A/C SERVICE ISSUE

A/C REFRIGERANTS: STILL NOT AS EASY AS 1-2-3-4(yf)

PLUS:
Lube Technology for Modern Engines
Editors Report

As new warnings and recommendations rolled across the country, we asked readers about the COVID-19 virus outbreak—the initial impact on their business and what advice they’d offer fellow shop owners.

New Lubes for Today’s Engines

The only time many vehicle owners think about engine oil is when there’s an unwanted oil spot on the garage floor. Late-model engines require sophisticated lubricants. Are you giving them what they need?

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A/C Refrigerants: Still Not as Easy as 1-2-3-4(yf)

It seemed like the industry had coalesced around R-1234yf as the automotive refrigerant standard. But changes in vehicle design and market demands have thrown things back into doubt.
For the past 25 years I’ve had the privilege of writing the Editor’s Report, and during that time this industry and our readers have weathered some fierce storms. The terrorist attacks in 2001 and their aftermath, the financial crisis of 2008 and numerous regional catastrophes, including 2005’s Hurricane Katrina, immediately come to mind. However, nothing, it would seem, will match the total global impact of the current COVID-19 outbreak.

As you read this issue of MOTOR, circumstances related to the viral outbreak surely will not be the same as they were before we went to press. Nonetheless, on March 17-19, we surveyed MOTOR readers to learn about the initial impact the coronavirus outbreak had on their businesses and what words of advice they would like to offer to other shop owners.

Toward the end of last month, 53% of respondents said they had already made changes to their business practices as a result of the COVID-19 outbreak. In addition to a generally enhanced approach to sanitation in both the shop and to customers’ vehicles, many of you described extraordinary efforts being taken to avoid spreading the virus. One shop owner has essentially eliminated human contact, requiring his customers to pay either by phone or drop box, while another now wears gloves and a surgical mask when taking cars out on test drives. Unfortunately, several of the shop owners we heard from had already made the decision to temporarily shut their businesses down, for as long as six weeks.

Among shops that have made changes, those changes were communicated to their customers in a variety of ways—37% using social media, 34% signage, 25% e-mail and 20% on their website. Others have used text messaging, mailed letters and even called each one of their customers.

Even in the relatively early days of the crisis, nearly half (48%) of shops reported a drop in business, with another 31% saying it’s too early to tell. For shops in university towns, the effect on business had been immediate, as campuses across the country began shutting down.

For the most part, shops hadn’t encountered parts shortages but, especially considering the impact on global manufacturing, that’s likely to change. A few shops who specialize in the Alfa Romeo and Fiat brands told us it had been impossible to get parts from Italy, and one shop owner said he couldn’t get Ford parts from his local dealer, who had closed for at least two weeks.

There’s no question the COVID-19 outbreak is going to hit the wallets of many consumers and in some cases affect their ability to pay for necessities, including vehicle repairs. With that in mind, we asked readers if they have considered, or might consider, offering special payment options for customers whose financial situation has been affected; 35% answered affirmatively.

At the time our survey was taken, only 15% of shops had been affected by some local or state mandate, but most expected that to change.

We concluded our survey asking readers what words of advice, based on their own experience, they would offer fellow shop owners to help them deal with the turmoil caused by the COVID-19 outbreak. Many offered practical suggestions about sanitary practices, the importance of empathizing with customers’ concerns and offering service specials to help ride out the tough times. The overwhelming message, however, was one of optimism and a sense of assurance that the challenges being faced will eventually come to an end.

While no one knows what the outcome and lasting effects of this crisis will be, always remember that you are a vital part of an industry that is critical to every community in this great country we call home.

As new warnings and recommendations were announced, we asked readers about the COVID-19 virus outbreak—the initial impact to their business and what advice they’d offer fellow shop owners.
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Mechanical problems on technically sophisticated engines can get very expensive. How repairs are made and who pays for them are topics for which vehicle owners may be unprepared.

Just a Link of Chain

I am working on a 2013 BMW X3 with the N20 engine. The customer bought the vehicle from a Honda dealer in 2015, when it had about 32,000 miles on it. A couple of years later, when it had just over 75,000 miles on it, the timing chain failed. The customer had an extended warranty (included in her original $34,000 purchase price), so a BMW dealer installed a used engine on behalf of the warranty company. The used engine’s timing chain was not replaced before the engine was installed in the X3. Mileage on the used engine at the time of its installation is not known.

Fast-forward to today. The used engine’s timing chain began making noise several months ago. The X3 now has about 110,000 miles on it. The customer returned to the dealer, where the service department informed her that the timing chain had stretched and that the timing chain guides were possibly damaged. The extended warranty had expired, so she would be responsible for the cost of any repairs, which would be substantial. As an alternative, the dealer offered to purchase the vehicle from the customer in its unrepaired condition for $2000. The owner declined the repair estimate, as well as the dealer’s purchase offer.

After the vehicle sat in the dealer’s lot for several months, the customer had it towed to our shop for a second opinion. We were able to confirm the BMW dealer’s timing chain diagnosis fairly quickly. Although we could make the needed repairs for less than the price quoted by the BMW dealer, it would still be an expensive proposition. To make matters worse (if that’s possible), the customer now owed more on her original bank loan than the vehicle would fetch on the open market. Consequently, it sat in our lot for a couple more months while the customer tried to decide how to proceed. Ultimately, she opted to sell the vehicle to us, for a few hundred dollars more than the dealer’s low-ball offer.

We intend to replace the timing chain and oil pump chain assemblies and resell the vehicle. What do you know about timing chain problems on these engines, and any other problems related to them? The X3’s engine was still running when it was delivered to us, but it seems to be substantially down on power. I’ve heard that a damaged timing chain may be detected by the vehicle’s engine control unit (DME). Because the timing chain has stretched, the DME recognizes the resulting change in valve timing. Consequently, it may have shifted into a limp-home mode, in a self-preservation attempt. Is this correct?

Michael Jefferson
Buffalo, NY

Where to begin, Michael! BMWs of your customer’s vintage, specifically those with the N20 engine, have experienced timing chain problems. BMW issued a service bulletin, SI B11 03 17, addressing at least part of this problem. BMW was described as “N20 and N26 Engine: High Pitched Whining Noise From Lower Engine Area.”

Three years ago when the bulletin was issued, BMW attributed the noise (whining noise from the lower engine area near the engine oil pump that increases in frequency when increasing the engine rpm) to wear on the engine oil pump sprockets. Technicians were instructed to compare the noise they were hearing from the engine to a sound file on the BMW service website, to confirm they were the same frequency. The required service “correction” involved replacement of the engine oil pump drive chain module, timing chain, timing chain tensioner, slide rail, tensioning rail and guide rail.

