

High Power Primary

It just might last longer than you think!



Bob Altabet

Business Development Consultant

αβ • Alpha Beta Planning

www.alphabetaplan.com

914-962-5795

RBC Technologies: www.rbctx.com



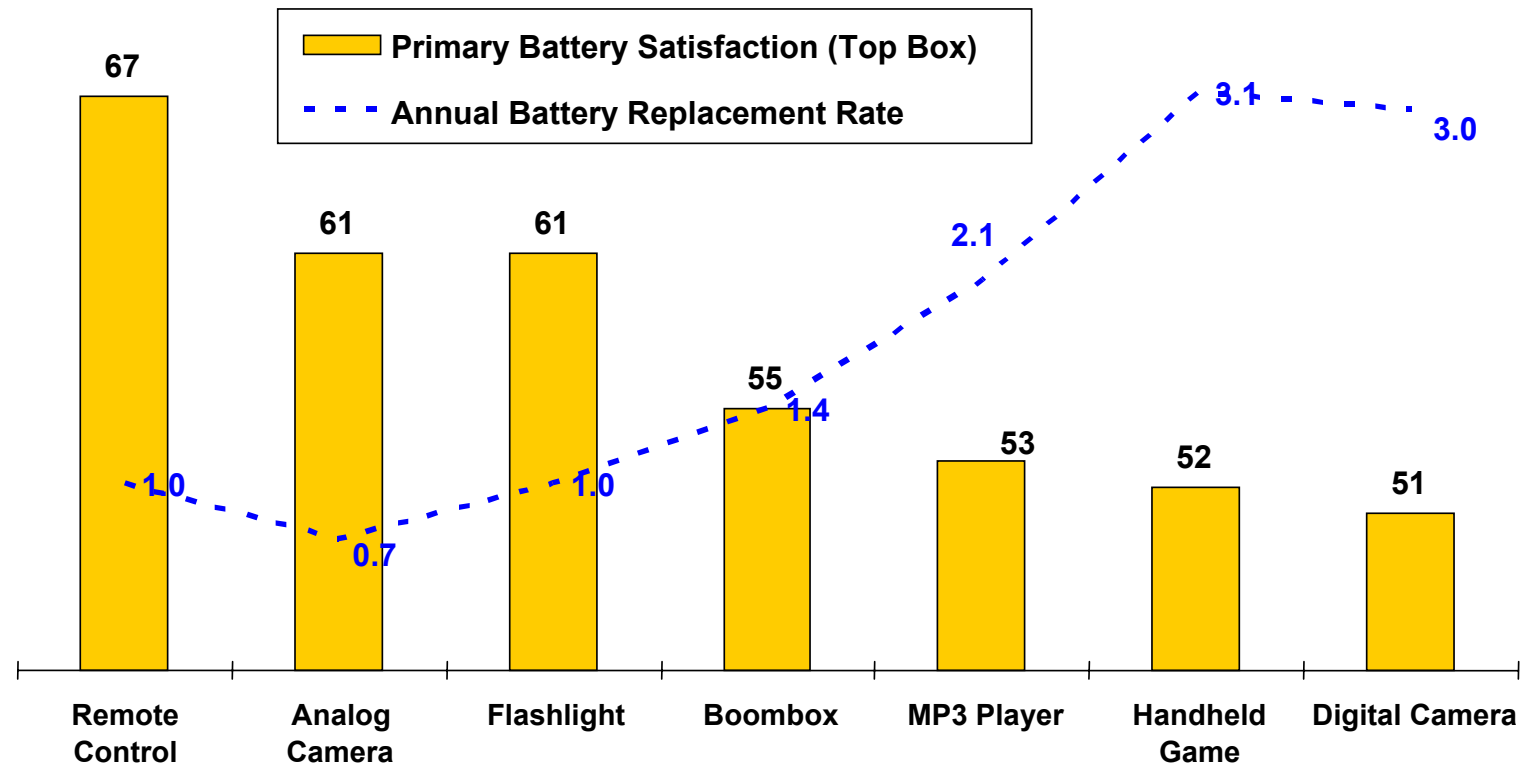
RBC Technologies Profile

- **R&D company, focusing on advanced battery technologies**
- **RBC commercializes technologies through licensing and joint venture partnerships**
- **RBC is currently concentrating on innovative, patent pending and patentable, high power cylindrical alkaline technology**



