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Five fundamental steps

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→ **On the cover:** Photo courtesy of Rush Enterprises

OVERHAULED

Fleet Maintenance and *VehicleServicePros.com* are now aligned by subject matter. The main curriculum is now:

On the Vehicle

+ Featuring: All things related to vehicles and trailers

Shop Operations

+ Featuring: All things related to managing an efficient, productive shop

In the Bay

+ Featuring: Diagnostic and repair information; maintenance and service; tools and equipment



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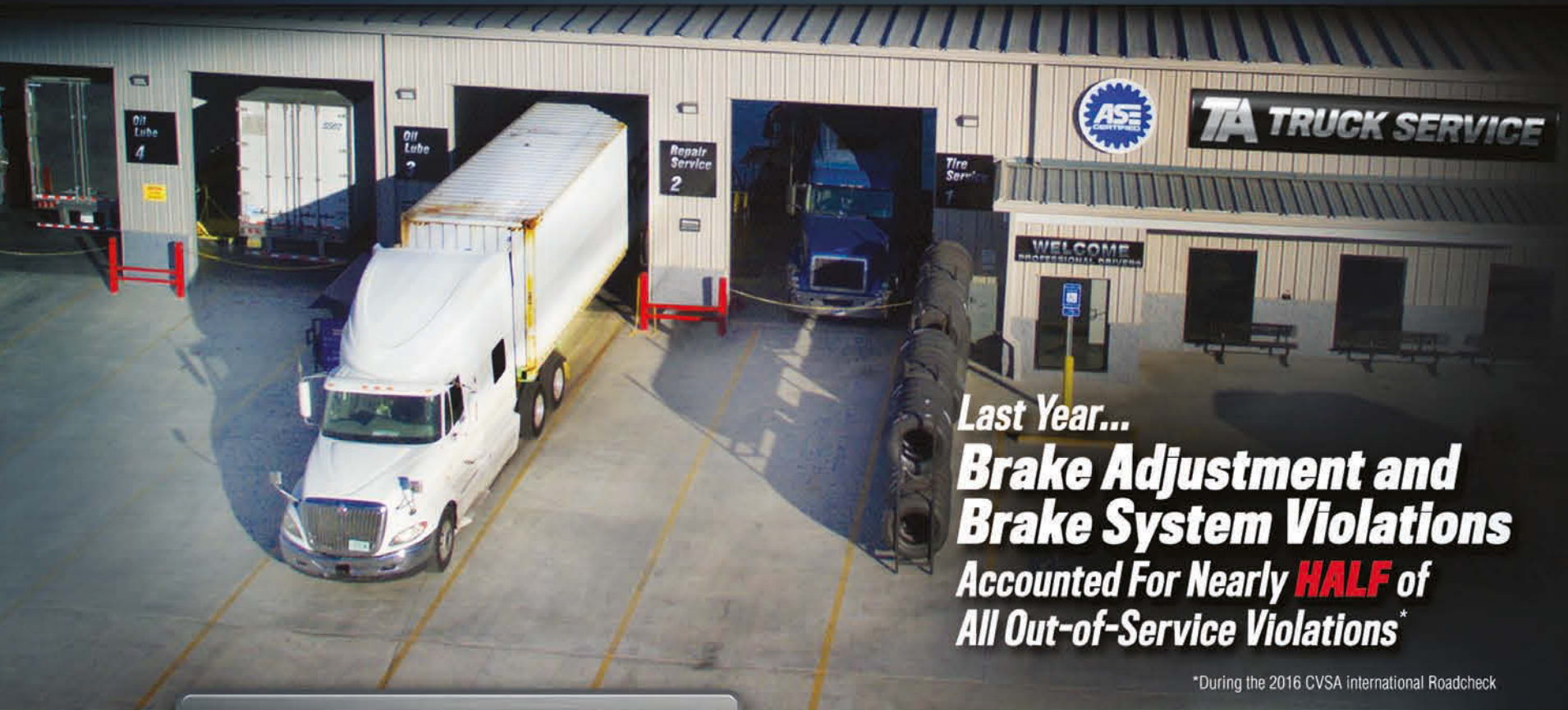
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Main trends impacting trucking
By Paul Cigala

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KOLMAN'S KORNER

Episode 130: Truck Fuel Efficiency

Ben Karrer, global product strategy manager, Eaton Corporation, discusses heavy duty truck fuel efficiency.

VehicleServicePros.com/20859182

KOLMAN'S KOMMENTS



The safety enforcement focus has changed

Every year, the Commercial Vehicle Safety Alliance (CVSA) conducts its International Roadcheck, the largest targeted enforcement program on commercial motor vehicles in the world. This year's category violation emphasis is on cargo securement.

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ARTICLE

Complying with Food Safety Modernization Act regulations

All U.S. shippers, carriers, loaders and receivers who engage in "transportation operations" of food must follow the Food Safety Modernization Act (FSMA).

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VIDEO



QuickTrick Alignment demonstrates the Fleet Wheel Alignment System, a portable wheel alignment tool for preventative maintenance.

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TECH TIP

Extending oil change frequency can translate into cost savings, provided fleets pair the right oil with the right filter at the right change interval for the right vehicle.

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ASK THE EXPERT

Why is utilizing a refrigerant identification tool required

on some A/C service equipment?

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What's the future vision for your operation?

Will you be able to spot the paradigm shifts?



By David A. Kolman
Editor



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Like other industries, trucking is suffering from something called marketing myopia — a nearsighted focus rather than seeing the “big picture” of what its business really is about. That warning was delivered by Troy A. Clarke, chairman, president and CEO, Navistar International, in his address “Reimagining the Future of Commercial Vehicles” to the recent 2017 Technology & Maintenance Council (TMC) Annual Meeting & Transportation Technology Exhibition.

Navistar is a holding company whose subsidiaries and affiliates produce international brand commercial and military trucks, proprietary diesel engines and IC Bus brand school and commercial buses. TMC is the only industry association focused solely on truck technology and maintenance to help improve trucking efficiencies across North America.

Clarke said businesses fail because they are “too tied to the exact way they have been doing things” and don’t pay attention to what their customers need. Moreover, businesses don’t foresee the impact of new technologies that do a better job of meeting those needs.

In 2004, the two leading mobile phone makers in the world were Nokia and Motorola, noted Clarke. In June 2007, Apple introduced the iPhone. The company — which wasn’t even in the phone business, but in the music player business — came along with something very different, and major mobile phone players like Nokia, Motorola, Ericsson and BlackBerry became largely irrelevant.

“They are not alone,” he said. “Entire industries have been put at risk by the offerings of new players that disrupt the status quo and shift the paradigm.”

Complicating matters, technology “is outpacing our ability to understand it fully, and that gets in the way of seeing where it may lead,” added Clarke.

Trends

Another challenge, Clarke said, is that businesses are focused on solving immediate problems rather than developing a vision for the future, which is essential. In planning for the future, he cautioned businesses not to be myopic or they could be at “risk of missing a really big paradigm shift and failing to take advantage of it.”

To avoid that fate, he said it is necessary to think about some trends now converging on trucking that will shape its future.



» Troy A. Clarke, chairman, president and CEO, Navistar International

Photo courtesy of Navistar

» **Greenhouse gases emissions.** Emission standards, a major concern in urban areas, are getting tougher and “we are moving to a city-dominated world,” Clarke said.

“By 2025, cities will account for 80 percent of energy use and CO2 emissions,” he added.

In response, he noted an increasing number of urban areas in Europe and other places around the world are setting themselves up as “low emissions zones” or even “zero emissions zones.” These zones restrict vehicle access or else charge a toll for vehicle entry, and he said this trend is likely to come to North America.

Clarke speculated that this could lead to a regional hub delivery structure wherein high-performance diesel big rigs would deliver freight on automated superhighways to a network of regional hub and spoke facilities. There, the loads would be broken down for delivery by high-performance electric vehicles to low-emissions or zero-emissions zones.

» **Traffic congestion.** Vehicle access to urban areas is becoming more of a challenge due to “exploding” traffic congestion, Clarke said. By 2030, traffic congestion in the U.S. is expected to increase by roughly 50 percent, and “drivers stuck in traffic aren’t productive.”

» **Automated and connected vehicle technologies.** These are leading to “tremendous improvements” in collision avoidance and collision mitigation, reducing the severity of remaining accidents, Clarke said. Vehicle-to-vehicle and vehicle-to-in-

Outside players can come in and disrupt.

frastructure will improve highway utilization by regulating traffic to avoid congestion, plus reduce the risk of accidents even more. That means vehicles can be lighter in weight because they’ll have less need for protection against crashes, which will make for greater fuel efficiency or load capacity.

» **Electricity.** Electricity is shaping up to be an increasingly predictable and stable commodity for many years to come, and unlike natural gas or hydrogen, it already has a full-fledged distribution network in place, Clarke said. What’s more, electric vehicles are much easier to maintain, as they contain considerably fewer parts than conventional vehicles.

“Are we rapidly reaching a real inflection point for electric trucks?” Clarke asked.

No Small Changes

While it is necessary to worry about today’s concerns, the industry must think about where it is going, Clarke advocated.

“All of us have businesses that we want to see succeed in the future and not be taken out of the equation by disruptors — companies that are hovering around our space today and not limited by their knowledge of our industry, but poised to capitalize on parts of the value chain.

“Given the pace of change in technology and all the new players who have gotten involved in recent years, I think the changes ahead are not going to be small, incremental ones. The people who see the paradigm shift coming are the ones who are going to win.

“The market today is dominated by the people who saw the new paradigm coming before it happened,” he continued. “As history shows, the opportunity for a paradigm shift often comes from the industry itself, from the people on the ground who invent the new technologies.”

The people who invent those new technologies, Clarke said, also create a long-term, more sustainable goal for the business. ■



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HOW TO BUILD A

Reliability Culture

By Robert Williamson, CMRP, CPMM, MIAM, Owner, Strategic Work Systems

[SHOP MANAGEMENT]

W

hen it comes to advancing vehicle and equipment reliability, there must be an improvement or change in the way people think and work toward common goals. These goals include investing in new vehicles, equipment and technology; more maintenance; improving existing systems and processes; better vehicle and equipment operation, etc.

Regardless of the path taken, there needs to be a change in the way people think and work. In other words, create a reliability-improvement culture.

A fundamental requirement for this is the establishment of an “island of excellence.” This is where:

- Breakthroughs in thinking and working occur
- Focused improvements in equipment performance and reliability take place
- Real shop-floor culture change emerges
- Team members become the advocates of a reliability-improvement culture

Preconditions

For all this to happen, certain things must take place.

1. Prepare and communicate a persuasive business case for change.

Top management must clearly articulate a compelling business case for improving equipment reliability. There should be specific reasons for change. For example:

- Impact of current vehicle and equipment performance and reliability on the operation
- Changes in vehicles, equipment and technology
- Different management expectations
- Increased competition
- Business growth opportunities
- Changes in regulatory requirements

2. Concentrate on breakthrough opportunities.

Review shop and vehicle equipment performance for apparent improvement opportunities; consid-

» One way to help keep vehicles out of the shop and on the road doing their jobs is to create a reliability-improvement culture within your organization.

Photo courtesy of Navistar

» Breakthrough opportunities for improvements can come from focusing on specific shop and repair processes, looking for hidden problems and then figuring out ways to eliminate the causes for them.

er operations where any changes would result in immediate improvements.

Look for issues such as high amounts of unplanned downtime, sporadic unplanned downtime, increasing or excessive amounts of waste and/or rework, and increasing or excessive road service calls.

Collect and review maintenance data, searching for information that can be used to drive maintenance operations and improve efficiency.

Think small for big changes. Focus on a specific area of the shop, a particular model of vehicle, etc. Rapid and sustainable change is made excruciatingly more difficult — and risky — by attempting to make organization-wide changes.

Identify a breakthrough opportunity where results can be observed within two weeks to two months.

5. Sustain and leverage the improvements.

All of the improvements, successes, failures and actual methods used should be documented, communicated and leveraged for additional reliability improvements for vehicles, equipment and for the shop. This is where the island of excellence becomes a showplace, and the breakthrough team becomes the promoter of reliability.

Conclusion

In reality, reliability is more about people than technologies. Creating a reliability-improvement culture, in most cases, is about changing the way people think and work, and that includes their changing their behaviors and habits.



3. Gather a multi-functional breakthrough team.

This team should include top managers, middle managers, shift managers, technicians, vehicle operators, etc. People at all levels who directly and indirectly influence maintenance reliability need to be fully engaged in the improvement process in order for a meaningful dialogue on reliability improvement.

Encourage out-of-the-box and innovative thinking.

The multi-functional breakthrough team also needs to be made aware of, and truly understand, the reasons for change.

4. Look for causes of problems.

As part of its duties, the breakthrough team should look for hidden problems and investigate ways to eliminate the causes — or sources — of those problems using root cause analysis tools. The intent here is to go beyond the quick fix and identify the underlying causes/sources of a problem so that the most effective solution can be determined and implemented.

In addition, the team should evaluate inspection and maintenance procedures to determine how they address any problems that have been uncovered. Do existing procedures need to be modified, or should new ones be developed?

If so, a best practice is to come up with detailed step-by-step instructions — complete with photographs and illustrations — as needed, along with brief checklists to serve as reminders of the procedural steps. Use these as training documents.

Doing so enables them to practice and support reliability improvement.

