Morgan Advanced Materials

NAATBatt 2019
Company Update – March 13, 2019

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Morgan Advanced Materials (LON: MGAM)

Approximately 8,800 employees
Manufacturing in over 30 countries
Selling into more than 100 countries
2018 revenue GBP1.03 billion

Primary markets addressed (% by 2018 revenue)

- Industrial
- Transportation
- Petrochemical and Chemical
- Energy
- Semiconductor and Electronics
- Security and Defence
- Healthcare

Global Business Units
- Thermal Ceramics
- Molten Metal Systems
- Electrical Carbon
- Seals and Bearings
- Technical Ceramics
What’s the deal with thermal runaway….

Parameters for tests:
- Module with 24 prismatic NMC cells
- Two cells are grouped together to form an element
- Each element separated by material sheets
- One element within the module was overcharged until thermal runaway occurred
- 100% SOC for all cells within module
- All inherent safety features disabled
Morgan’s suite of solutions for prevention or mitigation of the effects of a thermal runaway event

**Cell-cell**
- Prismatic/cylindrical:
  - Superwool EST Block
  - Superwool EST Paper

  **Pouch:**
  - Superwool EST Compression Paper

**Module-module**
- Superwool Papers
- Mica Laminated Superwool Plus Paper
- WDS Vacupor
- WDS Lamdaflex

**Pack**
- Superwool Papers
- Fiberglass Laminated Superwool Paper
- Superwool Blankets
Morgan in energy storage

**Related Technologies**
- Thermal processing of electrode materials
- EV lightweighting
- EV vacuum pump components
- EV water pump components
- Ceramic feedthroughs

**Alternative Technologies**
- Fuel Cells
- Supercapacitors
- Flow batteries
- Sodium-sulfur
- Sodium-metal halide

**Lithium-Ion Batteries**
- Dealing with Thermal Runaway
- Anode materials and additives
- Separator materials
- Recycling technology (molten metal separation)
- Battery transportation
- “Beyond Lithium Ion”

**“Beyond Lithium Ion”**
- Lithium-Ion Batteries

**EVD**
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**Separator materials**
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Thank you