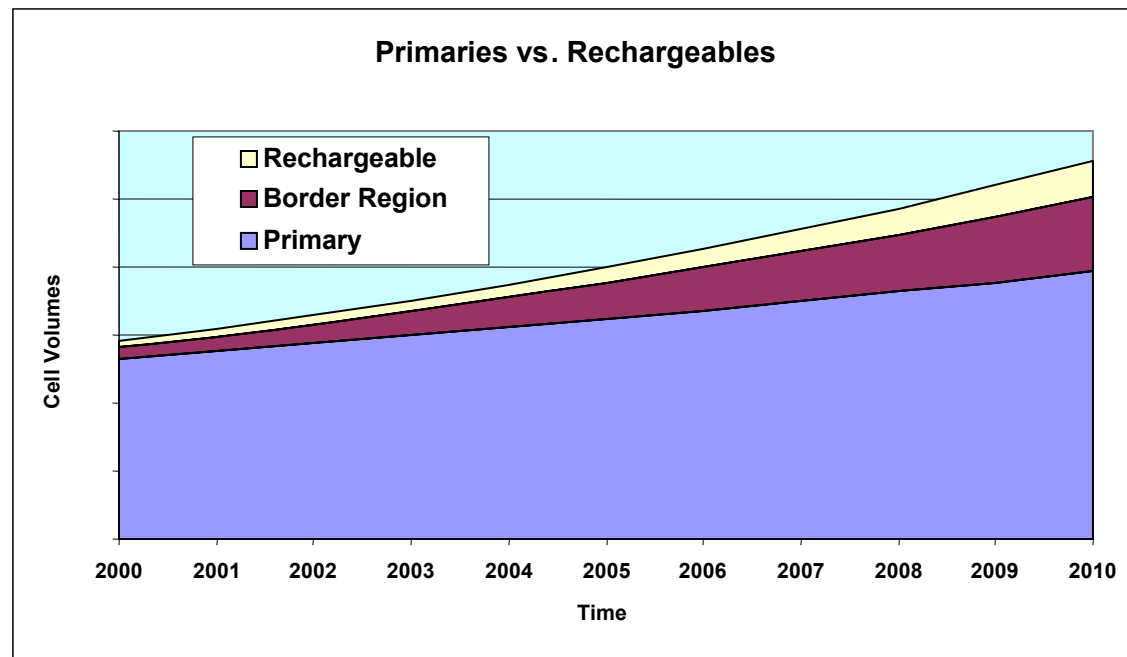
Primary Battery Consumer Satisfaction

- Good satisfaction for lower power devices
- As replacement frequency increases, satisfaction declines
- Combination of power requirements and duty cycle



High Power Device Explosion

- Growth of high power devices driving rechargeable cell volume growth
- Primary risks losing the border region, e.g. digital cameras, MP3 players, PDAs, or other new high power devices
- Primary batteries growth forecast
 - 3 - 4% or 6 - 8% depending on how well primary developers respond to the high power challenge