The key is to engage the right people, on the right equipment, using the right tools. In the process, they'll begin developing their own common-sense reliability culture. ■



ROBERT WILLIAMSON, CMRP, CPMM, MIAM, is the owner of Strategic Work Systems (www.swspitcrew.com), a company specializing in products and training for visual systems for improving equipment effectiveness. He is a member of the Institute of Asset Management, the professional body for those involved in acquisition, operation and care of physical assets.

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PART ONE OF A THREE-PART SERIES ON TRANSPORT REFRIGERATION UNITS



Three Elements Of Good Routine Maintenance Procedures

By David A. Kolman, Editor

These steps can go a long way in reducing overall costs and ensuring reliable functioning.

[TRAILERS]

The old adage, “an ounce of prevention is worth a pound of cure,” is especially true when considering the value of the billions of pounds of perishable goods hauled in truck trailers chilled by transport refrigeration units (TRUs) every day in North America. Maintaining those TRUs to help ensure proper operation is the key to satisfactory on-time deliveries and avoiding equipment issues that could lead to a costly load loss.

Fortunately, the built-in analytical and diagnostic features on many TRUs make it easier than ever to troubleshoot and stay on top of unit performance. Many of today’s TRUs are more reliable and durable

than their predecessors, thanks to design improvements that decrease demands on unit engines.

What’s more, many modern TRUs’ preventive maintenance (PM) service intervals have been stretched out by as much as 15 percent compared to earlier models, owing to improved system efficiencies resulting in reduced engine run-time hours when operating in the start/stop mode.

Pre-Trip Inspections

One of the handiest maintenance practices of all is the pre-trip inspection routine, which truly amounts to that proverbial “ounce of prevention,” especially considering how little operator effort it takes to do: a simple push of a button.

“The pre-trip doesn’t replace the need for scheduled service and preventive maintenance, but what it does is rather extraordinary,” says John Jameson, comprehensive maintenance and repair agreements (CMRA) program manager, Carrier Transicold (www.carrier.com/truck-trailer/en/north-america), a company that helps improve transport and shipping of temperature controlled cargoes with a complete line of equipment and services for refrigerated transport and cold chain visibility.

“A pre-trip should be done prior to loading the refrigerated compartment,” he says. “In the time it takes to grab a cup of coffee — 10 to 15 minutes — the control system on a Carrier Transicold trailer unit, for example, will run 13 to 17 tests covering hundreds of potential alarm conditions, including about 75 that are specific to the pre-trip routines.”

To name a few, the pre-trip routines examine:

- Electrical system continuity
- Engine high and low speeds
- Fan motor operation
- Refrigeration system valve operation

On Carrier trailer units, the APX Control System

» To get the longest life and lowest cost of ownership from trailer refrigeration equipment, it must be spec'd correctly and then properly maintained. Because refrigeration units are only as good as the service performed on them, good, routine preventive maintenance means the difference between reliability and continuous problems.

Photo courtesy of Carrier Transicold

display module will indicate pass/fail results for all tests. Alarm conditions, if detected during the scan, can then be viewed by the operator.

Regular Schedule

Beyond taking advantage of the pre-trip routine, Jameson advises that the regular preventive service schedule per the manufacturer's recommendation be maintained.

"Performing regular preventive maintenance per original equipment manufacturer (OEM) recommendations will help ensure the diesel engine and refrigeration system mechanical components, including the compressor, are running true, and will assure that fluid and filter changes are done at appropriate intervals," he says.

Variances in TRU platform design make significant differences in the amount and frequency of maintenance required in the PM schedule. For example, notes Jameson, Carrier Transicold has both a traditional belt-driven platform and a hybrid diesel-electric platform, each with different maintenance needs.

Vector hybrid units were purposely designed to require less maintenance than traditional units, he explains. The refrigeration system is all-electric, powered by a generator connected to the diesel engine.

Thus, many of the routine maintenance components found in conventional belt-driven refrigeration systems are gone. Examples include the mechanical clutch, gearbox, alternator, mechanical fan shaft, some of the refrigeration valves and most of the belts and pulleys.

"Since many of those serviceable parts are not required, concerns about mechanical failures are reduced," Jameson

says. "A part that's not there is one less part to maintain."

"As a result of fewer serviceable parts, lifecycle costs are reduced with hybrid designs," he adds. "If operators take advantage of electric standby and run the hybrid units off an electric power source when stationary, engine hours are reduced

even more, thus extending service intervals further."

Items to Check

There are items for which OEMs generally recommend an annual PM inspection, while other maintenance procedures have

been extended through the years, Carrier Transicold's Jameson says. For example, oil changes may now be performed at 3,000 hours or two years — whichever comes first, and extended-life antifreeze coolant replacement intervals are now 12,000 hours or five years.

He notes here again, the APX

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» A service technician initiates a diagnostic routine on a refrigeration unit controller to aid in troubleshooting.

Courtesy of Williams Carrier Transicold

control module simplifies things by keeping track of engine hours to help determine when it's time to do a PM check.

During preventive maintenance, Jameson says the following items

should always be checked:

- ➔ Engine oil (add as necessary)
- ➔ Battery cables and clamps
- ➔ Lift pump screen
- ➔ Belt condition (tightening as necessary)
- ➔ Coolant level (adding more if needed)
- ➔ Exhaust system and mounting hardware
- ➔ Air filter (changed, if needed)

With conventional units, Jameson says the gearbox and compressor seal should also be visually checked for leaks, keeping in mind that the presence of a small amount of oil in the compressor shaft seal area is normal.

"The engine should be checked for proper operation and the pre-trip routine should be initiated with all active and inactive alarms noted,"

advises Jameson. "Technicians should observe fuel lines, oil lines, filters and the exhaust system for leaks, and should listen for unusual bearing noise from components, such as belt idlers or fan shafts. Water should be drained from the fuel tank and debris should be cleared from defrost drains."

Additional adjustments, such as battery checks, coolant flush and fill and belt changes come at longer intervals, he adds.

"To summarize, a solid equipment maintenance program is essential to running a cool refrigerated transport operation," Jameson says. "Running trailer units through the automated pre-trip routine before loading and following the preventive maintenance schedule will help ensure reliability and uptime for the long haul." ■

PART TWO OF A THREE-PART SERIES ON TRANSPORT REFRIGERATION UNITS

Protecting Your TRU A\$\$ets

By Sid Gnewikow, Manager, Technical Service and Warranty, Thermo King North America

Recommendations for establishing appropriate maintenance schedules

It doesn't matter if you are an owner operator running one refrigerated truck or trailer, a large fleet running hundreds, or somewhere in between; establishing and maintaining adequate transport refrigeration unit (TRU) maintenance schedules

is crucial to your success and your bottom line.

Properly maintained TRUs will not only operate more efficiently in cooling performance and fuel consumption, but will also experience fewer breakdown situations, which will

save you maintenance costs and downtime. Most importantly, you will avoid a compromised, or worse yet, lost load situation.

Recommended TRU maintenance inspection schedules should be a key component in every business operating plan and documented in food safety plans. While this should be a long-standing best practice for refrigerated fleets, it is now considered to be a requirement of the *Food Safety Modernization Act* and more specifically, the *Sanitary Transportation of Human and Animal Food* (STF) ruling that was published last year by the Food and Drug Administration (FDA).

Shippers have the primary responsibility in determining appropriate standards for the safe transportation of food products and carriers. Loaders and receivers must abide by the STF ruling and perform as expected.

A documented, thorough TRU maintenance inspection schedule will go a long way in avoiding the unexpected and keeping your refrigeration units running smoothly and

compliantly.

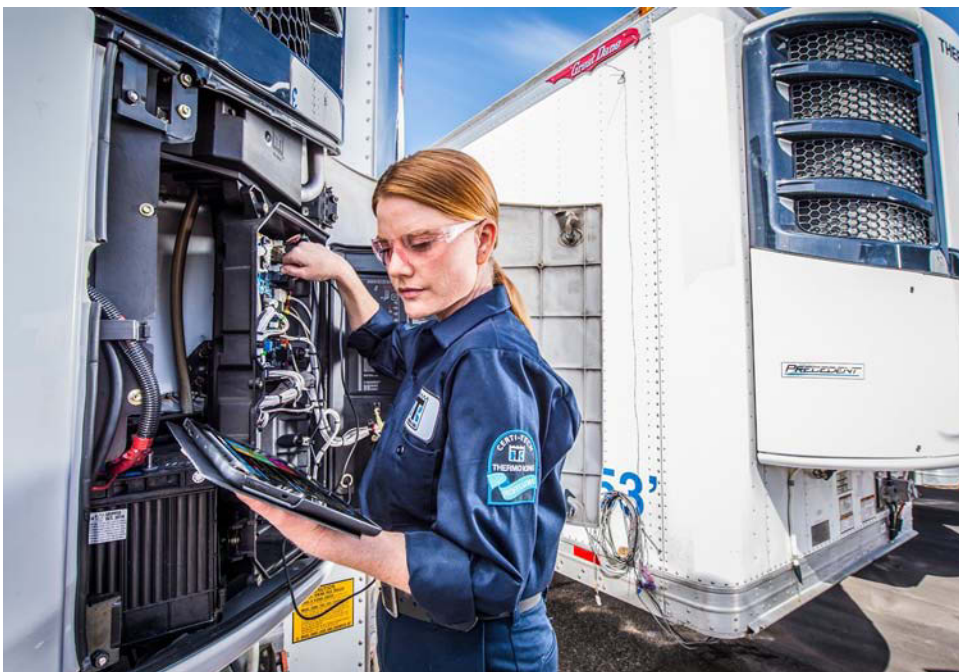
Must-Dos

To assist operators, Thermo King provides a recommended maintenance schedule for all of its truck and trailer units and documents the suggested procedures for pre-trip, 1,500 hours, 3,000 hours and 4,500 hours/annual inspection intervals. Important to note is that recommendations do vary, depending on whether units are mechanically or electrically driven. In addition, there are several must-dos when it comes to refrigeration unit maintenance. These include:

➔ **Fans** — To cool efficiently, units need to move as much air as possible. Because fans are run off the engines of mechanically driven units, keeping up with the rpm is crucial.

Belt tension and condition is vital to proper fan operation. If a fan stops spinning, the unit will shut down. The condenser fan is driven by the engine. If the engine overheats, airflow will stop, box temperatures will rise and cargo is at risk.

➔ **Coils** — Cleaning condenser and evaporator coils is another essential. Beyond the common build-up of dust and dirt particles that,



» A documented, thorough TRU maintenance inspection schedule helps avoid the unexpected and keeps refrigeration units running efficiently and compliantly.

Photo courtesy of Thermo King

if not attended to, will eventually slow down air flow, there are risks of shrink wrap or small pallet pieces being pulled into the unit. If air flow is blocked, the unit will try and defrost more often, intuitively thinking it is iced up. This will again put load temperatures at risk. Condenser and radiator coils should also be checked often as outside elements, such as pollen or pollutants, can quickly build up. This will cause the engine to run hot and create a potential shut-down event due to overheating.

➔ **Batteries** — Battery inspections should be done in late summer or early fall. Cold weather will zap weak batteries. Follow the battery manufacturer testing procedures. Some require load testing only; some also require coolant conditioning.

➔ **Fuel Tank/Oil Changes** — Clean the tank and fuel filters, perform recommended oil changes and don't skimp. Just like in an automobile, these simple preventive maintenance steps are the first defense in making sure an engine runs smoothly.

➔ **Electrical Connections** — With today's newer technology, like the Thermo King Precedent trailer units, checking the electrical connections to ensure that they are clean and tight, per the recommended maintenance schedule, should be standard procedure. It should be the first thing checked if something is not right. Simply tightening a loose connection has corrected many error codes.

equipment and diagnostic tools, they are documenting the maintenance activities and schedules.

