

Engineering Impacts on Battery Pack Manufacturing

Charge your projects with innovation.
Put our extensive design expertise to
work for you.



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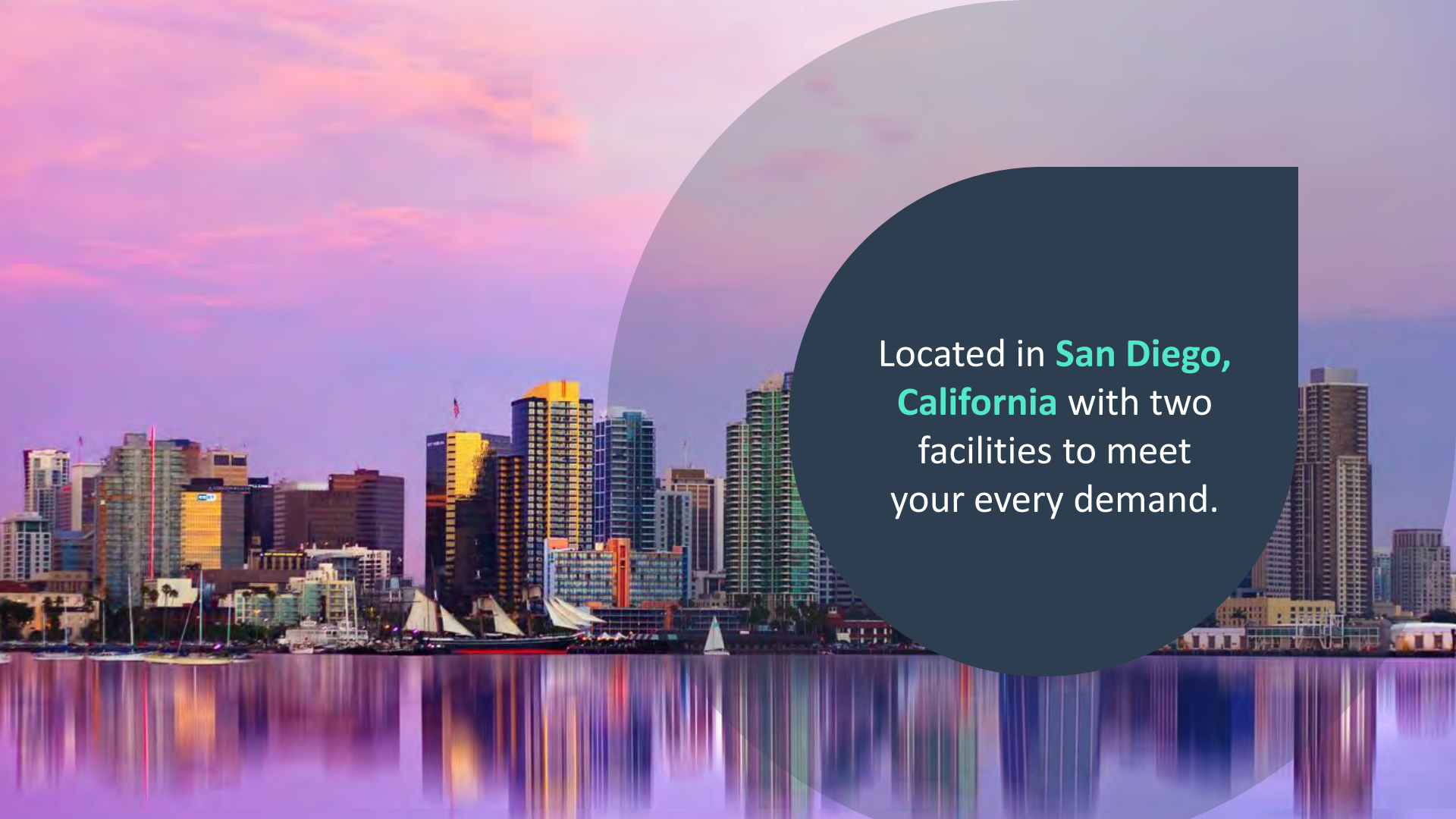
BATTERY POWER
2016
AUGUST 3-4 • DENVER

Agenda



- iTECH Overview
- Common Requirements
- Li Ion Battery Pack Assembly
- Manufacturing Implications
- Engineering Investments
- Conclusion



A panoramic view of the San Diego skyline at sunset. The sky is a mix of soft pinks, purples, and blues. The city's skyscrapers are illuminated, with some reflecting the golden light of the setting sun. In the foreground, the water of San Diego Bay is calm, creating a clear reflection of the city and the sky. Several sailboats are visible on the water. A large, dark teal circular graphic is overlaid on the right side of the image, containing white text.

