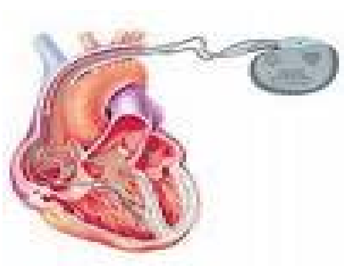
Medical Device Application Note

Contour Energy Systems Delivers Portable Power At the Heart of Defibrillators

Implanted defibrillators – devices that apply sharp electrical shocks to the heart when a heartbeat becomes dangerously rapid or erratic – have become a multi-billion dollar business for medical device makers. These devices have savedthousands of lives annually among patients with weak or damaged hearts who are at heightened risk of sudden cardiac arrest.



In the case of implanted defibrillators, small battery-powered canisters are inserted into muscle under the collarbone connected to the heart by insulated wires known as leads. It goes without saying that the performance of battery systems powering these critical medical devices can mean the difference between life and death in some cases.

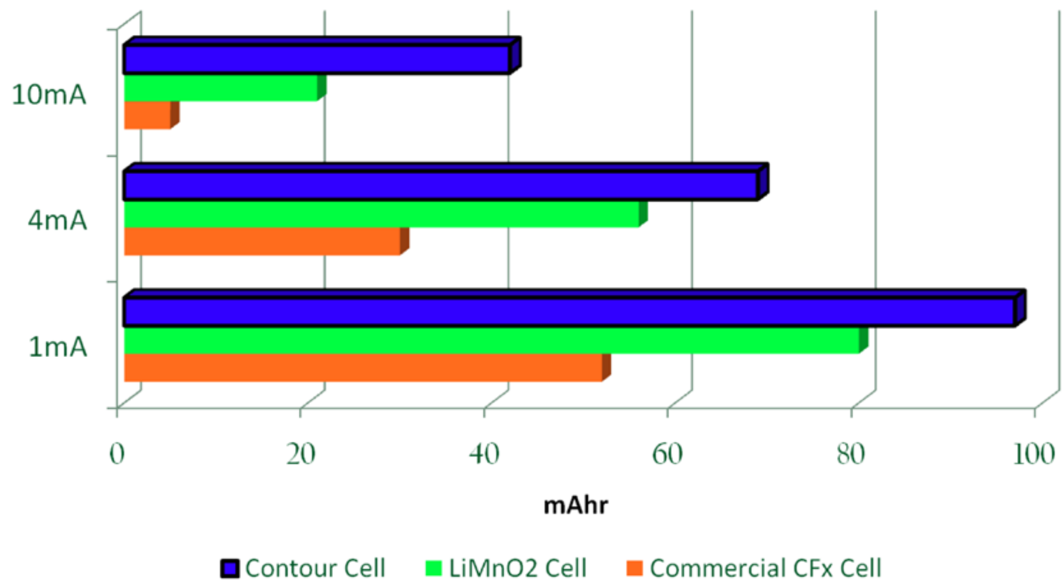
The leads in defibrillators serve two purposes: to *sense* when the heart is experiencing an abnormal rhythm that requires a shock and to *deliver* the shock itself. Given this persistent workload, defibrillator canisters need to be replaced when batteries are depleted -- currently every four to seven years.Because implanted defibrillators require an invasive procedure when they have to be replaced, medical device manufacturers are constantly seeking improved battery systems with the greatest longevity and reliability.

The large global market for defibrillators is not limited to implantable devices.Many defibrillators are designed to be multi-purpose devices that can also deliver low-powered stimulation to pace slow-beating hearts or to help the four chambers of the heart contract in more synchronized rhythms.

External defibrillators, which deliver life-saving jolts through paddles applied to the chest, are now standard equipment in ambulances and many other emergency response vehicles. In recent years, simpler models of such devices known as automated external defibrillators, or A.E.D.'s, have been placed on commercial aircraft, in offices, schools and for home users.

Contour's Advanced Lithium/Carbon Fluoride Battery System

To ensure optimal and safe performance when used inimplantable, multi-purpose and external defibrillator applications, Contour Energy Systems provides advanced lithium / carbon fluoride battery solutions in coin cell, cylindrical, thin film and prismatic form factors without the use of heavy metals or other toxic materials. Each of these batteries offers up to 8 times the performance compared to similar sized lithium cells to offer the greatest longevity of any lithium-based battery on the market today.



Unlike liquid lithium systems, such as lithium sulfur dioxide and lithium thionyl chloride, Contour's carbon fluoride batteries operate at a lower pressure rating and do not use toxic electrolyte systems that can cause severe damage in case of unexpected venting or leakage.

Contour's advanced Lithium/Carbon Fluoride battery has a gravimetric energy density of over 600 Wh/kg—more than twice that of either Sulfur Dioxide or Manganese Dioxide. It also has a higher volumetric energy density of 700-1000 Wh/l, which allows for packing more power into a given space. And combined with its higher gravimetric energy density, this extra power adds no additional weight. In addition, unlike Sulfur Dioxide and Manganese Dioxide batteries, Contour's Carbon Fluoride does not possess operational problems such as passivation.

Another major advantage of the Carbon Fluoride battery is the ability to customize or tune its cathode to meet the specific requirements of next-generation defibrillators. By altering how fluorine is introduced into the carbon structure at the atomic level during the manufacturing process, the battery's fundamental properties can be changed to achieve an optimal balance of energy and power densities, enabling new functionality and/or better performance for existing functions.

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