Consumer Trade-off Issues

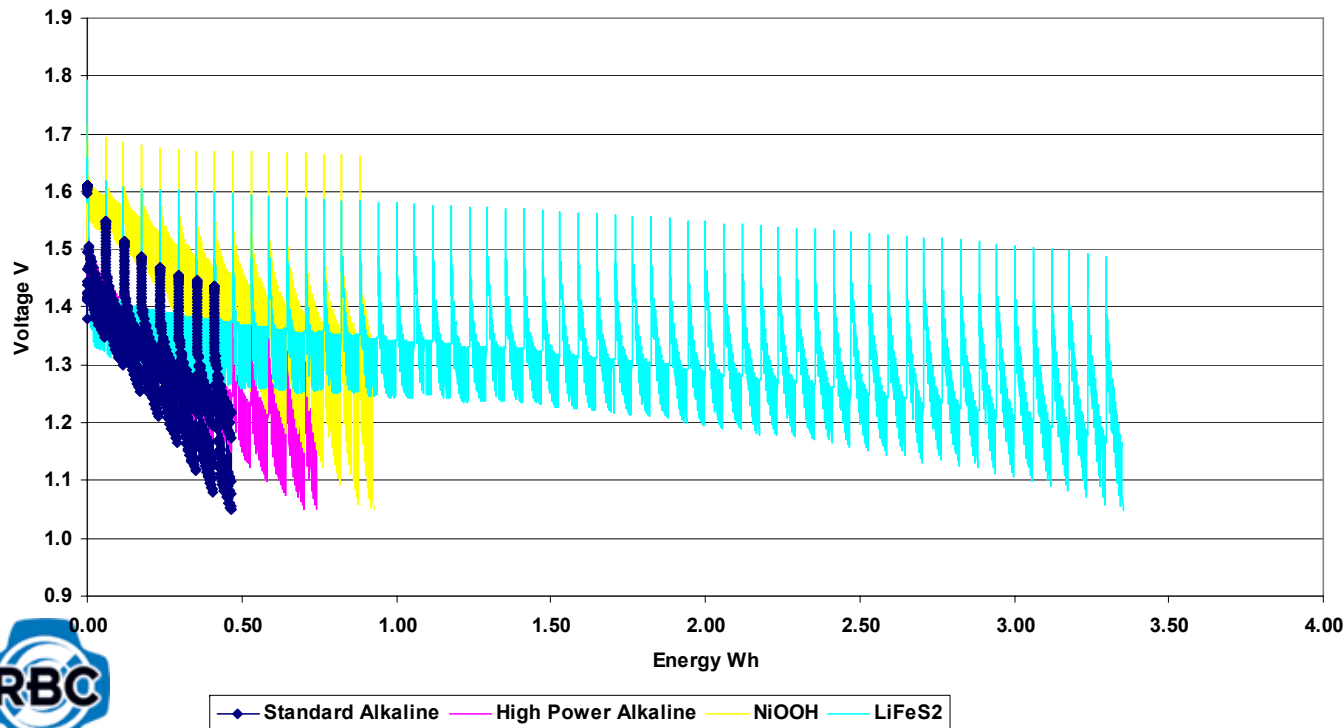
- Historically 90% of consumers preferred primary
- By 2003 that number was down to 60 to 80% depending on the application
- Preference is sensitive to changes in relative performance
- **Consumer Issues**
 - **Primary availability convenience**
 - “All batteries die”
 - Primaries simplify carrying a back-up
 - Primaries simplify buying a back-up any time or any place
 - Sloping curve lets the device or an indicator provide a better warning
 - **Recharging inconvenience**
 - Fast chargers reduce this concern
 - But, consumers need <15 minutes to make it a non-issue
 - **Economics**
 - Rechargeable savings economics only appeals to a small portion of consumers
 - Irrational? **No!**
 - Consumer risk profile is “risk-averse”
 - Need a 6 month investment payout



AAs in the Marketplace

- Standard Alkaline = 80 pulses
- High Power Alkaline = 125 pulses, 1.6X standard
- Nickel Oxy-hydroxide = 160 pulses, 2.0X standard
- Lithium Iron Disulfide = 570 pulses, 7.2X standard

In The Marketplace
AA Digital Camera Pulse Test
1.5 W 2s, .65W 28s, 10x/hr, Rest 55min, 1.05V



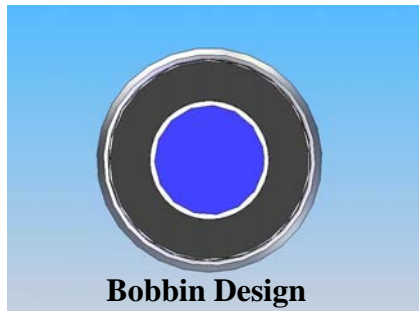
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RBC HRB Products

- RBC's High Rate Bobbin (HRB) patent pending cell design is a hybrid between wound and bobbin cells