This will eliminate maintenance lapses and reduce confusion if service is needed somewhere else in the dealer network, as well as keep units in peak condition and on the road. ■

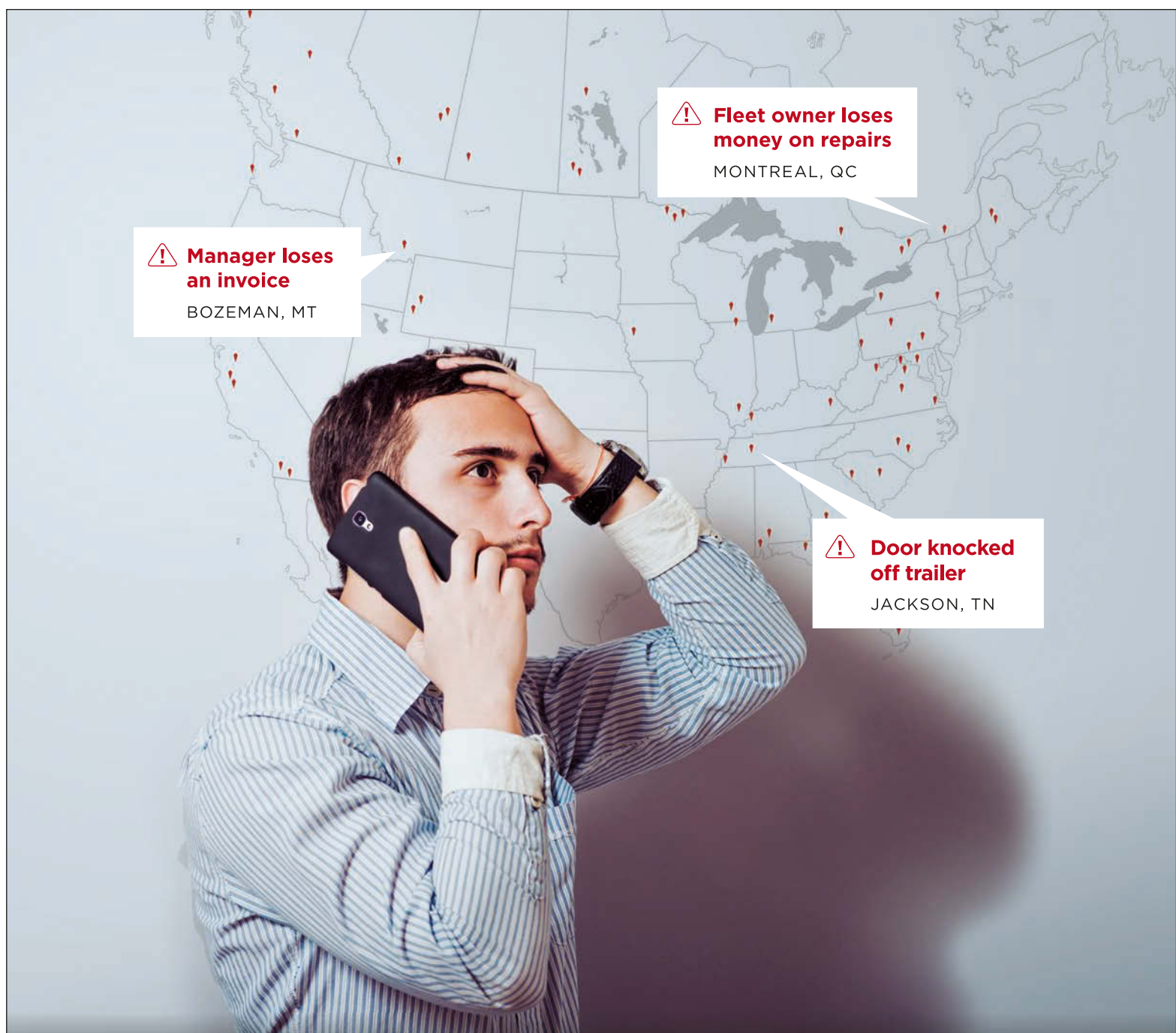


SID GNEWIKOW is manager of technical service and warranty for Thermo King North America (<https://na.thermoking.com>), a world leader in transport temperature control systems for trucks, trailers, buses, rail cars and shipboard containers.

Online Exclusive

A sample maintenance inspection schedule for a trailer refrigeration unit can be found at:

➔ VehicleServicePros.com/20856209



When in Doubt

While many of the actions on recommended maintenance inspection lists are common sense, not all fleets are equipped to handle them all. When in doubt, look to the professionals, like Thermo King's nationwide dealer network.

There are definite advantages to choosing factory-certified and trained technicians to perform the preventative service work on refrigeration units. Not only do they utilize genuine parts and perform the maintenance using the right

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PART THREE OF A THREE-PART SERIES ON TRANSPORT REFRIGERATION UNITS

Six Purchasing CONSIDERATIONS

By Tom Kampf, Senior Product Manager,
Trailer, Thermo King Corporation

How to narrow
down the choices

Procuring a trailer or truck refrigeration unit in 2017 is quite different than it was 10, five or even one year ago, not only because of evolving technology, but also because of legislative regulations and mandates related to noise, emission and food safety standards.

The choices available today are plentiful, and can be overwhelming at best. To ensure the right decision for your application, fleet and budget, there are several key areas that are a must to consider.

1. Capacity – First and foremost, the product chosen has to meet the cooling requirements of the load; in other words, what are the capacity needs of the products being transported? Is it produce, meat, ice cream, pharmaceuticals or a mix? Will the products be hauled in multi-zone compartments or in a

single compartment at a single temperature – fresh one day, frozen the next, or a consistent load and temperature day in and day out?

There are units of varying sizes and capacities to meet every need, some multi-purpose and some application specific.

2. Fuel Efficiency and Maintenance – To compete, earn a decent profit and in many cases, merely survive in today's highly competitive over-the-road transport refrigeration industry, choosing a refrigeration unit that burns fuel efficiently, is easy to maintain and features a dependable performance record and warranty offering is a must. Fuel economy and unit reliability translate to less downtime, reduced maintenance expenses and increased bottom line profits.



» When considering a refrigeration unit purchase, look at the big picture – total cost of ownership – and not just upfront costs. Fuel, maintenance, reliability, legislative compliance and ensuring the safe transport of goods all play into the decision making.

Photo courtesy of Great Dane Trailers

catastrophic maintenance event. Power management accessories can include anything from solar panels that generate power and extend reefer battery life to boost chargers for liftgate battery

charging, to supplemental alternators, to Thermo King EON power packs that power interior trailer lights and more.

Depending on the unique power needs of the truck or trailer, there

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Playing into these costs are accessories and options that are available with certain trailer and truck refrigeration units today, such as telematics and power management products, which can help produce and store power while on the road.

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are options to consider when choosing the refrigeration unit, and you'll want to ensure compatibility.

3. Reliability and Durability – Transport refrigeration units, whether on trucks or trailers, take a beating while on the road. Depending on the operating location, they will be exposed to the full gamut of environmental factors, including extreme temperatures of heat and cold, precipitation and wind, not to mention various road hazards like rocks, salt, insects and even birds.

Units should be chosen that are built to withstand whatever is thrown at them.

4. CARB – California Air Resources Board (CARB) compliance is another consideration that

has been on most radars for nearly 10 years, when California first announced its fight against environmental pollutants. If your refrigerated truck or trailer travels in or through California, and if you plan to keep the unit for more than seven years, it must meet CARB ultra-low vehicle emission standards or they must be fitted with a Level 3 emission device, such as a diesel particulate filter (DPF), which adds considerably to maintenance costs.

Today's options for units that meet CARB's evergreen requirement are limited but do include Thermo King's Precedent S-600 or S-700 single temperature units and S-610M, C-600M or S-600DE multi-temperature trailer units.

Temperature Monitoring

By David A. Kolman, Editor

Air conditioning systems have different temperature requirements depending on where they are used, says David Barden, technical support manager, Power Probe Tek (www.powerprobetek.com), a manufacturer of diagnostic equipment for the automotive industry. In-cab AC systems are

designed to keep the driver and passengers at a cool, comfortable temperature. AC systems for refrigerated boxes and trailers typically require much lower temperatures, close to or even below freezing temperatures to protect their valuable cargo.

When diagnosing a refrigeration system's performance, one of the first steps is to monitor the actual temperature of the air coming from the cooling unit's evaporator – the outlet temperature, Barden explains. Although the actual discharge temperature is what is normally measured, it is more important to know the net temperature drop created. How much did it actually cool the air?

Another step is to determine the temperature of the air going into the AC system before cooling, he adds. This is known as ambient air temperature.

Comparing the ambient air temperature to the evaporator outlet temperature gives a true measure of the system's efficiency, he says.

FLOW PROBLEMS

Checking an AC system's cooling efficiency with simple temperature checks can alert a technician to possible airflow problems or even

indicate if the refrigerant charge level is too low or high, Barden says. Regularly checking cooling system temperatures as part of a preventive maintenance program could potentially spot system inefficiencies and possible loss of refrigerant before the issue causes a larger problem, like a total shutdown of the AC system.



» Using a tool that can measure real-time temperature readings and wirelessly transmit them for easy analysis saves time and effort when servicing AC systems.

Photo courtesy of Power Probe Tek

Having a tool that could show multiple temperatures at multiple locations could save time and effort when servicing AC systems.

By way of example, Barden says Power Probe Tek's recently introduced TEMPKIT easily monitors air temperatures at multiple locations. It uses a receiver/base unit for measuring ambient air temperature and a remote temperature sensor that wirelessly transmits secondary temperature readings back to the base unit up to 16' away.

This, he says, allows readings to be quickly and easily analyzed.

5. Food Safety Modernization Act (FSMA) – Another major legislation, which came into effect in 2016, is the Federal Motor Carrier Safety Administration’s final rules for the *Sanitary Transportation of Human and Animal Food* (STF). The rule established requirements for shippers, loaders, carriers by motor or rail vehicle and receivers involved in transporting food to use documented sanitary practices to ensure the safety of that food.

Specifically, the rule has established requirements around record keeping and operations that should be considered when choosing the refrigeration unit and available accessories – like telematics and data loggers – that will satisfy STF requirements, offer proof of compliance and demonstrate safe food transport.

6. Total Cost of Ownership – Tied to bottom line profits, including residual value for resale, is total cost of ownership. When considering a refrigeration unit purchase, be sure to look at the big picture and not just upfront costs. Fuel, maintenance, reliability, legislative compliance and ensuring the safe transport of goods all play into the final equation.

Choose a reputable partner who can collaborate with you, provide a reliable network of trained service providers and offer valuable counsel on the refrigeration units that will best meet your needs.

Takeaway

There is no one-size-fits all refrigeration unit. Choose a supplier who:

- ➔ Can offer the selections that meet varying life-cycle and greater-than and less-than capacity requirements and various configurations.
- ➔ Can offer power management and telematics options that will give you both performance and peace-of-mind that your load will be protected.
- ➔ Has a history of providing reliable, long-lasting equipment and the operational training to ensure you use it properly.
- ➔ Will be with you for the long haul. ■



TOM KAMPF is the senior product manager for trailers for Thermo King Corporation (www.thermoking.com/global). Founded in 1938, Thermo King and is a world leader in manufacturing and innovating transport temperature control systems for a variety of mobile applications, including trailers, truck bodies, buses, ship-board containers and rail cars.



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Corrosion, Trailers And The Never-Ending Battle

By David A. Kolman, Editor

What really causes corrosion on heavy duty trailers?

[MAINTENANCE & REPAIR]

Absent the protection provided by corrosion-inhibiting technologies, the critical metal structural and ancillary components in any heavy duty trailer would quickly begin to oxidize and corrode. Today, all trailers being manufactured have some type of corrosion protection applied to their metallic surfaces, and anti-corrosion coatings are the most common.

The simple combination of moisture and the sodium chloride from road salts combine to create the corrosive one-two punch that will continu-

ously assail a commercial fleet, if maintenance professionals don't assume a defensive posture. It often starts as stones and other road debris cause chips and abrasions to paint epoxy-based and galvanized coatings, but maintenance activities can degrade coatings as well.

If even a small area of a coating is dislodged, the unprotected metal will begin to react and oxidation begins. Left unattended, the corrosion that started with a small chip in a protective coating can expand by allowing water and salts to migrate and begin corrosive activities between the coating and the metallic surface it was meant to guard.

Fleet maintenance professionals will often see osmotic blistering as a sign that corrosion has begun. The blisters actually create microenvironments consisting of high humidity and levels of chloride that promote rust development.

» Maintenance professionals need to assume a defensive posture to prevent damaging corrosion that develops as result of the combination of moisture and the sodium chloride from road salts, and from some maintenance activities as well.

Photo from iStock



“Many people associate cold weather with corrosion, but actually, every rise in temperature of 10 degrees Celsius doubles the rate of corrosion, even if no humidity is present,” says Mike Duncan, Ph.D., vice president of technology, Daubert Chemical Company (www.daubertchemical.com), a leader in the formulation of cavity wax and wax-based underbody coatings. “Iron oxide corrosion caused by moisture alone has limited solubility and is relatively slow acting, but iron chloride corrosion, accelerated by moisture combined with the sodium chloride in road salt, has almost unlimited solubility and can spread very rapidly.”

Many trailer components are also vulnerable to galvanic corrosion caused by dissimilar metals making contact. A simple maintenance repair that pairs the wrong nut, bolt or washer can create a corrosive response.

Problems can also occur as a result of fasteners being tightened, which can dislodge surface coatings, exposing reactive metals to one another and to the elements.

If they are taught what to look for and to look for it constantly, Duncan says fleet maintenance professionals can often locate corrosion and remediate it before it does real damage. Corrosion detection should be a part of every formal preventive maintenance (PM) protocol.

Likely Locations

Left unattended, corrosion can flourish virtually anywhere a metallic component is found on a trailer. Some areas on a vehicle are more susceptible than others, but high exposure to road-born moisture and debris strikes are the key factors in determining where corrosion is most likely to dwell.

“As trailer refurbishment specialists, we have a unique perspective on trailer corrosion and we see situations and trends that others in the industry might not be aware of,” says Dave Letts, president, Transport Finishes (www.transportfinishes.com). “We see corrosive activity occurring most often on forward facing surfaces under the trailer. We also observe that the closer a surface is to a tire, the higher the probability that this surface will show signs of corrosion.”

Letts notes that forward-facing crossbars on trailer landing gear are particularly susceptible to rock strikes and the road spray kicked up by tires. Bogie assemblies are equally at risk, along with structural crossmembers above and behind them.

Anything below an 8- to 10-foot “spray line” should be considered the prime corrosion inspection zone, he adds, and identifies upper couplers, landing gear K-members attachment points on wing plates, cross-member end clips and the butt welds on lower hinges of door frames as key areas to watch for signs of corrosion.

