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BATTERY POWER – AN EVOLVING TECHNOLOGY

By Larry Nembhard – Keystone Chief Engineer

Little doubt exists about contemporary battery power and its diverse use potential. With the advent of lighter, smaller, higher powered, lower amperage cells, the technological applications have become "understandably" broad. Significantly, the use of portable medical devices which are battery-powered, has grown exponentially over the past 5 years.

Now, with the introduction of lower-discharge-rates, as in Lithium-Ion PCB Holders and Retainers for vertical and horizontal placement, the evolution of battery uses moves well beyond Flashing Beacons or Cell Phones, Defibrillators or Temperature Monitors.

Part and parcel of the use of advanced manufacture are the rapid growth of battery holder types to include Retainers, Contacts, Clips, Snap-ons and Snap-ins for Coin Cell and Button-cell types as well as Strap assemblies for Dual and Multiple Holders. Add to these in-series or parallel configurations; PCB mounts; Built-in Separate Compartments; Insulated Polarization types; Inverse Polarity Protection and Retention Latches. Balancing battery strength and size is yet another concern. The answer is the combined use of plastic and metal sub-components which also answered space and cost considerations. Retainer clips are also in use to lock-in batteries securely and withstand shock and vibration. In addition, where lowered resistance is a must, contacts made of Phosphor Bronze and Beryllium Copper, all alloys, are used for battery contacts as well as interconnects.

Essential to these advances are the development of manufacturing techniques which have generated connecting apparatus to retain battery types securely positioned while easing cell installation and replacement. In addition, the introduction of many battery types offering lower-discharge rates, as in the case of Lithium-Ions, shelf life has rapidly improved. Instead of 3 or 5 years, 10 years for certain types, can now be expected. The development and use of proper connective platings are directly correlated with longer-term battery life.

Of major importance are the reliability and durability of connectors/contacts. Here, the emphasis is upon plating because plating selection depends on such factors as: Galvanic reaction, Conductivity, Hardness, Solderability, Corrosion and Environmental effects. Galvanic reaction occurs when dissimilar materials in contact with each other corrode. Plating dissimilar metals with compatible platings helps protect base metals. Anodic index under harsh environments calls for no more than 0.15V index difference. But where use is in offices and other controlled environments, the index can be up to 0.5V. Indexes start with Gold at 0.0V to a high of 1.85V for Beryllium Copper. Therefore, the most popular platings used are: Gold, Silver (0.15V), Nickel (0.30) and Tin (0.65V).

In terms of use, Gold, while very expensive, is an excellent conductor essential for low current uses. It has superior electrical properties, offers best corrosion resistance and good solderability. Silver is the best conductor but oxidizes easily and must be cleaned regularly for effective use. While soft, it reduces contact resistance but wears quickly. Nickel is likely the most used for contact platings, is extremely hard, has excellent anti-corrosion benefits but needs high temperatures and more active flux for proper soldering. Tin plate contacts solder at lower temperatures, have excellent solderability but being soft, wear easily. Tin whiskering could be a problem.

One innovative contact /connector plating is Tin-Nickel - an alloy of 65% Tin and 35% Nickel. It is highly resistant to corrosion and tarnishing, non-magnetic, will not wear easily and has good hardness value. For low current applications, a Gold Flash over Nickel Plate is used. Pragmatically, no single plating is suited for all applications. The goal is to choose one which meets the most important use factors, bearing in mind mating cycles, solderability, product life, mating contact and cost.

Environmental concerns dominate the safe disposal of batteries regardless of size or type, per government regulation. In turn, this has encouraged the design of battery holders/retainers, clips, et al which enable quick and easy battery installation and removal followed by safe disposal. Consequently all battery holders and retainers must be environmentally friendly and RoHS compliant.