Top View of AA Cylindrical Cells

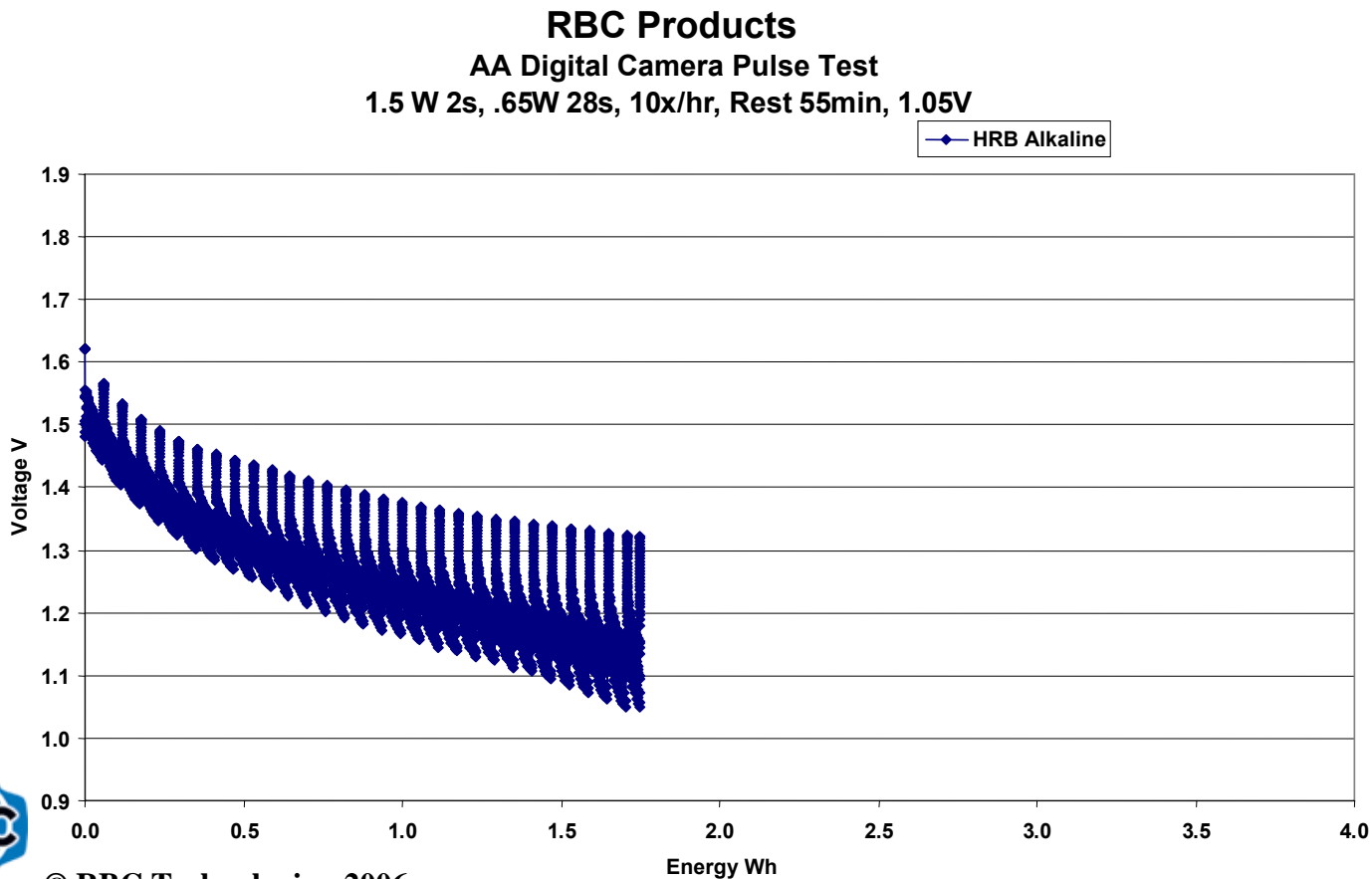


- Intermediate in:
 - Surface area between anode and cathode
 - Power
 - The manufacturing ease of bobbin and the complexity of wound
- Innovative manufacturing process closely based on conventional alkaline with similar low productions costs
- Pilot line in place to demonstrate high speed manufacturability



