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# BATTERY DOS AND DON'TS

**BATTERIES HAVE AN INCREASINGLY TOUGH JOB TO PERFORM. PROPER SERVICE AND INSPECTION IS THE KEY IN MAKING THEM LAST!**

**PETE MEIER** // Technical Editor

**T**he demand on the vehicle's battery is increasing as technology continues to move us toward an all-electric future. Start/stop systems place additional loads that add additional stress to the battery, and modern charging systems are designed to supply just enough to keep the battery alive. Add to that the fact that modern electronics are less tolerant of weakness in the battery than ever before and you can see that it is important for us, as professional technicians, to be able to properly service and test them.

But what are the common mistakes we are making when servicing and testing batteries? What are the proper methods we should be employing? To find out, I talked to several industry experts and asked their opinions.

## **AGM or flooded?**

According to Jim O'Hara of Clore Automotive, "The biggest issue we see when testing lead acid batteries...is being completely unable to identify the battery's construction or misidentifying the battery's construction. Digital testers rely on judgement maps for each of their testable batteries. Identifying an AGM battery as flooded or vice versa could yield inaccurate results." O'Hara adds, "If a battery is truly bad, it likely won't matter, but if a battery is marginal, it very much will. Also,

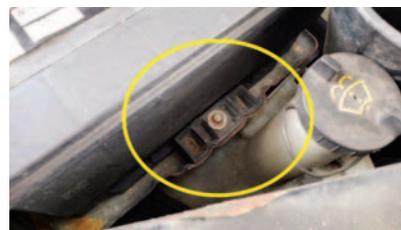
many technicians have trouble with the terms AGM and Gel, thinking that AGM batteries are Gel batteries. They are not. Finally, many technicians do not properly identify spiral batteries as AGM construction. Our testers have an AGM Spiral setting vs AGM Flat Plate setting to try to distinguish between the different types and make it clear to users that Spiral batteries are typically AGM construction."

My contacts at EnerSys, the makers of ODYSSEY batteries, echoed O'Hara's comments. "Identifying the type of battery the technician is dealing with is probably the biggest hurdle. Sometimes it is not clear what type of battery is in the vehicle, or what type of battery is supposed to be in the vehicle. Some vehicles come from the factory with an AGM battery and must be replaced with an AGM battery. Gone are the days of buying the cheapest battery available that happens to fit. Always pay careful attention to the recommendation of the manufacturer. This not only applies to battery type, but also CCA rating. Never put in a battery rated for less than what was original equipment."

Properly identifying the battery design is also critical when it comes to maintaining the battery, whether it's the responsibility of the vehicle's charging system or your shop's battery charger. Patrick McLaughlin, Exide Technologies Product Manager-Transportation, offers, "AGM batteries do not have maintenance



**BE CAREFUL WHEN TAKING YOUR OCV MEASUREMENTS.** If the reading is questionable, access the battery terminals/posts directly — especially on side post or remotely mounted batteries.



**MAKE SURE THAT THE BATTERY MOUNTING IS SECURE** to minimize the impact of vibration on the battery. If any form of deflector or heat shield was originally fitted, be sure to reinstall them as well.

requirements; however, the charging profile is different than a conventional flooded battery. AGM batteries are more sensitive to overcharge due to the internal gas recombination cycle. Some battery chargers will have Flooded and AGM settings, which essentially toggle the maximum charge voltage up or down to match each technology." It's easy, then, to understand that misidentifying an AGM battery as a conventional flooded design and trying to correct a low State of Charge (SOC) with your old, high pow-

ered, shop charger will actually cause more harm than good.

## Speaking of SOC

We all know that one of the very first measurements we need to take when assessing the condition of the battery is the Open Circuit Voltage (OCV). But is your OCV measurement accurate and what minimums are acceptable before proceeding with further tests?

Davis Knauer, Vice President Automotive Battery and Diversified Products Engineering for East Penn Manufacturing has this to say: “Accurate testing requires a minimum State of Charge level. A rested open-circuit voltage (that means it’s been over 24 hours since the battery has been exposed to charging) of 12.4 minimum is required for load testing.”

Where you test can also have an impact on your test results. If you just brought the car in and connected your meter or handheld battery tester to the battery’s cable ends, your test results may be suspect. This is especially true if you’re trying to test a remotely mounted battery using the jump points under the hood. According to the pros at Bosch, “[When a tester is hooked up to the battery cables, especially side terminals], corrosion on the underside of a terminal, unseen by techs, can prevent tester clamps from making good contact. Techs should always clean terminals and cables prior to testing or replacing a battery.”

