels to help optimize maintenance intervals.

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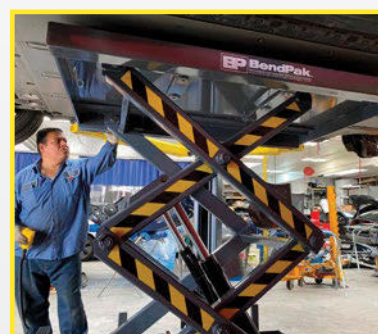
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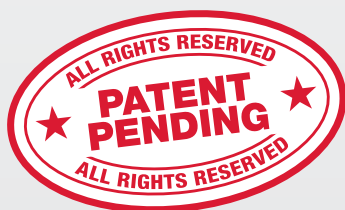
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CRACKPROOF GLASS REPAIR GAMEPLAN

Insights to help fleets determine when it's time to repair or replace, and when it's best to outsource glass repair.

By Gregg Wartgow

[MAINTENANCE]

A tiny windshield chip or crack might not seem like a big deal on a rough-and-tumble commercial vehicle, but these issues can spread if not resolved in a timely manner. First off, driving with a damaged windshield is not only unsafe, but oftentimes illegal. When you factor in today's Advanced Driver Assistance Systems (ADAS) such as windshield-mounted cameras, the importance of swiftly and properly resolving glass-related issues is at an all-time high.

And because cameras are likely attached to the windshield, repair personnel must also remember that temporarily removing these devices adds a few extra steps to the process. As with any vehicle repair, even the smallest oversight can fracture into a host of new problems if not done right the first time. That never needs to be an issue if a fleet develops a sound glass repair strategy and sticks to it. *Fleet Maintenance* spoke with several glass repair experts to find out what that gameplan should look like.



1. Decide if the damaged area requires replacement or repair

The decision to repair or replace generally comes down to four elements:

- ➔ Regulatory requirements
- ➔ Driver vision
- ➔ Structural integrity of the glass
- ➔ Cost and downtime for the fleet

U.S. Department of Transportation regulations state that a windshield cannot have damage in what is essentially a driver's primary viewing area. That said, there are a couple of exceptions: when a crack isn't intersected by other cracks; and when the damaged area is no closer than 3 inches to any similarly damaged area and can be covered by a 3/4-inch-diameter disc. However, it's important for fleets to understand that some states have more stringent regulations.

"Some states require a windshield to be replaced any time damage is on the driver's side within that primary viewing area," said Thomas Patterson, director of new product development and technical training for Glass Doctor, a Neighborly Company, which specializes in glass repair and replacement services. "We as a company do not condone doing a stone chip repair in that primary viewing area. That's where we would simply recommend replacement."

What is the driver's primary viewing area? Based on the Repair of Laminated Auto Glass Standard (ROLAGS), it is 12 inches centered off of the steering wheel and 12 inches wide in the path of the wiper.

Glass Doctor also doesn't like to attempt repairs in the vicinity of any windshield wiper heater grids that might be on the vehicle. "That creates a hot spot, which we never want to do," Patterson added.

For windshield damage that is outside of those sensitive areas, there are instances where chips and cracks can be repaired, helping a fleet reduce both downtime and repair cost. This is also true of similar types of damage to back glass and vehicle door windows.

"Now it comes down to the type and size of the break," Patterson said, adding that there are a few key damage classifications a glass technician needs to look for.

A "bullseye" looks like the glass was shot by a BB gun, but there are no visible legs or cracks protruding out.

"A good glass technician can repair this type of damage up to an inch in diameter," Patterson said.

"Many of today's vehicles have aluminum and/or really thin pieces of metal. Traditional tools have a decent chance of damaging those types of materials. You have to treat the replacement differently than when working with steel."

Thomas Patterson, director of new product development and technical training for Glass Doctor



» Inductor Glass Blasters help technicians safely remove damaged windshields for replacement.

Induction Innovations

A "star break" does have three or four cracks emanating from the point of impact. "As big as you can safely go is around 2 inches," Patterson said. "Anything beyond that starts affecting the integrity of the glass."

A "combination break" is another form of damage. This is essentially a star break on top of a bullseye. "Again, anything 2 inches or smaller can usually be repaired without much problem," Patterson said.

According to Patterson, one of the biggest misconceptions is that a stone chip repair is an aesthetic repair. In reality, the purpose of the repair is to maintain the structural integrity of the glass.

"When the repair is completed, it might not look any different, and sometimes it might look a thousand times better and almost disappear," Patterson pointed out.

2a. Make the repair

To properly perform a stone chip repair, there are different types of tools and resins available. Regardless of which specific products are utilized, the process should always follow a proven blueprint.

"The first thing you want to do is create a vacuum to extract any air or moisture out of the break (using a specialized tool that works like a syringe plunger)," Patterson said. Trapped air or moisture is the dark color you can see in a break. Once that air or moisture is vacuumed out, it's time to introduce a liquid resin that bonds the glass back together.

"Once the resin is suspended in that vacuum and you open the chamber up, the vacuum pulls the resin into the break to fill the void," Patterson said.

Introducing the bonding resin is a relatively straightforward process, but sometimes the technician needs a little assistance. For example, the tiny cracks in a star break may radiate out a bit further than the vacuum can draw.

"Then the technician has to flex the glass to open up the break," Patterson explained.

Glass Doctor technicians use a steel probe to push down on the center of the crack. That opens up the inside of the break so the resin can flow in from underneath and fill the crack all the way to the end of the fingers.

Once the technician feels good with the repair, the UV curing process can begin. Each resin is matched with a specific range of the light spectrum for curing.

"The technician puts on their UV lamp to cure the resin, which essentially freezes everything in place," Patterson said. The curing process generally takes just a few minutes.

"Then the technician is left with the pit where the glass was removed from the break," Patterson continued. "Our technicians use a pit filler, which is a more viscous and dense resin, to fill that pit. They apply that resin and put a piece of polyvinyl on top to hold it in place, and then cure it with their UV light. Once that's cured, they just remove the polyvinyl piece, scrape the filler down so it's flush with the glass, and buff it until it's shiny like the rest of the glass."

2b. Make the replacement

As mentioned earlier, there are instances when a windshield cannot be repaired and must be replaced. There are different ways a technician can go about removing a windshield or other panels of glass. Cutting it out with a knife is arguably the most common.

There are also specialized tools a glass technician could use. Equalizer is one manufacturer that offers these types of tools. Equalizer's product offering includes tools designed to help separate lower corners of windshields when a knife won't work, battery-powered bladed tools to enhance the cutting-out process, and cord-and-wire devices.

Patterson said many in the auto glass repair industry have reverted back to an old-school methodology—but with a little twist, literally.

"When I started out in this industry more than 40 years ago, we used piano wire," Patterson said. "Now we're using what is essentially a braided cloth string. The technician feeds it through and uses a ratcheting-type device to cut out the glass."

"We like this method for several reasons," Patterson continued. "Many of today's vehicles have aluminum and/or really thin pieces of metal. Traditional tools have a decent chance of damaging those types of materials. You have to treat the replacement differently than when working with steel."

A glass technician could also use an induction heating device to help remove windshields and other panels of glass. The Inductor Glass Blaster from Induction Innovations is one example.

"The science behind this tool is pretty simple," said Cliff Lu, sales and marketing specialist for Induction Innovations. "The technician uses the Glass Blaster to heat up the pinch weld while applying constant outward pressure with an I-wedge. That allows the technician to release the urethane line at its lowest possible temperature, helping to avoid any collateral damage to the vehicle."

According to Lu, using the Glass Blaster is straightforward for a skilled technician.

Removing a windshield involves a five-step process that generally takes around 15 to 30 minutes on a large vehicle like a semi-truck. That's a considerable time saving over the traditional method of using knives or wires, which Lu said can sometimes take a couple of hours.

As Patterson also pointed out earlier, protecting the area around the repair is an important

consideration for a glass technician. That's why one of the five steps of the Glass Blaster process includes spraying cool water around the window to protect the paint from overheating and to guard against damaging any rubber. Lu said a technician could also use another product from Induction Innovations, Inductor Cold Shield Thermal Spray Gel, for an added degree of protection.




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Tips for selecting a good glass repair partner

Some fleets may conclude that partnering with a good glass repair provider is their best game plan for glass repair. National companies like Glass Doctor have service offerings tailored to commercial fleets. Plus, with mobile technicians and shops located throughout the country, a national provider gives fleets consistency and peace of mind wherever their trucks may need attention.

"Fleets should also go back to the basics [when evaluating a potential glass repair vendor]," said Jonathan Freinkel, a fleet operations leader at Cox Automotive, a nationwide automotive services and technology provider. "Make sure the vendor is insured and has the right equipment. For example, big trucks need something like scaffolding to get in position. You also want to ensure that sensors can be recalibrated and that the vendor has the inventory of glass pieces needed."

Kyle Coltrain, another fleet operations leader at Cox Automotive, said fleets should also think about downtime. "With every service provider we partner with, we are continuously analyzing who has the quickest time of arrival and service completion, and who will provide best-in-class service at a fair price to our fleet clients. This is managed and reviewed with every service we dispatch, enabling us to have a constant, dynamic vendor ranking program based on speed, quality of service, and price."

Speaking of downtime, fleets may also want to consider other glass-related services the company can provide. For instance, Glass Doctor offers headlight restoration as well as hydrophobic coating on the outside of the windshield to dissipate rain. Glass Doctor technicians even offer wiper blade replacement. "We want to be the complete answer for a fleet when it comes to glass," said Thomas Patterson, director of new product development and technical training for Glass Doctor.

In today's commercial vehicle industry, being a complete glass-repair solution largely comes down to knowing when to repair and when to replace, along with how to perform the prescribed procedures thoroughly and efficiently. What might seem like an insignificant crack or chip could end up sidelining a vehicle just like a blown engine. By having a good game plan for glass repair, fleets can keep downtime to a minimum while also maintaining a high degree of safety.



» Glass Doctor techs try to avoid repairs near windshield wiper heater grids, which can cause hot spots.

Glass Doctor

3. Factor in ADAS devices

ADAS features such as windshield cameras are adding a layer of complexity to the glass repair process. While still a relatively small share of the overall commercial vehicle market, ADAS has become more common on both medium and heavy-duty trucks over the past few years.

"Nowadays, it's very important to know how to identify the presence of ADAS in a medium- or heavy-duty vehicle," said Richard Zenteno, national sales manager for ADAS at Autel North America, a provider of ADAS diagnostic and calibration solutions. "Look for exterior clues, such as a camera mounted on a windshield or beneath the side mirrors. You may also see lights on the side mirrors designed to alert drivers. Then there are interior clues, such as lights on the dashboard showing safety features like lane departure."

Then it's important to recognize when an ADAS feature needs to be calibrated. There are a couple of windshield-related instances where ADAS calibration would need to be performed: when the wind-

shield is replaced and when any repairable damage could interfere with a camera's ability to see.

"I would say that for damage within a few inches of the camera, it's a good idea to do an ADAS calibration once the repair is completed," said Fabio Mazzon, technical manager at TEXA USA, a provider of ADAS diagnostic and calibration solutions.

There are a couple of reasons why. First and foremost is the safety of the vehicle, which leads to the second reason. "Insurance companies typically want proof that the ADAS calibration was done properly after replacing or repairing a windshield," Mazzon said.

There are two ways a technician can go about calibrating an ADAS windshield or side mirror. Each has their pros and cons.

Mazzon said the most common method is what is referred to as a dynamic calibration. This is where the calibration takes place while the vehicle is being test driven. In this scenario, the technician may need a CDL if the type of vehicle being serviced requires one.

The other method is known as static calibration. This is where the technician performs the calibration with the



» TEXA USA's RCCS 3 calibrates ADAS system radars, lidars, cameras, and sensors, some of which are attached to vehicle windshields.

TEXA USA

vehicle parked, typically in a shop. Mazzon said one consideration is space because the technician needs to set up targets in order to calibrate the camera. The shop will also need to invest in those physical targets, along with any necessary fixtures and other accessories to make them work.

Zenteno said ADAS manufacturer instructions for performing a static calibration can sometimes be confusing, which inevitably adds time to the process. That is why Autel designed its ADAS CV calibration hardware so the technician can set up the target in a matter of minutes.

"We've focused on making it fast to set up for multiple manufacturers," Zenteno said. "That comes down to being able to set up the distance quickly, centering the target and crossbar quickly, and also squaring the crossbar quickly."

Another popular solution for static calibrations is the TEXA RCCS 3 ADAS calibration frame. It is offered in two versions, one with a 75-inch digital monitor and the other with panel targets. One advantage of the monitor is that the shop doesn't need to have numerous panels on hand in order to calibrate different types of vehicles and ADAS sensors. All of those different types of panels can be displayed digitally on the monitor.

A good diagnostic scan tool is also a must. Mazzon said a good one will guide the technician through the calibration process with an intuitive user interface.

Patterson said Glass Doctor shops throughout the country use a variety of ADAS calibration tools. Each has their pros, cons, and limitations.