The BMW X3 is equipped with a four-cylinder turbocharged engine in the N20 family. This engine has both variable valve timing (VAriable NOckenwellenSteuerung for German speakers) and variable valve lift (Valvetronic). Operation of these systems may be compromised by problems with the conventional timing chain.
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DrivePRO ES
Trouble Shooter

BMW also announced an extended warranty on the N20 at around the same time. It applied to the X3, as well as several other BMWs that were equipped with variants of this engine. For these, including X3 models that were produced between 3/2012 and 2/2015, a 7-yr./70,000-mi. warranty was offered.

BMW operates a website where an owner can quickly determine whether or not he owns a vehicle that’s covered by any ongoing BMW Owner Reimbursement Program. It can be found at http://bmw-reimbursement.bmwPortal.nsf. Owners would also receive notice by mail of any program under which a vehicle falls. Several class action lawsuits involving this engine and its associated problems have also been initiated.

Back to the problem at hand. The four-cylinder N20 engine has several sophisticated features, including a turbocharger, variable valve timing (VANOS in BMW-speak) and variable valve opening (Valvetronic). Operation of these systems is overseen by the engine management system control unit (DME), which monitors various inputs, then makes decisions that affect the operation of the three main systems listed above.

You’re probably already familiar with variable valve timing, as this is a system that’s been employed by several manufacturers, going back quite a few years. The way these systems operate may differ from one manufacturer to the next, but the perceived benefits are the same. Valvetronic takes valve control a step further, by adding control of valve lift. The amount of valve lift can be adjusted continuously, according to engine speed, load and driver inputs.

Because valve opening can be adjusted between nearly fully closed and fully open, BMW engines equipped with Valvetronic do not require a throttle plate to control engine speed. A throttle plate is present, but it’s there as a fail-safe device. Under normal operating conditions, the throttle plate remains fully open at all times. This reduces pumping losses that occur in engines with conventional throttle control, allowing for an increase in engine efficiency and a reduction in fuel consumption.

A single-row timing chain connects the crankshaft and two overhead camshafts. A plastic chain guide assembly on the right side of the engine forces the chain to travel in a slight arc as it passes over the guide. Timing gear wear, chain stretch, chain guide breakage and engine damage have been observed on these engines. Before valves start hitting pistons, timing chain stretch, timing gear wear or timing chain guide wear all can affect camshaft timing. The timing chain tensioner is there to compensate for wear, but only so much.

At some point, a change in cam-to-crank or cam-to-cam timing will be noticed by the DME. The DME makes adjustment to valve timing and lift (VANOS and Valvetronic) in an attempt to compensate for these timing changes, but its tools are limited to some extent. If the DME determines there is a serious problem, it may switch to the limp-home mode you describe. Since it has direct control over valve timing and lift, placing a limit on engine performance is not difficult for it to achieve. You may stomp on the gas pedal as hard as you want, but since it’s not directly connected to a throttle plate, you’re not going to get the increase in engine speed you’re requesting.

Since the DME has adapted to the engine operating with a stretched timing chain and a damaged guide assembly, you’ll need to give it a heads-up after the damaged timing components have been replaced. This involves clearing any stored adaptations from the DME’s programming so it can begin adapting to the new timing components and the restored cam-to-crank timing. Sources tell me that it may also be necessary to perform a complete DME reprogramming to restore the engine’s original performance capabilities. To do so, you’ll need dedicated reprogramming equipment and software to get the job done. Once completed, your shop’s X3 will be ready for a new owner.
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Everyone likes making money but most spend less time thinking of ways to save money. Reducing costs will allow your shop to improve its profits, during good times or bad.

Headlines like the one I saw in the Wall Street Journal proclaiming “Kraft Heinz Beats Profit Expectation as Sales Slide” always intrigue me. The story explains that the company’s “beleaguered products fell more than anticipated in the third quarter, but the food maker beat profit expectations after a year of weak results and strategic turmoil.”

How can you make a profit when you have lower sales? The reality is in the math. If you can lower your costs, even slow sales will still allow you to make a profit. This is an economic fact of life huge corporations like Kraft Heinz, GM, Apple and others exploit.

The sneaky thing about costs is they have a way of creeping up on you, and an automotive repair shop is not immune to this phenomenon. Here are a few examples of shop costs that if lowered can increase profits even if sales are down.

**Rent** is probably the major cost in your business. It would be a good idea to check around and see if you can rent a similar or even larger shop in the area at a lower cost. If you own the building, check on the possibilities of securing a lower rate mortgage. Also, there are lots of companies claiming you can save money by refinancing. It’s easy enough to find out how much. Just Google “refinancing” and punch in your number. The result might save you a lot of money. You might also consider refinancing any business loans you have.

**Jobbers** are an important part of any auto repair business. Chances are if they’re giving you good service and good prices, you’ll be content with doing business as usual. However, it’s a good idea to contact other jobbers in your area to see what they can do to win over your business. If a jobber is willing to give you the same good service but at a better price, consider switching over. You won’t get a better price unless you ask for it. Don’t hesitate to let your current supplier know you can get a better price elsewhere, then give them the opportunity to match it.

Ask your jobber salesman to go over the prices his firm is charging and see if they can do better. Big-ticket items like batteries have some room for a price adjustment. Very often distributors or manufacturers will give the jobber a much better price for a volume order. For example, consider how much oil or antifreeze you use in a year and suggest a bulk order that will save you money. You might look into buying your oil in drums and asking the supplier to loan you the dispensing equipment as part of the deal.

**Penetrating oil** can put a hole in your cost-of-sales budget. One of my pet peeves is the way some techs waste it. They don’t just spray some on the rusted bolt or joint, they literally paint the whole part with the oil. Keep a close eye on how much penetrating oil each of your techs use. You might be surprised how often they use up a whole can when a few shots would work just as well. The same can be true of the bags of absorbing material you use for an oil spill. Certainly, keeping spilled oil from becoming a slip & fall hazard is important, but often simply a wipe.
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Trade Secrets

with a rag will do the trick and you won’t have to sweep it up.

Shop tools are important to the efficient operation of any shop. Equipment like battery chargers and other large, portable items are relatively easy to keep track of. But small tools like torque wrenches, scan tools and other tempting items that can easily disappear need to be accounted for on a daily basis. Keep close track of those smaller pieces of equipment that you might not think of checking. I wish I had a dollar for every one of my own open-end wrenches or ratchets that “accidentally” got into someone’s toolbox.

One way to keep your small tools from wandering off is to dab on a bright color paint and apply some unique marking. In this way, one glance and you know it’s a shop tool that was not put back after it was used. Make an inventory of those shop tools. An easy way is to snap a photo of the tool drawer with all the tools in it. Then you can more easily spot that one is missing.

Paper towels are cheap enough, but when you have techs washing their hands frequently, the yearly cost can be a shocker. If you’re buying paper towels from the local grocery, try to buy in bulk. And when you do have a nice inventory of paper towels, keep them under lock and key, not in the washroom. Otherwise, it may be tempting for others to take a few rolls home for the car, the house, etc. Also, consider installing a hot-air hand dryer in the restroom.