“Another issue can be with remote-mounted batteries, often found in vehicle trunks to save space under the hood. If techs test the battery using the underhood booster terminals, this may lead to falsely diagnosing a battery as bad. Additional resistance caused by the length of the cable can often result in inaccurate battery diagnosis. If a remote-mounted battery is tested and fails, techs should locate the battery and directly test it to confirm if it’s an issue with the battery or if the issue is elsewhere.”

“Testing failures in a vehicle must be confirmed after the battery is removed from the vehicle. Readings made while connected in the vehicle can be affected by poor connections, active loads and effects from recent operation,” added Knauer.

## On to performance testing

I was first taught to use a carbon pile load tester to test the vehicle’s battery. Later in my career, I was introduced to the handheld conductance testers that are popular and required by many OEMs. Today, I personally prefer the use of a DSO (Digital Storage Oscilloscope) to test the battery. What do the experts have to say? Let’s start with this great overview Knauer shared:

**“Load Testing:** The gold standard for serviceability of engine starting batteries is a load test conducted according to the Battery Service Manual published by BCI (Battery Council International). A load of half the CCA rating is applied for

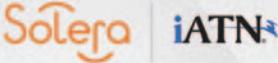
15 seconds. The voltage must not fall below a limit that depends on the core battery temperature at the start of the test. The battery must initially be at least 75 percent charged, which correlates to a well-rested, open-circuit voltage of 12.4 or higher.

**“Conductance Testing:** Conductance testers that correlate to BCI standard load test results are useful tools. They may provide a quick decision or they may say CHARGE AND RETEST. You may trade some accuracy for speed, but it is generally worth the time saved. The user must connect it properly, avoid putting in incorrect data to the tester, charge the battery properly before retesting when requested by the tester, and reconfirm failed results obtained in a vehicle after the vehicle connections are removed from the battery terminals and the



PHOTO: CLORE AUTOMOTIVE

**CONDUCTANCE TESTING** is one of two acceptable ways to performance test the battery. Just be sure to properly input the test parameters — battery rating, type, etc.



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terminals are cleaned. Proper connections to side or stud terminals REQUIRE that charging adapters be used properly.

**“Diagnostic Fast Chargers:** These can be effective, but their potential to streamline the warranty process too much and not do more extensive testing must be weighed against the possibility of increased warranty and added replacement costs. Following recommended safety procedures (shielding, etc.) is a must when using these testers.

**“Battery Sensor Equipped Vehicle:** A battery sensor equipped vehicle continuously monitoring the battery should be able to make a much more informed decision than any quick test by a technician, but some level of secondary confirmation may be required for warranty situations on a case-by-case basis.”

Exide’s McLaughlin agrees, adding, “We [also] recommend the methods as outlined in the BCI Service Manual. The first is the carbon pile test. At 15 seconds if the battery is (less than) 9.7 volts, it should either be replaced or recharged and re-tested. Batteries greater than 9.7 volts can be returned to service. The second is a conductance test with one of the various meters available on the market. We recommend following the meter’s guidance on whether the battery is Good, Bad/Replace or Recharge and Retest. We do not advise making decisions solely on the estimated CCA rating output.”

So I think what we’ve learned so far is that either testing method will provide us accurate results IF we ensure that we are connecting our tools directly to the battery. If you take a quick test in the vehicle and it passes, you’ll probably be OK, but if the initial test is questionable, you’ll need to remove the battery and test directly at the posts.

If the SOC measurement indicates a discharged battery, you’ll need to identify the reason for the discharge. Today’s charging systems are designed to maintain the battery properly and

the only reasons for a battery to be discharged are age, faults in the vehicle’s charging or electronic systems or extended periods of storage where the vehicle is not being used.

According to EnerSys, “When a vehicle sits for long periods of time, it can destroy the battery through repetitive deep discharges. Alternators are not deep-cycle chargers; their output is limited in operation. Elevated temperature can accelerate self-discharge and add to the total rate of storage discharge.”

This high alternator demand can also cause damage to the alternator itself over time, and it should never be relied upon to replenish a discharged battery. If your customer stores his/her vehicle for extended periods of time, recommend the use of a home battery maintainer to protect the battery and alternator from harm and premature failure.

