



Images courtesy of EaglePicher

CUSTOMER:
EaglePicher Technologies

INDUSTRY:
Defense Electronics/Power Systems

PROJECT NAME:
Thermal and Mechanical Analyses of a Lithium-Ion Battery

CUSTOMER LOCATION:
Joplin, Missouri

OVERVIEW

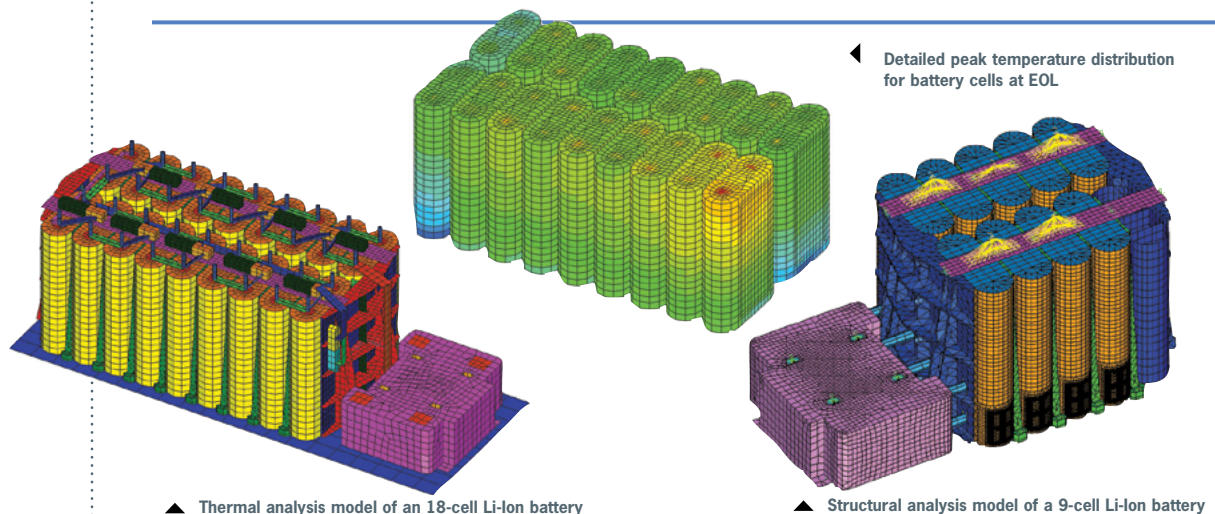
EaglePicher Technologies is a leading producer of batteries and energetic devices for the defense, space, and commercial industries. In particular, EaglePicher is a leading developer and supplier of lithium-ion (Li-Ion) batteries to satellite manufacturers. The batteries are subjected to high dynamic accelerations during liftoff and extreme temperature environments once deployed in space. ATA has supported EaglePicher since 2007 by providing a comprehensive suite of thermal and mechanical analyses to support the design of a number of different Li-Ion battery systems.

THERMAL ANALYSIS SUPPORT INCLUDED:

- ▷ Developed thermal finite element models (FEMs) of the batteries.
- ▷ Defined thermal coupling and resistances between components.
- ▷ Performed transient thermal analysis for multiple load cases. Transient thermal analysis simulated the maximum depth-of-discharge (DOD) eclipse cycle. Temperature profiles were predicted throughout the 70-minute discharge period for end of life (EOL) without cell failure and EOL with one cell failure.
- ▷ Developed summaries of predicted thermal profiles for all load cases and maximum and minimum temperature time histories for each cell.
- ▷ Correlated thermal FEM using thermal couple test data at 24 locations on the structure.

MECHANICAL ANALYSIS SUPPORT INCLUDED:

- ▷ Developed structural FEMs for the batteries.
- ▷ Performed quasi-static analyses and determined component stresses and fastener margins of safety.
- ▷ Conducted modal analyses of systems using NX Nastran and determined both random response and shock response using the forced response analysis module of I-deas NX. Calculated component and fastener margins of safety and predicted RMS accelerations at critical locations.



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