Located in **San Diego,**
California with two
facilities to meet
your every demand.

Overview



Location: San Diego, CA

Founded: 1997

2015: Subsidiary of Universal Power Group (UPG)

Office + Manufacturing: 38,000 Square Feet

Two Facilities:

- Building A: 18,000 Square Feet (Offices & Manufacturing, SMT-PCA, Charger Assembly)
- Building B: 20,000 Square Feet (Battery Pack)

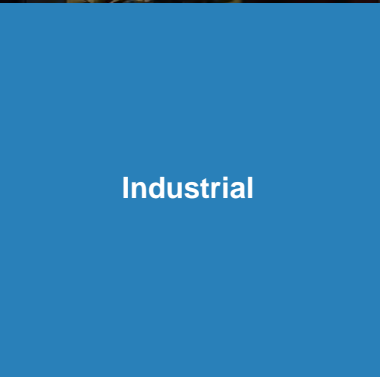
- > iTECH specializes in the design and manufacture of custom battery packs and battery chargers
- > Providing engineered application-specific product solutions
- > Support most cell chemistries – NiCD, NiMH, Li-Ion and LiFePO4
- > ISO 9001:2008 certified and ISO 13458:2003 certified
- > FDA: CA Licensed, Product Registered



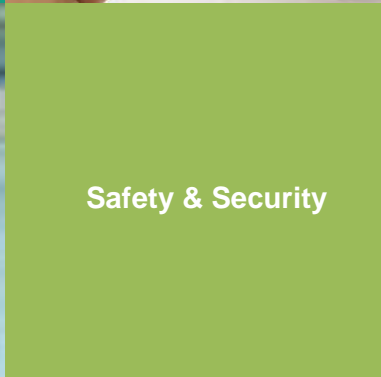
**Handheld
Instruments**



Medical



Industrial



Safety & Security



**Communications/
Military/Homeland
Security**

Application Focus:

- > Portable Power – Batteries, Charging and Docking Systems supporting a Host Device
- > Where Health, Safety or Significant Revenue Count on Predictable Battery & Product Operation

A Continuation of Past Presentations

- August 2013 Choosing the correct
Li Ion Cell
- August 2014 System Level
Considerations
- August 2015 Safety from an
Applications Perspective

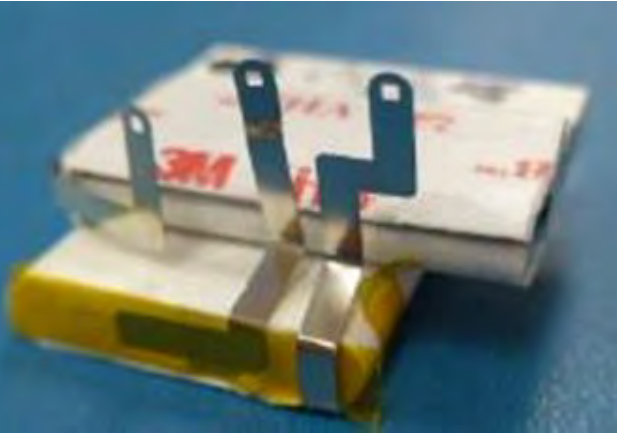
Common Requirements

- Shrink Wrap
- Injection Molded Cases
- Potted Packs



Common Requirements

- Resistive Welding
 - Ni Strips
- Manufacturing Alignment Tools
- Test Fixtures and Processes



Resistive Welding

- Resistive welding uses electric current and mechanical pressure to create a weld between two pieces of metal. In our case a battery or PCBA is connected to a Ni Strip. Electrodes conduct the electric current to metals such that they are fused together.

