Battery Care
- reprints from SLICE -

DOSING YOUR BATTERY
by Kevin Martin / intro by Geoff Eldridge

Following the success of Kevin Martin's article on the revival of a tired car battery in Slices 86 AND 91 we decided to reprint an updated version for the benefit of those of you who missed it first tune. As you will see, Kevin's marvellous EDTA is still around, and the good thing about this stuff is that IT REALLY WORKS!

Kevin also says that he is happy to offer help to members with problems, so don't be afraid to write to him. A little courtesy of at least a stamped addressed envelope and a few words of thanks will no doubt be appreciated. Try not to phone, we don't want to wear out our welcome! -Ed.

Kevin writes:

To understand what can be done to prolong the life of a battery requires a simple appreciation of how a car battery works. All car batteries are a series of cells, the most common is the 12v battery which is simply six cells in series. Each cell consists of a plate of lead and a supported plate of lead(IV) oxide, both immersed in fairly concentrated sulphuric acid. The lead(W) oxide plate is the positive pole, the lead plate is the negative pole. As the battery discharges, electrons flow from the negative to the positive pole; when we charge the battery, we simply drive electrons back in the opposite direction.

The reason for a battery failing to work properly any more is due to the chemical processes which take place within each cell. As the battery discharges, the positive plate reacts with the sulphuric acid to produce lead ions and water. The negative plate simply dissolves to form lead ions in the process which finally leads to the battery's complete failure. On charging, the positive plate builds up a thicker coating of lead(W) oxide, removing water and lead ions from the sulphuric acid as it does so, the negative plate fizzes and releases hydrogen from the sulphuric acid as it builds up a coating of lead.

It is the lead ions formed in the discharge cycle which cause problems. They combine with sulphate ions in sulphuric acid to form highly insoluble lead sulphate. When this coats the plates of the battery. it fails to deliver enough power to be of use. The battery may well be thoroughly serviceable in every other way - only the 'sulphating' stops the battery delivering enough power to start the car.

The sulphating can effectively be removed by adding to each cell the tetrasodium salt of a a weak organic acid known to chemists as EDTA. EDTA stands for ethylenediaminetetraacetic acid, it is a complex analytical reagent which forms co-ordination compounds with many metal ions, including the lead ions formed in the discharge cycle of a battery. The compound formed by lead ions and EDTA is very stable in alkaline solution, but not so in the acid medium of a battery. This is extremely long term - as EDTA forms a compound with the lead ions in the lead sulphate of a battery plate, this compound tends to break down again, but this time the lead sulphate doesn't coat the plates, it sinks down to the bottom of the cell, and the EDTA is flee to continue its work. What EDTA effectively does, then, is to free the battery plates of sulphating.

As can be seen from above, treating a battery with EDTA is likely to be most effective when the battery, for one reason or another, spends periods when it is not fully charged, and so contains too many lead ions. This is likely to occur if the car is used for just short trips, or is infrequently used.

To treat a battery with the tetrasodium salt of EDTA you simply add about, a rounded teaspoon full of the powder to each cell - this assumes an average size of battery but the exact amount is in no way critical. What you should do then is to use the car normally for a few days or agitate the battery frequently for a few days, and then give it a thorough charge to build up on the cleaned plate areas.. On the assumption that sulphating has been effecting the performance of your battery, an increased performance will be noted from here on.

By far the most common problem seems to be what to do with a battery during a long term period of inactivity. This situation seems most commonly to arise in cars which are either taken off the road for the winter or for a long term rebuild, where a perfectly good battery remains after a car is scrapped, and in a few cases in batteries which are used in caravans during the summer months only. The run of events seems all too familiar: an excellent battery sits in the garage, it gets charged when its owner remembers, and after six months or so when it is needed, it doesn't deliver enough power any more. With just a little effort, a battery can be stored for many years in a way which causes no deterioration at all in its performance.

Firstly, the electrolyte must be removed from the battery. Care must be taken since it is fairly concentrated sulphuric acid, but the operation can be easily and safely carried out. The simplest way of removing it is to turn the battery frequently on its side with the tarminals uppermost. and then completely upside down over a plastic bowl. Never do this over a metal contained or particularly over a stainless steel sink - the battery still works at this stage and any dead short across the terminals may well leave a burn mark on the sink! The electrolyte will probably be r~usable, even if it looks dirty, so if it is caught in a bowl it can be kept for future use. An average sized battery contains about t5 litres (2.5 - 3 pints) of electrolyte which can be stored in screw top glass or polythene bottles.

After the battery has been emptied, it should be washed out with copious amounts of cold water. Don't stint on this, keep mihig and tipping out until the last trace of sediment emerges. If you don't remove all of the acid at this stage, it will chug to the plates and coat them with lead sulphate, leading to all the familiar problems associated with sulphating. Don't be tempted, either, to remove the acid by adding an alkali -~ this will form lead hydroxide or plumbates which will finish off the battery for good. When washed, the battery can be successfully stored for years dry, on its side, with the plastic caps removed.

When the battery is to be used again, the acid can simply be poured straight back in. Whilst it is out though, the plates can be cleaned of any sulphate deposits which may have built up during its working life by using EDTA. Add about a rounded teaspoon of the tetrasodium salt of EDTA to each cell, and then top~up with hot water.

EDTA works slowly in battery acid, but extremely quickly in alkaline solutions such as it forms in hot water. Leave the EDTA solution in the battery for a few minutes, and then remove and wash out well with water. After the EDTA treatment, the acid can be poured back in. If you are short of electrolyte, you shouldn't be if it was drained properly), get a little from your local battery suppliers. If they won't co~operate, or want to charge you the earth, ask your local chemist if he will make you up a little 4M sulphuric acid (1 part concentrated sulphuric acid to 4.5 parts of water).

A second point regularly raised is whether anything can be done with a battery which seems to be completely dead. This quite simply depends on what is wrong with it, and more importantly, how it came by its demise. Testing the battery with a voltmeter tells you surprisingly little; it should give a reading of about 13.7 volts, but will give this if there are virtually no plates left. Also, don't test it with the ammeter function on a multimeter, it may deliver about 2()0 amps and leave you badly out of pocket! Testing the specific gravity with a hydrometer can also be misleading, different manufacturers use slightly differing acid concentrations. As a rough and ready guide, a battery which suddenly and spectacularly fails, or fails to start a car after a long static charge, might as well be thrown away. Those most likely to be resurrected are ones which were in good condition but have stood neglected for some time. These need the electrolyte removing and a treatment with EDTA, as described above. In one, albeit spectacular case, someone recently claimed to have returned to use a battery which was 14 years old and had laid out of use for 10 years!

Many people have also asked me about distilled water, whether it is really necessary, and if it is worth the cost. In both cases the answer is usually "No". If you have a fridge or freezer, you can collect the ice that forms due to condensation of water vapour in the air and use that. Failing that, you can use ordinary tap water, if you have to, but it is better to prepare yourself a topping-up solution. To do this, put about a quarter of a tea-spoon of EDTA in a jug and add a pint of boding water, allow it to cool, and carefully decant the water of any sediment which may fall to the bottom. long term yourself a topping-up solution like this is far more economical than continually buying distilled water for batteries.

If you would like enough tetrasodium EDTA to treat a battery, I can let you have some for 31.50. if you have any queries or problems please do feel free to write (with a s.a.e) or phone.
My address and number:
Kevin Martin, 19 Brookmead, Meppershall, Shefford, Beds. 5G17 55A (Hitchin 814827)