Battery, Charger Advances Drive Cordless-Tool Uses

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One of the most important parts of a cordless tool system is the corded part: the battery charger. Not only does the charger deliver power to the tools, it affects their economy, efficiency and performance. It's a complex relationship that is often misunderstood.

Cordless-tool technology was developed for NASA. The first cordless tools went to the moon with the Apollo astronauts in the late 1960s. The first consumer cordless tools were available in the early 1980s. At this time, the NiCad (Nickel Cadmium) batteries that came with cordless tools were rated at 0.8 to 1.0 amp-hours, which means they delivered 0.8 to 1.0 amps for one hour. Chargers at that time took as long as 48 hours to recharge these batteries, although this time was reduced to 12 hours relatively quickly. Charging time was high because the technology charged the batteries using only 50 to 100 milliamps. NiCad batteries now offer 2.4 amp-hours, and Nickel Metal Hydride (NiMH) batteries deliver 3.0 amps in the same size battery pack. In spite of the storage/weight advantage of NiMH batteries, industrial and other users are more familiar with NiCads.

The key to decreasing charge time and increasing NiCad service life is in the design of the charging system. Unlike lead-acid batteries, NiCads thrive on faster charges. Higher amperages charge the batteries more quickly and condition them for longer service life. However, higher amperages have obstacles. One is found within the structure of the multiple-cell batteries used in cordless tools. Typically, a battery pack for a cordless tool has multiple cells inside. These cells produce 1.2 volts each, so a battery pack with 10 cells produces 12 volts. After the first several discharges, the cells begin to discharge unevenly. Therefore, a means of balancing voltage from cell to cell is an obstacle.

Another obstacle is the fact that the stronger the current is that's used to charge a battery, the greater the heat and pressure build-up within the battery. And, while heat reduces the recharging cycle and increases battery capacity, overheating can damage the battery. Heat and pressure generated during fast-charging applications, therefore, straddles a fine line between decreasing a battery's useful service life and increasing service cycles from a recharged unit.

In the 1990s, Metabo addressed and overcame these obstacles. Using micro-processors, its ICS10 system pushes higher-amperage current 7.5 to 8.0 amps rather than 50 to 100 milliamps in previous years into the batteries, with brief (milliseconds) pauses during which the charger runs diagnostics on the battery. With each pulse of diagnostics, the charger's microprocessor adjusts to deliver the optimum charge. The result is a reduced charge time of 10 minutes. The system uses the last 30 seconds of charge time to "balance" the energy level of the cell

group. At this time, the battery also cools to room temperature.

While 10-minute recharges are a great advance over the 24- to 48-hour charges of the past, the extended service life of the battery also benefits the user and the environment. The long charges of the early '80s meant short service lives for the batteries. Most could only be recharged up to 50 times. Now, 1,000 recharges are common, with some systems capable of 3,000. As engineers improve the storage capacity/weight ratio of batteries, expect greater selections of cordless saws, grinders and other high-torque tools for industry. Thanks to advances in charging and battery systems, the cordless tool is no longer an adjunct tool reserved for special uses and as a costly convenience. In many cases, it is the primary production tool in its group.