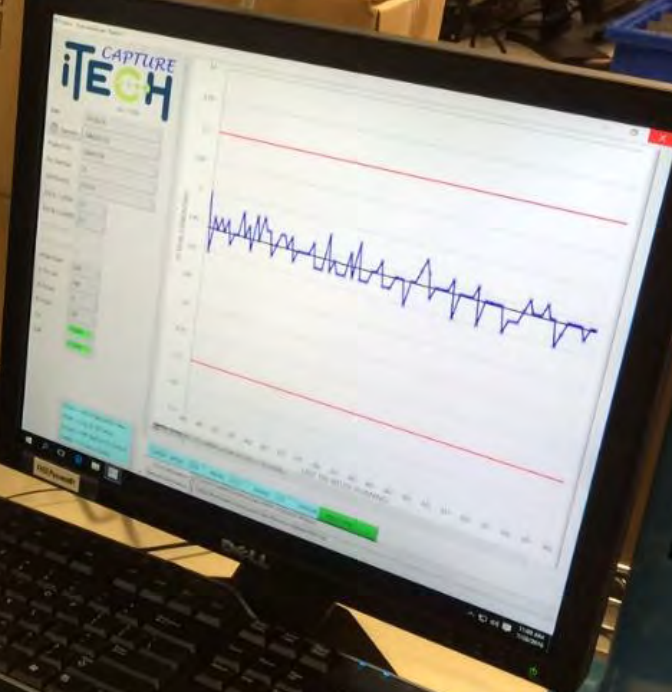
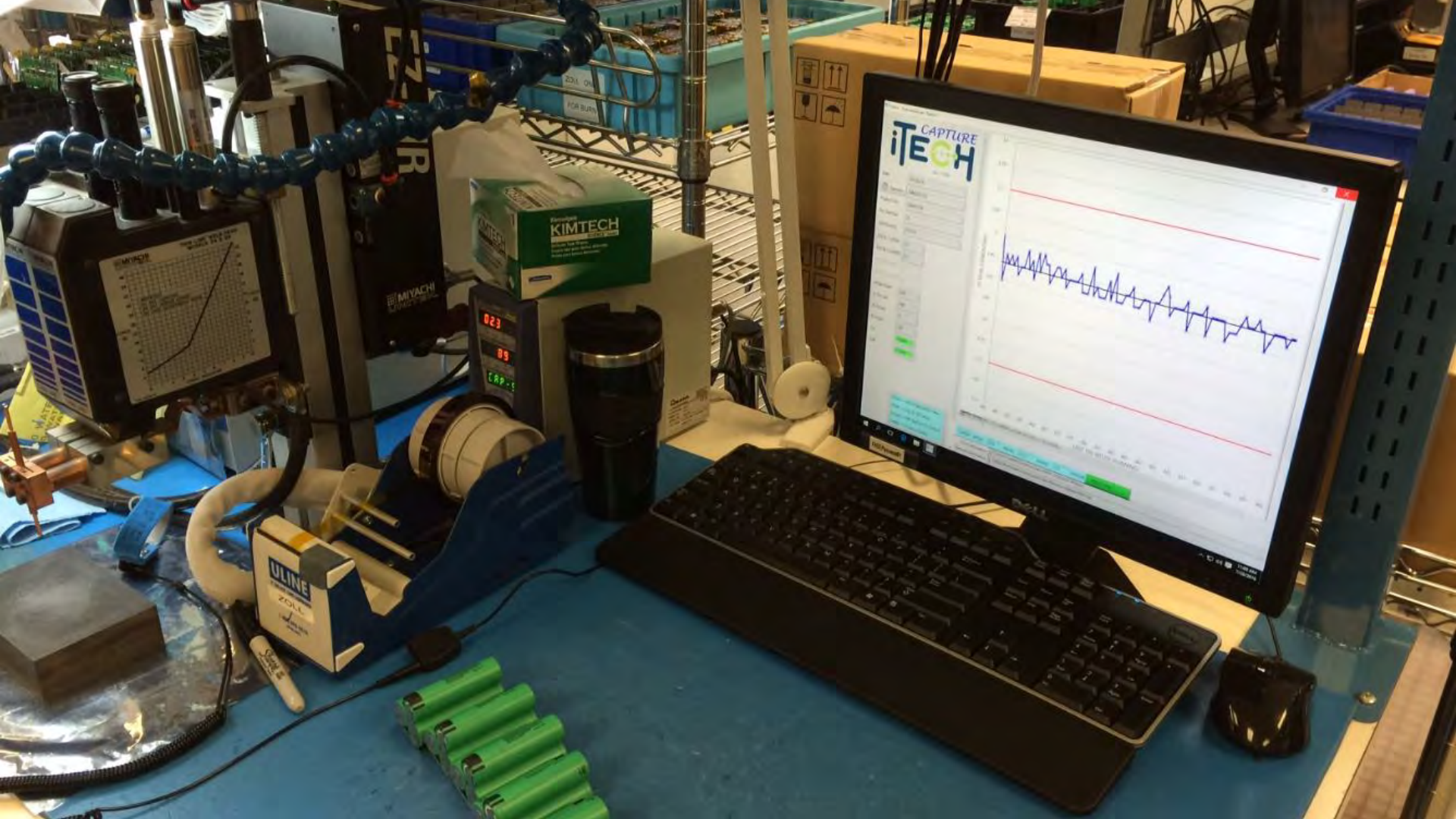


Resistive Welding

- Statistical Process Data provides weld quality assurance
- Pull testing validates set ups
- Fast and reliable process
- Solder? Placing a Soldering Iron on a Li-Ion Cell is not Recommended.