“Ledges, flanges and areas forming pockets often allow debris to collect and remain moist. [This] creates the perfect environment for rust,” says Letts. “Electrolysis can be a self-inflicted problem for fleets, and we often see it around fasteners, resulting from ill-informed maintenance practices.”

Maintenance inspections should also include areas around welds. Heat from the welding process changes the composition of base metals and regardless of the quality the welding materials, there will always be some disparities in their makeup, presenting the opportunity for electrolysis to take place.

2016's Top 10 North American truck trailer and chassis OEMs

1. Wabash National Corporation
2. Hyundai Translead
3. Great Dane Trailers
4. Utility Trailer Manufacturing
5. Vanguard National Trailer & CIMC Intermodal
6. Stoughton Trailers
7. Manac
8. Strick Corporation
9. MAC Trailer
10. Wilson Trailer Company

Source: Trailer/Body Builder Magazine

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» Corrosive activity occurs most often on forward-facing surfaces under the trailer. The closer a surface is to a tire, the higher the probability that this surface will show signs of corrosion.

Photo courtesy of Daubert Chemical

Refrigerated Trailer Maintenance Tips



» Any damage to a refrigerated trailer's inner or outer skins — like rips and punctures — needs to be repaired promptly and properly to prevent moisture from entering the walls, ceiling or floor and degrading the foam insulation.

Photo courtesy of Great Dane Trailers

A reliable refrigerated trailer is essential for handling perishable and temperature sensitive loads. To retain the dependability and performance built into new trailers, they need regular inspections and thorough preventive maintenance.

Fleets with routine scheduled maintenance programs have a lower total cost of ownership, notes Larry Adkins, product applications manager, commercial trailer products, Wabash National Corporation (www.wabashnational.com). Wabash National is a diversified industrial manufacturer and a leading North American producer of semitrailers and liquid transportation systems. Customers should refer to their operator's manual for recommended maintenance.

Preventive maintenance (PM) service intervals can often be driven by component selection, he says. Adhering to lubrication and inspection requirements for components can result in shorter PM intervals.

Adkins says key components to inspect on refrigerated van trailers include brakes, lights, tires and wheels, wheel ends, suspension components, upper coupler and kingpin, rear impact guard,

landing gear, rear frame, doors, floor system, exterior walls and roof, interior liner and scuff panels, chute (if equipped), air return bulkhead (if equipped) and aerodynamic devices (if equipped).

MOISTURE

There are several issues unique to refrigerated trailers. One is that as refrigerated trailers age, the insulation system between the internal and external skins degrades. Another is moisture, which causes the insulating materials to break down more rapidly, resulting in a loss of thermal efficiency.

Damage — like rips and punctures — to a trailer's inner or outer skins, when ignored or not repaired properly, allows moisture to enter the walls, ceiling or floor, as well as degrade the foam insulation.

In all these situations the refrigeration unit has to work harder to make up for this loss of insulation performance, say officials with Great Dane trailers. This, in turn, causes the refrigeration unit to work harder with longer cooling unit run-times, consuming more fuel to maintain the desired interior air temperature. This increases operational costs and unit maintenance.

Eventually, they say, the insulation will degrade so much that the unit cannot properly “pull down” or have enough cooling capacity to get the job done.

Great Dane Trailers (www.greatdanetrailers.com) is a leading manufacturer of high-performance commercial transportation equipment, including dry and refrigerated trailers and truck bodies, as well as steel, aluminum and combination platform trailers.

INSULATION EFFICIENCY

One way to check a refrigerated trailer's insulation efficiency is to weigh the trailer at regular intervals, say Great Dane Trailers officials. This helps determine if there is moisture accumulation or water pickup through condensation or leakage into the insulation.

Check for spots where water may leak out during cleaning, other than from regular drain holes, they advise. This indicates water entrance into the insulation. The areas allowing water to enter need to be located and properly sealed.

Furthermore, the officials recommend keeping a record of the length of time the mechanical

refrigeration unit cycles and its frequency. An increase of an appreciable degree in frequency and in duration of the cycles, or both, could indicate a general deterioration either in the trailer insulation or refrigeration unit.

Excessive air leakage may cause the refrigeration unit to run for long periods of time, add the officials. Excessive air leakage indicates problems such as perforated walls or worn out areas of door seals or door locks around vents, side doors and refrigeration units. These areas should be repaired.

DOORS

Doors also need attention to ensure an efficient seal to eliminate moisture intrusion and keep the cold air in when closed. Great Dane officials say to check:

- Rear doors for damage or warpage to panels, frame or hinges.
- Compression seals to see if they need to be repaired or replaced to ensure a tight closure.
- Seals around vent doors and perform maintenance as needed.
- Interior linings or insulated doors for damage or loose or missing fasteners and repaired as required.

Silicate concentrations also form around welded areas. The silicate is not only difficult for paints and hard coatings to bond with, but its salty composition means that moisture can easily activate it and cause corrosion to begin.

Problems

How can maintenance professionals promote safety and save their fleets money, while increasing trailer longevity and resale value?

"We see the results of effective PMs on a daily basis, as well as the results of a lack of preventive maintenance," Letts of Transport Finishes says. "You can tell a lot about a fleet by the way it maintains its trailers, and that ultimately impacts both safety and asset utilization."

A part of
every PM
protocol.

He says a poorly maintained trailer will deteriorate steadily and that this is a recipe for a Compliance, Safety, Accountability (CSA) infraction. He proposes a scenario where a corroded mudflap bracket has come loose and falls off a trailer.

"A loose or missing mudflap bracket is a formal invitation for authorities to conduct a roadside inspection," he says, "and an out-of-service vehicle generates no revenue."

Letts observes that a vehicle with active corrosion is also far more difficult to work on. It can be costly and time consuming to have to heat, cut or break off corroded fasteners. Wiring can also become contaminated, lamp holes can become misshaped and sometimes patch panels have to be added to keep equipment functional.

"Maintenance crews can spend more time on preliminary corrosion-related repairs before they can even address the original problem," he says.

Letts is adamant that an active corrosion prevention PM plan will pay dividends when it's time to sell a used trailer. He insists that poorly

maintained trailers often sell for 50 to 75 percent less than even reasonably maintained trailers, and some poorly maintained trailers often must be sold as scrap.

"If corrosion is allowed to gain a foothold and remain active on a trailer's structural members, you are going to regret it," says Letts. "Once the structural integrity of vehicle is compromised,

you're looking at repair costs that may make it virtually impossible to salvage."

Prevention Measures

Fleet maintenance professionals have a number of tools to inhibit trailer corrosion on in-service

➔ Page 26

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vehicles. Today's trailer manufacturers use a range of methods to prevent corrosion on new vehicles, and fleets have varying options available to them for corrosion prevention on in-service vehicles. In the process of original construction,

» **Rust-proofing compounds, like Nox-Rust X-121B, can be applied directly on active rust and to large areas of a vehicle, like the entire undercarriage, including cables and wiring, to stop active corrosion in the field.**

Photo courtesy of Daubert Chemical

vehicle components are often treated inside and out with corrosion resisting substances. After the assembly process is complete however, interior access can be limited.

Trailer OEMs fight corrosion on a trailer's structural crossmembers with paint applications, two-step zinc and paint combinations, epoxy coatings and construction using costly galvanized, stainless steel or aluminum components. The technique used by the vast majority of trailer manufactures is hot melt wax-based coatings.

Do Dollies Right



» **All components and the entire converter dolly should be inspected according to a regular schedule, and all maintenance performed by a qualified individual.**

Photo courtesy of Wabash National

Converter dollies, like any vehicle, require routine preventive maintenance to ward off any unplanned downtime and costs from an unanticipated equipment failure.

A converter dolly is a coupling device comprised of one or two axles and a fifth wheel by which a semitrailer can be coupled to another semitrailer. Think of a tractor pulling two trailers — a “doubles” combination, or pulling three trailers — a “triples” combination.

When it comes to converter dolly maintenance and safe operation, Gary Gaussoin, president and chairman, Silver Eagle Manufacturing Company (www.silvereaglemg.com) — a leading North American manufacturer of on-highway converter dollies for the heavy trucking industry — advises consulting a number of Technology & Maintenance Council (TMC) recommended practices. These are specifications or practices related to the maintenance of equipment,

and they include informational documents that cover technical aspects of maintenance, equipment and supporting technologies.

He cites these TMC recommended practices:

- *Recommended Practice (RP) 713C, Procedure for Hooking Up Multiple Trailers*
- *RP 721C, Practices for Safe Maneuvering of Converter Dollies*
- *RP 728A, Trailer Axle Maintenance*
- *RP 747, Drawbar Eye Maintenance Guidelines*
- *RP 618B, Wheel Bearing Adjustment Procedures*
- *RP 640B, Alternate Wheel Bearing Adjustment Systems*
- *RP 643A, Air-Ride Suspension Maintenance Guidelines*
- *RP 650, Guidelines for Fifth Wheel Pre-Delivery Inspection, Preventive Maintenance and Troubleshooting*
- *RP 751, Safety Chains and Attachments*
- *RP 756, Ergonomic Design Parameters for Safe Maneuvering of Converter Dollies*

Comprised of a broad collection of experienced fleets, equipment suppliers and service providers, TMC (www.trucking.org/Technology_Council.aspx) is the only industry association that is focused solely on truck technology and maintenance.

Checklists

Silver Eagle's Gaussoin offers this advice when it comes to scheduled maintenance and proper repair:

- All components and the entire dolly should be inspected according to a regular schedule.
- Never use a dolly that has damaged or inoperable systems.
- Ensure that all maintenance is performed by a qualified individual.
- Make sure that repairs are done using approved parts, components and

procedures, otherwise the warranty may be voided.

Larry Adkins, product applications manager, commercial trailer products, Wabash National Corporation (www.wabashnational.com) — a diversified industrial manufacturer and a leading North American leading producer of semitrailers and liquid transportation systems — says key components to inspect on converter dollies include:

- Brakes
- Lights and wiring
- Tires
- Wheels and wheel ends
- Suspension components
- Pintle eye
- Slack take-up devices.
- Fifth wheel (which should be maintained in accordance with the vendor's recommendations)
- Running gear
- Frame and fasteners

Maintenance professionals must take into consideration what type of corrosion-fighting method was originally used on a vehicle when making repairs, as some coatings and materials are harder and more costly than others to work with, says Duncan of Daubert Chemical. He also notes that the company's Nox-Rust corrosion-inhibiting solutions are compatible with virtually all commonly used anti-corrosion coatings.

Fleet maintenance crews can use its Nox-Rust X-121B as part of an effective PM protocol that stops active corrosion in the field, he says. It is a thixotropic wax gel rust-proofing compound designed to provide a long-term protective film for primed and unprimed steel.

Nox-Rust X-121B shares the performance characteristics of Nox-Rust 1210HP, a hot melt corrosion preventive coating designed to be applied to various trailer structural members from a heated dip coating tank.

Both solutions, which contain rust-inhibiting chemicals, are hydrophobic, literally excluding water molecules from contact with the metal they cover, Duncan explains. "The products' ability to protect metal from salt, humidity, dirt and debris makes them one of the most effective direct-to-metal protective coatings around."

Wax-Based Technologies

"With the exception of stainless steel and aluminum crossmembers, which are cost prohibitive, other anti-corrosion methods, such as galvanized steel, rely on the application of a coating, and in all cases except wax-based coatings, those coatings are prone to chipping," Duncan says. "In contrast, wax-based coatings are soft, pliable and self-healing, even when struck by rocks or abraded."

"Due to its malleability, the material won't chip and essentially encapsulates a metal substrate in a protective coating that is much better suited to the wet abrasive environments found under a heavy duty commercial trailer." ■

Online Exclusives

To learn the results of Daubert Chemical's corrosion testing on galvanized steel trailer components, visit:

➔ VehicleServicePros.com/20856814

For advice on establishing a maintenance schedule for flatbed trailers, offered by Vanguard National Trailer Corporation dealers, go to:

➔ VehicleServicePros.com/20856843

A photo gallery of flatbed repair and maintenance, provided by Vanguard National dealer ILoca Services can be found at:

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Techniques To Accomplish More Each Day

By Joel Levitt, Director of
Projects, Reliability Leadership
Institute, Reliabilityweb.com &
David A. Kolman, Editor

Four approaches to mastering your time

Maintenance management can be a pressure cooker. Emergencies, short staffing, vendor problems, shop backlogs and asset breakdowns all contribute to stressors on the job. While removing the stressors is impossible, changing one's attitude is quite possible by "mastering" one's environment.

This can be accomplished by developing time management skills. The goal is not to feel in control, because that is an illusion. The objective of time management is to feel that you can master anything that comes at you. Mastery of this type pays dividends in effectiveness.

The Nature of Time

Time is the only truly non-renewable resource. Unlike energy, it cannot be saved or created. It is also the only resource that everyone has exactly the same amount of. In the amount of time, we are all truly equal.

Do you know how you spend your day? Keep a log of what you actually do in a typical week. Time management experts agree the place to start managing your time is by finding out how you spend your time.

As you go through each day, write down the percentage of time you spend at each activity. Then, as you review the percentages, ask yourself: If I were the kind of manager I'd like to be, what would be the ideal percentages for each activity?

The reality of being a maintenance manager is that frequently you are not in control of your time. When you are not in control of most of your time, it is doubly important to control what little time is left.

