

Battery Applications for the Home: Diverse Requirements and Possibilities

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Florida Battery Seminar 2017

Introduction

- Windows 10 adoption by Enterprise customers was expected to drive some PC growth late in 2016
- Some studies indicate consumers may consolidate devices, rather add more: smart phone and tablet, or smart phone and PC with detachable tablet...
- ***Little Profitability in Consumer Electronics for Battery Manufacturers***

Battery Applications in the Home

- Smart Home
- Portable Appliances
 - Sweeper
 - Vacuum
 - Others?
- Gardening and Power Tools

Internet of Things

- Smart Home
 - Thermostat
 - Security
- Connected Cars
 - Security
 - Internet Access
- Wearables
 - Extension of Smart Phone
 - Fitness Tracking
 - Security
- Smart Cities
 - Smart Parking
 - Cameras
 - Traffic sensors
 - Security

Still Growth in IoT

- Big problem: Batteries for IoT devices are typically quite small and inexpensive. Still not much margin.

Smartwatches

Applewatch 205 mAh

Pebble Time Steel 150 mAh

Nike Sportwatch GPS 170 mAh

Garmin Vivoactive 150 mAh

Samsung Galaxy Gear 315 mAh

Samsung Gear 2 300 mAh

Other devices are typically wired (security cameras) or require very little power (thermostats)

Control Panels

- When Security is involved, backup power is essential
- Although control panels are typically wired, there is backup battery to provide power during outages
- Requirements for backup are much different than other consumer electronic applications
 - Constant high SOC
 - Possible higher thermal environment depending on product design
- Long term reliability and swelling concerns

Battery Requirements

- Must be reliable for years at high SOC and possible high temperature
- Cell makers must understand customer requirements before recommending chemistry
- High voltage chemistries can be used at lower charging voltage and prolong service life of the battery

Portable Appliances

- Personal grooming
 - We've come a long way from cordless toothbrushes and shavers!
 - Removing corded products from the bathroom eliminates safety risks
 - Hair dryers
- Cleaning products are growing fast
 - Dyson, Bissel, Hoover all offer vacuums with lithium ion batteries
 - Robotic vacuums are growing in popularity
- **Performance needs vary widely!**

Hairdryer

- 400 Watts
- 15 min runtime on Med Heat
- 7 min runtime on High heat



- Like a big powerbank
- Charge your phone while dry your hair ?!

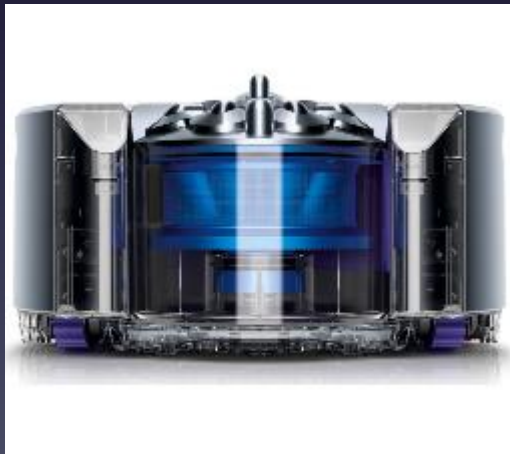
Vacuums

Many Sizes, Shapes and Features

Also varying power requirements



Robot Vacuums



Vacuum Power Requirements

- Vacuum motor, brush motor ...
- Cleaning power versus Run Time
- Varying run time from 8-40 minutes
- Robots are much lower power with 1 hour of run time or more

Power Tools

- Lithium Ion powered tools have been around for years.
- Workshop: Screwdrivers, drills, saws
- Lawnmowers, trimmers, chainsaws

Battery Requirements

- Vacuums are much like power tools
 - High rate capability, up to 8C
 - Battery thermals can affect run time significantly
 - Must shut off due to voltage or capacity, NOT temperature
- Robot Vacs need weight to improve cleaning capability, so NiMH is still used in some products
- As run time becomes a differentiating feature, lithium ion chemistries are replacing NiMH in home appliances

Summary

Battery requirements for the home cover the range of lithium ion chemistries available.

Customers always want equivalent performance to corded products and this will drive higher power capability and longer run times.

Just as in Consumer Electronics, there will be trade-offs that need to be clearly communicated to avoid customer dissatisfaction.