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CAP-5

ULINE
ZOLL
BATTERY CHARGER

ZOLL
BATTERY CHARGER

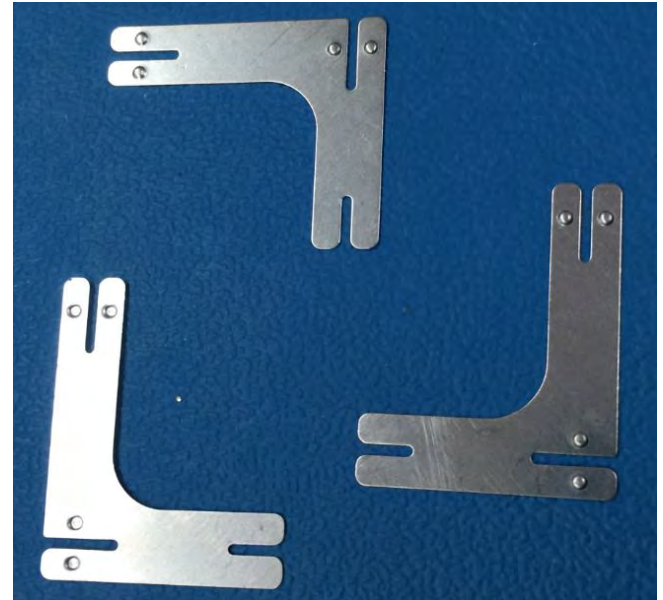
FRAGILE
HANDLE WITH CARE
DO NOT OPEN
FOR BULK

MIYACHI
ULTRASONIC CLEANER



Ni Strips

- Ni Strips can be tooled to make precise fits between cells and PCBAs
- Industrial Design often limits space
- Application specific Ni Strips allow
 - Tight weld controls
 - Mechanical precision
 - Elimination of a failure mode