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[TRAINING & RESOURCES]

» Things tend to pile up fast for maintenance managers. Typically, by the end of the work day there always seem to be unfinished matters. By developing and maintaining effective time management skills, you can become more productive, which will help decrease anxiety and stress.

Photo from iStock

Here are four projects to improve your time management.

Project No. 1 — Schedule time to clean up your desk, organize your office

Get a box of manila folders and put them in order with the tabs alternating left to right.

Get a blank piece of full-size paper to use as your master to-do list. Or, use Microsoft Outlook's tasks or another mobile phone, tablet or computer calendar system. It is important to get a to-do system that is easy to use and keep on top of.

Put all of your papers from your desk, and from elsewhere in your office, in a pile.

Go through every piece of paper in that pile and be ruthless about throwing out as much as possible away. Separate into a new pile the papers you need to keep. If there is an action that needs to be taken, save the paper in this new pile.

proper files. This keeps your desk clean between each activity.

Apply the same procedures to your drawers, file cabinets, closets, etc.

Project No. 2 — Supercharge your time

Look at areas where you could do two things at once without sacrificing quality of either. For example, your twice-daily commute. An hour commute could translate into more 200 hours a year of learning time through the use of "books on tape" or Great Courses.

Get an app for your smartphone or carry a microcassette recorder to record ideas, memos, letters and instructions. If you have staff support, have them transcribe your "tapes." Have them use a separate page for each idea or project.

Delegate some of your tasks/work to your staff. A well-trained crew will multiply your effectiveness.



» If a workspace is messy and cluttered, valuable time is wasted looking for files, supplies, materials, etc., among all the clutter. A workspace that is well-organized provides a feeling of control and competence, which leads to higher levels of productivity.

Photo from iStock

Match your energy level to the work.

From this pile, start with the top paper and ask yourself: Is there any work that must be done for this? If so, add that assignment to your master to-do list. Then, ask yourself: Should I keep the piece of paper? Remember, you recorded the assignment. If it's a keeper and no file already exists, prepare a manila folder.

Continue with this routine up until you reach the bottom of the pile. Do not do any work required by any paper unless it can be handled within 1 to 2 minutes.

Clean and organize your desktop. This encourages efficient work habits.

Put your work on your desk. Complete it to the level possible at that time and put it back into its

Learn to speed-read. Benefits to learning this skill include being able to absorb information faster and allows reading material in less time.

Project No. 3 — The 80/20 Rule

Nineteenth century Italian economist Vilfredo Pareto observed that in Italy, 80 percent of its wealth and influence belonged to only 20 percent of the population. Investigating different industries, he found that 80 percent of the results come from just 20 percent of the actions.

This generalization, originally called the Pareto Principle, is now known as the 80/20 Rule.

Since 80 percent of our results will flow from 20 percent of our activities, if we identify these critical few activities and increase our time commitment to them, we can double or triple our results each day.

Go through your master to-do list and examine each item. Divide the items into a 20 percent important, highly leveraged activity and an 80 percent low leverage activity.

The 20 percent activities should be scheduled first during your high energy intervals throughout the day. (Energy levels will be explained later on in this article.) The top three of these activities become your bottom lines. Those bottom lines are: If I do nothing else today, I will do my bottom line items.

Fill in the low return on investment activities — the 80 percent activities — around the 20 percent activities.

14 Tips to tame time killers

1. Learn when to say "no."
2. Place a clock where it can be clearly seen while at your work space. This will help you to not lose track of time.
3. Train yourself to be able to throw things away, put things away and delegate duties and tasks.
4. To more easily throw things away, put "T.O." (throw out) dates on all files. Every two months or so, review your files and throw away the old ones.
5. When doing important work, consider switching off your phone, email, text messaging, etc. You can follow-up when the work is completed.
6. Put up a "Do not disturb" sign when you absolutely have to get work done.
7. Always work to complete what you start. Going back will always cost you time.
8. Track your time spent. Use a simple timer. Key in the amount of time you want it to track, for example, 30 minutes. The timer counts down and when the time is up, it will beep, letting you know the allotted time period is up.
9. Do the appropriate level of quality for each task. Some projects need to be done "quick and dirty," while others need excellence. Know the difference. Inappropriate quality is a time killer.
10. Decide what your most important jobs/duties are and prioritize them.
11. Do your highest priority or most anxiety-producing items during your highest energy time.
12. Politely end conversations that aren't going anywhere.
13. To get the best return on investment from meetings that you run, insist that people do their homework. The least efficient meeting is one where people sit around and watch each other think.
14. Gain efficiency by grouping related activities together. For example, make all telephone calls back to back.

Assign realistic priorities or codes to each task:

- ➡ Priority 1: Due today by 6 p.m.
- ➡ Priority 2: Due tomorrow by 6 p.m.
- ➡ Priority 3: Due by the end of the week.
- ➡ Priority 4: Due during the next week.

An alternative is to prioritize tasks within this grouping by adding a decimal place. For example, a Priority 1.0 task needs to be done immediately, whereas a Priority 1.5 task needs to be done by the end of day.

A word of caution about the 80/20 Rule. We assume we know what the most important activity is at any given time or what tasks are the most profitable. This is not always the case, however. You might never know what is important before the end of the work.

Think about police detectives. How do they know the one fact or the piece of evidence that will prove to be pivotal in a prosecution? They don't know. That's why they methodically gather everything even remotely relevant in their search for solving a crime.

Project No. 4 — Energy level

Another key to mastering time is to determine your patterns of energy. Our energy goes up and down all day. Your most productive hours in a day will be when your energy level is high. That's when you should take on your most challenging work.

With high energy we are better at concentrating, analysis and problem solving. With low energy, such tasks become more difficult and take us more time to complete, often with not-so-good results.

Look into behavior that robs you of energy, such as big lunches, certain meetings or certain people. Leave time for high priority work and jealously guard this time.

Here is an exercise to help you establish your energy level by times of the day:

- ➡ Set-up a spreadsheet with hours down the rows and days across the columns.
- ➡ Every hour or so, evaluate your energy level, giving it a score of 1 to 10, and add this to the spreadsheet.
- ➡ After a week, plot the curves and you will see your high energy times.
- ➡ Knowing this, you can plan your high return (20 percent) activities during your high energy times.

When it comes to managing any maintenance operation, the effort put into developing time management skills and proactively mastering time is well worth the effort. Without doing so, you get to the end of your work day with plenty of unfinished work and wonder where the time went. ■



JOEL LEVITT is director of projects for Reliabilityweb.com's Reliability Leadership Institute. Reliabilityweb.com provides the latest reliability and uptime maintenance news and educational information. He is also author of Fleet Maintenance's Management Column.

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» Ask the right questions about temperature ratings to select friction that maintains performance, service life and safety.

Photo courtesy of Bendix Spicer Foundation Brake



By Keith McComsey

DIRECTOR, MARKETING AND CUSTOMER SOLUTIONS, BENDIX SPICER FOUNDATION BRAKE

Bendix Spicer Foundation Brake (www.foundationbrakes.com) combines and expands the complementary wheelend foundation brake technologies of two global leaders' Bendix Commercial Vehicle Systems and Dana Commercial Vehicle Products. The joint venture, formed in July 2004, is a single, complete source for OEM brake system design, manufacturing, hardware and support for all foundation brake components and actuation systems, as well as all-makes coverage of medium and heavy duty aftermarket parts. McComsey has been involved in the commercial trucking industry for 25 years in engineering and product management roles at both the truck OE and supplier levels. He works closely with customers regarding current and future Bendix brake technologies.

Heat Transfer In Braking

The science of friction selection and performance

A cardinal rule when it comes to brakes is that heat is the enemy of braking performance. In today's high-performance and severe duty drum brakes, this is especially true as heat generation and its potential effects are strongly tied to the friction material that provides stopping power.

To better understand the connection between temperature and brake friction, it helps to look at some of the science behind heat transfer in braking, temperature ratings and other factors that should be considered when choosing friction.

Temperature Points

Temperature's critical role in commercial vehicle drum brake applications is centered around three points within the drum brake system (view accompanying diagram).

- Drum bulk temperature — Overall average temperature of the drum.
- Lining bulk temperature — Overall average temperature of the friction material.
- Engagement temperature — Temperature at the point of engagement where the friction makes contact with the drum surface. This can be roughly thousandths of an inch in depth at both the drum surface and lining surface.

These three temperature points represent the full temperature range experienced by these major components within drum brake applications.

It's important to establish a point of reference when discussing friction and temperature. A brake system has a wide variety of components — each with unique thermal properties — that make it nearly impossible to identify one temperature as the most critical for the entire system.

Engagement Point

Understanding the brake system's temperature during a brake application begins at the engagement point, where temperatures can briefly surpass 1,000 degrees F. The amount of heat that is generated at engagement begins to dissipate as heat is transferred into the drum,

with the drum acting as a heat sink.

Without that dissipation, the cast iron drum would be red hot, creating an extreme environment difficult for any type of friction material to withstand.

In less frequent brake stop conditions, the typical ranges for drum bulk and lining bulk temperatures tend to differ since the materials are different. A typical drum bulk temperature would be in the range of 300 to 500 degrees F, where the lining bulk temperature would be within a range of 200 to 300 degrees F, depending on the friction.

Maintain the lowest possible braking temperatures.

As stops get more frequent, heat continues to transfer into the drum, raising the drum bulk and lining bulk temperatures. These bulk temperatures can reach up to 600 degrees F in drums and approximately 300 to 400 degrees F in linings.

Braking temperatures can increase in some conditions, such as severe duty use (in applications requiring more frequent or harder stops, or in situations in which cooling air to the brake is restricted). Sometimes these two factors go hand-in-hand, where more frequent stops tend to mean less air flow or cooling.

These severe duty applications may require a higher-grade friction to better withstand the increased levels of heat.

The Goal

The goal of brake and friction design is to maintain the lowest possible braking temperatures. Reduced temperatures lower the risk of loss of stopping power — known as brake fade — while also extending the life of your brake friction.

It's important to remember that the elevated temperatures at the engagement point of the friction and drum



dissipate almost immediately. Although it may be acceptable to measure 1,000 degrees F on the drum surface during engagement, prolonged exposure at this temperature will lead to the failure of any NAO (non-asbestos organic) friction.

Placing too much emphasis on keeping brake temperatures low, however, can lead to a misplaced reliance on brake lining temperature ratings, particularly those that claim ratings of 950 to 1,000 degrees F.

Industry Tests

The most valuable and accepted industry tests in the OE and aftermarket friction certification process are the FMVSS (Federal Motor Vehicle Safety Standard) 121 and the Society of Automotive

Friction temperature ratings are numbers without context.

measured — drum bulk or engagement — and where the readings are being taken, friction temperature ratings are numbers without context.

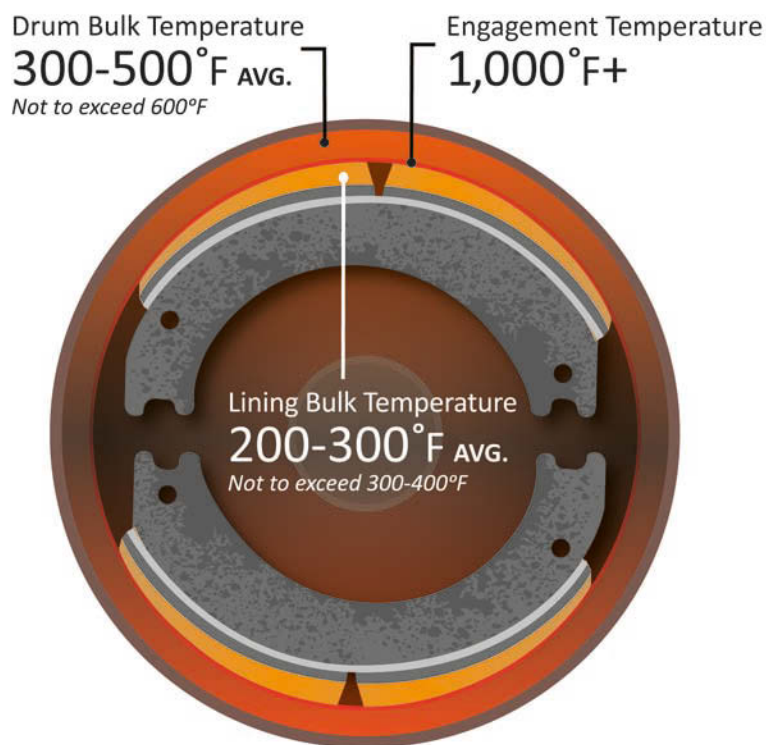
Actual friction life and performance will be dictated by resin quality and performance in the SAE temperature wear section.

The results of both the FMVSS 121 and SAE J2115 tests should be requested from any potential supplier when considering friction for severe duty applications, even if that supplier has provided “temperature ratings” far exceeding

Selecting the proper friction is vital for maintaining the performance, service life and safe operation of drum

brakes, especially in severe duty applications. Familiarity with proven industry standards, as well as the science and reasons behind friction design and recommendations, goes a long way toward making the right choices to meet fleets’ needs and keep trucks operating safely on the road. ■

Temperature Ranges in Drum Brake Operation



Graphic courtesy of Bendix Spicer Foundation Brake

Engineers (SAE) J2115 tests, used by Bendix and other leading brake and friction suppliers. These two tests, which all commercial vehicle drum brake friction materials must adhere to, establish the following drum bulk temperature guidelines:

- FMVSS 121 Dynamometer Test — Brake Power or Fade Section: 150 to 450 degrees F.
- SAE J2115 (Section 7 — Wear and Effectiveness at Temperature) Measured at 250, 350, 450, 550 and 650 degrees F

Neither of these tests references or makes a recommendation on “temperature ratings” for brake friction. Similarly, major truck manufacturers do not include temperature ratings in their friction material certification guidelines. Why? Because without specific information on what temperature is being

normal system operating temperatures. Regarding specific temperature claims, ask whether they’re measuring drum bulk or engagement heat, and where it’s being measured.

