

All charged up

Quintin Moore, Project Manager at Lincad, looks at the evolution of power management systems in the military...

With electronic-based systems playing an ever increasing part in military systems, the availability of a reliable power source and associated power management system has become a critical element in achieving missions in the battlefield. This article will discuss the evolution of simple battery systems into efficient power management systems, which maximise the efficient use of available power to satisfy a range of power hungry systems.

With the demand for greater functionality and intelligence in the battlefield, simple equipments are now replaced by complex electronic-based systems providing multi-function capability. With this step change in functional performance, a significant jump in power requirements has also been necessary but with the requirement that the volume and more critically the weight of the power system remains the same or even be reduced.

This has meant a major change in power requirements initially to identify portable power sources with higher energy density and secondly to apply power management to the available power. This latter point is necessary to ensure that the maximum energy can be extracted efficiently from available charging sources and to manage the available power output to the electronic systems to provide the most efficient conversion and distribution to the electronic systems. This may also involve prioritisation on the power distribution to more operationally critical systems.

Rechargeable portable power source technology has developed considerably over the past 10 years with the lithium ion cell technology now being widely used to power military systems. This technology has an energy density of around 160Wh/kg, however, new systems currently in excess of 350Wh/kg are currently being considered for military portable power applications over the next 12 months and 600Wh/kg in the next three years. Currently, the 24V 5Ah battery from the 1970s is now a 24V 19Ah battery in similar weight and volume.

Although these new power systems provide major benefits in energy density, the technology needs to be managed to maximise the output and to add the necessary safety features to enable these high density power sources to be managed for military applications. This means that the power source is no longer a 'dumb' battery but an 'intelligent' power source with on-board power management.

Intelligent power sources are more expensive but have major benefits in operational functionality, power efficiency and an increase in life-cycle of between four to six times over dumb batteries. It also provides the capability for accurate battery status and diagnostic information to be presented on a battery display or on a communications link to a host system. Power management features can also be extended to provide low battery warning alarms and prioritise power to critical systems.

A basic intelligent power solution provides cell management to maximise the power efficiency and delivery, and the ability to be charged from a dc power source or non-intelligent charger. This capability can be further extended by incorporation of on-board AC/DC or DC/DC converters to enable charging from a wider range of power sources.

In addition power management can enable any power input, eg. a generator, to be primarily used to power the hosts systems and any remaining power if available can be used to charge the battery. This therefore enables the intelligent power system to act as a UPS (Uninterruptible Power Supply) and power conditioning system.

It can therefore be seen that integration of an intelligent power management solution into a military system provides major benefits in system capability and flexibility. Successful management will not only maximise the available power but provide the capability for the power to be managed both in charge and discharge.

Successful power management systems using the above techniques have recently been introduced into service with British Forces for vehicle and soldier based man-pack applications and will enter service on artillery based systems in 2007.



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