"Most of the tools out there will get the job done today," Patterson said. "But one thing we look at, because this is a significant investment, is what the manufacturer is doing to improve their technology for the future. ADAS calibration has only come on over the past six or seven years, so it's still fairly new. But the technology is changing fast. We want a diagnostic tool and ADAS calibration system that stays on pace with any new developments."

Regardless of which calibration solution a shop has, the ADAS manufacturer

dictates which calibration method should be used. Sometimes, it's a combination of both static and dynamic. Whatever the case, Patterson said it's critical that the technician actually performs the calibration correctly. It is possible to perform a calibration to the system's bare minimums, which might allow it to "pass" and not throw any fault codes. Thus, Patterson said some technicians just

put the camera back on after the windshield is replaced, scan the vehicle, see that there aren't any fault codes, and assume everything is fine. "It is critical that the proper calibration procedure be followed," Patterson reminded. ■

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Charging ahead

Ready or not, electric trucks are going to be the standard before you know it. Here's a progress report to help show where the industry stands now on equipment reliability, TCO, chargers, and more.

By John Hitch

[ZERO-EMISSIONS]

Every year, a totally decarbonized transportation industry inches closer to reality. When exactly that will happen isn't clear. Those several years of inching have added up, though, and what is certain is that electrification is coming, whether fleets are ready or not.

According to CALSTART, 5,483 medium- and heavy-duty zero-emission trucks (ZETs) have been deployed from 2017 to 2022, with 3,510 in the last year alone and 178% over the previous cumulative five years. More than half (58%) were cargo or step vans.

The number of ZETs is nowhere near the 1.1 million+ total MD and HD trucks sold in 2022, so most fleets do have time to research and plan. Some, though, must start phasing in EVs as soon as next year. According to California's recently passed Advanced Clean Fleets (ACF) rule, last-mile and government fleets must begin adding zero-emission vehicles in 2024, with drayage, last mile, and yard tractors required to be zero-emissions by 2035. Work trucks and day cabs have until 2039, and sleeper trucks and specialty until 2042. Touted by the California Air Resources

Board (CARB) as "a first-in-the-world requirement," the sale of trucks powered by internal combustion will be banned starting in 2036.

California is merely ground zero for zero-emissions; many other states will follow, with federal mandates eventually coming into play. The truck OEMs all have carbon neutrality goals, too. Navistar even stated its S13 powertrain will be its last diesel platform.

And most importantly, initial fleet customers have been (mostly) satisfied with commercial electric vehicles (CEVs). Several early adopters have reported to *Fleet Maintenance* their overall success with EVs, attributed to factors such as happier drivers, reduced maintenance, and better total cost of ownership.

They also admitted industry-wide adoption faces some formidable obstacles—questions that demand answering before even small fleets start chugging down the electric Kool-Aid. Will trucks and charging stations be available at scale? Can batteries support enough duty cycles to make the transition profitable? Will the grid be able to support all these new draws on power?

And will the maintenance sector so seasoned at fixing internal combustion engines be able to upskill fast enough to troubleshoot and repair all the new electrical components?

The sample size is simply too small and the technology too new and fluid for *Fleet Maintenance* to declare any of these questions settled. We can, however, offer up what many early adopters and technical experts have found so far, and where they have confirmed benefits and identified deficits.

Think of it as a CEV progress report of sorts, something to mark how the industry is doing so far. It might not convince you to place an order or start drawing up charging station plans, but we hope it will help guide you through the transportation industry's most significant transformation since we traded in horses for horsepower.

First impressions from an EV leader

EVs account for a quarter of DHL's global fleet of 119,000 assets, so the company is well on its way to meeting its goal of net-zero emissions by 2050. Replacing one diesel truck with an EV saves an average of 100 tons of CO₂e per year, according to the German-based company.

“Over the past 10 years, DHL Supply Chain has made progress with EVs across most vehicle sizes, including light duty, yard trucks, and heavy duty. Thus far, we have been satisfied with vehicle performance,” noted Stephan Schablinski, VP of operations excellence for DHL Supply Chain’s GoGreen business, which focuses on sustainable transport.

Along with meeting emissions, Schablinski cited several benefits to drivers—quieter operation leading to flexible night operations, less fatigue so fewer accidents, and all that torque and acceleration provided by the electric powertrain. The maintenance department also comes out as the winners.

“EVs have longer service intervals and lower maintenance costs because they have fewer parts,” he noted. “For example, a diesel engine has approximately 200 parts that need to be maintained and replaced if and when they wear out. An electric [powertrain] has around 20 parts.”

In North America, half of the logistics company’s yard tractors are electric, though heavy-duty will be slower to reach that level until various areas catch up. Schablinski pointed out DHL is “faced with a host of uncertainties, such as lead time, supply chain issues, and other factors that will need to stabilize before organizations can scale heavy-duty EVs.”

Fleets have many more hurdles to overcome and questions to ask prior to adopting EVs.

Schablinski said these include:

- “Is EV service available close to the operation?”
- “Are incentives available and are we eligible?”



» DHL has 119,000 vehicles in its global fleet, with EVs accounting for 25%.

DHL

➤ “Does the incentive timing match the implementation timeline?”

A fleet must also coordinate across multiple stakeholders, including the building landlord, utility and facility managers, charging hardware and software providers, as well as installers.

“It’s also important to consider that everything needs to happen within a specific and thoughtful timeline,” he advised. “We don’t want the truck to arrive a year before the EV charging infrastructure or the other way around, as the clock on depreciation and OEM warranty starts ticking at the time of delivery.”

All these challenges are to be expected during such a massive technology transformation, though, and the potential is worth the effort, he reasoned.

“Considering what current EV technology can deliver, the time it takes to implement, and the cost, EVs are meeting our expectations,” Schablinski said. “As the technology and over-

all EV ecosystem evolve in the future, there is a significant opportunity to simplify, standardize, and work through some teething issues that come with any new and innovative technology.”

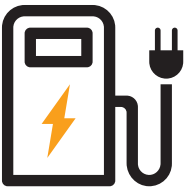
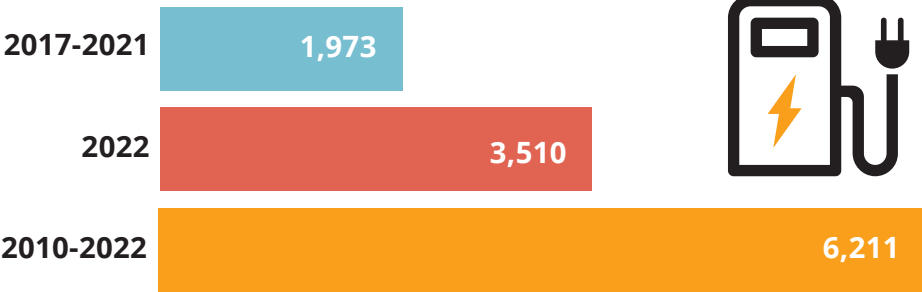
After seeing how those 30,000 EVs work in fleet operations, Schablinski has noted some room for improvement.

“EV charger cords are limited in length—typically 19 ft. with some up to 25 ft.,” he said. “Therefore, it is important for OEMs to align on a standard placement for the truck charging ports. If one OEM places it under the driver door and another places it farther back, this can lead to a problem, as you are not able to reach the port to charge the truck.”

His suggestion?

“It would be ideal to have different charge port options on the front, driver door, passenger door, and back,” he said. “These small adjustments and customizations would make a big difference in terms of ease of use.”

Zero-emission truck (Class 2b-8) deployments



Total number of new medium- and heavy-duty truck sales in 2022

1,186,966 units

Source: CALSTART



» Half of DHL's yard tractors are now electric, like this one from Orange EV.

DHL

Finding a dependable range



» DHE has three Volvo VNR Electric Cass 8 tractors in its fleet.

Dependable Highway Express

California fleets have known what's coming in terms of emission regulations for a while. Some may have held out hope the lawsuit filed by the Truck and Engine Manufacturers Association against CARB to halt stricter 2024 emissions standards would go somewhere (it didn't), or that the Golden State would get tired of going green (it won't). Dependable Highway Express decided early on to take electrification seriously and embrace it from the beginning, making it well-prepared for the coming ACF mandates.

The carrier operates 400 less-than-truckload assets, 100 in truckload, and another 100 in drayage. DHE beta-tested VNR Electric prototypes through Volvo's LIGHTS project and has two first-gen production models and one new second-gen extended-range version operating out of its Ontario, California terminal.

Right now, DHE is figuring out two of the most pressing issues: range and charging capabilities. If a fleet can't answer how far a truck can go and how to power it, it's not very dependable.

Because DHE has operated Class 8 EVs since 2020, Troy Musgrave, director of process improvement at Dependable Supply Chain Services, has a good idea of these capabilities.

Testing out their EVs themselves has allowed the fleet to truly measure what the batteries can do. The gen-1 VNR Electric has a marketed range of up to 150 miles, though that does not mean the truck, which has a 264-kW battery, gets close to that on one charge.

"The first thing you have to do is remove 20% [capacity], because the battery holds that in reserve," Musgrave explained. "You've got 211 kWh to use. In my experience, they also advertise 1.8 kWh per mile—and that might be what the truck

"We're getting anywhere from 85 miles to as high as 180 miles [on the first-gen trucks] and we do that through opportunity charging."

Troy Musgrave, director of process improvement, Dependable Supply Chain Services

consumes, but when you add in standby power—all that power that's required to put the energy in the truck—it's more like 2 [kWh per mile]."

This is a technical way to say DHE's older VNR Electrics get about 105 miles per charge. These are in LTL applications; fully loaded trailers would diminish this performance even more. The extended-range version ups battery energy storage to 565kWh, for a marketed max range of 275 miles. It features an improved design (with six battery packs) for faster charging. It can receive 250kW in one hour, according to Volvo.

DHE has not tested the extended range's upper limits just yet, as they received the truck 45 days before speaking with *Fleet Maintenance*. But Musgrave intends to push the range limits when given the opportunity. He expects the range to max out at around 238 miles.

This is not to say these trucks' daily routes are limited by one battery charge.

"We're getting anywhere from 85 miles to as high as 180 miles [on the first-gen trucks], and we do that through opportunity charging," Musgrave said. "Even 15 to 20 minutes on a 150-kW charger will put a significant amount of energy back in."

Opportunity charging occurs when drivers return to the terminal for lunch or a break. And up until 80% full, the battery accepts energy at a greater rate.

"Once it gets up to about 80% capacity, the length of time it took you to go from 20% to 80% will be as long to go from 80% to 100%, because the [charger software] throttles it way down to fill up that last little bit."

Musgrave doesn't plan on getting any more Class 8 trucks with the gen-1 batteries. Diesels just offer more flexibility for day and night routes.

"At night, the truck is traveling anywhere from 300 to 500 miles and in the daytime, it's traveling up to 200 miles," Musgrave noted.

He envisions a scenario where technology improves enough so that the fleet can operate from southern to central California with only EVs, with drivers changing out depleted trucks with fully charged ones and continuing on, "like the Pony Express," Musgrave mused.

"You don't need a bunch of trucks; you just need enough trucks and a scheduling format that can get you to the next place," he continued.

The Tesla Semi, currently running routes in Pepsi's fleet, boasts a purported 500-mile range, which Musgrave noted exceeds certain hydrogen fuel cell trucks' 400-mile range. The issue with Tesla will be how fast they can fulfill orders.

"I've got an order for 10 of them," Musgrave said. "And I don't know if I'll see them before I retire."

Vetting EV reliability

According to CALSTART, as of the end of 2022, fleets had 136 (non-pickup) choices to start their electrification journey.

Ryder, which runs the gamut of transportation solutions, from leasing and used sales to maintenance and supply chain management, has vetted a large swath of these solutions at every duty cycle, such as Freightliner's eCascadia and eM2, as well as the MT50e chassis, and Navistar's Lonestar EV (using Dana's e-powertrain). Ryder also has reserved Tesla Semi tractors.

In the van segment, Ryder has Ford e-Transits, and by 2025 will lease up to 4,000 of General Motor's BrightDrop Zevo 400 and Zevo 600 medium-duty electric vans. Add to that yard tractors, buses, and soon electric refrigerated trailers.

At ACT Expo in May, Ryder also launched RyderElectric+, which it calls a "turnkey electric vehicle fleet solution" to help fleets navigate the electrification process by bundling the vehicles, charging, telematics, and maintenance all for one price, with advisers available as well.

"We aim to help make the integration of electric vehicles as seamless as possible by offering solutions that are streamlined through one provider at one cost," said Karen Jones, Ryder CMO and head of new product innovation at the unveiling.

Not all vetted solutions work out. As far back as the summer of 2017, Ryder was providing exclusive maintenance for Workhorse's electric step vans and even started a short-term leasing program with the Workhorse C-Series in 2020. Production of that model halted on the heels of a recall due to reliability issues. Workhorse launched a new electric van, the W56, in March at Work Truck Week in Indianapolis.

Whether the EV heads into series production, as the eCascadia and eM2 have, or gets retooled by the OEM, Ryder gleans new insights. Fleets can purchase the comprehensive form of this wisdom via the company's EV Shop startup guide.

Arun Chickmenahalli, director of maintenance and research and development for advanced vehicle technology at Ryder, said the strategy is a "clear path for the shops to adhere to—a process-driven approach while implementing EVs."

