Mitigating Cell-to-Cell Thermal Communication during Thermal Runaway Events in Batteries

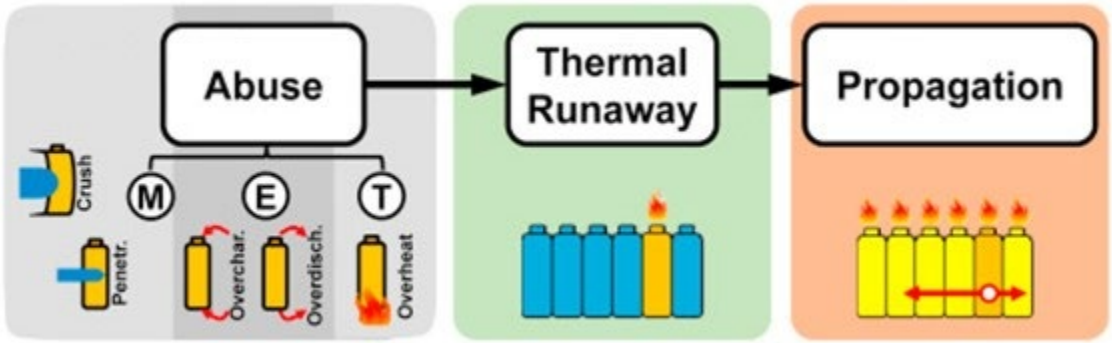
2021 Space Power Workship
SPW Lightning Talks

April 20th, 2021

Kevin Roth (PhD), Project Manager,
ADA Technologies
kevinr@adatech.com, 303-874-8287

ADA – Need for Cell Protection

- Lithium-ion batteries are ubiquitous in everyday life
- High-energy lithium-ion batteries have inherent safety risk of thermal runaway
- Thermal runaway
  - Damage leads to elevated temperatures, feeds exothermic decomposition, results in thermal runaway event



X. Feng, et al, 2017

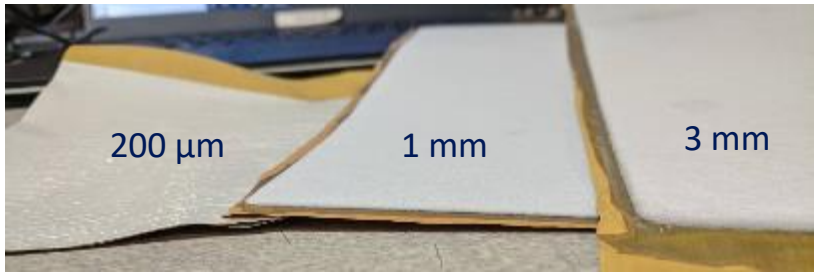
- Heat from thermal runaway can propagate to adjacent cells causing a cascading failure event, eventually leading to entire battery failure
- Noteworthy examples:
  - Variety of EV-related incidents
  - Boeing 787 Dreamliner
  - April 2019 lithium battery fire at Arizona Public Service facility likely caused by thermal runaway