RBC Performance

- HRB Alkaline:
 - 290 pulses, 3.7X performance vs. standard alkaline

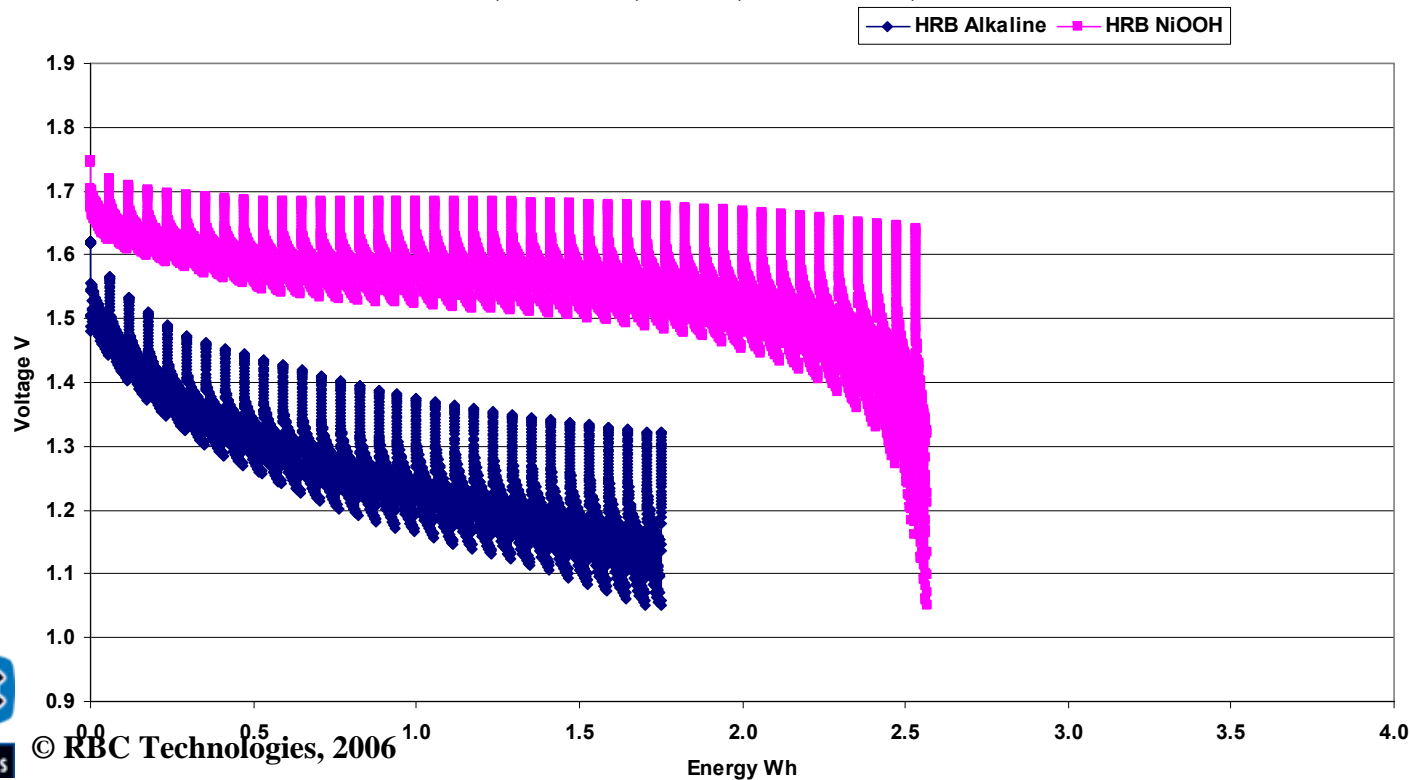


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RBC Performance

- **HRB Alkaline:**
 - 290 pulses, 1.7 Wh, 3.7X performance vs. standard alkaline
- **HRB Nickel Oxy-hydroxide:**
 - 430 pulses, 2.6 Wh, 5.5X performance vs. standard alkaline

RBC Products
AA Digital Camera Pulse Test
1.5 W 2s, .65W 28s, 10x/hr, Rest 55min, 1.05V

