

**Sol Jacobs**  
Tadiran Batteries



## Lithium-Powered Orthopaedic Bone Drill Features Higher Performance With 36% Less Weight

*Replacing alkaline batteries with high power lithium cells enabled BioAccess single-use cordless bone drills to become lighter and more powerful, delivering numerous ergonomic benefits to orthopaedic surgeons.*

Faced with overwhelming work schedules, orthopaedic surgeons are continually seeking new ways to manage their time in surgery more effectively and efficiently. One common sense approach involves the early adoption of new technologies that save time and simplify surgical procedures, thus enhancing productivity and reducing possible fatigue.

Farsighted surgical device manufacturers are staying well ahead of the curve by continually enhancing their products and services to deliver productivity-enhancing benefits. An excellent example of this proactive approach to new product design occurred when BioAccess, a surgical device manufacturer, introduced a new power management solution for its cordless small bone drill. (See Exhibit 1.)

The device had been powered previously by alkaline battery packs that performed well and offered excellent reliability. However, recognizing that significant benefits could be achieved by simultaneously increasing drilling power while reducing weight – benefits such as reduced fatigue, greater user comfort and increased power for shorter work cycles – design engineers at BioAccess began to explore alternative power sources for their cordless orthopaedic bone drill.

The engineers' review of available battery chemistries led them to consider the TLM Series high power lithium batteries from Tadiran, a class of batteries designed specifically for applications requiring high current pulses for relatively short intervals of time.

After testing and analysis, BioAccess specified custom battery packs consisting of six TLM-1550-HP AA-size high power lithium batteries, which featured an open circuit voltage of 4.1 V and the ability to handle pulses of up to 15 A, with 5 A maximum con-

**EXHIBIT 1**  
**BIOACCESS ORTHOPAEDIC SMALL BONE DRILL**



tinuous load. The ability of TLM Series cells to deliver high energy density and capacity enabled the bone drills to produce greater torque and faster drilling speeds. These batteries were also able to operate across an extremely wide temperature range (-40° C. to +85° C) and withstand pre-surgical sterilization temperatures as high as +125° C. While BioAccess' bone drill is specifically designed for single use, the cell's extended temperature range makes it extremely well suited for sterilization cycles. The increased power achieved by converting from alkaline to

high power lithium batteries also enabled the cordless bone drill to deliver excellent performance characteristics that have been validated by positive feedback from surgeons.

According to Bob Chapolini, M.D., President of BioAccess, "With the TLM cells we get much more power than a standard alkaline pack, while trimming 36% off the weight. This noticeable weight reduction makes the product more ergonomic by reducing user fatigue. If we had used a AA alkaline pack giving the same power as the Tadiran pack, the drill would have been three times heavier and twice the volume (requiring 15 AA-size alkaline batteries versus 6 AA-size TLM-1550-HP batteries)."

Chapolini adds, "TLM-1550-HP battery packs enable more active drill time and a long shelf life, as well as more instantaneous power when the device is activated. Use of a TLM-1550-HP battery pack ensures a more positive and reliable experience, as our latest generation of cordless drills are capable of delivering more power compared to alkaline cells, along with more stall torque, 30 to 40 seconds at a time, with 20 to 30 cycles."

Chapolini notes that he demonstrates the bone drill in physician offices, medical conferences and symposiums. "Any time we go to a symposium or conference, we've usually kept our demo units in storage for weeks or months at a time without testing system reliability," he says. "Fortunately, every time that we have pulled a bone drill out of the box it has operated powerfully and reliably, which provides greater reassurance to the prospective customer. What's more, the power provided for these small bone procedures is such that it may give us an opportunity to sell the drills into other classes of surgery that involve larger or heavier power tool classifications, which opens additional doors of opportunity for our product," Chapolini adds.

Recognizing that extended storage life coupled with high reliability would be important product attributes for BioAccess' orthopaedic bone drill, Tadiran's quality assurance department conducted extensive testing on the TLM-1550-HP cell to ensure that it would achieve an extremely low annual self-discharge, resulting in exceptionally long shelf life of up to 20 years.

Based on attributes such as high capacity and energy density, long shelf life and an extended temperature range, high power TLM-1550-HP batteries are rapidly gaining acceptance as an optimal power source for single-use medical devices such as hand-held power devices used in hospitals, clinics, or by field responders. A comparison of the TLM-1550-HP battery vs. other technologies is visible in Exhibit 2.

The example of the BioAccess orthopaedic bone drill illustrates how design engineers can take a proactive approach to new product design, working closely with battery manufacturers to determine optimum power management solutions as part of a continuous improvement philosophy.

**EXHIBIT 2  
THE TLM-1550 HP AND OTHER POWER TECHNOLOGIES**

	Previous Alkaline Pack	TLM-1550-HP Pack	Alkaline Equivalent to TLM-1550-HP Pack
Weight (Oz.)	6.3	4.0	12.4
Volume (Cu. In.)	3.3	3.3	7.13
# of Batteries	15 AAA	6 AA	15 AA

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