He shared some of Ryder's approach to vetting EVs and developing a maintenance program with *Fleet Maintenance* this spring.

For Chickmenahalli, proving EVs are reliable and that users develop "a good cadence for maintenance activities" will be critical to ensuring electrification succeeds. He said Ryder does extensive technical and OEM evaluations to discern which EVs offer customers the best value.

He noted while about two-thirds of an EV is the same as a conventional truck, the electric components that constitute the other third are quite different and servicers must start planning on how to adjust operations to accommodate them.

"The majority of OEMs" allow Ryder to perform diagnostics and in-house warranty work, Chickmenahalli noted, but some prefer to "learn for themselves" first. This creates a maintenance firewall, where Ryder isn't sure what it will take to maintain these trucks.



» Ryder began testing several EVs of various duty cycles, and launched RyderElectric+ in May.

Ryder

"It is definitely restrictive for us not to be doing all the high-voltage work. In the interim, we should be learning."

Arun Chickmenahalli, director of maintenance and research and development for advanced vehicle technology, Ryder

"It is definitely restrictive for us not to be doing all the high-voltage work," he offered. "In the interim, we should be learning."

Each OEM does things a little differently—from battery chemistry to power management to charging—and that expands to each class segment. "There is not one simple process that you can follow for one technology," Chickmenahalli explained.

Simple, no. But still possible. Ryder still needs to

come up with maintenance plans for any vehicle it plans to lease or service, such as how to visually inspect for nicks in wire harnesses or corrosion on the battery.

Prior to an EV coming to a Ryder shop, the company executes an EV technician training plan, developed in conjunction with the OEM. This includes how to implement Ryder-developed tools, equipment, and PPE to ensure safety.

"Some of the training is very specific to their technology that will not be adaptable to another technology," Chickmenahalli said.

Each shop gets a rollout guide and the responsibilities of each employee are laid out ahead of time.

Chickmenahalli follows a strict Six Sigma methodology and checks the progress of those shops through quality audits 60 to 90 days after "to see if they're adhering to the policies and procedures."

While this is going on, Ryder scores the EV on several fronts, such as issue resolution, diagnostics, field trials, production readiness, training and documentation, and vehicle communication. The technical evaluation questionnaire comprises 128 questions.

"We come up with a level of confidence with this OEM or a technology provider—basically a matrix that we define," he said.

Even with this level of evaluation, Chickmenahalli said for Class 3 and higher, it will take one full lifecycle—5 to 7 years—to fully understand what it will take to maintain CEVs in terms of what components break down, how warranty repairs will work, the parts supply chain, and several other aspects.



» Ryder technicians go through extensive training before working on EVs.

Ryder

Figuring out TCO

Theoretically, electric trucks should be better for the environment and a company's bottom line—the ultimate win-win. To verify this, fleets will need years of data comparing the costs of their diesel operations versus EVs. But adopting these trucks doesn't have to be a leap of faith, according to Fleet Advantage.

The company, which offers data analytics, equipment financing, and life cycle cost management, recently unveiled a new digital tool EVAN (Electric Vehicle Analytic Navigator) to estimate these assets' total costs of ownership for individual fleets. The lifecycle cost analysis tool takes into account several variables, including equipment and charging costs, incentives, and maintenance cost per mile through a truck's first six years, and provides a side-by-side comparison with a comparable diesel tractor.

Armed with this knowledge, fleets can better determine if adopting EVs now will ensure future profitability as well as sustainability.

"Everybody has different needs; they have different reasons for doing it," noted Hadley Benton, EVP of business development at Fleet Advantage. "But ultimately, [electrification] needs to make economic sense at the same time, balancing that with reducing your greenhouse gas emissions and greening your fleet."

That's not always going to be the case. One EVAN example provided by Fleet Advantage found a food service fleet running in Florida would save \$43,609 over six years to stick with diesel when leasing. In this case, the EV had a \$0.03 better maintenance and repair (M & R) CPM over six years, and a decisive edge in fuel costs, with a \$0.15 charge cost per kWh versus \$4.13 diesel cost per gallon. These could not offset the 2024 BEV's upfront cost of \$236,000 (versus \$145,000 for the diesel tractor) and ensuing finance fees.

The disparity was even more apparent when EVAN crunched the numbers for a Hawaiian grocery fleet. Leasing a diesel truck versus battery-electric would yield a 110% better TCO: \$205,361 for the diesel; \$443,889 for the BEV (due to much higher electrical costs in Hawaii).

Benton noted while Fleet Advantage has "billions of miles of data on diesel trucks," they had to rely on data supplied by OEMs to make the EV assumptions. Even with more and more fleets adopting, the technology is "all very new," he said.

Benton, who has specialized in fleet risk management for much of his 30-year career in the industry, explained all the uncertainty surrounding what type of battery chemistry will win out, or where fuel cells might see more adoption, "creates risk and drives the cost up."

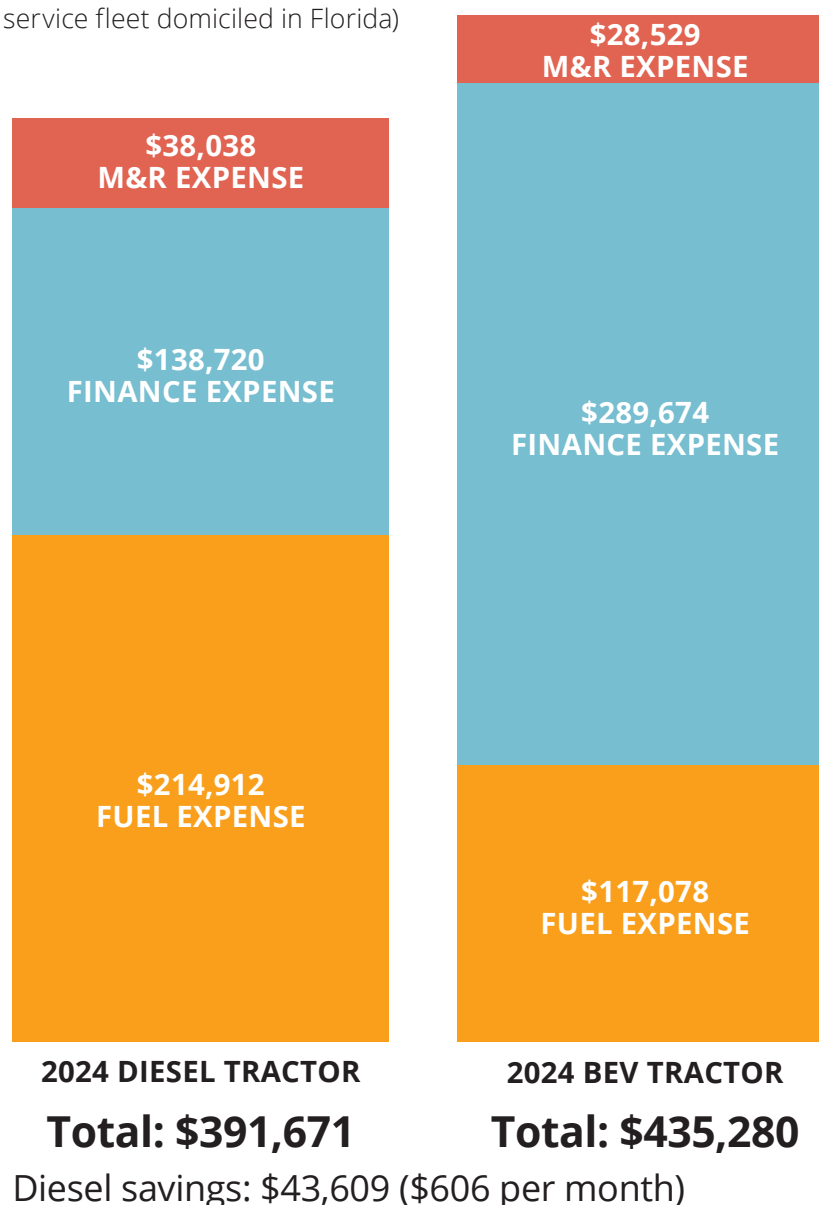
At some point, these questions will be sorted out and the risks will be reduced, allowing the advantages of EVs to stand out.

"The maintenance and repair costs are probably going to be about 25% less than a diesel from what we've seen so far—and could be as much as 30%," Benton said. "The fuel cost advantage is probably about 40-45%."

It's not clear when OEMs will find ways to reduce upfront costs as they scale production,

Diesel vs. BEV 6-year TCO comparison using EVAN tool

(Food service fleet domiciled in Florida)



Source: Fleet Advantage

“Early adopters are usually the ones that help fund the transition. It seems like with electric vehicles, that’s not the case.”

Terry Rivers, VP of maintenance, Cox Automotive Mobility Fleet Services and sr. manager of vehicle services training

but when they do, those maintenance and fuel savings will provide a better TCO argument. So fleets should be analyzing where they currently stand and what duty cycles BEVs might flourish in, Benton argued. "You've got to consider your options and start thinking about what the future holds and set some goals," he said.

In this respect, it's much riskier to procrastinate until regulations force fleets to decarbonize and try to play catch up.

"By then it's too late; they'll be left behind," he concluded.

Repowering

One way to circumvent those high initial costs is to convert existing fossil fuel trucks to an EV. Cox

Automotive found this allows their team to start learning about deploying EVs without incurring the usually steep learning curve costs.

"Early adopters are usually the ones that help fund the transition," said Terry Rivers, VP of maintenance for Cox Automotive Mobility Fleet Services and sr. manager of vehicle services training. "It seems like with electric vehicles, that's not the case."

At least that's not the case when Cox transplanted an electric powertrain into a disabled 2017 Sprinter van used for mobile maintenance.

"The motor blew and to replace, it's about \$25,000," Rivers explained. "We converted it for \$45,000."

Cox was assisted by a repowering company called ZEVX, and Vanair installed four 5,000-w

batteries in the back to run power tools, the electric welder, and an air compressor.

River said it costs \$133 less per week to power the truck, which went into service earlier this year, with electricity as opposed to diesel. At that rate, this Sprinter van will make up that \$20,000 difference in about three years. But the cost savings don't stop there.

"The electric savings are going to be found in uptime and maintenance," he said. "There's close to 10,000 moving parts on an internal combustion chassis platform and less than 1,000 moving parts on an electric."

For mobile maintenance trucks and other work trucks that idle more often because they double as the worker's 'office', the benefits of electrification are even more pronounced.

Running A/C in summer and heat in winter burns approximately a half-gallon of fuel per hour, or about \$2/hour, Rivers said. EVs, by contrast, use resistor wires, similar to a hair dryer, to heat up quickly and up to 1,000% more efficiently, Rivers said.

Now that mobile tech doesn't have to wait for the cab to reach a comfortable level and ends up being more productive, Rivers said.

He added starting cycles are also harder on the engine: "Warm-up cycles are the worst thing for internal combustion engines. First off, it destroys the engine—that cylinder head expands more than the cylinder block does further and faster at different rates, so it literally shreds the cylinder head gasket, causing undue wear and tear."

Cox will alter the battery capacity for future conversions, Rivers noted.

"We put exactly what we needed in that truck, but what we should have done is about 150% of what we needed," he said.

From a day-to-day perspective, this would allow a mobile tech to have enough range to take on another job and generate more revenue. Down the road, it will ensure the vehicle has the capacity to do a typical day's work.

River expects batteries to lose upwards of 20% capacity after seven years. The truck would have a limited operating range and/or have to stop more often to charge if you keep it, and that decreased capacity also makes it harder to sell.

"In seven years, that vehicle is worthless to everyone," he said. "Nobody will buy an EV with a bad battery, because they know it's going to cost them \$25,000 to \$40,000 to put a battery in it."

Overbuying mitigates this risk and is better for battery health. By not fully charging lithium-ion batteries and running them down, Rivers said a battery would only lose 10% capacity over seven years, not 20%.

Conversion is also far better at reducing emissions by eliminating new emissions at the manufacturing stage, noted Rivers, who has worked closely with EVs since 1997.

Thirty percent of a vehicle's lifetime carbon emission output comes from manufacturing it, he said.

"You're not carbon neutral on that vehicle for over 10 years," Rivers said. "But if you take a vehicle you already bought, it's a compound carbon emissions reduction. You're carbon neutral in just a few years, three to five years max."

Maintaining EV batteries & chargers



On the maintenance side, the relationship

between the EV's battery and chargers presents the steepest learning curve, as it is most dissimilar to how conventional trucks are fueled. With a diesel truck, you stick the nozzle in, squeeze and lock the handle, and wait until the tank is full. Chargers have the same basic form factor as a fuel pump, with a cord and "nozzle," but transferring electrons is far more complex. A fleet must consider things like charge cycle, charge volume, rate of speed, and ambient temperature.

According to John Ellis, director of sales, global EV battery solutions at Cox Automotive, understanding and managing battery behavior is the most important aspect of successful EV adoption. By doing so, a fleet ensures vehicles will "continue to have range health through the life of that vehicle so that your long hauls don't turn into short hauls way too soon."

