<table>
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<th>Things That Matter</th>
<th>Why</th>
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| 1 | Battery Chemistry | The various battery chemistries can have different:  
  • Voltages – Open Cell and Operating  
  • Operating temperature ranges  
  • Self discharge rates, i.e. Shelf Life |
| 2 | Size | In general, larger batteries have;  
  • Greater available energy (Capacity)  
  • Higher discharge rates  
  • Longer run times |
| 3 | Construction | Batteries are made in Cylindrical, Flat, and Coin/Button form factors  
  • Cylindrical batteries are able to discharge at higher rates than flat, or coin/button cells.  
  • Batteries made with wound electrodes have the highest discharge rate capability  
  • Coin/Button cells have small form factors, but also low discharge rates. |
| 4 | Depth of Discharge |  
  • Battery capacity is specified to end of life voltage  
  • Over discharge leads to cell damage and leakage  
  • Circuit designs must have voltage cut offs |
| 5 | Safety |  
  • Primary batteries are not to be charged.  
  • Battery cavities should be isolated from the circuits  
  • Battery cavities should be designed with battery polarity control. |
| 6 | Temperature |  
  • Battery performance declines at low temperatures  
  • High temperatures increase self discharge and reduce shelf life |
| 7 | Environmental Conditions |  
  • Temperature, humidity, shock and vibration all can reduce battery performance and damage the battery.  
  • Please consult Duracell for safety and handling guidelines |
| 8 | Batteries are not AC Power Supplies |  
  • Batteries are dynamic sources of power  
  • The battery’s internal resistance rises with the depth of discharge  
  • Power declines as internal resistance increases  
  • Batteries are impacted by environmental conditions |
| 9 | Batteries have Shelf Life or “Freshness” limits |  
  • Shelf life refers to the ability of the battery to retain capacity under specified storage conditions.  
  • Different battery chemistries have different shelf life limits, ranging from 3 – 15 years depending upon the chemistry.  
  • Rechargeable batteries lose energy at a high rate and need to be recharged weeks or months after the last charge. |
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| 10. Intermittent vs. Continuous Discharge Affects Run Time | - Discharging batteries intermittently results in longer run times than with a continuous discharge.  
- Designing discharge with an optimized pulse drain and duty cycle will result in the best run time |
| For more design help, contact Duracell’s Global OEM Sales and Consulting Group | [www.duracell.com/OEM](http://www.duracell.com/OEM) |