

Toby Clark learns the latest advice about 12V batteries and how best to care for them

Tony Zeal, training manager at Swedish charger manufacturer CTEK, observes: "I think batteries are still the most ignored service item in any fleet." Zeal says that when he started in the motor trade, "the only time the battery got tested was when the customer complained about poor starting. If it wasn't for the white fluffy acid on the battery posts you'd assume the battery was in good condition.



A BATTERY OF TESTS

"But now it's the heartbeat of any modern vehicle – you're not going to push-start a vehicle if it's got a flat battery. In a fleet you can either make money or save money just by regular testing and charging of your batteries."

The lead-acid battery is still the obvious choice for starting applications: lithium-ion batteries have some specialist uses where weight is critical, but offer no advantages for trucks. The traditional 'wet' battery, 'flooded' with electrolyte, has largely been supplanted by the EFB (enhanced flooded battery); this contains a fleecy material to hold the electrolyte closer to the lead plates, giving it better resistance to deep discharge.

Valve-regulated lead-acid (VRLA) batteries also have pressure relief valves which allow the gas that would otherwise vent during charging to recombine with the electrolyte, practically

eliminating the need to add water and reducing the risk of corroded terminals.

A recent development, and better still, is the absorbent glass mat (AGM) battery: in this VRLA battery the electrolyte is absorbed into a tightly constrained fibrous glass mat. This structure (which may be flat or spiral in shape) stabilises the electrolyte, making it more resistant to vibration or spillage and improving its transient performance – ideal for stop-start applications.

While manufacturers quote operating temperature ranges for their batteries – often over a very broad range, such as -40°C to +60°C – a battery is far less effective at low

ROBIS BATTERY MANAGEMENT SYSTEM

Rotronics, distributor of the Midtronics range of battery testers and chargers, has introduced a web-based battery management system called ROBIS. It was developed over two years, and trialled with customers such as Royal Mail and Stagecoach before its commercial launch in February 2019. Since then, it has recorded well over a million battery tests a year and is being used by customers for whom uptime is critical, such as Norfolk Fire & Rescue. Rotronics says that "wireless upload of data is crucial for minimising data analysis time for

technicians" and that the package offers "live battery health data, presented in easy-to-read reports that identify batteries in need of recharging, replacing or re-balancing". Compatible battery testers include the Midtronics EXP1000FHD and CPX900.



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temperatures. A healthy battery at full charge will give its optimum performance at around 25°C. According to Tony Zeal: "At freezing point, about 66% of that power will be available. At -20°C, you're only looking at about 40% power." And in a 24V system, if one battery is underperforming, "the other battery has to take up the slack".

Even if batteries are not being used, 'self-discharge' means their state of charge (SoC) declines over time. For lead-acid batteries this happens faster at higher temperatures, but in any case, a battery should always be fully charged before it is stored. "At 40% state of charge, a battery will still operate; but if it's left outside at -26°C it'll be a block of ice in the morning. Most of that fluid

when it is not charged is water – it's not an acid/water mix any more." Conversely, "if you can keep your battery healthy and close to 100% SoC, you're looking at -70°C before your battery will freeze". But if it does freeze, he adds, "you cannot charge, so you have to take it indoors; hopefully the casing is not split, so you can try to recover it".

It's worth remembering that starting problems may not be due to the battery itself: battery cables need to be kept in good condition, and terminals should be kept clean and clamped securely. Varta recommends cleaning corroded terminals with a dilute solution of sodium bicarbonate (after disconnecting the battery, of course), then applying a suitable grease.

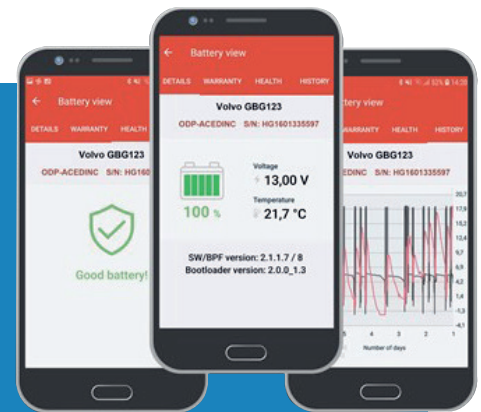
BIG BATTERY KILLER

"With a 24V system, one of the biggest killers is that over time the batteries will go out of balance; we assume that they are fitted as a pair, but what will happen is that one receives more demand than the other.