Trash disposal can be costly. Depending on where your shop is located, there may be multiple trash service companies from which to choose. Get prices from several companies and find out what services they provide. Ask if a larger container picked up less often would save you money. If there’s a dump in your area, it might be worthwhile to dump your own trash. Shop for the best price.

Technician time is valuable, and it does not make sense to have a skilled technician doing tire repairs or other lower skilled jobs. Analyze which jobs you have your higher paid technicians performing. It may be worthwhile to hire a helper for the mundane jobs, to make your top technicians more productive.

Towing can be an important source of work for your shop. But are you making money doing your own towing or would it be more profitable to use a towing company? It depends on the volume. If you have enough tow calls to keep a driver busy, then by all means run your own truck. But if you have only occasional tow calls and sometimes must use a skilled tech to drive the truck, that takes him or her away from lucrative work that requires their skill. In such a case, it might pay to use a towing service.

Heating a shop gets expensive, but you can save money with a waste oil heater, provided such systems are approved for your location by the local fire authorities. Modern units are efficient and well worth their cost. But you’ll need to have access to enough waste oil to make the investment pay by keeping it in operation.

The Trade Secret is to know that wasted pennies can add up to wasted dollars over the course of a year. Analyze your day-to-day operations to see where expenses can be minimized, helping your bottom line. Consider how much work you must do to earn $100; that might give you the impetus to want to negotiate for better prices and to cut your daily operating costs.

I welcome your comments on this or any automotive topic. E-mail me at bcerullo@motor.com.
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Nissan’s intelligent power distribution module (IPDM) offers a self-test sequence for the various loads it controls. This helpful function can simplify electrical diagnosis.

A self-test controlled by a smart fuse panel may speed diagnosis of common electrical components on Nissan and Infiniti vehicles. Here’s how it works and what it covers. For convention’s sake, I’ll refer to both makes as “Nissan.”

A typical Nissan that rolls into your bay has an underhood fuse/relay center called the intelligent power distribution module (IPDM). A schematic may label this an IPDM E/R. But the suffix E/R simply stands for engine room, meaning the engine compartment. Note that an IPDM usually is black; the one I photographed here happened to be white. Also, an IPDM houses a mini computer, the central processing unit (CPU). The vehicle’s body control module (BCM) communicates with this CPU via a CAN bus.

Some electrical basics that I recently reviewed apply to this topic. For example, an electrical load is a device that does work. Loads include components such as lamps, motors, solenoids, etc. I also said that the switch controlling a load may be on the supply (hot) side or the return (ground) side of a circuit.

When the switch controls the ground side, it’s often called an A-circuit.

The BCM can command the CPU inside an IPDM to perform an extensive self-test sequence. When given this command, the CPU acts like a solid-state switch in an A-circuit: It turns on various loads by grounding each individual load—one at a time, sequentially. For example, suppose this CPU grounds the headlamps and both of them operate normally. In that case, the bulbs and related wiring are okay. If the customer’s complaint concerns headlamp operation, then the cause must be rooted somewhere other than the basic bulb circuits. That’s a time-saver if I ever saw one.

The coolest part of this diagnostic procedure is that you don’t need any scan tool—let alone an OEM one—to initiate the self-test sequence. Instead, you issue the command with a combination of ignition switch and door switch maneuvers. I’ll describe the actual procedure in detail next month.

**IPDM Repair Issues**

Let’s examine potential IPDM service issues before continuing with our main topic. First and foremost, Nissan banned replacement of any IPDM relay, period. However, replacing any of the traditional, blade-type fuses inside the IPDM is okay. *Typically*, these relays are removable. But reportedly, the entire setup just wasn’t designed for it. If someone does R&R a relay, it may create slop between the relay’s male terminals and the IPDM’s female terminals. In turn, this may cause intermittent electrical problems on the circuit or system that particular relay controls.

Suppose a technician plays hero by changing one relay instead of replacing an entire IPDM, but later on, old electrical symptoms return or new ones crop up. Who do you think the angry customer will blame?

Second, the relay replacement ban has confused some technicians because Nissan made
an exception to its own rule. Nearly 10 years ago, it issued a service bulletin about oxidized ECM relay contacts in 2004-06 Armadas and Titans as well as 2005-06 Frontier, Pathfinder and Xterra models. According to Nissan, the problem appeared only on white IPDMs within these vehicles. The bulletin cited "engine performance issues, including the possibility of stalling at low engine speeds." Consequently, Nissan released a replacement ECM relay, Part No. 284B7-CW29E and relay removal tool number J-50389. The tool was designed to help techs remove the original ECM relay without damaging the female IPDM terminals. Finally, this bulletin stressed that overall, Nissan discouraged IPDM relay removal.

Some of my sources are Nissan/Infiniti specialists with 25 or more years of repair experience with these vehicles. One of them summed up this white IPDM repair as a confusing but "one-off" occurrence.

Third, these same sources have encountered ECM relay failures on Nissans. Forewarned is forearmed: When a failure occurs, the vehicle may stall but eventually restart. Or it may die and have to be towed to the shop.

Fourth, not surprisingly, Nissan forbids moving relays from one location to another within an IPDM. However, some techs said experience has taught them about swapping relays during those harried, down-and-dirty diagnoses. For example, suppose the vehicle won’t start and it happens to have fog lamps. Some specialists told me they may temporarily swap the fog lamp relay for the ECM relay. If the vehicle restarts, it confirms that the ECM relay was the culprit.

One of my pals suggested that I prepare for this topic by removing relays from some scrapped-out IPDMs. I tried yanking relays with things you’d usually find in a toolbox—a slim standard screwdriver, a pocket screwdriver and a long seal pick. It took some practice even though the IPDM was on a workbench instead of buried inside an engine compartment.

Personally, on the bench I had to "rassle" a bit in order to disengage the tab that locks the relay into the IPDM assembly.

You cannot activate Nissan’s self-test unless the driver’s door switch is working. If you open the driver’s door and the dome light operates, then the door switch is functional and you can proceed with your test.

Let’s wrap up with a few reminders. The IPDM self-test I described earlier can check the following electrical loads: headlights, parking lights, taillights, license plate lights, front fog lights (if so equipped), oil pressure warning light, front windshield wipers, a/c compressor clutch and cooling fans. That’s a bunch of stuff.

Nissan first used this self-test procedure around 2004. The vehicle must have an IPDM as well as the correct ignition switch. Visually inspect the engine bay for an IPDM and/or refer to a wiring schematic. If the vehicle has an IPDM, then look for one of two ignition switches. A conventional, key-operated ignition switch is okay. A pushbutton START/STOP switch is fine, too, as long as it has the accessory (ACC) and on (ON) positions on it.