Operation Temperature

Both in the garage and on the road, it’s difficult to accurately measure brake operating temperatures. The only reading that can be easily obtained without equipment such as thermocouples is the drum bulk temperature.

If the drum bulk temperature is anywhere near 1,000 degrees F after brake operation, something is very wrong with the brake, and could even lead to a fire. Only brief in-stop drum brake temperatures should ever exceed 600 degrees F.

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The Root Cause Of The Technician Shortage

Why this predicament exists



» The real problem for the commercial vehicle maintenance and repair industry is not a shortage of technicians, but a scarcity of qualified technicians.

Photo from iStock

We lack qualified entry-level technicians.

Conference after conference and meeting

after meeting for the last few years, the subject of a technician shortage has been a main topic of discussion. It seems everyone expects the associations, councils, manufacturers and/or suppliers to provide the solution to finding technicians. In the end, everyone leaves the gatherings with little or no call to action or solution.

Is there a solution? More importantly, is there a problem? If there is, what is the real problem, how do we solve it and, above all, who is responsible for the resolution?

Replacement Need

Every two years, the U.S. Department of Labor (DOL) posts the number of people in each occupation, by a six digit code, and forecasts out 10 years the projected job growth (new positions created) and total growth and replacement. The last report, for 2014, was published in December 2015.

Per the DOL statistics, there were 263,900 truck technicians in 2014. The projected growth in 2024 is 295,500, for an increase in new positions of 31,600. In the same period, the total growth and replacement is 76,900.

Doing the math, we have a replacement need of 45,300. That means nearly 59 percent of our total need for truck technicians is replacement.

The Pipeline

This data supports most companies' and people's belief that we have a shortage. But more information is needed to determine our real shortage. We must look to the schools that teach the skills needed for the occupation of

truck technician and ascertain how many students they graduate each year.

By looking only at public and private schools that teach at the post-secondary (after high school) level, we can determine the shortage and then allocate resources to resolve the problem.

It has been determined that public community colleges and institutions that have truck technician curriculum graduate about 5,080 students each year, and private for-profit and non-profit graduate about 5,658, for a total of 10,738. When you do the math, it doesn't seem like there is a shortage, or does it?

Skills

In a recent survey by the Technology & Maintenance Council to determine the skills employers require in an entry-level truck technician, this question was asked: Which statement best describes your situation: Do you have a shortage of applicants, or do you have a shortage of *qualified* applicants?

More than 80 percent of survey respondents said they have a shortage of qualified applicants. Knowing that, the DOL data and the graduate information, we can now validate that the real issue is not a shortage of technicians, but a scarcity of qualified technicians.

Searching for and recruiting experienced technicians will become increasingly difficult and may be impossible. Experienced technicians are at a minimum. You might think about developing your own future workforce.

Issues to Address

There are multiple factors that created a shortage of qualified technicians. No single group is



By George Arrants

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WheelTime (www.wheeltime.com) is North America's largest dedicated service and parts network for quality truck and coach care. WheelTime University provides assessments, training and ASE (Automotive Service Excellence) test preparation for WheelTime member technicians and fleets that may not have their own training program. As an Automotive Education Consultant specializing in National Automotive Technicians Education Foundation (NATEF)/ASE Accreditation, Arrants works with instructors and administrators to develop partnerships with local business and industry through program advisory committees. These committees help schools establish, develop and maintain programs that are relevant to the needs of automotive, medium and heavy duty and collision industries and the community. He chairs the Technology and Maintenance Council's TMC SuperTech – the National Technician Skills Competition – and the TMC FutureTech – the National Student Technician Competition. His entire career has been in the automotive service and education industries.



to blame. Here are some of the major concerns that need to be addressed.

➔ **What education is teaching must not be what industry needs.**

That is as much the industry's fault as it is education's fault. If industry isn't involved with technician programs in their community and/or schools at a state or national level through advisory committees or other functions, then how can educators know what the industry needs?

If educators were actively involved with our industry, and were asking what we need, then educators would know what is expected.

This is where everyone needs to be involved. No one should be sitting on the sidelines expecting others to do this for them. Get engaged. If you're not involved, you have no right to complain or voice your concerns.

➔ **Some employers expect entry-level technicians to be productive their first day on the job.** The expectation of entry-level technicians is sometimes too high and unrealistic. Were you productive on your first day on the job or even the first week? No. So why would you expect someone else to be?

Unrealistic expectations for technicians and other employees in your organization are driving quality people away from our industry.

Industry is not involved with technician programs

If you have a high turnover rate in any of your locations or organization, realize that it's mostly likely not due to pay. Rather, it's due to how they are treated, the work environment and lack of recognition.

Do you treat your employees like your children or your grandchildren? This generation is different from Baby Boomers, and we have to learn how to positively engage them.

➔ **Other industries are taking our technician graduates.** We are lucky to have programs across the country that train in the area of our needs. Plus, we can recruit from automotive programs that have similar skills sets.

There are other industries that don't have training programs in schools. These industries have high demand and high-wage positions, but don't have the pipeline we have

to create entry-level technicians. They look for programs or occupations that have similar skill sets and recruit from those programs and schools.

This is truly our industry's fault. Students come to these programs and schools looking for a career path as a truck technician.

Because we may not be as involved in these programs as we should be, these students find a different pathway and we lose them forever.

The industry's shortage of qualified entry-level technicians is a national problem with a local solution. We need to come together to fix it. Get involved, now. ■

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» Obtaining parts for maintenance jobs is a major time consumer. This can be avoided through kitting — a process where all the parts required for a planned maintenance job are picked and packed in advance.

Photo from Bigstock

The Value Of Kitting

This process works to ensure maintenance timelines are kept

Studies of maintenance worker productivity

conclude that obtaining parts for maintenance jobs is a major time consumer. The question on planned work — where the parts are mostly known in advance — is who should be responsible for having them on-hand?

One way to avoid problems is with kitting. This is the picking and packing all the parts for a planned maintenance job. In some cases, the kit also includes specialized tools and test gear.

The items are generally picked during off-peak hours a day to a week before the job is scheduled.

“A well-implemented kitting process will pay huge benefits in the form of reduced inventory investment and increased utilization of maintenance technicians and storeroom employees, as well as overall equipment reliability,” says Wally Wilson, an expert on material management with Life Cycle Engineering (www.lce.com), a company that provides engineering solutions that deliver lasting results for private

industry, public entities, government organizations and the military.

Kitting Example

In a large mining truck maintenance shop, the manager obtained the luggage lockers from the town’s bus station before it was torn down. He had the lockers mounted so that the doors were outside the maintenance warehouse next to the issue window.

The back of the lockers were inside the cage and removed, like the open back of P.O. boxes. He bought tubs that slid into the lockers’ width and depth.

When the parts were picked for a maintenance job, they were placed into the tub, along with the printed work order. The tub was put into a locker. The key for the locker was put into the job envelope. When the technicians showed up with a planned work order, the parts counter people just handed them the envelope with the key and checked off the pick list.

Any large parts were noted on the pick list and located on pallets next to the lockers.

Big Issues

Issue No. 1. What happens if a repair for a broken down vehicle needs the same part that is already kitted? This seems to be most common in the middle of the night when no staff is around.

The simple solution is to require the person taking the part from a kit to somehow “officially” notify the parts room/warehouse that the part was taken. The parts room/warehouse then “officially” notifies whoever is responsible for the work schedule to declare the job no longer “ready to go.”

The parts room/warehouse then initiates immediate replacement with priority proportional to the importance of the original job.

Issue No. 2. When a planned job is rescheduled, the question is should the picked parts be returned to the stock. This will be a judgment call.

Typically, if the job will be done within a week or two, it is okay to keep the parts kitted. After that, they should be returned.

Rescheduling introduces false usage which might stimulate over-ordering. When the job is kitted, it is charged to usage. The system might reorder, even though the part is on the kit shelf. If the part is then returned, the maximum might be exceeded.

Issue No. 3. The work planner should anticipate certain situations. For example, if a bearing is bad, then the opposite bearing is likely to be bad as well. In such instances it is okay for the kit to contain a few extra parts, just in case.

Your systems have to allow for quick and simple returns, or extra parts will disappear.

Kitting Questions

The answer to these questions can help you develop a workable kitting strategy:

- How many planned jobs do you go through in a week? This will tell you how much space will be needed for kits.
- What is the average number of parts on a work order? The higher this is, the greater the chance one part will be missing.
- Is job planning mature and commonly held to be pretty accurate? Kitting is more valuable as planning gets better.
- Do you have enough knowledgeable personnel in the parts room/warehouse? Without such people, kits will often be late, and that doesn’t help productivity.
- Are there good relationships between parts room/warehouse, planners and maintenance workers? The kits will get better if these groups freely communicate.
- Does the parts room/warehouse maintain a decent service level? Kitting works best when most of the items are already in stock.
- Is the physical inventory for parts within 3 percent of the Quantity on Hand (QOH)? This shows if there is already good reporting discipline. ■



By Joel Levitt

DIRECTOR OF PROJECTS, RELIABILITY LEADERSHIP INSTITUTE, RELIABILITYWEB.COM

Reliabilityweb.com provides reliability and uptime maintenance news and educational information to help make asset managers, reliability leaders and maintenance professionals safer and more successful. The Reliability Leadership Institute is a community of practice to improve how organizations deliver asset performance through the use of Uptime Elements, a reliability framework.



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» Low deck height for taller loads

The **XL Specialized Trailers MFG Mini-Deck** offers drivers a low deck height for taller loads and a galvanized finish for added durability. The trailers are available in capacities from 60,000 to 80,000 lbs, with lengths of 48' and 53', as well as 29' or 34' in the well. The Mini-Deck features a 12" loaded deck height with 4" ground clearance. The three-beam deck design is small and light, but provides plenty of strength, according to the company.

➔ For more information visit VehicleServicePros.com/20856329

» Spring tension allows mud flap to drop unharmed



JMR's Quick Release Mud Flap System is designed with two pieces: an upper bracket that bolts to the truck, and a lower plate that attaches to the mud flap and slides into the upper bracket. Spring tension allows the mud flap to drop unharmed, and a flag warns the driver. Sliding the mud flap back into place takes less than 30 seconds, according to the company.

➔ For more information visit VehicleServicePros.com/20858835

» Designed for vehicles used mainly in drive position

Pirelli's TG85 On/Off Road Drive Tire is designed for mixed use vehicles used mainly in the drive position. The tread design features shoulder blocks and a massive central rib to resist tears. The wide, deep transversal groove offers improved grip on slippery surfaces. The tread compound is designed to provide lower operating temperatures to increase mileage and tire integrity, while the undertread delivers longer tire life and protection against casing damage, according to the company.

➔ For more information visit VehicleServicePros.com/20857194



» Offers low seating position

The **Commercial Vehicle Group Captain Lo and Ensign Lo Seats** offer a low seating position for vehicles that possess a non-flat floor under the seating area. The Captain low seat offers a chugger isolator, air lumbar adjustment and rear cushion tilt with cushion extension. The Ensign Lo features a low profile seat cushion, air lumbar and cushion extension. Mounting brackets are available for popular medium duty applications, including Freightliner's M2 and FLN and Ford's F-650 and F-750.

➔ For more information visit VehicleServicePros.com/20859194

» Nearly doubles usable fuel capacity

Transfer Flow's 60-gal Replacement Fuel Tank for the 2017 Ford F-250, F-350 and F-450 Super Duty short bed, crew cab diesel trucks nearly doubles the original usable fuel capacity. The 60-gal replacement fuel tank is manufactured in the U.S.A. with 12-gauge aluminized steel for strength and corrosion resistance. Exterior fuel lines and a relocated water separator maximize the available chassis space. The system comes complete with a full installation kit.

➔ For more information visit VehicleServicePros.com/20859205



» Traps contaminants, allergens and odors

Luber-finer's Extreme Clean HD Filters trap contaminants, allergens and odors. The air filters use carbon activation to remove up to 98 percent of bacteria, dust, pollen, mold spores and exhaust gases from incoming air, according to the company. Baking soda in the media minimizes unpleasant nuisance odors that can distract drivers. The Extreme Clean HD is available in 16 parts numbers covering major over-the-road trucks.

➔ For more information visit VehicleServicePros.com/20859327



» Designed for long haul applications

The **Cooper Tire & Rubber Company Roadmaster RM180+(EM) SmartWay Tire** is now available in load range H for tire sizes 11R22.5 and 11R24.5. The RM180+(EM) is designed for long haul applications. The tire features a highway tread pattern and optimized footprint to promote even wear. The tire is designed to deliver long tread mileage, durability and retreadability while also providing low rolling resistance for improved fuel economy.

➔ For more information visit VehicleServicePros.com/20859310



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TOOLS & EQUIPMENT

A roundup of the latest tool and equipment offerings.