This is due to battery degradation, which Ellis said has "grown exponentially through mismanagement of the battery." For example, if a fleet has chargers at Florida and Pennsylvania terminals, each will have to be set up to account for the variation in ambient temperature, he advised. Cox has developed an EV Battery Health tool for its Manheim auto resale business that provides health scores for batteries to validate a battery's health. Cox plans to carry this over to the CEV side as well.

"In general, battery best practices come down to never fully discharging or overcharging the battery," explained Nikolas Runge, VP of products and services at InCharge Energy, a developer of CEV charging solutions.

How effectively batteries get charged depends on interoperability, or how the vehicle communicates with the charger, Runge said. He likens the connection to "a handshake" between the two.

An awkward handshake here will interrupt the communication and energy will not flow. This means that a mixed fleet may run into issues as currently "each OEM has a little bit of a different leeway in interpreting" these communication standards, Runge said. One OEM's set upper or lower tolerances may be considered out of bounds for another and charging could be disrupted.

» EV chargers are aesthetically close to diesel fuel pumps, but the similarities stop there.

Nikola

Runge would like to see more standardization on this front, as has happened with passenger vehicles.

"It was very interesting and actually also astonishing to me that the heavy-duty and medium-duty vehicle OEMs have learned nothing from their passenger vehicle colleagues," he said.

InCharge offers battery management software and is working on developing a solution using Nikola Tre BEVs. The OEMs also have developed technology to ensure batteries last.

"When it comes to maintaining the battery health the OEMs have built in very smart systems that are keeping the battery at the perfect temperature—they actively cool or warm after delivery prior to charging," Runge said.

As fleets slowly figure out how to properly operate and charge a few vehicles, they will likely find themselves with vacant chargers and/or underutilized EVs. To make good use of these, InCharge will go into production this August on the V2X bidirectional charger. This allows fleets to generate additional revenue to offset the cost of their EVs by using these vehicles' batteries for onsite storage.

"For example, a school bus in the summer gets charged when the electricity is cheap, and when the electricity would be too expensive, we can discharge the vehicle," Runge explained.

This method also can work as an off-grid solution where a row of vehicles can power facilities in case of an outage.

The final piece is getting skilled workers adept at working with high-voltage cables to maintain chargers, which have a slew of wires and controllers that may need service and repair. Having enough people trained in time is a concern to Runge.

"The electrician needs to be specifically trained on that type of charger," he said. "Otherwise, they cannot repair that."

It takes about a year for a charger technician to be fully trained and work on their own. ■

For related content go to FleetMaintenance.com/equipment



TRACTOR-TRAILER AIR LINES: Contamination keep away

How to ensure air stays clean from the compressor to the brakes and other systems.

By Seth Skydel

Why is it important to ensure a clean, consistent path for compressed air to take from the compressor to trailer components, which include brakes, automatic tire inflations systems, and air ride systems?

For Richard LaFlamme, technical services manager at SAF-Holland, the answer is simple: failure to do so impacts carriers and their customers.

"Restricted or contaminated air causes premature component failure," he said. "The consequence is unwanted and unplanned out-of-service time, which delays deliveries and increases maintenance costs, especially in high duty cycle applications."

There are other reasons as well.

"The air system uses numerous components to control the brakes, suspensions, and other things," said Dick Winter, lead senior engineer at Link Mfg. "These valves and solenoids have seals, O-rings, diaphragms, and other moving

parts, which work best when you have clean air. If contaminants find their way into the air system, they begin to act on the components, reducing their effectiveness."

Chris Stadler, product marketing manager for Volvo Trucks North America-VNL, noted that any pneumatic component can be subject to moisture or oil contamination, so careful attention to system health and functionality is necessary for maximum uptime.

"Ensuring the cleanliness of compressed air is more important than ever given the dramatic rise in use of vehicle pneumatic technologies in the past decade," he added. "Without clean compressed air the risk of expensive repairs and downtime dramatically increases."

Stu Russoli, senior highway product manager for Mack Trucks, agreed, adding that "pneumatic technologies have become integral to the safe operation of trucks, so delivering consistent, clean compressed air to those systems is extremely important."

But defining 'high-quality' air is difficult because there isn't an industry standard, related Richard Nagel, director of marketing and customer solutions for air supply and drivetrain at Bendix Commercial Vehicle Systems. "And yet," he said, "because systems today are more sophisticated

than they used to be, they also require a higher quality of air."

According to Mark Hawkins, head of technical products for Redline Detection, air brake leaks are becoming an even bigger issue for some fleets. Hawkins said some of today's heavy-duty trucks have characteristics that make them more susceptible to a leak.

Historically, main lines were made of heavy-duty copper with threaded connections. Leaks rarely emerged unless rub-through occurred, Hawkins explained. "Fleets never really had a problem because everything had a good, heavy-duty connection, and everything was still threaded between parts," he said.

Today, this is not always the case. There are large bundles of air lines because air is being supplied not only to the brakes, but also to the suspension and the cab, among other areas of the vehicle. "Things just aren't as robust as they used to be," Hawkins related.

What happens when air is not clean?

If air systems are not maintained properly, they

may not operate correctly or could fail completely. In the case of brakes, components could freeze up or fail prematurely, Russoli noted. For a suspension, loss of ride quality is likely as well as the inability for the suspension to be raised or lowered, which results in a loss of critical capabilities.

“Excessive moisture in compressed air has caused steel air tanks to corrode internally, which creates particulates in the air lines that can damage the systems that use the air,” Russoli continued. “That’s especially true for transmission control systems, and is important considering the increased use of automated manual transmissions that rely on compressed air to operate.”

Braking system modulators and wheel-end pneumatic components can freeze with excessive moisture or fail prematurely from chemical incompatibilities with oil contaminants, Stadler noted. “When this occurs, contaminants will accumulate inside valves and O-rings, causing corrosion, clogging, or internal valve damage,” he explained. “Any internal damage or freezing in braking components could cause sudden loss of [anti-lock brake system] functionality or more advanced braking or traction control functions.

“Suspension control system components can be subjected to the same failure modes,” Stadler continued. “Any internal damage or freezing could cause the sudden inability to lower the suspension to pick up or drop off a trailer. In rare cases, if enough moisture has accumulated in the air bags, it can affect load leveling controls and optimization for dynamic control, resulting in loss of productivity for load sensing adjustment and driver comfort.”

Stadler pointed out that prolonged excessive moisture causing internal corrosion of steel air tanks is of particular concern because the corrosion creates additional particulates that are subsequently sent through to downstream systems.

“When more moisture is introduced, the rust particulates coagulate or congeal, causing devastating effects and often sudden, complete failure,” Stadler said. “This type of failure has typically targeted the air compressor governor, given its proximity to the air tanks and small internal mechanical components that can easily be compromised. Any pneumatic component can be subject to moisture or oil contamination, resulting in a challenging diagnostic process to uncover the issue.”

Additionally, Stadler noted that transmission and emission systems utilizing vehicle air have been subject to sudden failures. Transmission control systems, like those with air-assisted clutch actuation or overdrive assist, have been victim to contaminated compressed air. Damage to pneumatic components within the emissions system are often undetectable, he added, but have caused problems to downstream emissions components and impacted processes.

Joe Kay, director of engineering at Cummins-Meritor, pointed out that there can be negative consequences if water or particles get inside suspension air bags. “Any ingress can have longterm affects such as non-functioning valves, internal corrosion, etc.,” he said.

LaFlamme related three areas of air system contamination concern. One is when oil from the



» Contaminant build-up in pneumatic systems leads to premature component wear and tear.

HalDEX Air System

compressor becomes hot enough to congest the discharge line with carbon, restricting airflow. “The heat from this restriction expands the air molecules, slowing system air pressure regeneration,” he said. “Excessive oil will also corrupt the desiccant properties in the air dryer filter.

“Another issue can be when high water content freezes in the air system, preventing proper system operation,” LaFlamme continued. “Excessive water reduces the actual air volume, reducing functionality. Impurities in water, like minerals, can cause springs inside the valves to decay, eventually causing the valve to malfunction and leading to failure. Water impurities can also cause combination-style brake actuator center seals to pass air from the parking chamber to the service chamber.”

The third concern is alcohol. For example, when alkyl-grouped molecules modify polymer and elastomer components, like O-ring seals, this will eventually cause them to malfunction.

If contaminants are somehow introduced into the air system, Winter reported, they can increase friction within valves. “Valves obviously have moving parts, and contaminants can begin to hinder their movement, so they begin to develop operational limitations and extra resistance to smooth component motion,” he explained. “You can also get air leaks if the contamination gets on seals and compromises them. Once that happens, the seals no longer mate up properly and you can have a leak path through any gaps.

“Contaminants can also reduce your overall airflow in the system, and this alone can cause problems,” Winter continued. “They can also cause accelerated component wear within the valves. Especially when you’re dealing with a contaminant like oil, it can begin to coat surfaces and valves and then, if you’re trying to run an O-ring over it, that can accelerate wear.”

Depending on the type of contaminant, the system might be exposed to a chemical attack on the rubber components within the valve as well, Winter pointed out. “Even a substance as seemingly benign as water can get trapped in the wrong place and can freeze, which will prevent a valve from moving properly,” he said. “You could also have water accumulation in an air line and if it freezes, you’ve got a plugged system.”

Best practices: Suggestions from suppliers

- ➔ Ensure the engine air filter is clean
- ➔ Replace the air compressor (and discharge pipe) if it pumps excessive oil into the air system
- ➔ Drain reservoirs daily
- ➔ Follow PM instructions for air dryers
- ➔ Avoid inducing alcohol and lubricants into the air system
- ➔ Seal gladhand connections when equipment is decoupled
- ➔ Confirm that air dryers are operating properly and change cartridges on time
- ➔ Regularly drain the air tanks. If oil or excessive water is present, it may be an indication that you need to address quickly
- ➔ Train drivers to monitor the frequency of their compressor turning on and off or when the dryer purges; if too often, that may be an indication of a leak
- ➔ Never put additives into an air system. They can remove lubricants and collect in valves, negatively affecting rubber seals
- ➔ Check air lines for sections where water could freeze.

Redline Detection offers a unique piece of shop and service equipment to help technicians locate air system leaks in a matter of minutes. The Air Brake NanoLeak Finder is a heavy-duty diagnostic leak detector that diagnoses high-pressure air brake, air suspension, and air-powered systems. The detector, used in conjunction with the included NanoLeak Handheld Leak Locator, locates all air brake and air-powered system leaks.

Choosing the right compressor for service trucks

Making the right choice for mounted compressors is important, noted manufacturer Vanair. Two of the most popular types of air compressors are rotary screw and reciprocating (or piston) models.

A rotary screw air compressor is oil-flooded. The oil inside the unit acts as a lubricant, seals the rotors, and cools the system from the heat of compression. Key benefits to using a rotary screw compressor include fewer moving parts and less maintenance.

A reciprocating air compressor works by using pistons driven by a crankshaft to compress the air. These compressors, which require an auxiliary tank for air storage, are best suited for intermittent use, such as on service and tire trucks.

In the end, choosing a rotary screw or reciprocating air compressor comes down to application and desired lifespan. ■

TMC Recommended Practices address air system issues

- **RP 617A** – Contaminant Elimination Procedure for Tractor, Trailer, or Dolly Air Brake Systems
- **RP 619B** – Air System Inspection Procedure
- **RP 630A** – Air Compressor Diagnosing for Excessive Oil Consumption

SPOTLIGHT ON SAFETY



» A technician uses an Ottobock Back exoskeleton during repairs, which transfers some of the force bearing down on his shoulders and back to other body parts.

Mazda Toyota Manufacturing

The astronomical importance of shop ergonomics

Vehicle maintenance puts a heavy burden on the body, but with the proper tools, from sophisticated exoskeletons to simplistic creepers, shop managers can lighten the load.

By Alex Keenan

Even the most basic preventative maintenance tasks, when repeated over the course of 20 years, take a toll on the body and can result in a back or shoulder strain while performing an otherwise-innocuous task. But while the task may appear innocuous, the cost is not.

“If I strain a muscle in my shoulder or my arm, that’s at least six weeks of therapy, twice a week,” said Michael Renforth, VP of safety, health, and environmental for Dickinson Fleet Services. “And then that’s obviously light duty. So that means you can only lift five or 10 lbs., you can only push or pull up to five or 10 lbs., and usually there’s no climbing. Basically, this person is sorting paperclips.”

And if the injured technician in question runs a mobile truck, then the loss of manpower is even worse, as the idle truck becomes a sunk cost until another technician gets into the driver’s seat. But the impact of an injured tech does not simply begin and end with him or her, the hidden costs multiply throughout the shop.

And because technicians are a shops’ most valuable asset, management needs to consider not just what tools and technology can help workers perform more efficiently, but more ergonomically as well. One small strain can cascade into a litany of problem for a fleet, so preventing musculoskeletal disorders (MSDs) should be at the top of any shop’s list of priorities.