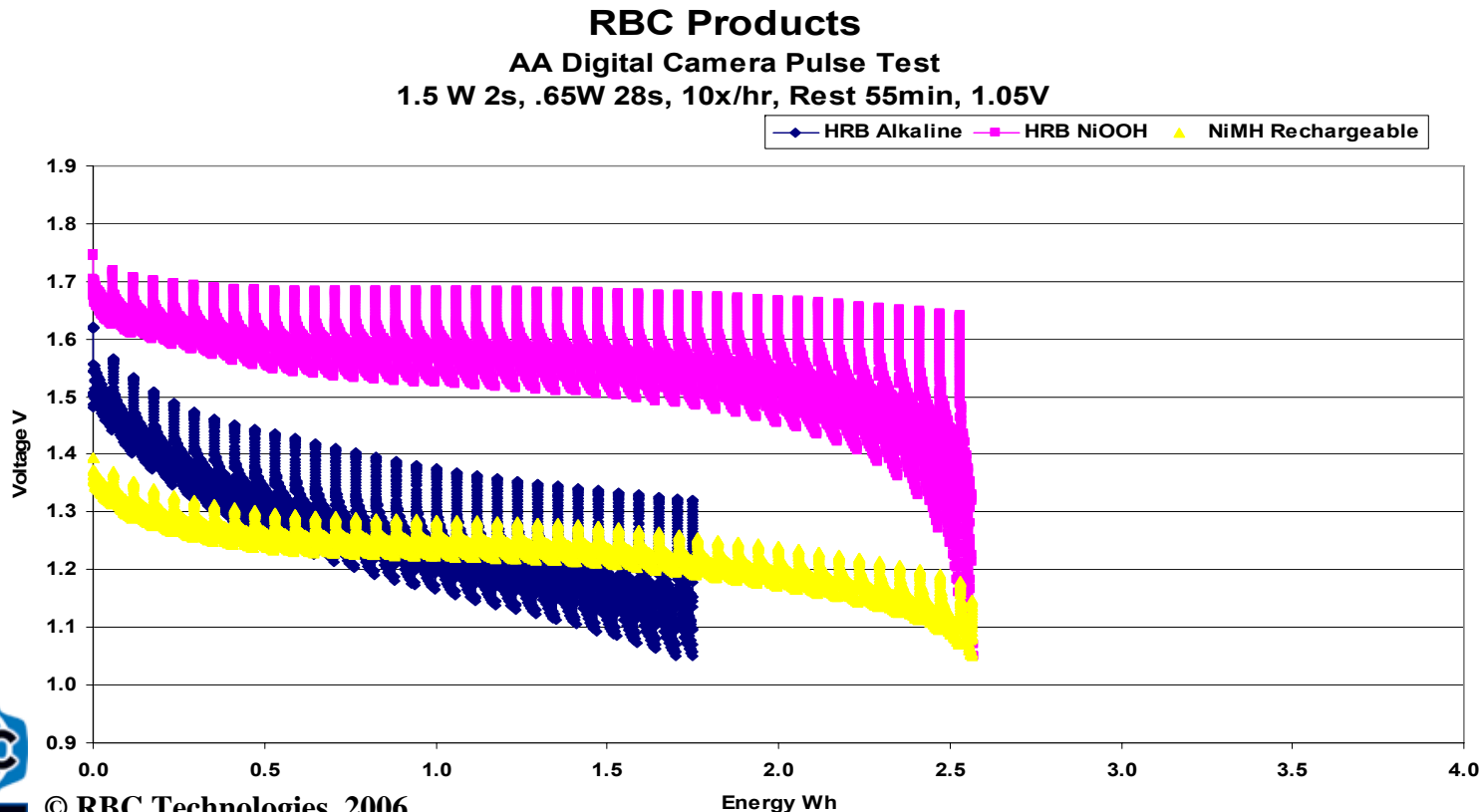


What About Rechargeables?

- HRB Alkaline:
 - 290 pulses
- HRB Nickel Oxy-hydroxide:
 - 430 pulses

Single cycle performance

- NiMH Rechargeable
 - 430 pulses
- Lilon Prismatic Rechargeable
 - 330 pulses (or 590 adjusted)



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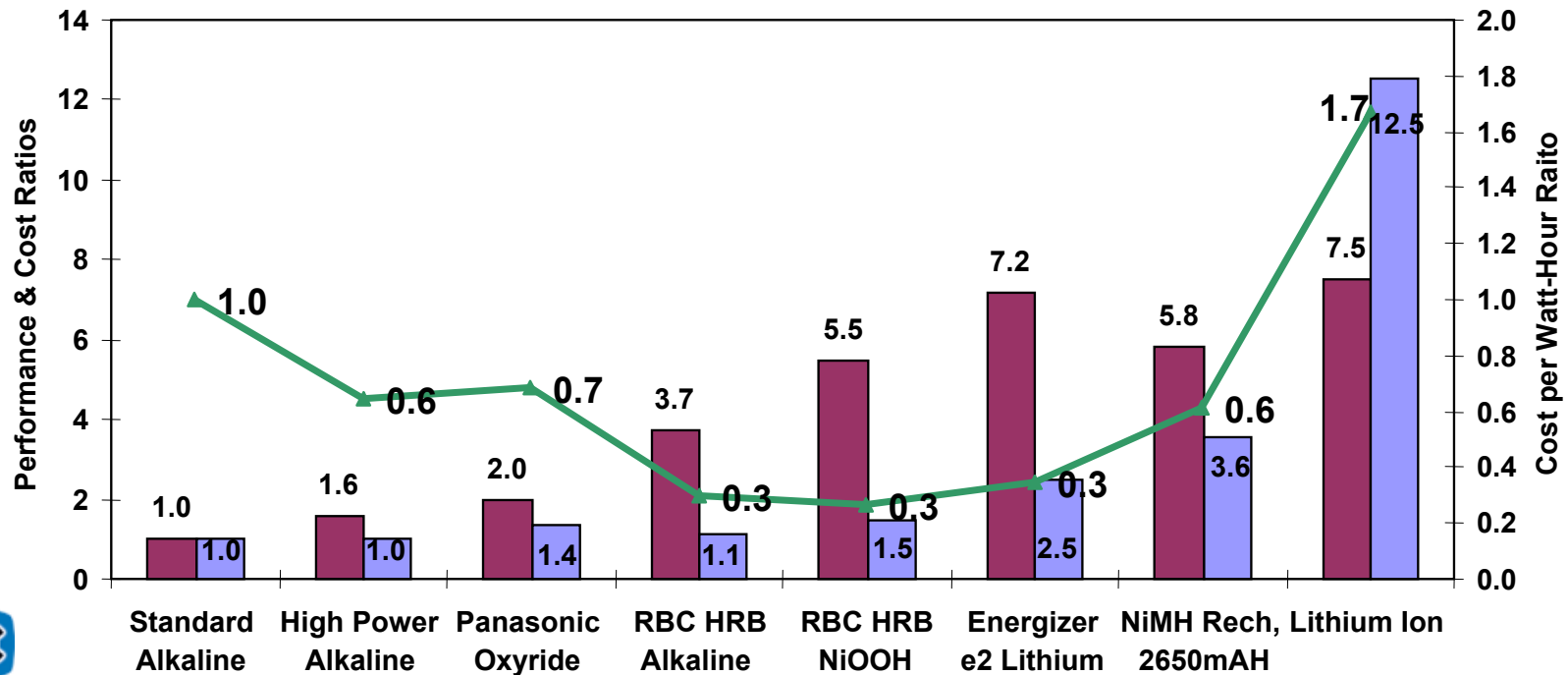
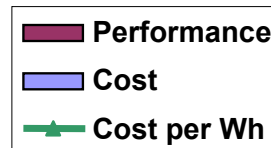
Cost & Value