Although they are wired in series, one will fail before the other. By testing regularly, and keeping a record, the operator will have a better idea if one of them is about to fall off a cliff." Zeal cites a major survey which tested over a million PSV batteries: 12% needed to be replaced, but more to the point, 55% were out of balance.

"Most big fleets should have in place some sort of battery management system," says Zeal. When one battery fails, he says: "A good system takes both batteries out of the vehicle and replaces them with good batteries. Then you take the good battery, recharge it to 100% and keep it in a separate place."

A lot of people scrap that second battery, he says, but eventually, "what you end up with is a good set of second-



THERE'S AN APP FOR THAT

The new AGM (absorbent glass mat) TPPL (thin plate pure lead) DINC commercial vehicle battery was shortlisted as a finalist in the parts and technology solutions category in the Automechanika Innovation Awards in September.

It features the Connect battery monitoring system from EnerSys, and is the first AGM TPPL commercial vehicle battery with Bluetooth connectivity, a built-in sensor and a dedicated app to allow fleet operators easy access to real-time information on the batteries in their vehicles.

The sensor provides information including:

- Voltage measurement
- Temperature measurement
- Recording of the battery's history
- Monitoring of the battery's state of health
- Advance warning and safeguard notifications.

Peter 't Hart, director of transportation for EMEA & APAC at EnerSys, said: "Operators are often left in the dark when it comes to accessing detailed information about the state of the batteries in their vehicles, which can be frustrating since batteries play such a vital role in fleet efficiency. The new Odyssey DINC battery with Connect battery monitoring system has been designed to remove that uncertainty and, for the first time, operators have a wealth of valuable data at their fingertips."

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Tony Zeal



WARNING 
Powdery residue at the terminals is a warning sign of poor battery condition

MEASURING A BATTERY'S STATE OF CHARGE (SOC)

To establish the state of charge of a battery, you can measure the open-circuit voltage (OCV) – but you need to know the relationship between OCV and SoC. Manufacturers such as EnerSys provide a table of OCV values and the corresponding SoC (for its Odyssey range of AGM batteries):

OCV	SoC
12.9V	100%
12.6V	75%
12.2V	50%
11.9V	25%
11.5V or less	0%

EnerSys says you use 'a high-quality voltmeter', but most importantly, "the voltage reading must be taken at least four hours after the battery finishes charging, or at least 30 minutes after it finishes a discharge. Measurements will not be accurate if adequate rest time is not allowed." Other manufacturers quote slightly different times, but all insist that you leave a rest time before measuring the voltage.

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hand batteries. You can begin to replace a failed set with a good second-hand set, and you start to save money". It doesn't have to be guesswork, he adds: "There are testers that will tell you if two batteries will work well together – you should look for a conductance tester – then you can cable-tie the handles together!

"Just make sure it's a smart charger," says Zeal. "Don't use a linear charger on a modern battery." A smart charger will apply "certain voltage, amperage and time measurements to charge the battery. Everything is controlled". For example, "as a battery fills up, those amperages are reduced. A linear

charger doesn't reduce the amount of current: that turns into heat and releases hydrogen gas". This is why some facilities require batteries to be removed for charging. But Zeal says: "There's not so much need for off-vehicle charging with a modern smart charger."

He adds: "You can use either a 24V charger or two 12V chargers, but if you are trying to bring batteries back into balance, using two 12V chargers is better than charging them in series. That brings each battery back into its own full state of charge."

Maintenance ('float' or 'trickle') chargers supply a constant low current (0.5-1.5A) and should only be used to maintain an already full-charged battery; they are not suitable for recharging a deeply discharged battery.

Ideally you should raise the charging voltage at lower temperatures. For example, EnerSys

recommends compensation of +18mV per degree below 25°C (and a similar reduction above this temperature). "Temperature compensation comes into play in extremes," says Zeal, but he reckons it doesn't matter in a workshop situation. Some smart chargers feature automatic temperature compensation, but this usually only detects the ambient temperature; a sophisticated battery tester such as the Midtronics EXP-1000 includes an IR sensor to measure the battery casing temperature directly.

In conclusion, says Zeal: "Charge whenever you get the opportunity – that's the key to get through the winter. If the batteries are resting up over the weekend, put them on charge." **TE**