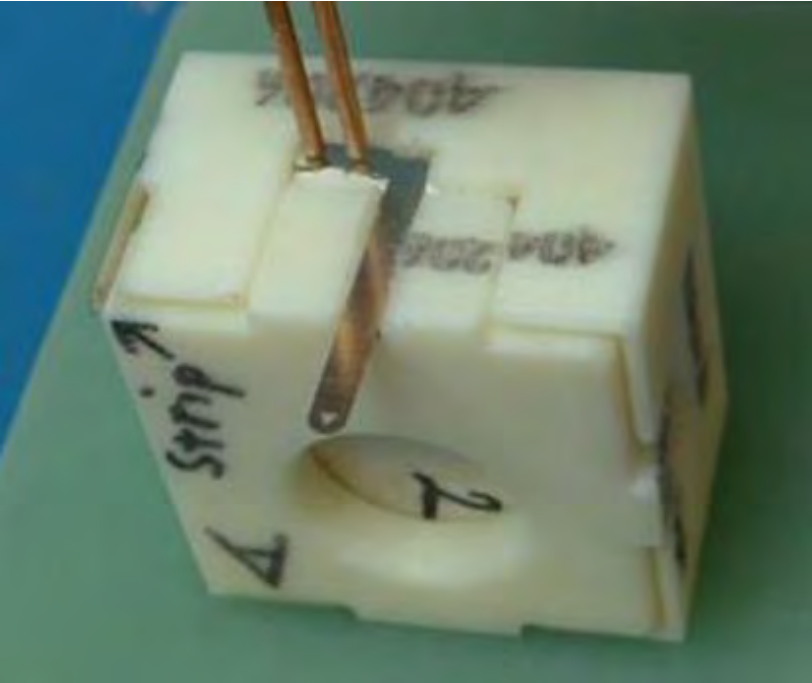


Manufacturing Alignment Tools

- Allows accurate repeatability
- Pokeyoke
- Save time



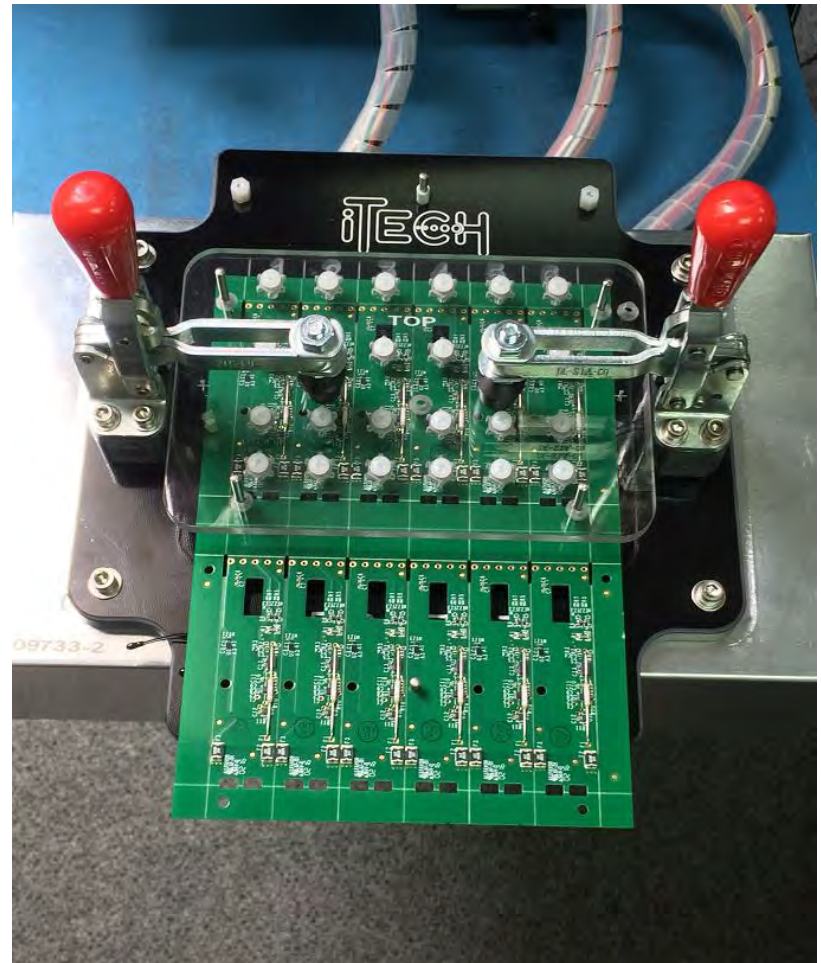
Manufacturing Alignment Tools



Test Fixtures Processes

- Simulate use and failure models
 - Test PCBAs
 - Test Finished product
- Keep records
- Analyze data
- Continuously Improve





Li Ion Battery Pack Assembly

- Shrink Wrapped Battery Packs
- Injection Molded Battery Housing
- Potted Battery Packs

CHARGE YOUR PROJECTS WITH
INNOVATION

Shrink Wrap

- Interconnect
- PCBA Location
 - Components in or out
 - Sharp edges tear
- Single wrap plus end caps
- Dual wrap
- Used in embedded applications



Injection Molded Battery Housing

- Project must allow for:
 - Industrial Design, Prototyping, Hard Tooling, Mold Testing/Flow Analysis, Tool Texturing
- In most cases the battery pack becomes part of the host exterior.