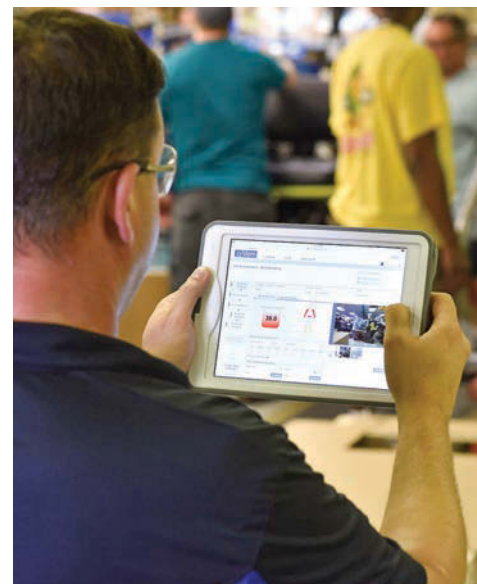
According to Kristi Hames, senior solutions strategist for VelocityEHS, an environmental, health, and safety software provider, here’s what happens when a worker suffers one of these injuries:

“You’re dealing with someone who’s out of work, so you’re short staffed, you’re dealing with the cost of an injury and having to pay for that,” Hames said. “You might have to pay overtime for someone to cover that job, and you might have to pay extra to have a temp come in and do that job.”

But even when someone is able to cover the missing technician’s work, they’ll still need to learn the rhythm of the job, which will decrease a shop’s efficiency.

If technician MSD injuries were a rare occurrence, these setbacks might not be so detrimental. But they are more common than you might think. The U.S. Bureau of Labor Statistics reported 272,780 incidents of worker injuries due to MSDs in 2018. On a granular level, 28% of injuries among general maintenance and repair workers involved an MSD in the same year, with the highest concentration of these injuries found in those aged 45-54. That’s right around the median age for diesel technicians in the U.S., according to Zippia.

So, what injuries must managers strive to prevent among their standing, crouching, and supine (lying face upward) technicians, and what tools can help them do so?



» Software can track a shop’s safety practices.

VelocityEHS

Standing sprains

According to the Centers for Disease Control and Prevention, precision production, craft, and repair workers accounted for 17% of back injury cases.

“The way these injuries happen is when you get into the peaks of exhaustion or strain, like if you’re picking up things repetitively,” explained Marvyn Rieger, key account manager for mobility accounts at Ottobock, a developer of industrial exoskeletons that reduce fatigue for workers by providing extra support for backs and shoulders. “You’re most likely going to get that pain in your back after you’ve picked up a heavy crate.”

Exoskeletons have been used in the automotive manufacturing space for several years to ease the repetitive motions of lifting power tools overhead to assemble chassis. As the



» One of the most obvious and common ergonomic tools in any shop is the automotive lift.

Rotary Lift



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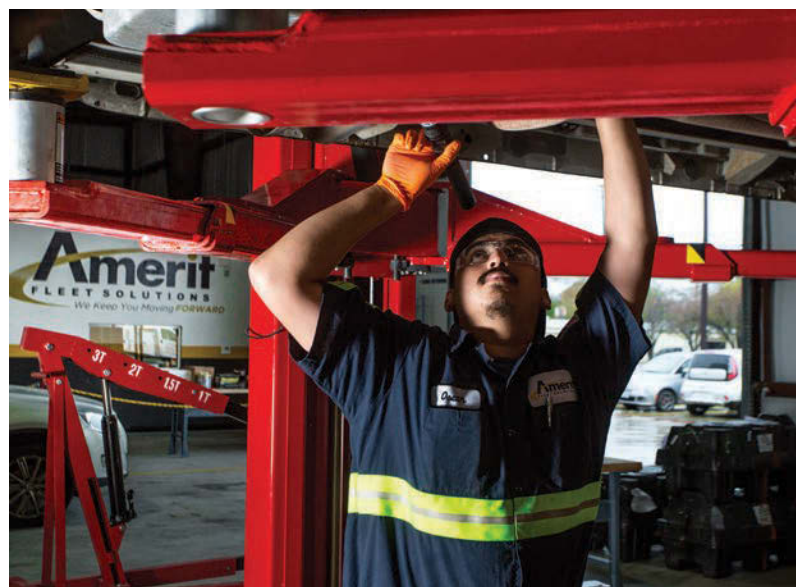
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» Lifts position work at the most ergonomically comfortable height.

Amerit Fleet Solutions

technology matures and costs come down, they should also find a use in the shop, particularly where older workers find themselves performing several hours a day of overhead work.

But they aren't the only solution to improve ergonomics. Even the most ubiquitous shop equipment, lifts, help prevent injuries during extended periods of standing.

According to Jason Matthews, product manager for automotive lifts with Vehicle Service Group, two-post lifts such as Rotary's SPO16/20 Series symmetric lifts can be used to enhance technician comfort.

"Having the ability to raise the vehicle up to a comfortable height where you can walk underneath it, or you can lower it down so that you can grab the tires or the wheel assembly to remove those at a more natural position, is going to make it easier to do the work with less straining, and make you less prone to injury," Matthews explained.

These lifts can also be outfitted with other accessories to avoid lifting and bending with heavy tires, such as Rotary's Wheel Wing tire hanger, the B2000P Wheel Balancer from John Bean, or the ATD-7478 lifting table from ATD Tools Inc.

"Today, there's a lot of 4x4 trucks, and all these guys like to put the big tires on them, so in some of our stores, we do have some extra lifting devices for that," said Benjie Greene, commercial director, Black's Tire and Auto Service. "When we're balancing tires, especially on the truck side, we've got the lifts installed on the balancers. If we're having to make a tire repair and we've got a spreader, we've got the air-assisted lift where our guys are not having to lift that heavy tire up on that spreader to facilitate the repair."

Back pain

Technicians spend just as much time kneeling by vehicles as they do standing beneath them. This can invite back strain as well as injuries from repetitive repair movements, such as shoulder tendinitis and shoulder pain, as the National Institute for Occupational Safety and Health (NIOSH) reported in a 1995 study.

The risks of this repetitive overhead work, especially with a tool in hand, remain as true today as in the '90s.

"For the shoulder, the most common injury we hear about in the advanced stages is rotator cuff tears," explained Ottobock's Rieger. "And then in the back, it's anything with the spinal discs, really L5 or S1 type of strains—slipped discs, etc., that come from that repetitive strain."

The L5 and S1 spinal sections refer to the lumbar vertebrae and sacrum, or lower back, which handles much of the strain involved in crouching and bending at the waist. This is where Ottobock's exoskeletons come in.

Ottobock's mechanical exoskeletons for the back or shoulder use spring-assisted mechanisms to help bear the weight of a tech's torso or arm when they change their posture from bending or crouching and return to their normal position, taking the load of the body from one section and transferring it to another.

"We have folks that kneel and have to work in front of them on the floor, and they still have that support for their back," noted Rieger, speaking of an aircraft maintenance use case. "The exoskeletons are more like a tool. They're often kept in a tool crib where folks go and rent out different tools, because their work instructions may say 'Consider using exoskeleton type: Ottobock Shoulder.'"

Ratcheting tools, when space allows, can also provide technicians some relief by avoiding awkward grips and positions, as well as utilizing anti-vibration gloves to lessen the impacts of using power tools.

"We try to use mechanized drivers, handles that can be held with a power grip that neutralizes your wrist posture," said Dickinson's Renforth. "We avoid pinch grips for forceful activities. We talk about the types of handles on tools; we don't want them longer than four inches. If you get a longer handle, it can create an awkward type of position or more opportunity to strain an arm or an elbow when using it."

Supine strains

Even lying down does not provide technicians much security from musculoskeletal injuries, especially when a technician is on their back for extended periods or levering themselves up and down multiple times a day.

As a result, shops need to be creative and make sure that their techs have the latest technology available to them.

"There are new devices coming on the market that we're always looking at," said Amy Lawson, assistant VP of EHS and security, Amerit Fleet Solutions. "There's very interesting things out there that help employees lower their bodies under vehicles and then raise them back up."

An example of these kinds of technology is Personal Positioning Technologies' Human Hoist Power Shop Chair, an electric and mechanical chair that can be manipulated into an adjustable stool or a creeper with the technician in it, fully removing the supportive onus from the technician's body. However, improving conditions in the shop does not always require the most expensive tech that money can buy.

"It may be as simple as using a pallet jack to move things rather than trying to shift it around with your own body-weight," Lawson mentioned. "Something that simple can make a huge difference."

One example is an ergonomically designed creeper. These can cost about a hundred bucks and contour a worker's body to ensure that work under the truck isn't backbreaking.

"Where we work, we can we place ourselves in a lot of awkward positions, at times inside the cab or underneath vehicles," Dickinson Fleet Services' Renforth commented. As a result, technicians find themselves rolling underneath tractors and trailers on creepers in both indoor and outdoor environments, he continued.

But while a typical creeper might merely make

wriggling beneath a vehicle easier, an ergonomically designed one, such as Lisle Corporation's black plastic creeper, No. 97102, can provide better support.

"What that means is that we shaped the body a little bit to fit a person's body better than the old, flat piece of wood that was always used," noted Jon Bielfeldt, VP of sales and marketing, Lisle Corporation. ■



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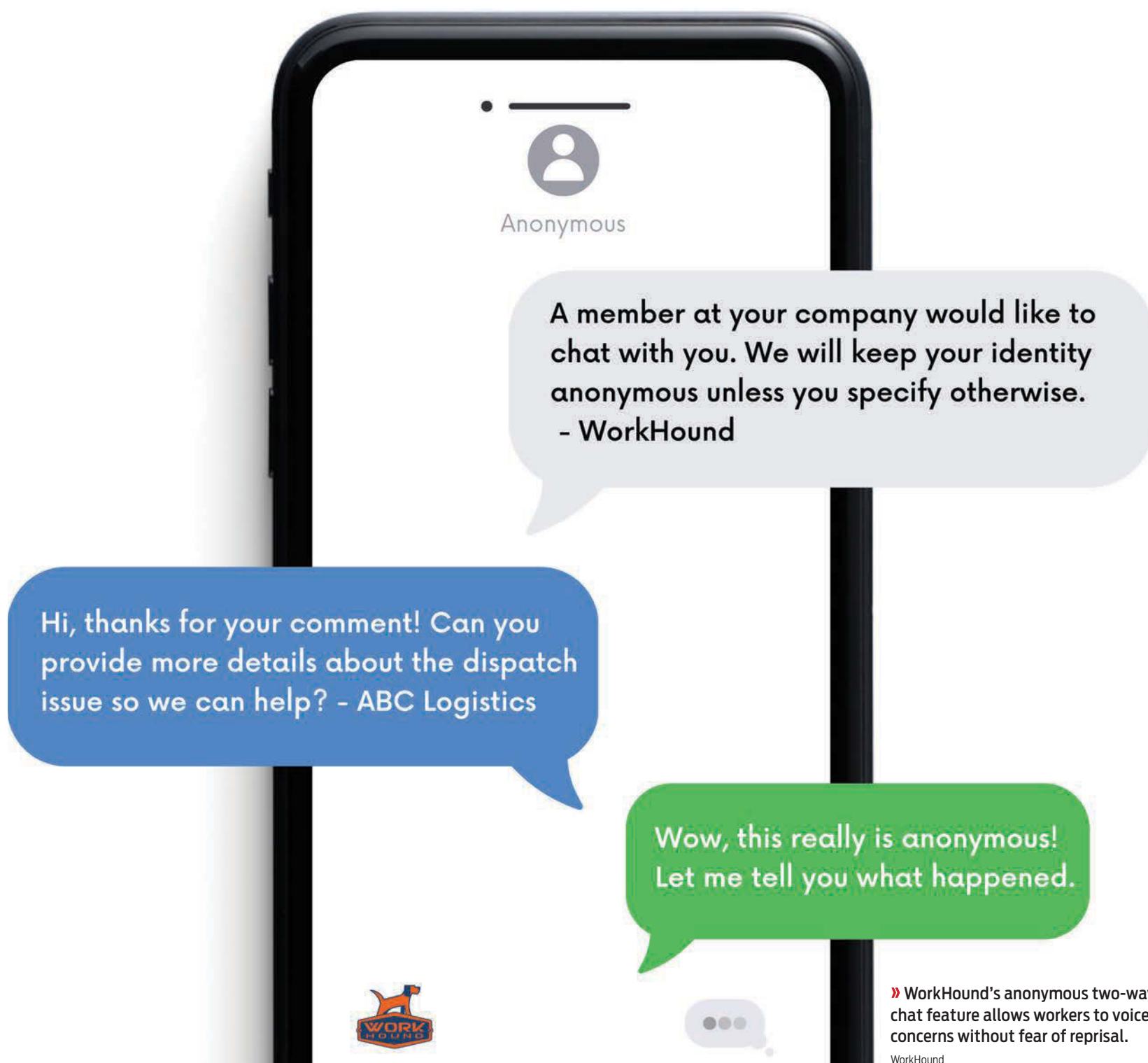


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» WorkHound's anonymous two-way chat feature allows workers to voice concerns without fear of reprisal.

WorkHound

Why to treat employee feedback as a gift

By John Hitch

WorkHound's new anonymous two-way chat feature can shine a light on systemic shop issues that could lead to employee turnover. And Max Farrell, the company's CEO and co-founder, explained how shops can use even negative feedback to improve the business.