Finally, open the driver’s door and see if the dome light works. If it does, then you’re ready to use this slick self-test. We’ll walk through it in my May column. Meantime, keep smiling and I’ll look for you here next time.
Oil degradation can cause driveability problems and engine damage. You may need to (re)educate your customers on the need for quality lubricants and service intervals keyed to conditions.

With the advent of gasoline direct injection (GDI), thin-film, long-life lubricants and ethanol-blended fuels, engineers have produced incredible leaps in the lubricant and fuel technologies used in today’s vehicles. But just one mistake in adding the wrong grade of engine oil or lubricant can damage an engine, transmission, transfer case or differential very quickly.

I think we can agree that after years of dealing with sludgy engines, bad fuel and other fluid-related issues, there are many factors beyond the oil change interval that can cause an oil to begin to sludge and fail. But looking at how these oil degradation issues start will give us a better understanding of what to look for when we’re actually working in the bays.

All fuels and lubricants are blended organic chemistry, the components of which, including the base stocks and additives—even for full polyalphaolefin (PAO) synthetic lubes—trace most or all of their constituent components to a barrel of natural crude oil.

The need for oil change intervals is derived from engineers’ calculations of how quickly a lubricant breaks down chemically. There are several factors, but the main one discussed here is the oxidation rate of the fluid. All organic chemistry will degrade or oxidize for different reasons and at different rates, depending on environmental conditions and driving habits. Customer drive cycles, not just time and mileage, should dictate oil change intervals in today’s GDI vehicles.

Oxidation occurs when four main organic properties interact—oxygen, sulfur, heat and moisture. It’s the oxidation process that breaks down the oil molecules via the buildup of acids, radicals, peroxides and other destructive chemical reactions. As this occurs, the increased wear on the oil molecules causes friction and the release of wear metals into the oil, accelerating engine failure. The wear metals are what testing labs analyze and record during oil analysis.

Years ago, using Group I and Group II oil base stocks, oil change intervals were only 2500 to 3000 miles. Now, with Group III, IV and V highly refined base stocks and advancements in additive chemistry, these oils can perform far longer, allowing the 5000- to 15,000-mi. intervals recommended by most OEMs today.

The rate at which lubricants degrade is wholly dependent on the chemical makeup of the product itself and the environment in which it runs. This either delays or accelerates oxidation. Some factors are the quality of antioxidant additives present in the oil, the moisture and heat content within the powertrain component itself, the driving cycle of...
the vehicle and, of course, the sulfur content of the fluid and other factors.

When oxygen, sulfur, heat and moisture are combined, sulfuric acid buildup starts. The acid will etch, or chew up, the molecule’s edges, which are designed to help provide the film strength and elastohydrodynamic (ESD) characteristics of the oil.

As this occurs, the oil molecules are more apt to clump together and stick, rather than roll off each other in the journals under pressure as designed. In addition, degraded base oil chemistry and additive dropout from this process will collect and coagulate, creating sludge.

When oil starts to break down, piston rings develop a carbon buildup in the ring lands. This is due to the broken-down oil cooking in the lands and carbon building up over time. Eventually, the rings can no longer freely move in their grooves; they stick to the piston. If the rings are sticking, they cannot seal against the cylinder walls, compression drops and blow-by gases increase.

In a turbo GDI engine, this problem has three nasty effects:

• As compression drops, the horsepower-directed fuel charge cannot combust properly due to insufficient compression, which is necessary to start the flame front as designed. This is a misfire.

• Crankcase pressure builds, causing high hydrocarbon content (gaso line) in the crankcase, which affects the fuel mixture. This contamination also adds a fuel vapor to the oil deposit on the intake valve, creating the unique carbon signature that’s so hard to remove by chemical means. This has required techs to perform a lot of walnut shell blasting, chemical treatment and physical cleaning to restore proper driveability.

• Oil blow-by also creates an imbalance in the designed intake vs. crankcase vs. exhaust pressure differentials, which can cause the GDI turbo to consume oil when it otherwise would not.

Furthermore, this vicious cycle of oil failure will wreak havoc with the variable valve timing (VVT)—specifically the cam phasers and oil control solenoids.

Another major problem occurring in turbo GDI engines with oil degradation is the destruction of timing chain guides made of plastics. The combination of oil issues and the sheer violence visited on the chains and guides with start-stop systems has contributed to early destruction of the chain guides, causing jumped chains and giving us lots of fun timing correlation codes to solve, such as P0011-P0021 series codes.

When sludging occurs, the VVT cam phasers will act as a centrifuge. As sludge enters the feed hole of the phaser, it’s slung to the outside of the phaser, where the high-rpm force will separate solids (sludge) from the
liquid carrier (the base oil). As this occurs, the phaser will continuously “pack” that deposit in until its internal parts cannot rotate or sweep via the fill or drain holes to the intended position.

We can use a lab scope to confirm this, and can often see the problem using the scanner’s live data. The neat thing about using a scope is that the exact amount of phaser movement can be measured right down to the degree. So this is our preferred method of diagnosing these components.

When mechanically blocked like this, one phaser will not travel as far as the other. The PCM will detect this, stop (default) VVT operation and set a DTC. You can diagnose this lack of movement using the same cam/crank sensor test as shown in the screen captures on the previous page; just actuate the phaser and capture a scope shot, then repeat a capture without actuation and measure the difference on the movement of the cam signals. Or, use an in-cylinder pressure transducer to measure the cam timing while phased and unphased as above.

One very effective solution for correcting the loss of piston ring oil control is to clean the rings with an oil solution designed for this purpose. There are many very effective products out there; you’ll have to determine the effectiveness of the products you use.

To gauge how bad the buildup problem is and whether you’ve corrected the ring concern, perform before-cleaning and after-cleaning compression tests on the engine. There have been many modern, low-mileage vehicles with ring cocking so bad that the tech was able to restore 30-plus pounds of compression per cylinder after cleaning the piston rings. You’ll be surprised (even shocked) at the effectiveness of this correction.

The restoration of power, idle quality and fuel economy is nothing to sneeze at. For example, on my wife’s 2015 Caddy SRX with the 3.6L GDI engine (73,800 miles), we were able to pull a 28-psi improvement in compression across the engine, which woke the power right up and increased fuel economy by 3.5 mpg.

There’s so much information on this subject. Stay tuned for the June column, which will cover diagnostics of the fuel deposit side of the issue. Happy spring everyone!