- High power alkaline and Oxryde deliver comparable values vs. standard alkaline
- E2 lithium and both RBC products deliver superior values
 - RBC delivers value at close to alkaline price points

High Power Primary

Performance, Cost, Value

AA Digital Camera Pulse Test

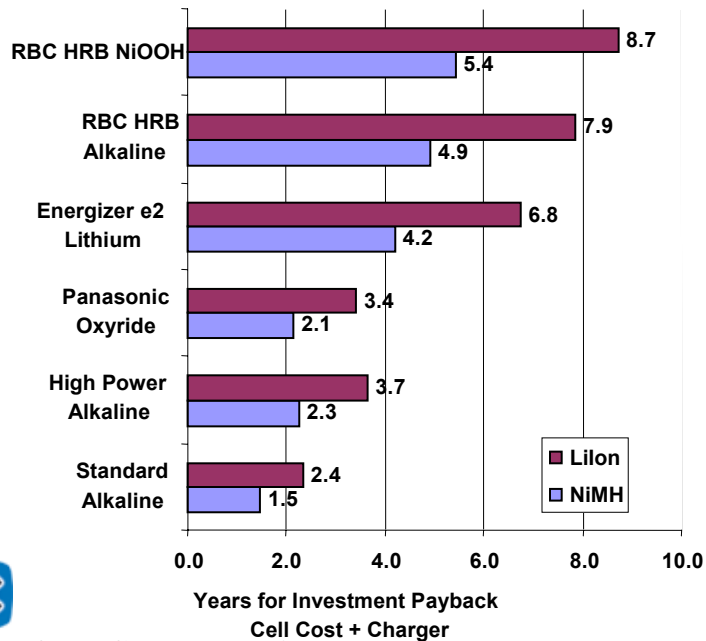


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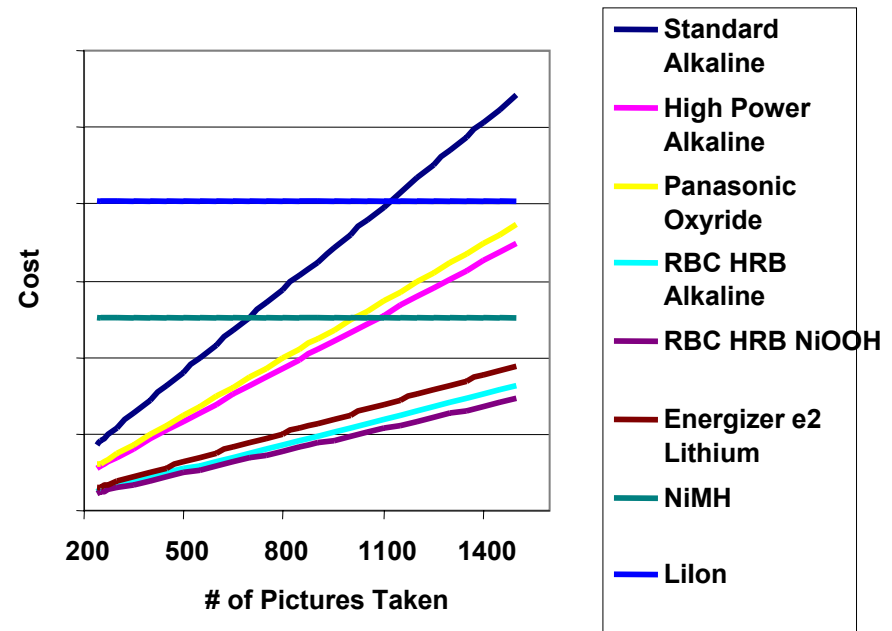
Values vs. Rechargeables