Slipping your two cents into the workplace suggestion box is a lot like tossing a coin into a wishing well—that bright idea or valid criticism has little chance of seeing the light of day. WorkHound is trying to change that through a new anonymous two-way chat feature added to its employee feedback platform, in an effort to make employers' retention wishes come true.

As the name suggests, the new feature works by allowing employers to respond directly to negative feedback anonymously entered into the app by workers, opening up a dialogue to fix any problems. The goal, according to WorkHound CEO and co-founder Max Farrell, is to resolve issues before an unhappy worker seeks a new job, while also providing a layer of anonymity.

In a typical scenario, a technician might inform management their spouse is not on their insurance and that they are "tired of the runaround and...about to quit," Farrell explained.



"That's a fixable issue," he said. "The company would reach out to address that [issue], and they retained a team member because of that."

"But there are also times where they share a comment and they don't want to reveal their identity," Farrell continued. "[The shop worker] wants to stay anonymous and the company still wants to try to resolve that issue."

The WorkHound co-founder shared a real trucking scenario where a trainer made two female drivers feel uncomfortable.

"You're in the truck 24 hours a day, so you don't want to pick up the phone and say, 'Hey, this person's crazy,'" he reasoned. "You want to be able to confidentially share that here's the issue at hand."

And in an environment where drivers and technicians are in demand, time is of the essence for companies to address any employee grievance.

"A technician can be happy on Tuesday, fed up on Wednesday, and quit by the end of the week—and then be in orientation somewhere else on Monday," Farrell said. "It's that volatile."

Instant feedback also allows management to move more quickly than acting on market data alone. For instance, anonymous feedback from technicians can tell a company that the shop down the road is offering a few more dollars an hour, and they can adjust to become more competitive and retain their workforce—which typically costs far less than hiring a new employee.

Companies set up who sees the alerts, which could include supervisors, directors, and human resources. While a shop supervisor may dismiss employee complaints about equipment safety, HR can measure those anonymous comments against other locations in

"The goal here is to make the company better and help the workforce be a better version of itself."

Max Farrell, WorkHound
CEO and co-founder

the company to discern if there's a systemic problem and act on it, Farrell offered.

"We work with each company to sort out a structure, because one of the challenges of workforce listening is that if you only have one person receiving that information, the company is not able to digest it and learn from it and then evolve."

So far, customer engagement has gone up 950% through use of the chat, according to WorkHound's product team.

"It's more user friendly and allows for quicker resolution, which helps even more with retention," said Jennifer Clark, experience improvement manager at USA Truck, a WorkHound customer.

The platform was originally created to bust systemic trucker turnover—trucking companies may experience 95% driver turnover annually. In the time since WorkHound start-

ed in 2018, the company has grown to include other transportation frontline workers, including technicians.

And the insights gleaned from surveys sent through the app can help fleets monitor workforce stability, just as telematics data informs them of pending engine trouble.

WorkHound users are also aided by a customer success team that works closely with each company using the platform.

"They have regularly scheduled calls to talk through the feedback, share some of the findings in the data, and just serve as an adviser to the company," Farrell said. "The benefit is that we get tens of thousands of comments, and watch countless companies go through some of these challenges, so we're able to say, 'Hey, we've seen this problem before—here's a way to approach that.'"

The app doesn't do all the work, though.

"Ultimately, it's on the company to make that action," Farrell said.

The results suggest that customers are acting on the feedback in a positive way. Farrell said in 2022, "88% of the time, a worker who revealed their identity stayed with the company at least 30 days after."

Whether the feedback is generated from a company prompt, or comes via an unsolicited anonymous worker, management should see it all as useful data, Farrell argued.

"You can either take feedback as a gift or as an insult," he said. "The goal here is to make the company better and help the workforce be a better version of itself. If there's a gut punch, the company needs to ask, 'How might we get better from this?' And if you have that attitude, then you're able to really improve as an organization." ■

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Aperia Technologies Inc.

How IoT reshapes maintenance

By taking the guesswork out of preventive maintenance and avoiding emergency road calls, IoT shifts the focus to data-driven decisions before the truck hits the road.

Most fleets today take a preventive approach to maintenance — pulling a truck off the road for scheduled service based on a predetermined number of miles or hours in operation. If a problem is not caught in time, what started as a minor issue can rapidly snowball into a more expensive repair that forces a vehicle out of service for an extended length of time.

For the trucking industry, connectivity, machine learning, and artificial intelligence technologies are now capable of revolutionizing maintenance practices. Predictive maintenance shifts the focus to data-driven decisions. Instead of repairing a truck as something

breaks, data can help spot and fix a potentially weak link in advance.

With the aid of real-time telematics data and analytics, fleets can begin to shift to a predictive maintenance program from the reactive or preventive plans that are commonplace today.

Know your data

For many fleets, new technologies can be a double-edged sword, with the excitement of unlocking savings and boosting productivity giving way to the reality of information overload.

So, while the transition to predictive maintenance can boost vehicle utilization and driver satisfaction by identifying emerging problems before they become larger headaches, the data generated from the countless IoT sensors being added to the rapidly growing number of connected trucks can quickly overwhelm fleets.

While the data from each IoT sensor can be used to positively impact fleet maintenance, their respective benefits are far from equal when focusing on the frequency and severity of component failures.

Getting started with predictive maintenance

It can be difficult to navigate how best to get started with a predictive maintenance program.

The best first step is to consider the equipment that not only carries a high maintenance burden, but also causes the greatest damage when it fails. To take a cue from the insurance industry, trucking can benefit by first focusing on “high-severity and high-frequency” incidents; those that are almost certain to occur and would be more likely to have devastating outcomes when they happen.

“Studies by the American Trucking Associations’ Technology & Maintenance Council (TMC) found that one out of five commercial vehicles is operating with one or more tires underinflated by at least 20 pounds per square inch (psi).”

Judith Monte, vice president of customer experience & marketing, Aperia

When considering these factors, it becomes clear that tires are the logical choice for an IoT-related investment.

Underinflated tires foreshadow premature tire wear, tire failure, or even a tire-related accident in the future. That can be seen in statistics from the National Highway Traffic Safety Administration (NHTSA), which show 35% of accidents attributed to “vehicle malfunctions” are primarily attributed to tire-related problems.

The main reason behind this troubling figure is how significant a problem tire underinflation is throughout the industry. Studies by the American Trucking Associations’ Technology & Maintenance Council (TMC) found that one out of five commercial vehicles is operating with one or more tires underinflated by at least 20 psi and that only 46% of all tractor tires and 38% of all trailer tires are within plus or minus 5 psi of the target pressure.

TMC recommends that any tire found to be inflated to less than 80% of target pressure should be inspected, and that a tire underinflated by 50% or more should be considered flat and taken out of service.

By Judith Monte

VICE PRESIDENT OF CUSTOMER EXPERIENCE & MARKETING, APERIA

Judith Monte is vice president of customer experience & marketing at Aperia Technologies. She has worked in the transportation industry for 25 years with a primary focus on uncovering and addressing client needs and creating personalized experiences that increase client value, loyalty, and retention. She holds a Master's degree in Business Administration from the University of Michigan.





Even a single underinflated tire could lead to a sudden blowout, preventing the driver from completing a safe, on-time delivery. The downtime caused by an emergency road call could lead to additional delays and lost revenue.

Predictive maintenance and tires

Tires need to be checked and maintained more than any other component on a truck and therefore stand to disproportionately benefit from the addition of automation paired with sensors and analytics.

Predictive tire maintenance tools, such as Halo Connect from Aperia Technologies, leverage machine learning to assess countless variables such as geography, temperature, and pressure profile to diagnose and categorize tire issues by severity, which assists in cost-effective maintenance planning. Data is continually captured by the system and compared with historical markers to recognize tire damage accumulated, spot early warning signs of potential failures, and plan the right time for maintenance.

With each mile, the predictive analytics of the system gets smarter. These features enable fleet managers to confidently make decisions about where and when to service tires, minimizing disruptions and maximizing equipment utilization. By coupling active inflation with machine learning, fleets utilizing Halo Connect are trimming unplanned, tire-related downtime by an estimated 90%. The result is a decrease in on-road breakdowns, reduced technician diagnostic time, and increased automation of routine tasks.

By constantly managing tire pressure and alerting when tire health is jeopardized, this technology can eliminate human error and simplifies processes for drivers and other employees alike. It extends the lifespan of tires by reducing wear and tear from underinflation while improving overall driving performance and fuel efficiency by ensuring optimal pressure.

If a more serious issue is likely to occur, the system notifies maintenance person-

nel to begin preparations for a repair process that will minimize downtime and help technicians focus on the highest-priority repair work.

With tools such as Halo Connect, fleets no longer rely on time intervals and historical assumptions, and tire maintenance shifts to a predictive model based on specific data and actual utilization.

Unlike other truck systems, the technology capable of transforming fleet tire maintenance is mature and available now. The savings and intelligence enabled by these digital tools will build a predictive maintenance foundation that larger investments in IoT and predictive maintenance practices can build on as they mature in the future. ▀

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FLEET PARTS & COMPONENTS

What's new in products for more efficient fleet operation.



» For medium-duty EV applications

The **Spicer Electrified e-Transmission** from **Dana Incorporated** (models eS4700t and the eS7900t) provide startability, gradeability, and road speed for many medium-duty electric vehicles. Offering 4,700 and 7,900 Nm of output torque between the two models, Dana's latest transmissions offer an integrated inverter system with silicon carbide technology and MOSFET power modules, an electromechanical actuation system, and a three-speed system with Ravigneaux gearing. They also feature Dana's OpenECU platform, safety readiness up to ASIL C, and compliance with ISO/SAE 21434, and can work with straight trucks, walk-in vans, refuse trucks, utility trucks, platform trucks, and more.

➔ For more information visit FleetMaintenance.com/53059231



» Applies to light-duty and midibus applications

Cummins-Meritor's ELSA 195 Air Disc Brake is a twin-piston air disc brake with variants for a variety of applications. With frame options that can suit several applications and duty cycles, ELSA 195 can work with light-duty and heavier duty vehicles. It also features a high commonality of aftermarket service kits and includes options for wear sensing, air chamber installation angle, and secondary sealing.

➔ For more information visit FleetMaintenance.com/53062145



» Streamlines wheel-end installation

STEMCO's Auto-Torq axle fastener is designed to advance wheel-end installation by eliminating the need for complexity and special tools throughout the process. This all-in-one solution works with any industry hub manufacturer and applies the proper clamp load on the bearings to increase service life and reduce installation mistakes. No washers, clips, snap rings, screws, or keepers are necessary while the Auto-Torq is in use.

➔ For more information visit FleetMaintenance.com/53042666



» Includes notifications for in-progress theft

The **CATrak** (models I and II) from **CATrak Technologies** is a catalytic converter theft deterrent that provides two lines of defense, one physical and one digital. The product includes one CATrak module, one cut detecting device (CDT), and one siren. The CATrak module and siren can be installed inside the engine on the catalytic converter with a clamping strip, then, if the CATrak harness is cut or experiences vibration, the siren activates and the owner receives a notification via the CATrak app. As well as this, the CATrak module uses GPS to track the position of the catalytic converter once it is taken with an internal battery with a lifespan of 3 hours.

➔ For more information visit FleetMaintenance.com/53060291

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» Protection for the bumper, fog lights, radiator, and CMS

Ex-Guard Industries' Collision Mitigation Style Guard, No. XG-CM125G2, protects trucks from collisions with fixed objects and animals, providing mid-height protection for the bumper, fog lights, radiator, and CMS. These extreme-duty guards are Daimler approved and designed for Freightliner New Generation (P4) Cascadias equipped with the Detroit Assurance collision management system. Available in silver or black, the 8-gauge, high-tensile steel guards come in two pieces and install in less than an hour. 94" in width and 31" in height, the XG-CM125G2 is adjustable and features corrosion-resistant PVC coating.

For more information visit FleetMaintenance.com/53062148



» Includes emission reduction technology and telematics

The **3rd Generation TriPac APU** from **Thermo King** is based on the TriPac Evolution, but with additional features to reduce emissions and monitor performance. Available in two models, the standard and the aftertreatment device model, the TriPac APU eliminates unnecessary engine idling and provides telematics capabilities for refrigerated transportation. The standard model is a 49-state EPA Tier 4 compliant solution, the company stated, while the aftertreatment device model is a 50-state compliant solution for both CARB and EPA Tier 4 regulations for new OEM or aftermarket installs. Thermo King's TrackKing telematics is available for both models, which both also include an updated controller and in-cab digital user interface.

For more information visit FleetMaintenance.com/53060284

» Features improved fuel efficiency

Bridgestone America's wide-base truck tire, the **Greatec M847**, offers durability and fuel efficiency. The tire features a 26/32nd tread design as well as stone rejector platforms and wide shoulder grooves. It also has reinforced sidewalls and its Turn In Ply design wraps the body ply around the tire's bead bundle. The M847 can be outfitted with IntelliTire and comes in sizes 455/55R22.5.

For more information visit FleetMaintenance.com/53059352



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The Shockit system consists of unique line wrench or crows foot sockets (metric or SAE) with a dimple designed to accept an 8 mm air-hammer-powered, non-turning radial punch drive. Three sizes of offset punches allow techs to reach difficult line nuts in extremely tight spaces.