The carbon buildup and stiction on the piston rings in the photo on the left was bad enough to break the piston ring. A clean piston and ring set is shown on the right.
A/C REFRIGERANTS: STILL NOT AS EASY AS 1-2-3-4(yf)

By Paul Weissler

It seemed like the industry had coalesced around R-1234yf as the automotive refrigerant standard. But changes in vehicle design and market demands have thrown things back into doubt.
It had been looking like a smooth transition from R-134a to R-1234yf, a low-global-warming refrigerant that while not a drop-in replacement, was not radically different, either. Sure, a shop will need a new recover/recycle/recharge machine and a refrigerant identifier to service the new refrigerant, and R-1234yf is much more expensive. But from a shop operations standpoint, the industry seemed to have sidestepped a lot of complexity in the changeover. Not so fast! Almost behind the scenes, things are happening to change that picture.
An SAE International Cooperative Research Group (CRP), composed of virtually all major carmakers, refrigerant producers and component suppliers, has been formed to find a new refrigerant. What’s the need, considering the expense and effort to convert to R-1234yf?

Answer: With vehicle electrification underway worldwide, the industry has noted the gradual incorporation of heat pumps for cabin heating. At this time, those battery electric vehicles (BEVs) with heat pumps still are installing either R-134a or R-1234yf, both of which are marginal performers at temperatures below 32°F (0°C) in heat pump mode. The reason is that mass flow of these refrigerants drops as ambient temperature falls into this range. R-744 (CO₂ used as a refrigerant) is an exception, performing well in heat pump mode but poorly in a/c mode. It was set aside, except for very limited production trials in areas with moderate summer temperatures.

So the typical plug-in hybrid and BEV has been forced to use conventional electric heaters (resistance or PTC) at sub-32°F ambients, which reduces BEV range by about 40%. There’s one exception—the Prius Prime—which incorporates a liquid/gas separator to enable heat pump performance down to about 14°F. This feature, adapted from commercial a/c, is part of a system that adds significant cost and complexity. An accumulator that is the heart of the separator requires surface heating to recover refrigerant during service.

The CRP will consider refrigerants even more flammable than R-1234yf because secondary-loop systems will be in the picture. A secondary-loop places the entire refrigeration system under the hood, perhaps hermetically sealed, with an antifreeze/water solution chilled in a heat exchanger and transferred through hoses to a front and possibly also a rear in-cabin

**Diagram:**

A refrigerant more flammable than the mildly flammable R-1234yf could be used in a secondary loop system because the refrigerant circuit is under the hood and there are antifreeze/water coolant loops connected to the passenger compartment heat exchangers.
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heat exchanger for passenger cooling. Secondary-loop refrigeration systems in current development use R-152a, an efficient, low-cost refrigerant commonly used as a computer dust-off spray. It’s less flammable than propane but more flammable than R-1234yf.

With vehicle electrification on a fast track, the CRP hopes to have a new refrigerant identified for system implementation by 2025.

R-134a Retrofit?

Although the industry approved retrofit procedures for R-12 systems when R-134a was introduced back in 1991, it had been made clear since then that further retrofit was not in the cards. Although R-1234yf is close to a drop-in replacement, it’s mildly flammable and among other system changes, a heavy-duty evaporator, subject to salt spray corrosion testing, was specified. The R-134a systems have no such evaporator.

However, in Europe, limits on importing R-134a in several countries have created shortages of the refrigerant, not only for automotive use, but for commercial chilling applications. For the latter, a retrofit refrigerant was developed—R-513a. It’s a blend of 56% R-1234yf and 44% R-134a, which means it can significantly extend the R-134a supply. The mixture is an azeotrope, which means it stays in solution (doesn’t separate) in the pressure/temperature ranges in which it performs in the vehicle.

And just as important, unlike pure R-1234yf, it’s not even mildly flammable. Because of its R-1234yf content, it’s more expensive than R-134a, and currently is running about $25/lb. in the U.S., vs. about $6/lb. for R-134a and $60 to $70/lb. for R-1234yf. But the R-1234yf content also is far lower in global warming potential (GWP) than pure R-134a, so the R-513a blend has less than half the GWP of R-134a (about 573 compared to 1430).

In the U.S., which has no supply issues with R-134a, the R-513a blend still might appeal to states where regulators have environmental concerns. But to date, no movement to mandating this has developed. In Europe, where there’s no legal restriction on its use, some equipment manufacturers have released machines to accept R-513a, and the blend is being used to retrofit some vehicles there. Hundreds of millions of cars and trucks on the road have R-134a systems from which the refrigerant eventually will be lost, so a 60% reduction in the GWP of all those vehicles by retrofit to R-513a can’t be ignored. R-134a machines (meeting SAE J2788) could be converted for the purpose.

For the U.S., the bottom line on all this is EPA approval, and the legal mandates for comment periods and
other requirements can take a long time. Perhaps some good examples of this problem are with SAE J2843 (recover/recycle/recharge equipment for R-1234yf systems), J3030 (R/R/R equipment for both R-1234yf and R134a systems) and J2851 (recover-only equipment for contaminated R-134a or R-1234yf from automotive a/c systems). They date back as long as seven years.

You probably thought that J2843 is “official,” and as far as SAE International is concerned, it is. But even though EPA has made it clear that it, J3030 and J2851 are the accepted documents, we’re still waiting for them to actually reference them by inclusion in the Federal Register. EPA is hoping to take care of all three documents with a single rule this year. We’ll see. At this time, only J2788, the standard for R-134a machines, is referenced in EPA regulations.

You might also think that because R-513a is composed of two refrigerants that already are approved (R-134a and R-1234yf), it would automatically be acceptable. No such luck. The process of approving a refrigerant under the EPA’s Significant New Alternatives Policy (SNAP) might be streamlined in this instance, but it still has to actually occur. And because R-134a is in good supply in the U.S. with no import or production limits, the feder-
A/C Refrigerants: Still Not as Easy as 1-2-3-4(yf)

The Prius Prime plug-in hybrid uses a heat pump with a liquid/gas refrigerant separator to enable it to perform in ambient temperatures down to 14°F, compared with 32°F with a conventional heat pump circuit. This is why other refrigerant options are under consideration.

Although late-model compressors have separators to hold most of the system oil in the compressor, enough circulates with the refrigerant to identify leaks elsewhere in the system. But after injecting the dye (as is being done here) and allowing enough time for it to circulate, use a lamp and goggles tuned by the dye supplier to improve leak detection.

The government would not be under any pressure to approve R-513a. If you think the feds move slowly when they’re under pressure, consider how slowly they’d move without it.

A/C Refrigerant Leakage
Late-model automotive a/c systems have better sealing capabilities than ever before, thanks in large part to EPA credits for fittings and components that are durably low-leakage. So you might think leakage is no longer a significant service issue. Again, not so. Refrigerant leakage remains a primary service problem, for several reasons.

First, refrigerant charges have been dropping for several years. A rule of thumb is that the system typically has about 10% in reserve charge. In the early days of R-134a (1993-on), many vehicles’ systems held over 3 lbs. of refrigerant and it took a loss of over a half-pound to result in a motorist complaining about poor cooling. Today’s systems hold as little as 1 lb., and in a few cases just 11 to 12 oz. So although there’s a lot less leakage on new systems, the reduced charges mean a lot less is tolerable before performance is affected noticeably, which translates to as little as perhaps 3 to 5 oz. in hot weather, depending on the system and the individual motorist.