» Durable dual injection grip clamp

The **Ullman Devices SMD Clamp Work Light** features a durable dual injection grip clamp with a soft grip, 3" clamping jaw. The light offers 375 lm output, color anodized aluminum housing construction and a continuous three hour run-time. Three AA alkaline batteries are included with the light.

For more information visit VehicleServicePros.com/20854387



» Can access all available modules

The **Autel MD808 Pro Scan Tool** can access all available modules for diagnosis operations, according to the company. The MD808 offers oil service reset, battery registration and rest, parking brake pad relearn, steering angle sensor relearn and diesel particulate filter regeneration functions. The 4" handheld device provides global OBD II coverage for U.S. domestic, Asian and European makes and models.

For more information visit VehicleServicePros.com/20856357



» Wrenches range in size from 8mm to 19mm

The **Cornwell 12-pc Metric Ratcheting Combination Speed Wrench Set, No. CRWS12MSA**, includes specially designed ratcheting wrenches that provide ratcheting action on an open end. This versatile multi-drive design can be used on six-point, 12-point, square, Torx, spline and rounded fasteners. The 90-tooth ratcheting system provides high torque, and requires only a 4-degree handle swing. These wrenches are made of a specialty chrome-vanadium steel to have superior strength and performance. Each wrench has a full polish and a chrome plated finish. They are packaged in a blow molded case for a convenient display and organizational storage. The wrenches range in size from 8mm to 19mm.

For more information visit VehicleServicePros.com/12258896



» 1/4" clean cut on mild steel

The **Titan U.S. ShopIron Cut 30 Inverter Air Plasma Cutting Machine** is a small portable dual voltage, single phase cutting machine. The machine is capable of a 1/4" clean cut on mild steel with the ability to cut all conductible metals, according to the company. This machine comes with a 12' plasma torch, power adapter and a 12-month warranty.

For more information visit VehicleServicePros.com/20856348



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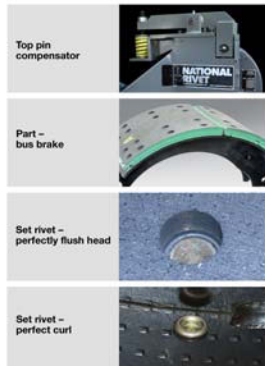
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» Provides consistent rivet sets

The **National Rivet & Manufacturing Company Model 800 and Model 1000 Rivet Setters** feature a top-pin compensator designed to provide consistent rivet sets and eliminate cracked brake line issues by counteracting for variable work thickness up to +/- 1/16". These machines are suitable for applications ranging from computer frames to automotive components.

➔ For more information visit VehicleServicePros.com/20858285

» Three speeds for sanding, compounding and polishing

The **6700-DCE Series Electric Palm Sander/Polisher** from **Aircat / Florida Pneumatic Mfg. Corp.** has three speed settings of 10,000, 7,000 and 4,000 RPM, allowing for sanding, compounding and polishing. The 6700-DCE was designed to be quiet at a 70 d(B) A noise level and comfortable with a 0.5m/sec² vibration level. The sander maintains 85 percent of its speed under load. The 20' low voltage DC cable allows use around vehicles and in assembly areas. The sander comes with either 6" or 5" Velcro sanding backing pad, a four-ply, 100 percent twisted wool 6" polishing bonnet, and a 6" foam polishing/compounding pad.

➔ For more information visit VehicleServicePros.com/20857199



» Directs sparks away from the user

The **Monster 3" reversible cut-off tool**, No. MST705, features a reversible motor which allows the change of rotation direction of the cutting wheel to direct sparks away from the user. The 0.5 hp motor delivers more power to cut heavier materials. This tool was designed to have a comfortable grip and low noise rating.

➔ For more information visit VehicleServicePros.com/12223267

» Unit connects to vehicle via Bluetooth

The **Snap-on Wireless Battery System Tester**, No. EEC550, allows technicians the freedom to maneuver around a vehicle with the main module communicating via Bluetooth to the monitoring unit connected directly to the vehicle battery. This capability eliminates the need for a second technician to perform on-screen commands. The menu and test results display on an easy-to-read, back-lit screen in eight languages. Engineered with patented conductance technology, the EEC550 detects discharged batteries down to 1V and tests 6, 8, 12 and 24V systems.

➔ For more information visit VehicleServicePros.com/12190254



» Delivers leak detection smoke up to 30 psi

The **Bosch HPT 500 High-Pressure Diagnostic Leak Tester** offers high-pressure leak detection for

heavy duty vehicles and turbo charged passenger cars. The HPT 500 delivers leak detection smoke up to 30 psi, and is designed with durable construction

for technicians and fleet owners. The machine includes a bottle of vapor-producing fluid, a remote control key fob, 100-240V AC plug and a hex key.

➔ For more information visit VehicleServicePros.com/20856401



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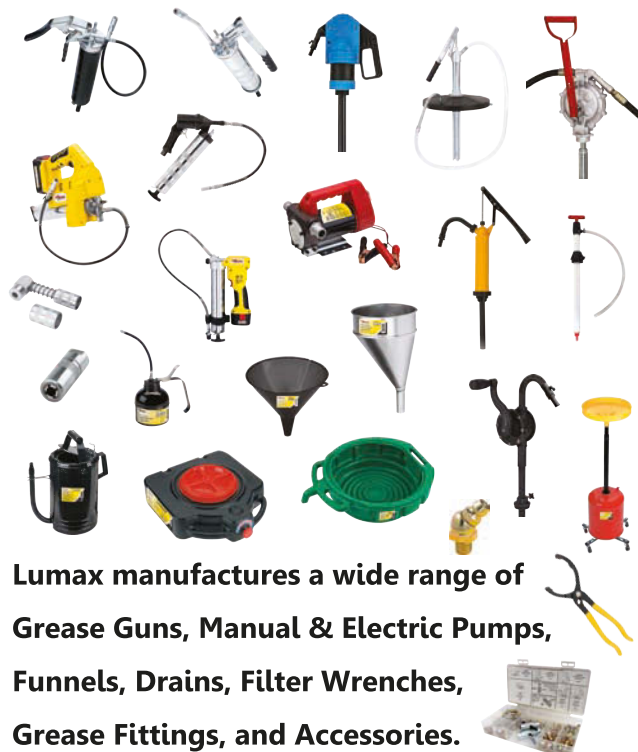
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» Set up and disassemble quickly



The **ShopSol Folding Heavy Duty Plastic Bins**, Nos. 1010267 and 1010268, set up and disassemble in seconds. Useful for many applications, these black baskets can be stored and used around the shop and other areas. The 1010267 model measures 17.9" wide by 12.1" deep by 9.4" high, while the 1010268 measures 21.5" wide by 14.7" deep by 24.4" high.

➔ For more information visit VehicleServicePros.com/12256976



» Jump starts gas engines up to 10L

Weego's Jump Starter 66 jump starts gas engines up to 10L and diesel engines up to 5L. The 66 fast charges phones, tablets and laptops, powers 12V accessories and features a tactical, pro-grade built-in flashlight. Weego's Smarty Clamps were designed to make jump starting easy. The Jump Starter 66 is IP65 rated for water, dirt and dust resistance, and is backed by an 18-month warranty.

For more information visit VehicleServicePros.com/20856299



» Offers comfort and protection

The **Ansell ActivArm Heavy Duty Laborer Glove**, No. 97-003, offers up to six times more cut protection than standard leather gloves, according to the company. The gel palm pads reduce vibrations and impacts. These gloves were designed for working with pneumatic tools, doing body and exhaust work and heavy equipment repair.

For more information visit VehicleServicePros.com/20856361

» Features 550 ft/lbs of nut-busting torque

The **Ingersoll Rand IQV20 W5132 Impactool** is a cordless 3/8" impact wrench with 550 ft/lbs of nut-busting torque and 365 ft/lbs of max reverse torque, which the company says matches the power capabilities of many pneumatic impact wrenches. The W5132 is available with a 3/8" or 1/2" drive, and a power regulator with four power and control settings designed for accurate tightening. Additionally, the tool comes equipped with a shadowless 60 lm Chip-on-Board (COB) LED task light that provides a 360-degree ring of light to the area that needs servicing.

For more information visit VehicleServicePros.com/12224678



» Designed to operate in high-speed tire shops

The **Hennessy Coats 80X Tire Changer** offers advanced features to operate in high-speed tire shops. The patented Robo-Arm Helper device assists in changing low profile or run flat tires, while the single point sealer concentrates air flow to seal the beads more efficiently and eliminate excessive maintenance. The RoboRoller powered assist provides additional power when mounting difficult tire assemblies by preventing the bead from rolling back over the mount tool.

For more information visit VehicleServicePros.com/20856404



» Grips fasteners without needing readjustments

The **Sunex 8" Adjustable Ratcheting Wrench**, No. 9610, features a ratcheting design that grips fasteners without needing readjustments, according to the company. The thumb lock allows the user to switch between ratcheting and non-ratcheting functions. The 9610 features an OSHA-compliant tethering hole, exceeds ANSI standards and has a lifetime warranty.

For more information visit VehicleServicePros.com/20857012



» Available in 3/8" or 1/2" drives

The **M7 Air Angle Impact Ratchet** is available in 3/8" or 1/2" drives and features 250 ft/lbs max torque. The tool has forward and reverse ring control. It includes a composite rubber covered grip for improved comfort, and also features a jumbo hammer mechanism.

For more information visit VehicleServicePros.com/20856862



» Grips both dry and oily surfaces

Galeton's P-Flex Nitrile 3/4 Coated Gloves feature a foamed nitrile palm coating that provides grip for both dry and oily surfaces. The palm, fingers and back of knuckles are coated for added protection. The lightweight nylon shell is designed to be breathable and comfortable.

For more information visit VehicleServicePros.com/20849537



» Features eight heavy duty metric sockets

The **Cal-Van Tools 12-point Metric Axle Nut Socket Set**, No. 976, features eight heavy duty metric sockets that fit axle nuts and automatic transmission tail output shafts on Toyota, Lexus, Chrysler, Dodge, Jeep, Audi, Volkswagen, BMW and many other makes. Includes socket sizes 29mm, 30mm, 32mm, 34-36mm, 38mm and 39mm. The set comes in a durable blow molded case.

For more information visit VehicleServicePros.com/20856880



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» Features handles for carrying and adjusting

The **Mac Tools Pro Spot 5000 Lumens Corded Area Light**, No. SPL5000M, offers three power settings: low, medium and high, as well as handles for carrying and adjusting. With a detachable base with powerful magnets for hands-free use, the SPL5000M rotates 180 degrees, swivels 360 degrees, is corded and is IP67 rated. The product provides 1,500 lm on low, 2,500 lm on medium and 5,000 lm on high.



For more information visit VehicleServicePros.com/20858450

» Keep devices charged on the go

The **AllStart IonSlim 12000 Power Bank**, No. 583, is a portable power travel companion for keeping smartphones, tablets and other devices charged while on the go. The slim 12000 Lithium battery device recharges in 4.5 hours and delivers up to six charges.



For more information visit VehicleServicePros.com/20856867

» Takes up 3' of floor space

ProLine's Motor City Lift King is a fast, easy and safe way to remove or install a pickup box, topper, car or truck door or semi hood, the company says. This product is designed to be used by one person, and only takes up 3' of floor space. The Lift King includes the main component, box attachment and bushing kit. Additional attachments are also available.

For more information visit VehicleServicePros.com/20857061



» Simple and portable battery analyzer

The **OEM Tools Digital Battery Analyzer**, No. 24369, is a portable battery starting and charging system analyzer. The voltage range is 1.5 to 15V DC with a battery CCA 240 to 2,000. The battery analyzer offers a menu for testing batteries and starting charging systems. The unit checks voltage, cold cranking amps (CCA), resistance and overall battery, alternator and starter conditions.



For more information visit VehicleServicePros.com/20858862

» Designed for confined work areas

The **Aircat Pneumatic 1/2" and 3/8" Compact Impact Wrenches**, Nos. 1057-TH and 1077-TH, are designed to improve access in confined work areas. This series weighs 2.8 lbs and is 3.85" long, while offering 500 ft/lb of torque.



For more information visit VehicleServicePros.com/20853910

» Purge air from fuel lines while filling

IPA's Diesel-Fuel Injection Cleaner and Primer, No. 9080, allows technicians to fill the fuel tank reservoir with a fuel system cleaning fluid and clean fuel injectors. It also allows technicians to purge air from fuel lines while filling them with clean diesel. The portable design features an internal 5-gal tank, battery compartment and coiled fuel hose with extra space for storing accessories.

For more information visit VehicleServicePros.com/20856383



» Offers 99.9 percent ultraviolet protection

The **Honeywell Uvex Hydroshield** is an anti-fog lens coating now available on the Uvex Flex Seal Goggle in clear lens and the Uvex Stealth OTG in clear, gray and amber lenses. Uvex Hydroshield eliminates fog 60 times longer and resists scratching two times longer than any other Uvex coated product, according to the company. Hydroshield lenses offer 99.9 percent ultraviolet protection.

For more information visit VehicleServicePros.com/20856265



» Forklift pockets on each end for easy loading

The **Maintainer Corporation Lube Skid** features a new aluminum air manifold for pump operation and four 55-gal composite tanks — three for oil and one for waste oil. The Lube Skid is 42" wide by 57" long by 49" high. The empty skid weighs 1,312 lbs. There are forklift pockets at both ends of the Lube Skid for easy loading and unloading, and it also has four heavy duty tie-down/lifting rings.