The hypersonic vibration of the air hammer frees the fastener without requiring the lateral movement of standard ratchets and wrenches.

Shockit even comes in heavy duty XL sizes to

loosen hydraulic fittings on tractors, forklifts & heavy equipment. Plus, the Diesel NOx sensor kit removes rusted diesel NOx and Particulate sensors.

Kevin Krepps runs a small, four-truck landscaping operation. With 20 years of mechanic experience, he keeps costs low by maintaining his own fleet of vehicles.

"My 2017 Ram with a 6.4L HEMI is used daily as a haul-and-tow vehicle," Krepps said. "The clutch fan was bad, and I needed to take out a stuck nut to replace it." Because the fastener is deep in the engine compartment, it could take almost an hour to remove enough parts to get at it.

"The Shockit's punchrod allowed me to sneak in without taking anything off the truck," he said. "It helped turn a 45-minute job into five minutes."

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» FLEET PARTS & COMPONENTS



» Eaton high-power lock box power connectors

Power management company **Eaton's high-power lock box (HPLB) power connectors**, for use in current and future electrified and internal combustion vehicle solutions, offer a space-saving profile, cost savings, and reduced manufacturing complexity, the company said. The HPLB terminal system was designed for high-current and high-temperature applications, up to 500 amps and 125 degrees C, respectively. The fully sealed connectors are also resistant to severe vibration and deliver a component service life that meets USCAR Safety Performance Requirements. HPLB connectors can be installed by a "pick-and-place" robot, allowing for what the company calls precise and safe connections.

➔ For more information visit FleetMaintenance.com/53060910



» Features bidirectional charging

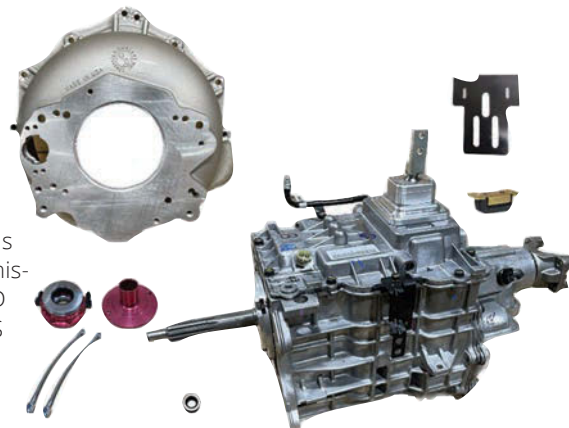
InCharge Energy's newest portfolio of fast chargers includes three new models, the **ICE-22 V2X**, **ICE-44 V2X**, and the **ICE-66 V2X**. Each of these chargers features bidirectional charging, which allows users to charge and discharge their vehicles' batteries or use them as a power source for other applications. The ICE-22 V2X is best-suited for fleets that use sequential charging and can discharge several vehicles back-to-back, the ICE-44 V2X is best for fleets that use sequential and simultaneous charging and may wish to discharge two vehicles at a time, and the ICE-66 V2X functions best for fleets that need to charge their vehicles quickly or put energy toward a building or facility.

➔ For more information visit FleetMaintenance.com/53060294

» Improved gearing for heavy-duty use

The **TREMEC 4x2 TR-4050 Pro-Fit HD manual transmission kit**, #PFGM-40005, from **American Powertrain**, is a 5-speed manual transmission kit designed for RWD 1988-98 Chevy/GMC OBS light- and medium-duty trucks. The kit includes a short throw White Lightning Shifter, a cross-member adapter bracket, bell housing, hydraulic bearing, pilot bearing, reverse light harness, shifter knob, and all the installation hardware. The kit has a torque rating of 600 lb.-ft. and constant-mesh helical gears with ratios of 6.16, 3.11, 1.71, 1, .76 od. Rev 6.03. Constructed of diecast aluminum alloy, the kit includes needle bearings under the gears.

➔ For more information visit FleetMaintenance.com/53060287





TOOLS & EQUIPMENT

A roundup of the latest tool and equipment offerings.

» Prevents damage to the strut

The **CTA Manufacturing Strut Lifter**, No. 8200, is used for the removal and installation of struts, drive shaft, control arms, and ball joint hub separation. It mounts onto a hydraulic transmission mount to service the strut safely and efficiently. The tool eliminates the need for this service to be performed by two people, as well as making the process safer. It features articulated depth and tilt. Built using polyoxymethylene (POM), the clamping jaws prevent damage to the strut.

For more information visit FleetMaintenance.com/53042249



» Available in three models

The **Rotary R3AC Series A/C Recharging Machines** are designed to automatically service the refrigerant in vehicle air conditioning systems. The product line provides professionals with a quick, efficient, and cost-effective way to recover, recycle, and recharge R-134a and R-1234yf refrigerant gases. Powered by TEXA, the A/C machines are available in three models: single-gas R3AC50-A (R-134a compatible), single-gas R3AC60-YF (R-1234yf compatible), and dual-gas R3AC80-AYF (both R-134a and R-1234yf compatible). Each machine is Wi-Fi enabled, updates automatically, and can connect to peripheral devices, such as smartphones and printers. Remote monitoring is also available through a mobile app.

For more information visit FleetMaintenance.com/53056994



» Capable of fastening rounded-off bolts

The **Matco Tools 5-pc Reversible Double Box Flex Ratcheting Wrench Set**, No. SRWFXLM52T, is designed to make for quick work, even in tight spaces. The 90-tooth ratcheting wrench requires just four degrees of movement and its long-length body provides access into narrow and deep spaces while the flexible box-end design allows the user to gain the ideal angle for the job. The box-end can open and fasten rounded-off bolts as well as 6-point, 12-point, TORX, square, and spline. The metric ratcheting wrench set includes sizes: 8mm by 10mm, 12mm by 14mm, 13mm by 15mm, 16mm by 18mm, and 17mm by 19mm.

For more information visit FleetMaintenance.com/53056985



» Convenient power-to-weight ratio

Ingersoll Rand's cordless **IQV20 Compact 1/2" Impact Wrench** features a 1/2" square anvil size for use with impact-rated sockets. It has 450 lb.-ft. of breakaway torque, 320 lb.-ft. of fastening torque, 2,800 RPM, and 4,200 BPM. Tight spaces can be accessed because of the 5.3" tip-to-tail length and compact size. The company said it's as powerful as pneumatic or corded wrenches and at 2.3 lb., the lightest in its class, all of which help reduce fatigue and improve tool control. Three speed options with a variable speed trigger cover a wide range of applications. The patented 360-degree LED shadowless light ring illuminates the fastener and impact-resistant bumpers on its upper and lower housing maximize durability. Kits W3131-K22 or W3151-K22 are available and include one impact wrench, one BL2023 battery, one BL2012 battery, and one battery charger.

For more information visit FleetMaintenance.com/53058869



» Able to access hard-to-reach spots

The **Solder-It 3-Position Adjustable Butane Torch**, No. PRO-15, is a soldering iron, hot air blower, and butane torch all in one. It's ideal for soldering, heat shrinking, and plastic cutting. With its three-position adjustable head, users can easily adjust the head's angle to access a variety of hard-to-reach spots. The butane torch also features a fold-out stand for handsfree work, a rubber-coated ergonomic grip, a safety lock, and a quick removeable tip design.

For more information visit FleetMaintenance.com/53059067



» 90 degrees of vertical rotation

The **Milwaukee Tool REDLITHIUM USB 400L Neck Light**, No. 2117-21, is ideal for delivering lighting for inspection work and general tasks. It adapts to users' lighting needs with 90 degrees of vertical rotation for complete lighting head adjustment and features a press-and-hold power button, delivering up to 400 lm of TRUEVIEW high-definition output and two-and-half hours of run-time on high. The neck light is IP54 rated, designed to survive most chemicals found in automotive body shops, and impact resistant for drops up to 6'.

For more information visit FleetMaintenance.com/53060299



» Includes four integrated power ports

The **U.S. General Series 3 72" Work Center Hutch** from **Harbor Freight** is designed to hold a large number of tools, such as drills, diagnostic tools, hand tools, and more. It features an easy-opening door with dual gas struts and four integrated power ports for charging batteries and tools. A rubber work mat is included to protect the work surface during use. A slotted back panel can be used for shelves, bins, racks, and other tool accessory organizers. An aerosol can holder and screwdriver rack are included. The unit is available in eight colors: black, red, blue, green, orange, yellow, white, and slate gray. All include black trim.

For more information visit FleetMaintenance.com/53060151



» Operates on 110V power

The **Cool Boss COOLBREEZE CB-12 and CB-14 Portable Evaporative Air Coolers** are the smallest units in the Cool Boss lineup. Both units operate on 110V power and feature three-speed controls on soft-touch LED control panels. The CB-12 uses a 12" fan to cool an area up to 650 sq. ft. and is rated to produce up to 1,565 cfm airflow. The CB-14 has a 14" fan that pulls more air at idle and reduces engine drag at higher rpms for better performance, energy efficiency, and economy. It can cool an area up to 850 sq. ft. and is rated to deliver up to 2,300 cfm airflow.

For more information visit FleetMaintenance.com/53060150



» Robust and durable housings

NightViu Working Lights from **Continental** are meant for construction, mining, and off-highway equipment applications and can withstand the harsh conditions found in these worksites, the company stated. Featuring aluminum die-cast housings with cataphoretic coating and shatterproof polycarbonate lenses, the LED lights also feature an integrated electronics driver and thermal management system. They are also rated IP6K8 / IP6K9K for durability and produce roughly 100 lumens per watt. Each beam pattern is offered in 1,500, 2,500, 3,500, and 4,500 lumens, and come in Ultra Wide, Wide, Flood, and Spot configurations.

➔ For more information visit [FleetMaintenance.com/53059029](https://www.fleetmaintenance.com/53059029)



» Accommodates AWG20 to AWG12

The **OTC Angled Wire Stripping Tool**, No. 5950D, features stripping dies on the angled tip above the pivot point. The patented angle design gives users the right leverage to strip or cut wires in tough-to-reach places. It also allows for a better view for tasks done in tight spaces, such as for wiring service under the dash, inside panels, and in the engine compartment. Accommodates AWG20 to AWG12.

➔ For more information visit [FleetMaintenance.com/53060154](https://www.fleetmaintenance.com/53060154)



» Features a lightweight design

The **UX10 Fully Rugged Tablet** from **Getac Technology Corporation** is part of the company's G-RuggedPro series. The 10.1" tablet offers a lightweight design and is easy to carry. Users have the choice between a 12th Generation Intel Core processor and an Intel Pentium Gold processor to suit their need. Other key features includes a LumiBond touchscreen, 8GB of DDR4 RAM (with the option of up to 32GB), fully sealed buttons, and protection against dust and water. It also incorporates a range of enhanced security features, including Microsoft's latest suite of authentication tools, TPM2.0, smart card reader (optional in UX10), and optional Intel vPro, fingerprint reader, RFID, and Windows Hello Webcam.

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» Has 18 locking height positions

The **Tuxedo Distributors iDEAL FP14KAC-X 14,000 lbs. Four-Post Commercial Alignment Lift** is designed for cars, SUVs, and trucks. Safety features include both narrow and wide runway mounting positions, an extended rise height, and a hydraulic/mechanical cable lift system with slack cable safety devices. It also offers 18 locking height positions, full-width rear wheel slip plates, two turntable positions with spacer covers, a single-point pneumatic lock release, and includes self-chocking ramps and wheel stops. The lift has an overall length of 252-1/2" (with ramp), overall width of 142" (with power unit), and an overall height of 92-1/2".

➔ For more information visit [FleetMaintenance.com/53058039](https://www.fleetmaintenance.com/53058039)



» Fits Cummins seals on ISX, QSX, ISX15, and ISX12 engines

The **CTA Tools ISX Rear Camshaft Seal and Sleeve Remover and Installer Set**, No. 3895, is designed to easily install and remove crankshaft rear main seals and wear sleeves on a wide range of Cummins engines, including ISX, QSX, ISX15, and ISX12 models. Made from high-standard carbon steel, the tool uses the flywheel CAD screws and positions the rear seal properly when pulled flush to the flywheel housing. It also uses self-tapping screws to attach the tool to the seal. The forcing screw is then able to pull the tool and remove the seal.

➔ For more information visit [FleetMaintenance.com/53059060](https://www.fleetmaintenance.com/53059060)



» Marked for easy identification

The **Lisle Corporation 13-pc Aluminum Spring Disconnect Set**, No. 39480, includes tools for separating oil cooler lines, fuel lines, heater lines, and air conditioning line couplings on most vehicles. The tools feature a spring-loaded construction which allows one-handed access to hard-to-reach, confined, and obstructed areas. The tools are marked for easy identification and come in a blow-molded case for storage.

➔ For more information visit [FleetMaintenance.com/53060149](https://www.fleetmaintenance.com/53060149)



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» **Impact-resistant and waterproof**

The **Double-Sided Slim Bar LED Task Light**, No. NT-7544, from **NextLED** features a double-sided design. The combined 800 lm COB LED ensures that users can illuminate even the darkest workspaces with ease. The body is made from high-quality cast aluminum, which makes it impact-resistant and waterproof, certified with an IP-X6 water resistance rating. With a foldable design and a strong magnet, it can be mounted anywhere for handsfree use. Additionally, it offers a top portable flashlight.