ADA – Thermal Runaway Performance of ADA's QiStop™ materials

QiStop™ – lightweight layers of flame and heat resistant materials

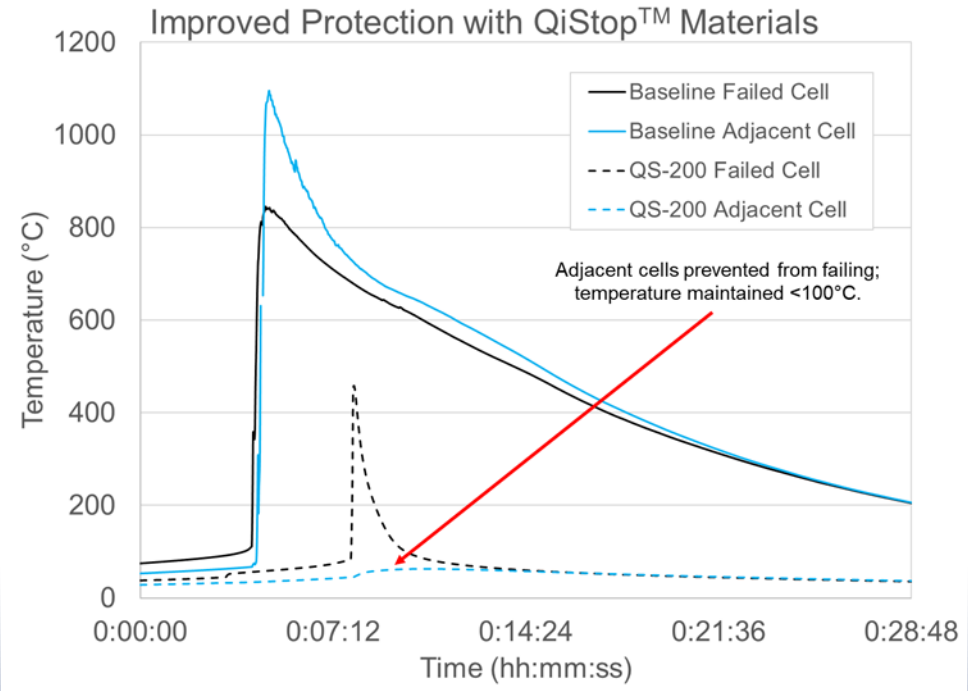
Pouch Cell Testing

- Demonstrated on mock-up 3-6 cell battery packs (5Ah, 16Ah cells)
- Cells stacked together with light compression, one cell overcharged to failure
  - Baseline test: no protection, full cascading failure
  - QiStop™ protection: prevention of cascading runaway event; adjacent cells maintain pre-test voltage