In addition to the effects of extended storage, EnerSys shares, “Many times issues with a vehicle’s electrical system are automatically blamed on the battery. It is true that changing the battery is the easiest thing to do to start diagnosing an electrical problem, but that may not be the actual source of the problem. An example is when a parasitic load is causing battery and/or starting problems. Replacing the battery will only mask the problem temporarily. Taking the time to see why a vehicle may have trouble starting or why a battery is constantly failing is key.”

Better yet, make sure the battery has indeed failed prior to replacement, especially if it’s one that is not that old! This may require the battery to be charged and retested. Just remember what the experts have told us and let the battery acclimate to room temperature and “rest” for a minimum of 10-12 hours. If the “rested” OCV is still below 12.4, replace it with confidence.

Whether it’s a young or old battery, be sure to test the vehicle’s charging system to ensure the new battery has a shot at a long and happy life!



PHOTO: CLORE AUTOMOTIVE

**STILL AN INDUSTRY STANDARD,** the carbon pile load tester should be used to “load” the battery to half of its CCA rating for 15 seconds — then observe the OCV reading. It should remain above 9.7v.



PHOTO: EXIDE TECHNOLOGIES

**AGM STANDS FOR “ABSORBED GLASS MAT”** and has several distinct differences in design from a conventional flooded lead acid battery. One is in how the battery must be charged and failure to follow the precautions will lead to internal damage.



PHOTO: ENERSYS

**SIDE POST BATTERY DESIGNS** can hid corrosion behind the battery cable connections and cause false test results. On both designs, make sure the connections are clean before reinstalling.

**Don’t forget the reset!** According to industry sources, there are more than 9 million vehicles in the U.S. fleet that currently require some

form of battery “reset” or “registration” when replacing the vehicle’s battery.

“Not performing battery reset functions can cause some vehicles to go into a weak battery mode that will affect the operation of non-critical electrical loads. This mode can be manually reset after replacing the battery via a tool connected to the OBD II port. Not performing battery registration functions may result in short battery life. Some vehicles manage batteries differently as they age. They will also treat AGM and flooded batteries differently,” says Knauer.

Bosch spells it out for us by offering these notes: “Most stop/start vehicles will require an ECM update when a battery is replaced to ensure the system works properly and the battery is being charged correctly. This includes newer vehicles from BMW, Mini and the Ford F-150, among others. The most important thing for techs to know or understand is that if they are replacing the battery on a start/stop vehicle, they should look for a battery reset procedure in their scan tool or invest in a separate battery reset tool that is updated for newer model year vehicles.”

### Other valuable tips

Our experts provided more information than I can fit in just one article. But there are still a few great tips and observations I think we need to squeeze in. All of our experts feel that parasitic drain is becoming increasingly common. “This causes batteries to live much of their life in a ‘discharged’ state, accelerating sulfation,” shares O’Hara.

Sulfation is the formation of crystals on the surfaces of the plates and is also an issue for those of you who keep batteries in stock. Remember, they, too, are subject to normal discharge.

Another common point raised by our experts relates to the use of “memory saver” devices. East Penn’s Knauer had this to say: “Vehicles and the people who drive them are relying more on the vehicle’s settings than ever before. Protecting these settings is a simple precaution that doesn’t get used enough. The loss of settings can be avoided with the use of a memory saver device. If the vehicle retains adequate voltage throughout a battery replacement, memory items such as radio presets and many other settings can often be preserved. However, it’s important to note that since the memory saver keeps power in the system, the operator should be careful that the positive cable end doesn’t contact something that could ground it out.”

And that’s a common problem, as Clore Automotive’s O’Hara pointed out. “The biggest thing we stress when a battery is removed is properly securing the cable ends, especially when a memory saver is used. In those cases, as you know, the cable ends are live. I have seen on iATN where a user posted that he had specific non-conductive “bags” that he used and placed over the

cable ends each time a battery was disconnected. This should be taught in the VoTech schools and be made standard practice in the industry. It is brilliant and much needed.”

Today, even removing the battery may require a specific process, so read up on the procedure before you even open the hood. And learn a little from the experts. Make sure you follow the proper safety procedures when working around batteries, verify a failed battery with direct testing, and ensure that the replacement battery has a shot by testing the vehicle for issues in the charging system or electronics, especially parasitic drain. Use the right battery for the application when selecting your replacement and be sure you tell the ECM you updated it if required. *TM*



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