- Values for rechargeable products improve when cycles are considered
 - But...median digital camera pulses per consumer/year ~480
 - Almost double what film cameras were
 - Rechargeables don't make the 6 month payout for the median consumer
 - 2 to 5 years vs. primary products on the market
 - Vs. RBC HRB products: 5 to 8 years
- 1100 pulses are needed for your payback period to justify
 - Not most amateurs

The Recharging Investment



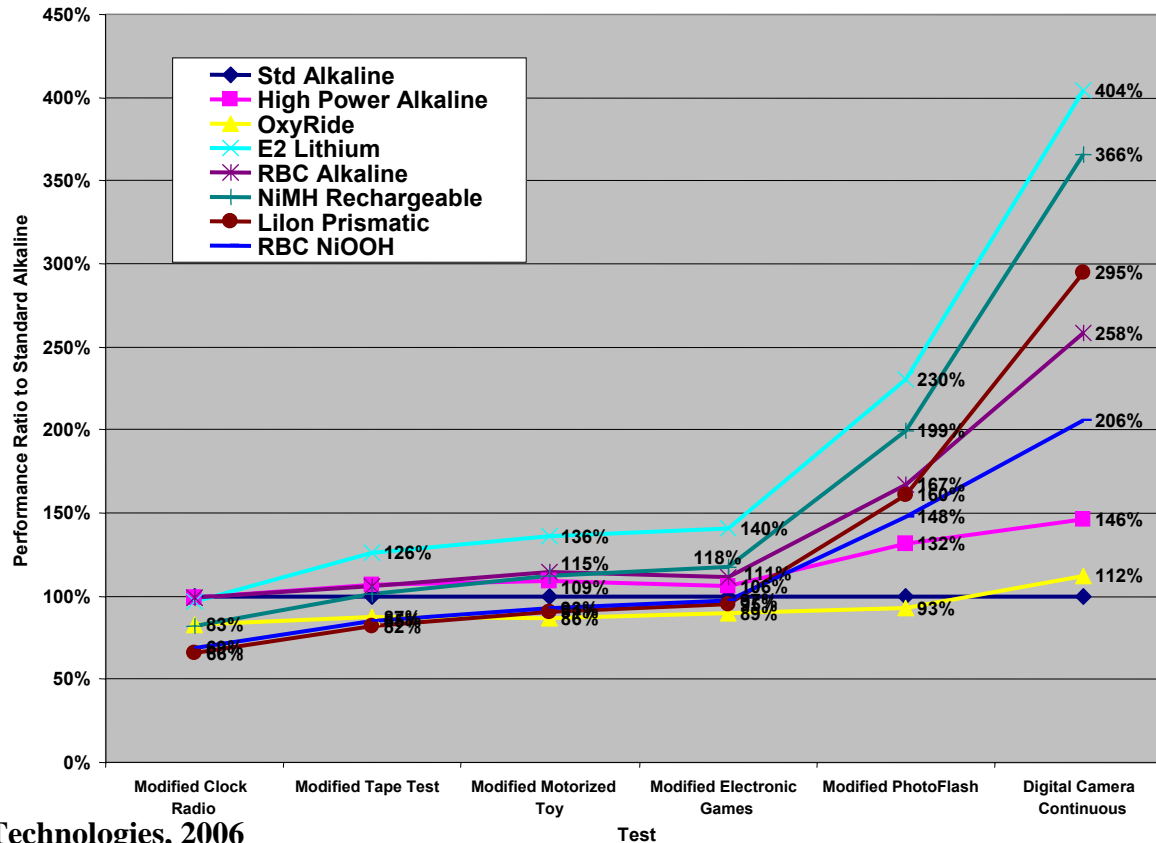
Rechargeable Payback by Picture Taking Usage



Other Application Test Results

- Benchmarked to standard alkaline as 100%
- E2 Lithium and RBC Alkaline are superior products in all test ranges
- Nickel products provide good high power performance but sacrifice performance at lower power

ANSI/IEC Test Results



Conclusion

Primary batteries...

- **...have more life in them!**
 - Increasingly capable of high power that required rechargeables
 - Continued developments in design, chemistry and manufacturing processes are improving performance and values
- **...deliver consumer convenience, avoiding the investment and long payout for rechargeables**
- **...deliver design options for OEMs**
 - Lower price point at the point of sale
 - Ready to operate out of the box

Challenge!

- **Incorporate the consumer into your design development process**
- **Talk to us about your needs!**
- **Talk to us about licensing!**



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