ECN – Use of Lead-Acid Batteries

ECN depends on rechargeable batteries to power weather stations, vacuum pumps, moth traps etc. These batteries are charged by mains supply, solar panels or wind turbines. Lead acid batteries are best suited to charging where they can be constant-voltage trickle charged and held at or near full charge for several years. (In contrast, Nickel based rechargeable batteries (NiCd & NiMH) require constant-current charging; should be stored discharged; and fully discharged before recharging. They do not hold their charge for long – a few weeks, and do not last long if continuously charged. However, they can be fast charged, and if charged correctly, they can last hundreds of charge cycles).

Lead Acid batteries can have an open or sealed construction. According to mechanical (lead plate), and chemical (sulphuric acid) design, they vary in cost, life expectancy and performance. Relatively low cost, open construction batteries are normally used in vehicles. They are designed to be continuously charged, but cope with much load cycling. They do not last long if left unused for many months since the lead plates sulphate up. On the safety front, open construction also means acid and hydrogen gas can escape.

Sealed lead acid, (SLA,) batteries, have generally overcome these problems, but are more expensive but do not have a good energy capacity/unit weight. They have the electrolyte held in a gel or in absorbent mats so they do not leak acid or release much hydrogen. This design means that, with correct operation, sulphation is also much less of a problem. Consequently, 12 volt SLAs are most suited to powering ECN field equipment. (Sulphation means that a non-conductive layer of lead sulphate has formed over some of the lead plates, reducing effective battery capacity. This problem is difficult to reverse.)

Manufacturers such as Yuasa, Sonnenschein/Exide offer a range of SLA batteries optimised for particular applications e.g. standby alarm systems, electric vehicles, solar powered systems. They can be supplied next day by, say, RS Components or CPC of Preston (tel. 08701 202530) (who are about 25% cheaper.) CPC also do Steatite & Camden SLAs at half the price, but these are non standard shapes & terminal fixings).

Batteries are classed by their energy capacity measured in Ampere Hours = Ahr. 5 Ahr capacity means the battery can deliver 5 Amp for 1 hour; 0.5 A for 10 hours; 50 mA for 100 hrs etc.

12V SLA batteries, consisting of 6 at 2 volts cells in series, can be constant voltage charged at 14.7 volts maximum for short periods and most can be trickle charged continuously at 13.7 volts. Modern SLA battery chargers have inbuilt programming to sense the battery type & state of change, and apply the correct charging sequence.

Battery temperature also determines the maximum charging voltage allowed; the rate of self discharge and overall battery life.

Yuasa NP range or Sonnenschein S300 range are suited to continuous charging & intermittent use. They can still store 60% of full charge after 1 year at 10°C without charging, or 6 months at 20°C. These batteries are the cheapest of their range and should last 5 years if correctly charged. They cannot cope with deep discharge. If the battery voltage goes below 11 volts, the battery should be charged immediately. Leaving it for a week or more before recharging will seriously impair life and storage capacity. These batteries operate best around 10 degrees C. At lower temperatures their charging capacity drops and at higher temperatures their life and self discharge time is reduced.

More expensive batteries in the range are more tolerant of heavy discharge and can have a life of 10 or more years. Sonnenschein Solar Dryfit batteries are designed for charging from solar panels; are long lasting but expensive.

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