Baseline cells post-test

QiStop™ cells post-test



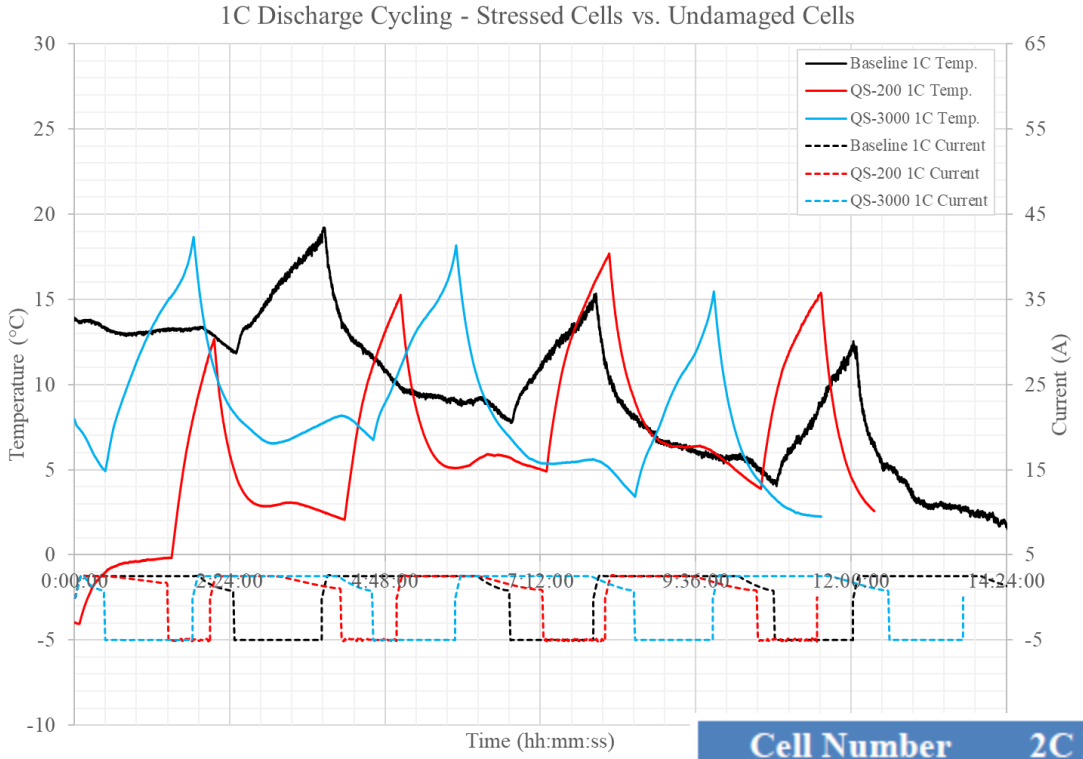
ADA – Thermal Runaway Performance

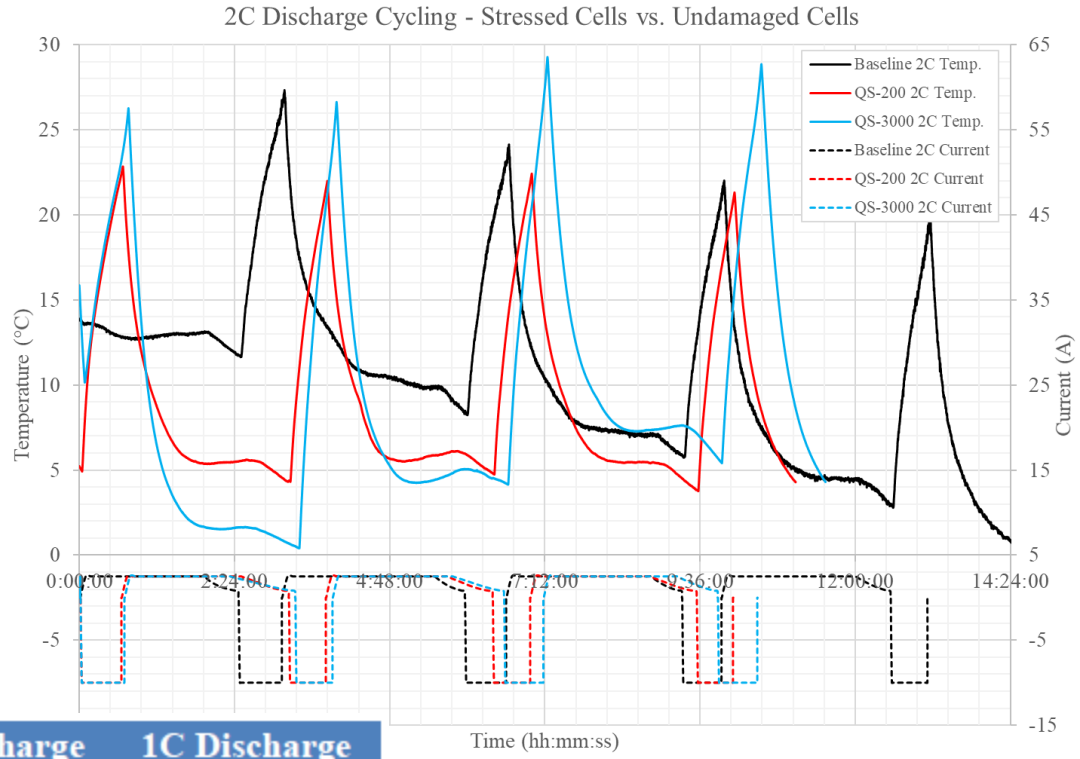
Baseline – first 30 seconds

QiStop™ – first 30 seconds

ADA – Stressed Cell Cycling – Post-Pouch Cell Overcharge

- Cells from QS-200™ and QS-3000™ 3-cell overcharge tests
- Only overcharged cell (center cell) failed during test
  - ***Adjacent cells cycled after event with only slightly decreased capacity***





Cell Number	2C Discharge Capacity	1C Discharge Capacity
Unharmed Cell	6.19 Ah	6.25 Ah
QS-200™	5.84 Ah	4.27 Ah
QS-3000™	6.15 Ah	6.27 Ah

ADA – Contact Information

Point of Contact
Dr. Kevin Roth
Project Manager
kevinr@adatech.com
Office: 303.874.8287
Cell: 719.250.1575

Russ Farmer
Executive Vice President
russf@adatech.com

Bill Gunter
Mgr. of Technology Transition
williamg@adatech.com

CERTIFIED ISO 9001:2015 COMPANY

ITAR Compliant International Traffic in Arms Regulations

ADA Technologies, Inc.