A second reason that refrigerant leakage is still a problem is the use of poor techniques and/or tools. You might not have to do much to find a leak on many vehicles, because a number of carmakers have been installing trace dye on the assembly line. They don’t always inject it the way you would, but instead may put a dye wafer in the receiver-dryer. Shortly after the system is operated, the wafer dissolves and dye mixes with refrigerant oil, which circulates through the refrigerant circuit. You’ll need fluorescing goggles and a blue or black light infrared lamp to actu-
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A/C Refrigerants: Still Not as Easy as 1-2-3-4(yf)

**REFRIGERANT LEAK DETECTION CAPABILITIES**

![Graph showing leak detection capabilities](chart)

**Identifiable Leak Rate:** 1 Bubble/Second

**SAE Lowest Sensitivity Leak Identification:** 14g (.5 oz.)/yr.

**SAE Highest Sensitivity Leak Identification:** 4g (.15 oz.)/yr.

Electronic leak detection still is the primary method of finding system leaks. As this chart shows, detectors that meet SAE J2791 (tested on R-134a systems) and J2913 (tested on R-1234yf systems) alarm on leaks far smaller than is possible with a soap solution or water.

Truly see the dye traces. Even if all the refrigerant has leaked out, it likely will leave visual traces at leak points somewhere in the refrigerant system. Trace dye has demonstrated effectiveness in exposing leaks, so we know it works even if we can’t determine leak size or otherwise quantify the results. With aftermarket trace dyes, all we can tell you is to use a brand-name product and get your goggles and lamp (black light or blue light) from the same supplier. Each dye supplier “tunes” its lamp and goggles to the level of fluorescence of its own trace dye formula.

Late-model compressors contain oil separators, so they retain most of the system oil. This reduces pumping losses, which helps improve fuel economy. Trace dye mixes with the oil, and it’s the oil that escapes from the system to identify a leak location. However, even with separators, enough oil remains in circulation with the refrigerant to enable the dye to remain an effective way to find a refrigerant leak.

Even if no oil leaks out, loss of refrigerant will allow dirt to adhere to the defective joint. So if you see dirt at a joint, crimp or other location, check it with an electronic detector that meets the current SAE standard—J2791 for R-134a systems and J2913 (often the same unit but retested to ensure similar performance) for R-1234yf systems.

**Electronic Leak Detectors**

We know that many shops developed a bad taste for electronic leak detection years ago, when some false-triggered repeatedly. But today’s testers, particularly the infrared designs that meet SAE J2791 or J2913, are far superior and include lists of shop chemicals against which they may false-trigger. Their highest sensitivity is 4g/yr., which may seem unreasonably small, but a few leaks of that size would be about a .5 oz./yr. In addition, all compressor shaft seals leak some refrigerant, certainly when the a/c is in operation. The manufacturing spec at one time was 11g/yr., but even today’s multilip seals can be expected to leak 5 to 6g/yr. with the a/c in use. That should make it clear why even 4g/yr. leaks need to be fixed.

On SUVs with rear a/c, don’t forget to check the refrigerant lines that run underbody to the rear HVAC unit. They’re often subject to damage from abrasive road film, including pebbles. Ditto for the bottom ends of the tubing in the condenser. There’s not much you can do for a leaking condenser except replace it, but underbody refrigerant lines are repairable with compression fittings, such as the AirSept Smart Splice type.

A soap & water solution squirted against refrigerant joints was a popular leak detection technique, along with propane leak detectors, in the days of R-12, when refrigerant was under $1/lb. and all joints leaked some refrigerant. When the solution bubbled, the technician knew he found a significant leak at that joint.

Although the industry approved R-12 and R-134a retrofit procedures in 1991, it’s been made clear that further retrofit is not in the cards.

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Using plain water in a squirt can to find a leak would require a leakage rate of over 55 oz./yr. to show up.

**Gross Leak Test**

SAE J2843 certified that R-1234yf R/R/R machines require the system to pass an evaporator gross leak test before they’ll allow the system to fully recharge. (They initially allow a partial charge of 15% of system capacity so a technician can find the leak with an electronic detector.) First the system must pass a vacuum decay test. If it fails, the test procedure specifies inserting the detector probe as far as possible into the floor duct of the vehicle, a/c off and blower set to low speed, air distribution mode set to floor. If the detector alarms, this indicates a gross leak from the evaporator, not allow repeatedly injecting 15% of the specified charge a second time?

There are a number of answers: One, if system pressure is under 10 psi, the R/R/R machine will not require refrigerant identification. But a complete restart of the machine, including the taking of a precharge vacuum decay test, all of which is somewhat time-consuming, is necessary to be able to install another 15% leak detection charge. Two, manually close the service valves on the hose couplers and the system will seem to pass the vacuum decay test. The machine will then start the 15% partial charge. Next, open the couplers’ valves and refrigerant will flow into the vehicle’s a/c system.

An alternative is to use a forming gas leak detection system (detector certified to SAE J2970 with 95% nitrogen, 5% hydrogen forming gas). This is used in certain European countries that ban injection of refrigerant into a leaking system, even for leak detection. A certified system—the D740 kit—is available from www.techno-tools.com.

Lastly, you should understand that caps are the primary seals for service valves. They’re easy to misplace (or they may drop into an unknown location) during vehicle service, and it’s common for a vehicle to be sent out the door with a missing cap because the shop doesn’t have a replacement (nor might the local parts jobber, as we’ve experienced), particularly for R-1234yf systems. Which is why you’ll be glad you have a box holding all the popular sizes of caps and valve cores on the shelf, just in case.

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**While late-model automotive a/c systems seal better than those in earlier models, refrigerant leakage remains a primary service problem.**

which because of its passenger compartment location is the most critical issue with a flammable refrigerant.

Obviously, a technician won’t want to charge a system with a gross leak of the expensive R-1234yf, but then the problem arises: If the system is empty and the leak is elsewhere, how do you find it, since the machine will...
NEW LUBES FOR TODAY’S ENGINES

By Bob Chabot

The only time many vehicle owners think about engine oil is when there’s an unwanted oil spot on the garage floor. Late-model engines require sophisticated lubricants. Are you giving them what they need?
Modern vehicle engine oils and other lubricants, as well as filtration techniques, have changed dramatically in the past few years, and automakers are driving this transition. Today, they are very specific about which lubricants they recommend and warrant for use in their vehicles.

Technicians need to be made aware of these changes, so they use the correct lubricants every time when servicing customers’ vehicles. The vehicles’ performance, durability and warranty depend on it. So does the reputation of you and your shop.

Compared to older vehicles, today’s vehicles feature a lot more sophisticated technologies that allow them to generate more power while using less fuel. Modern vehicles also include other high-tech components that help them perform better.