» For more information visit FleetMaintenance.com/53058036



» **Removes and installs lug nuts from Budd wheels**

The **OEMTOOLS Budd Wheel Axle Nut Sockets**, No. 37384, are designed to remove and install lug nuts from Budd wheels found on medium and heavy duty trucks, both import and domestic. Sizes include: 41mm socket with 1" or 3/4" drive, 1-1/2" socket with 1" or 3/4" drive, 38mm sockets with 1" or 3/4" drive, and 35mm socket with 1" drive.

» For more information visit FleetMaintenance.com/53060155



» **Made of non-marring silicone polymer**

The **Snap-on Flexible Magnetic Spray Can Holder**, No. FLEXCANHLDR, uses powerful neodymium front magnets to secure spray cans, and includes an integrated clip designed to keep loose lids in place. Rear magnets secure the holder to the user's toolbox or other metallic surfaces while their pull tabs make removal easy and damage-free. Compact yet strong, the holder is made of non-marring silicone polymer.

» For more information visit FleetMaintenance.com/21296066

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Battery testing and starters

» Vanair Goodall 10,000-Amp Start-All Jump-Pack

The versatile **Vanair Goodall 10,000-Amp Start-All Jump-Pack** has multiple power ports capable of not only jump-starting a dead semi-truck, but also charging phones, digital cameras, laptops, and portable gaming devices. Although light enough to pick up with two fingers, the 10,000-amp, 1332005S joules, 12V jump pack starts Class 8 engines with an instantaneous energy transfer to the battery the moment the cables are properly connected. A built-in LED work light, including an SOS strobe, on the back allows for late-night jumps.

"There's some type of magic behind it," said Matt Haage of Red's Truck Repair, while Kenny Gooch, service manager at Williams Dedicated, said it's "16,000 lbs. of iron brought to life by an 11-lbs. portable jump pack."

➔ For more information visit FleetMaintenance.com/53059962



» SP Tools HD Diesel 1600A Jump Starter / Jump Box, No SP61073

SP Tools USA's compact, high-density **HD Diesel 1600A Jump Starter/Jump Box, No SP61073**, can supply a lot of power in a short time to start both 12V petrol or diesel engines up to 10 liters in capacity, as well as motorcycles, ride-on mowers, and cars. Low-voltage accessories and USB-compatible electronics can also be charged when it is not being used as a jump starter. It can be stored in its case, which also includes 14 interchangeable tips and cords to connect to most devices, extra heavy-duty cable clamps, and chargers for use not just in a shop but also for camping or fishing trips.

"I've been using this jump box for a few months now. It's the best money I've ever spent on a jump box by far," customer Dave Kaler said. "Not only has it fired my diesel pickup right off, I have been using it on heavy machinery at work during these colder months and have not been disappointed. Works better than jumper cables and less of a pain to deal with. Easily will fire up three pieces of equipment without needing a charge. It also works on my Harley and yard equipment multiple times without needing a charge. This is an awesome tool to have."

➔ For more information visit FleetMaintenance.com/53059039



» Redline Detection Battery + Coolant Leak Detector

The **Redline Detection Battery + Coolant Leak Detector**, a first-of-its kind technology, is engineered exclusively for electric vehicles and ensures battery enclosures and battery coolant systems are sealed under precise pressures. It meets all OEM and battery manufacturer warranty standards for safety in lid-off repairs, battery maintenance, battery exchange, and collisions to protect against intrusion of water, dust, or contaminants that could cause catastrophic failure. OEMs, field service personnel, and battery manufacturers can remotely access data logging and reports as needed.

"The wide adoption of electric vehicles hinges upon safety and reliability," said Redline President Alex Parker. "Redline has partnered with leading EV auto makers to develop this technology, which gives 100% assurance that battery cases and battery coolant systems within them are sealed under precise pressures and meet all OEM and battery manufacturer warranty standards for safety."

➔ For more information visit FleetMaintenance.com/53059957





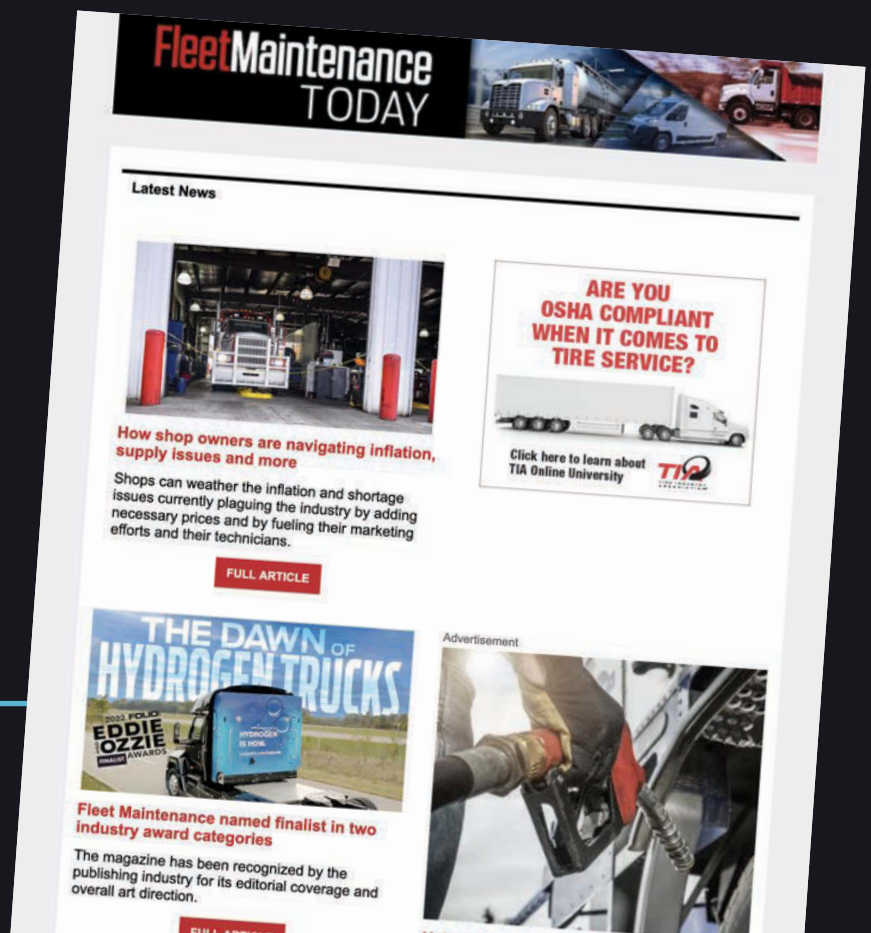
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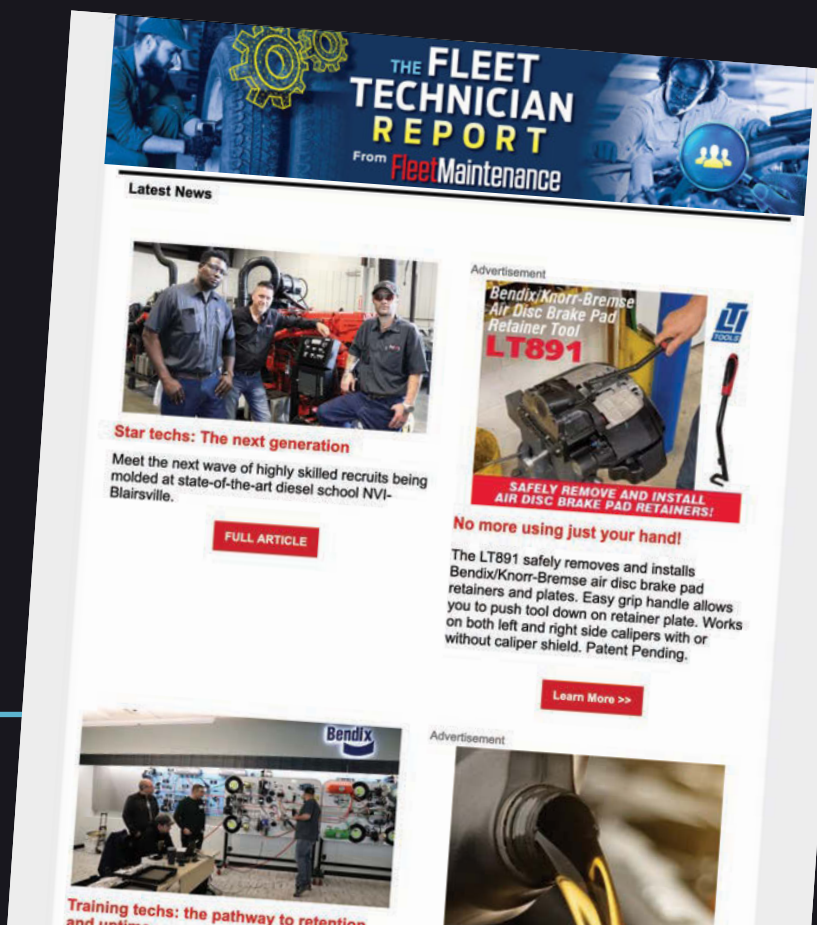
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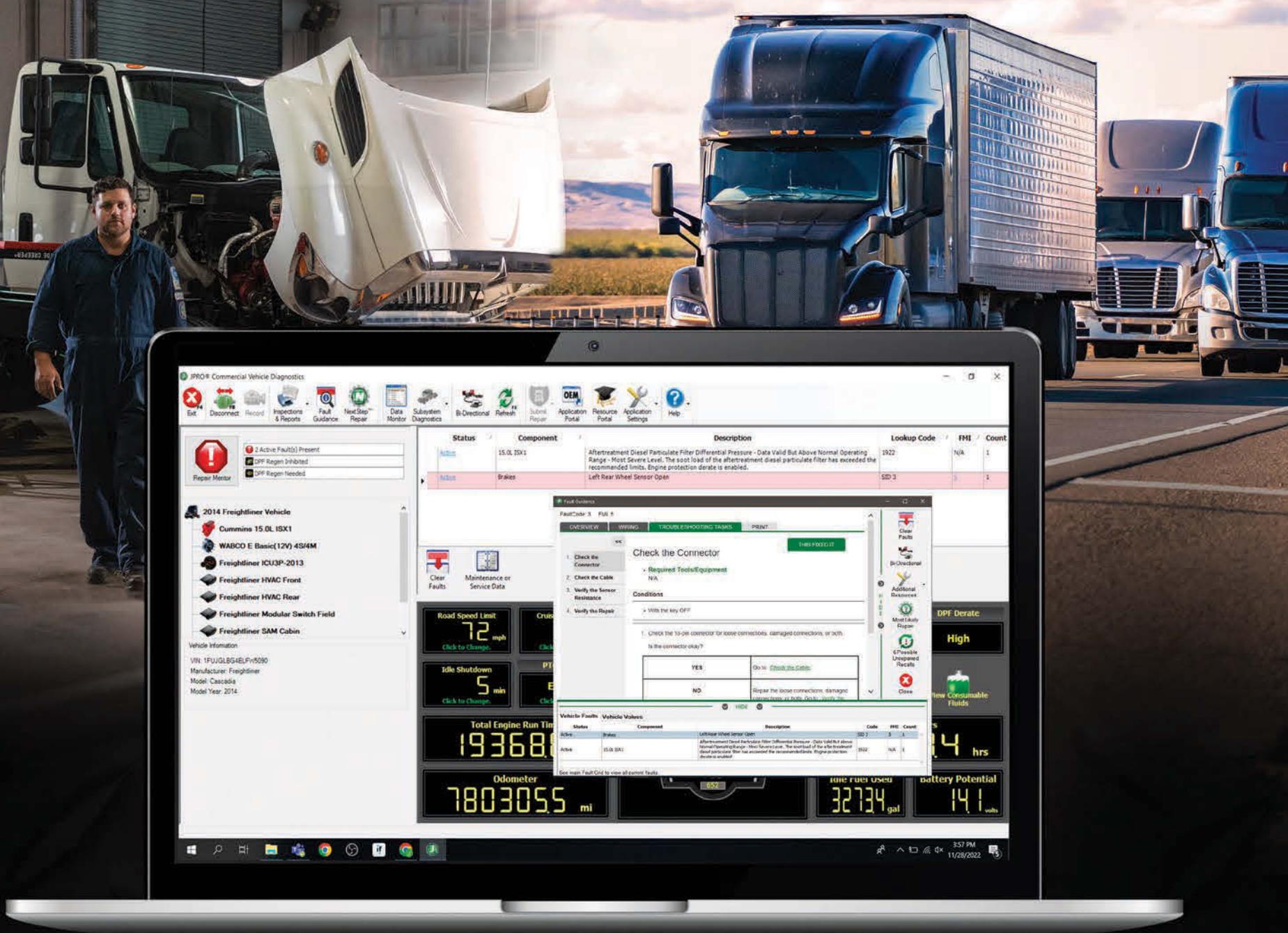
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