For more information visit VehicleServicePros.com/20856105





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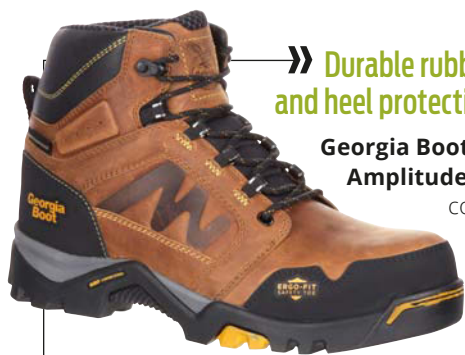
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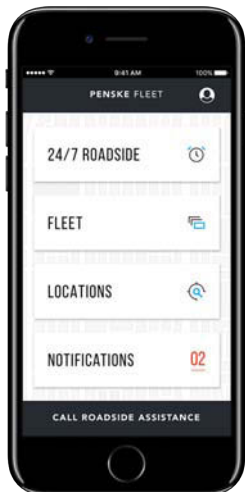
Georgia Boot's Amplitude offers comfort features and durability, according to the company. The Amplitude collection offers full-grain leather uppers, a high performance interior mesh line, the Georgia Waterproof system and durable rubber toe and heel protection. The oil- and slip-resistant outsole is made from flexible rubber and features abrasion resistance.

For more information visit VehicleServicePros.com/20853385

» Manage vehicles and service

The **Penske Fleet Mobile App** helps users manage their vehicles and find services. View real-time fuel prices, review a detailed 90-day history of vehicle maintenance services, search and find Penske locations for service, fuel or rental trucks, make one-click roadside assistance calls and monitor the status of roadside calls. The Penske Fleet app is available for free download in the Apple App Store and on Google Play.

For more information visit VehicleServicePros.com/20859191



» Disassemble without tools

The **CRKT Homefront** features "Field Strip" technology. This in-field, no-tool take apart capability allows users to clean off grime without returning to their workbench, according to the company. To disassemble the Homefront, push the front release lever away from the blade and spin the turn release wheel on the rear of the handle away from the pivot shaft. Once the handle releases, pull it up and away from the blade.

For more information visit VehicleServicePros.com/20858740



» Features a ratcheting caliper spreader

The **Powerbuilt Ratcheting Single and Dual Piston Caliper Tool**, from **Alltrade Tools**, features a ratcheting caliper spreader equipped with 2-pc steel plates (4-5/8" L x 2-3/8" H) for single, twin or quad piston calipers. The pads spread from a range of 1-1/2" to 2-5/8" pushing the caliper pistons back to allow plenty of room to install the new brake pads. Ideal for most large trucks and commercial vehicles with Quad piston Calipers, 2-pc 7" by 2-3/8" Steel Plate Add On adapters are also included. These added plates allow for a larger length range to more effectively work on larger calipers. The Add On Plates snap directly on to units and are held in place by magnets. The tool is easy to install and remove, according to the company.

For more information visit VehicleServicePros.com/20858553



» Water and impact resistant

The **Cat Pocket Pen Light**, No. CT2210, offers a slim, compact design. The high power LED generates 100 lm of light output. The light is water and impact resistant, and is constructed from rugged aluminum. The weather resistant push button switch provides reliable performance. The light also includes a durable steel pocket clip for portability. Two AAA batteries included.

For more information visit VehicleServicePros.com/20850307



» Three levels of multi-purpose use

Snap-on's 40" Shop Cart, No. KRSC430, features a sliding lid with two new drawers to offer three levels of multi-purpose use. The cart allows techs to work from the lid, drawers and inside the top at the same time. The KRSC430 lid comes in stainless steel or a bed liner coated surface, and the lid moves independently on 120 lb capacity ball bearing drawer sliders. The cart comes in 10 standard finish combinations with other colors and trim options.

For more information visit VehicleServicePros.com/20855844

» Removes rusted screws and nuts

The **CTA Tools VibroShock** is designed to remove frozen or rusted screws, nuts, bolts or plugs without damage. VibroShock generates axial vibration with controlled torque to release the welding between male and female threads. It locks onto an air hammer on one end with a 3/8" square drive on the other. The kit includes seven 3/8" square drive metric sockets. Socket sizes include 8mm, 9mm, 10mm, 11mm, 12mm, 13mm and 14mm.

For more information visit VehicleServicePros.com/20854537

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➔ For more information visit VehicleServicePros.com/20855574



» Delivered ready for installation



The **Premier Pits Prefabricated Pits** offer lower installation and maintenance costs, improved efficiency and better working conditions for staff, according to the company. The pits are produced by MIG welding together mild steel plates so they are watertight. Once the basic pit structure is completed, the ancillary additions and fixtures are fitted to satisfy individual customer requirements. The pits are delivered to the site in one piece, ready for installation.

➔ For more information visit VehicleServicePros.com/20858123

» 42" grease hose with extreme flexibility

The Legacy Manufacturing Flexzilla 20V Cordless Grease Gun,

No. L1388LFZ, features a 42" grease hose with extreme flexibility in subzero conditions. Rapid Reload technology allows for fast cartridge loading that includes a threadless grease barrel. The kit also includes two 20V rechargeable batteries, a one-hour quick charger and an automatic air bleeder valve for increased work efficiency.

➔ For more information visit VehicleServicePros.com/20858535



» Designed to be functional and affordable



The **Bear Edge Manual Folding Pocket Knife**, No. 61102, is designed to be both functional and affordable. This knife features a 440 stainless steel blade that opens quickly using either the thumb stud or the flipper. Ball bearing washers provide smooth and consistent blade deployment. The knife has an OD green G10 handle and an ambidextrous tip-up carry clip.

➔ For more information visit VehicleServicePros.com/20857623



» Features easy-to-use components

The **Mi-T-M Work Pro Series of Air Compressors** features components and can power everything from impact wrenches to drills to nail guns, according to the company. The 8-gal Work Pro air compressors feature a slash oil lubricated aluminum crankcase, stainless-steel braided discharge hose, regulator and two gauges for tank and outlet pressure and pilot valve unloader.

➔ For more information visit VehicleServicePros.com/20854123

» Ventilated mesh keeps hands cooler

Galeton's Palomino Meshback Pigskin Drivers Gloves,

No. 12755, feature ventilated mesh to keep hands cooler and drier during hot weather, keystone thumb for better mobility and elastic back for a good fit. These gloves are made with grain pigskin.

➔ For more information visit VehicleServicePros.com/20857325



» Delivers five cartridges of grease on one charge

The LuMax HandyLuber 12V Cordless Grease Gun

offers an ergonomic design and is constructed for durability. It has a maximum operating pressure of 7,000 psi and high flow rate of 3.5 oz/min. This grease gun features a built-in pressure relief valve and a 1500mAh Ni-Cd battery capable of delivering five cartridges of grease on a single charge, according to the company. The HandyLuber comes in a slim-line carrying case with a 30" ultra-flex hose, grease coupler and one-hour quick charger.

➔ For more information visit VehicleServicePros.com/20857008



» Available in straight or angled

The **KTI Professional Quality Die Grinder**, available in straight (No. KT187124) or angled (No. KT187134), is designed for smoothing out welding projects, getting rid of rust or cutting sheet metal. Each grinder is a heavy duty 1/2 hp, 1/4" drive tool with durable composite housing and a rear exhaust system. Each grinder is covered by a one-year repairable warranty, and is also available in a 4-pc display set for distributors.

➔ For more information visit VehicleServicePros.com/20854140

» Allows one-person installation of toppers

The **ProLine Topper King** is designed to provide a fast, easy and safe way for one person to perform the installation or removal of a topper. The Topper King is designed to be used by topper manufacturers or topper dealers that remove or install toppers on a high volume basis. Tailgate do not need to be removed when removing or installing toppers using this product.

➔ For more information visit VehicleServicePros.com/20857077



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VehicleServicePros.com/10122188

» Communicate with commercial motor vehicles for access to vehicle information

The **NEXIQ Blue-Link Mini** enables users to employ either iOS or Android smartphone or tablet devices to communicate with commercial motor vehicles for access to vehicle information. It plugs into the vehicle's diagnostic connector, and provides wireless Bluetooth communication with on-board electronic control units. Paired with an application, the device can be used as a low-cost telematics solution, enabling users to read parameters, command special tests, and calibrate controllers without having to take the vehicle to the shop. Software development kits (SDKs) for both iOS and Android are available on the NEXIQ website to assist developers with application development.

For more information visit VehicleServicePros.com/20858486



» Great for 30/36 spring brakes

The **Lisle Extra Deep 15/16" Truck Cage Bolt Socket**, No. 49020, works well on 30/36 spring brakes for Autocar, CCC style dump trucks and garbage trucks with MGM breaks, according to the company. It can also be used to remove fuel tank saddle clamps, U-bolts, S-cam brackets and caging bolts. The socket can be used with 1/2" drive and an impact wrench, is forged from alloy steel and is heat treated.

For more information visit VehicleServicePros.com/20854100



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Main Trends Impacting Trucking

New oils and technology are at the forefront



At the recent Technology & Maintenance Council (TMC) Annual Meeting held in Nashville, TN, we talked with a number of fleets to hear what they had to say about some of the key trends impacting the trucking industry.

We heard opinions on what the trucks of the future will look like, how engine technologies will change, the progress being made on autonomous vehicles and the impact new CK-4 and FA-4 diesel engine oils will have.

Diesel power will dominate.

Engine Oils

During the TMC S.3 Study Group's Full Tech Session on aftertreatment — which I had the privilege to be a part of in the planning stage — a consistent topic of conversation circled around the new CK-4 and FA-4 heavy duty diesel engine oils. According to most, fleets

» Topics of discussion among fleets at TMC's recent annual meeting included key trends impacting the trucking industry. Among them, changing engine technologies, progress with autonomous vehicles and the impact the new CK-4 and FA-4 diesel engine oils.

Photo courtesy of Technology & Maintenance Council

seem to be doing well adjusting to the change. Many of them felt well prepared and were not overly concerned about making a switch.

Not surprisingly, multiple fleets wanted reassurance about the backwards compatibility of the new CK-4 oils with the predecessor CJ-4 oils. We talked with many fleets and assured them that the new CK-4 oils are backwards compatible with the previous CJ-4 oils, and also provide performance improvements in high temperature viscosity control, oxidation resistance and wear protection.

Many fleets also said they preferred to simplify inventory management and keep one type of oil in stock versus two, since filling some trucks with FA-4 and others with CK-4 oils could be more expensive and time-consuming, not to mention the possibility of cross contamination.

Since most fleets are not made up of brand new trucks, I don't expect a lot of fleets will really begin to use the new FA-4 oils for at least a couple of years. The reason for this is that FA-4 oils are designed for trucks with 2016 or 2017 model year engines and are not backwards compatible with all engine make and models.

ExxonMobil suggests checking with your OEM or lubricant supplier for backward compatibility recommendations.

Over the next several years, we are sure this question will come up more often as more fleets diversify their mix of older and even newer vehicles in use.

Trucks of the Future

TMC's SuperTruck Study Group gave a presentation highlighting the latest OEM technologies in the next generation trucks, engines, drivetrains and trailers to increase fuel economy and cut down further on greenhouse gases.

We are already seeing the results of ambitious research projects starting to come to life, like the U.S. DOE's SuperTruck program. A public-private partnership started in 2009, it aims to advance the development of new technologies that can meet increasingly stringent vehicle efficiency standards.

Working side-by-side with Volvo engineers, ExxonMobil lubricant experts helped identify the best lubricant solutions to optimize fuel economy and ensure critical component protection for the Volvo SuperTruck's engine and driveline.

In extensive on-road testing, the Volvo SuperTruck demonstrated the ability to exceed the ambitious goals of DOE's SuperTruck initiative, achieving an 88 percent increase in freight efficiency — eclipsing the DOE's goal of a 50 percent increase.

Engines

For the foreseeable future, diesel will continue to be the most widely used engine technology for a number of years to come. We will see OEMs continuing to focus on introducing engines that deliver greater fuel economies and offer the potential to reduce emissions, typically through the incorporation of aftermarket treatment devices.

Longer-term, we see natural gas engine technologies becoming more popular for long-haul trucking, but also anticipate an increase in urban applications, like commercial bus transport and vocational services.

Driverless Vehicles

While the topic of driverless vehicles was discussed at the TMC meeting, it did not dominate conversation as some outside the industry might expect.

However, over the next few years, we anticipate seeing more progress with driverless commercial vehicles, like Freightliner's Inspiration Truck, which in 2015 became the first licensed autonomous commercial truck to operate on an open public highway in the United States.

We also recently saw Volvo test the capabilities of its self-driving version FMX truck inside the underground Boliden mine in Kristineberg, Sweden.

At ExxonMobil we are involved in supporting these types of technology advancements, working closely with strategic partners. ■



By Paul Cigala

COMMERCIAL VEHICLE APPLICATIONS ENGINEER, EXXONMOBIL

ExxonMobil (www.exxonmobil.com) has specialized in heavy duty lubricants for more than 80 years. Its Mobil Delvac (mobildelvac.com) heavy duty diesel engine oils deliver enhanced performance and engine protection with formulations that help resist oil degradation, reduce sludge build up, prevent wear and ultimately help extend drain intervals and engine life.



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