For example, four-speed or five-speed transmissions used to be the standard, but modern vehicles feature transmissions with seven, eight or even more speeds. These additional transmission speeds are better able to mesh with engine power and allow drivetrains to run more efficiently.

Modern hybrid and electric vehicles often have engines that get help from small electric motors powered by battery packs. These electric motors can power vehicles at slow speeds, run accessories when the vehicle is stopped, save fuel and generate extra power when it’s needed, such as when circumstances warrant rapid acceleration.

On one hand, these electric motors can serve as a backup, allowing the vehicle engines to be smaller and less powerful, which saves fuel. On the other hand, automakers can choose to combine electric motors with larger, more powerful engines for increased performance that appeals to different vehicle owners. Automakers have found a market for both.
New Lubes for Today’s Engines

New turbocharged stratified injection (TSI) technology enables conventional vehicles to use smaller engines that deliver the same or greater horsepower and more torque than previous larger engines. TSI may combine a turbocharger and a supercharger to supply the power needed through all rpm ranges (turbocharger for high rpm, supercharger for low rpm).

A turbocharger, either alone or in combination with a supercharger, enables more efficient combustion. In addition, variable valve timing and cylinder deactivation technologies also increase efficiency by allowing the engine to use only the fuel it needs.

The transition to innovative direct injection and TSI engines has arguably been the biggest technical shift in modern conventional vehicles over the past decade. But meeting the power and efficiency needs of these modern engines has been a challenge for lubricant manufacturers.

Changed Marketing Strategies

New lubricants must be capable of meeting the power and efficiency needs of modern engines. For most of the past decade, lubricant manufacturers have worked to meet that challenge. Of note, after eight years of development, the International Lubricant Specification Advisory Committee (ILSAC) has announced it has finalized the development of the GF-6 standard, which the organization says meets those needs fully without compromises.

ILSAC GF-6 lubricants will be available beginning May 1, 2020, according to Jeff Thompson, Executive Market Manager for Lubricant Additives in North America for Infineum International Limited. But the long wait for a new common industry standard suitable for modern engines has led many automakers to develop their own specific lubricants to meet their engines’ performance needs and associated warranties.

ILSAC GF-6 has the potential to meet the needs of modern engines, but without being market-proved over a long term, there’s no guarantee it will meet automakers’ current, let alone future, engine needs. So expect wary automakers to be cautious in adopting GF-6.

Don’t be surprised if some automakers don’t embrace GF-6, given that their engine technology develops much more rapidly than an ILSAC standard. Because of this and given the high costs of warranty repairs, some automakers may continue requiring their own lubrication products for their vehicles.

“There are many talented automotive technicians and shop owners, but few fully understand modern engine oils,” Peter Orlando, Senior Curriculum Developer and Technical Instructor for CARQUEST Technical Institute, shared with MOTOR. “Today’s advanced engine technologies rely on proper oil formulations developed by original equipment manufacturers.”

When the topic of engine oil comes up in conversation, Orlando’s and CARQUEST’s experience ed-
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ucating technicians has shown that many shops and technicians have not put much thought into the subject. Some even mistakenly listen to others who spout incorrect information regarding modern lubricants.

For instance, Orlando said that many technicians don’t know that an SAE 0W-30 grade engine oil is not thinner than a 10W-30 oil at engine operating temperature. Rather, 0W-30 does not get as thick when it cools as a 10W-30 oil does.

“The confusion occurs because people tend to think of oil thinning when it gets hot, which can cause many problems with a shop’s oil service methods,” Orlando explained. “That’s because many technicians think this thinning with heat is the problem with motor oil.

“It would be better to think along the lines that oil thickens when it cools to room temperature,” he continued. “Multigrade oils, such as 0W-30 and 10W-30, have a thickness of 10 at 212°F, but the difference occurs in the morning at 45°F when one actually attempts to start a vehicle’s engine.”

**Not Your Daddy’s Oil Anymore**

Today’s oils are available in conventional, synthetic, full synthetic and high-mileage blends. OEMs are constantly changing their recommendations for motor oil, doing so with almost every new model. Their current recommended motor oils can vary greatly over a short time frame, which makes choosing which lubricants to use a critical decision for technicians and shops.

“These OEM changes can be meant to increase fuel economy, improve ways to control deposits and limit oxidation and corrosion over the oil change interval,” Orlando noted. “For today’s modern vehicles, using a full synthetic proprietary formula that is designed specifically for that OEM may be essential to meet performance and warranty concerns.

“Consequently, the engine oils we have come to know and the brands we have used have changed dramatically in recent years,” he said. “Oils you may have trusted for decades may not be able to effectively provide the proper protection required by today’s engines. That’s why it’s critical for technicians and shops to get and stay up to speed with new lubricants.”

Without getting and staying properly informed, Orlando stressed, the ability of technicians and their shops to provide safe oil and filter service for some customers’ vehicles is threatened. Using the proper lubricant for each specific vehicle application is more than a difference-maker in automobile service; it has become a necessity.

**Lube Makers Make a Comeback**

Some lubricant manufacturers have already caught up to the OEMs. If ILSAC GF-6 proves itself, choosing the correct motor oil for your customers won’t need to be confusing.

For instance, according to Patty Lanning, General Manager of North America Marketing for Shell Lubricants, Pennzoil is a manufacturer whose new family of four full synthetic motor oils, introduced last November, has simplified the decision-making process for modern vehicle lubricants.

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New Lubes for Today’s Engines

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To enable OEMs to specify oils with viscosity grades of SAE 0W-20 or less, ILSAC has proposed GF-6 standards as two separate subcategories—ILSAC GF-6A for SAE XW-20 and XW-30 grades and ILSAC GF-6B for lower viscosity performance levels that have the same requirements as ILSAC GF-6A, except for fuel economy.

Pennzoil has introduced these new full synthetic motor oil products. Each is engineered to meet the requirements of all engine types and motorists’ driving styles.

GF-6A and GF-6B motor oils differ only in the viscosity grades offered. ILSAC GF-6A will be available in viscosity grades 10W-30, 5W-30, 5W-20 and 0W-20, while ILSAC GF-6B will be available in SAE 0W-16. Your shop may need to stock or source a greater number of oil grades and types than you’re accustomed to, but it’s never been more important to assure that the correct oil for a specific application is installed.

This article can be found online at www.motormagazine.com.
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Annual MACS Convention Ends on a High Note

The Mobile Air Conditioning Society (MACS) Worldwide recently concluded its 40th anniversary Training Event and Trade Show in Nashville. Air conditioning specialists participated in training seminars and were briefed on important industry developments and more. Over 700 attendees, 37 speakers and 70 exhibitors, 14 industry award winners and a bit of NASCAR glamour added up to an exceptional attendee experience.

The three-day event was held at the Gaylord Opryland Resort. A full day of technical sessions included seminars for heavy-duty/off-road technicians, passenger vehicle technicians and counter-persons. NASCAR driver David Starr, who has over 20 years of racing experience under his belt, delivered his remarks during the keynote Luncheon, sponsored by MAHLE Service Solutions. The day ended with a welcome reception for MACS members, held at the Wildhorse Saloon in the heart of Nashville’s Lower Broadway music and entertainment district.

Friday morning began with a general session. EPA’s Chenise Farquharson, Sanden International’s Jose Miguel Diaz and Nissens’ Michael Ingvardsen provided industry insights, updated attendees on the latest regulations affecting a/c professionals, explained how electrification is placing higher demands on climate control systems and shared how some European countries are handling changes to a/c systems and refrigerants. An a/c industry-focused trade show, including 70 exhibitors, capped the second day.

The MACS event’s final day was also devoted to both heavy-duty and passenger vehicle training seminars. The MACS Lunch and Panel Discussion, moderated by MACS Technical Editor Steve Schaeber, gave members an opportunity to share ideas and discuss their concerns. Ward Atkinson, MACS Technical Advisor, also explained how MACS members can mentor the workforce of coming generations, via SAE International’s STEM programs.

MACS Worldwide empowers members to grow their businesses, delivers tangible member benefits through industry advocacy with government regulators and provides accurate, unbiased training information, training products, training curriculum and money-saving affinity member services. MACS has assisted more than 1.2 million technicians to comply with the 1990 Clean Air Act requirements for certification in refrigerant recovery and recycling to protect the environment.

To learn more about MACS Worldwide, visit www.macsww.org. The 41st anniversary MACS Training Event and Trade Show, A/Ccess, will take place Feb. 3-5, 2021, at the Rosen Centre in Orlando, FL. The most current calendar of all regional training offered can be found on the training page of the MACS website.—Karl Seyfert

AutoZone Unveils National Account Program for MWACA Members

In a new partnership between AutoZone and the Midwest Auto Care Alliance (MWACA), AutoZone will provide MWACA members with several discounts and programs specifically designed to help build and grow their businesses.

Participating MWACA members will receive National Account pricing from AutoZone on parts and accessories for light-, medium- and heavy-duty cars and trucks. Alliance members will get real-time pricing and, where available, priority delivery service, along with access to AutoZone’s loaner tool program and a Shop Referral program. AutoZone also will provide customized inventory management solutions and additional rebate programs to help MWACA members improve their overall efficiency and productivity, including access to www.autozonepro.com, AutoZone’s commercial website.

For more information about the program, contact Daniel Brickle at daniel.brickle@autozone.com (314-304-3745) or Mark Knowles at markknowles@autozone.com (660-815-2725).

ASE Issues New Mission Statement

The National Institute for Automotive Excellence (ASE) board of directors has established a new mission statement that explains the organization’s primary objective: “To serve the transportation industry as an independent third party that upholds and promotes high standards of service and repair through the assessment, certification and credentialing of current and future industry professionals.”

“As new vehicle technologies are introduced and continue to evolve, the need for knowledgeable, well-trained repair professionals is more critical than ever before,” said Tim Zilke, president and CEO of ASE. “ASE is committed to supporting the needs of the industry by providing third-party certification of skilled professionals who are committed to service and repair excellence.”

Most recently, ASE introduced new technology in the form of the ASE Renewal App, which tests technical knowledge through an app on a phone, tablet or computer (see the February NewsBreak column). The app is available for use by technicians who are already certified in the automobile series of tests (A1-A9).
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Ford Transmission Cooler Line Disconnect Set
This patent-pending, two-piece Transmission Oil Cooler Disconnect Set (Part No. 39220) is designed to take the hassle out of removing the oil lines from Ford transmission coolers. Made of durable aluminum, the set includes a ½-in. tool for F-250, F-350 and F-450 Super Duty pickup trucks and a ⅜-in. tool for 2003 and later V8 Explorers and 2004 and later F-150 pickups. Lisle

Adjustable Creeper
Unlike competitive units, this adjustable creeper (Part No. JCW67MAX4) features a flat/oval metal frame design that eliminates sharp corners, making it more comfortable for technicians, says the company. The unit comes standard with a solid plywood core; high-density, 80-lb. foam padding; a four-position headrest; and large, specially designed casters for reduced rolling resistance and increased mobility. A convenient hinge mechanism allows one-hand height adjustments. Snap-on Tools

Automatic Center Punch
This spring-driven Automatic Center Punch (Part No. 17329) delivers a deep, distinct punch mark to a variety of materials, including metals, plastics and woods, without the need for a hammer or other striking tool. It features a durable chromium-vanadium steel body, an ergonomic handle with thermoplastic rubber grip for greater comfort and an adjustment knob that can vary the punch force from 13.5 to 31.5 lbs. to accommodate various materials. Mayhew Tools

RAM Pickup Fuel Pump
Designed specifically for 2014-18 RAM 2500/3500 pickup trucks, this replacement VDO Fuel Module (Part No. FP22068S) is engineered and built using genuine original equipment parts, ensuring that it matches its OE counterpart in fit, form and function, says the supplier. With just one SKU, the unit covers more than 217,000 vehicles currently on the road. Continental Commercial Vehicles & Aftermarket

Complete Tool Set
This new 613-tool professional-grade Master Set contains everything technicians need to perform routine service work in the shop or on the road. Included in the set are ¼-, ⅜- and ½-in. drive standard and flexhead ratchets; ¼-, ⅜- and ½-in. drive SAE and metric sockets in both standard and mid-lengths; ¼-, ⅜- and ½-in. drive SAE/metric hex and SAE/metric hex ball end bit sockets; ratcheting SAE/metric wrenches; long, nonratcheting SAE/metric combination wrenches; Philips/slotted dual-material screwdrivers; and a seven-piece pliers set. GearWrench

Diesel Fuel Additive
LX4 Lubricity Extreme is a new diesel fuel additive that’s claimed to increase the lubricity of fuel by up to 56%. According to the supplier, the new additive can benefit all diesel fuels, especially those with ultra-low sulfur content which have a tendency to cause damage to injectors, cylinders and injection pumps on older engines. Just one ounce of the additive treats up to 10 gals. of fuel in the tank. Hot Shot’s Secret

Reman Honda Steering Rack
Engineered specifically for 2012-14 Honda CR-V crossover models, this remanufactured AAE Electric Power Steering Rack performs like a new unit at a fraction of the cost of an OE replacement, says the maker. To ensure factorylike performance, each reman unit is disassembled, cleaned, shot-peened and hardened, then fitted with new boots, clamps, bearings, O-rings and seals. Inner tie rods are then re-pressed or replaced as necessary. CRP Automotive

After assembly, each unit is electronically tested to confirm that no DTCs are present, then endurance-tested to ensure optimum reliability and performance. Each rack comes backed with a 2-yr./24,000-mi. warranty. CRP Automotive
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