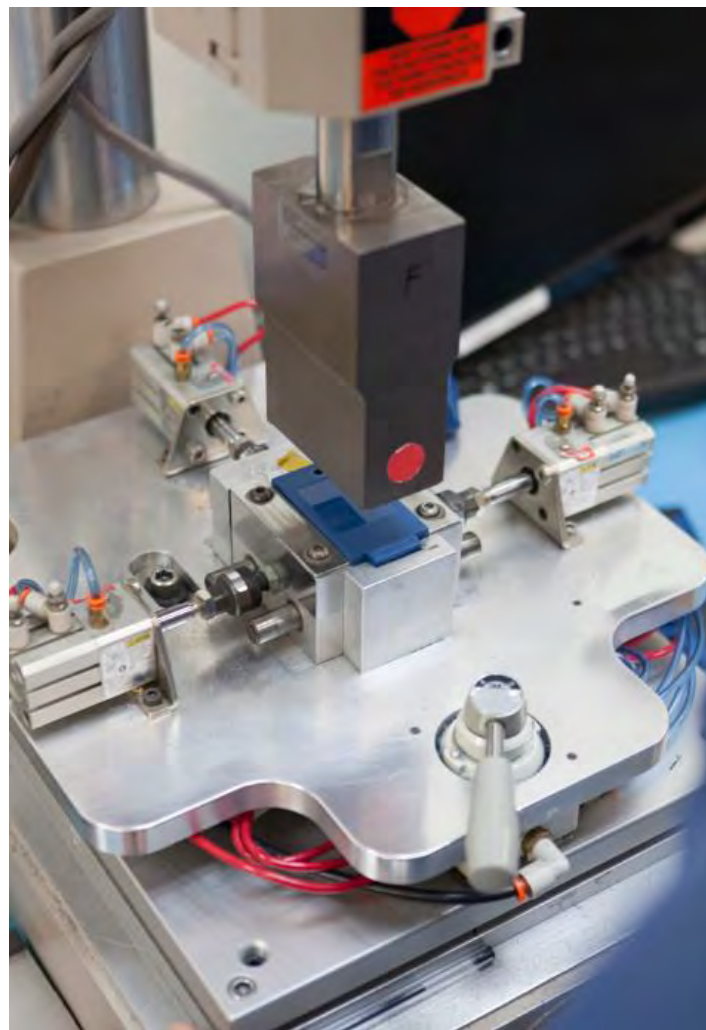
Injection Molding

- 2 to 4 Weeks
- 2 Weeks
- 6 to 8 Weeks
- 1 Week
- 1 Week
- 1 Week
- 12 to 18 Weeks

Plastic Design
Vendor Selection Quoting
Tool Fabrication
First Shot and Shipping
FAI Acceptance
Texturing

Closing Injection Molded Packs

- Ultra Sonic Weld
 - Plastic parts are bonded together using high frequency vibrations to melt designed surfaces together.
- Packs may also use traditional methods such as screws, glues or snap features



Environmentally Sealed

- IP Ratings for Air and Water tightness can be achieved
- Tested
- Sealed with Burst Disk





Potted Battery Packs

- Used in the most extreme environments such as Intrinsic Safety
- A whole pack or just a portion may be potted
- Potted products take advantage of many manufacturing operations

Potted Battery Packs



Potted Battery Packs





317

18

229

50

94

115



Manufacturing Implications

- Shrink Wrap
 - Lowest Cost
 - Quick to Produce
 - Suitable to Embedded



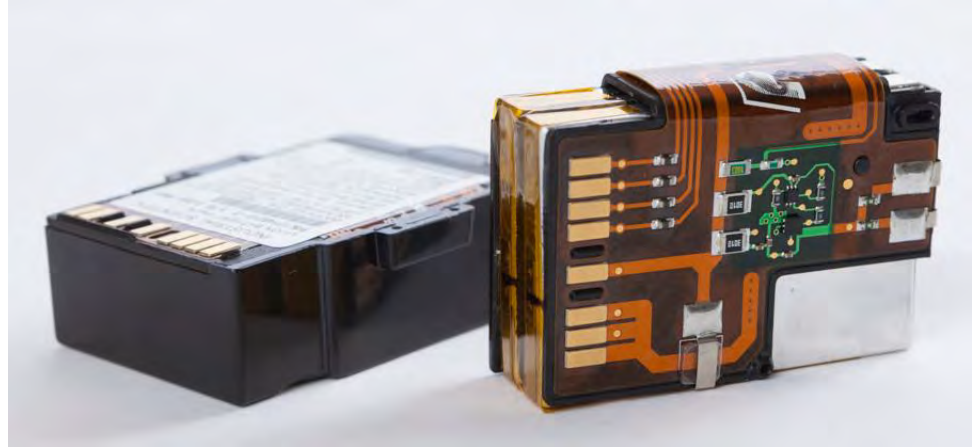
Manufacturing Implications

- Injection Molded Battery Packaging
 - Tooling
 - Pack sealing process
 - Finished product



Manufacturing Implications

- Potted
 - Longest production process
 - Requires advanced techniques
 - Suitable to the most critical environments



Engineering Investments

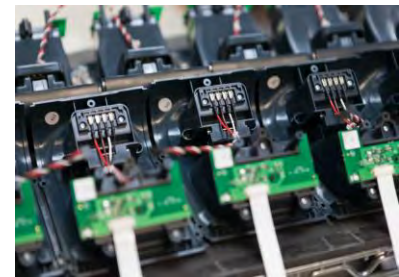
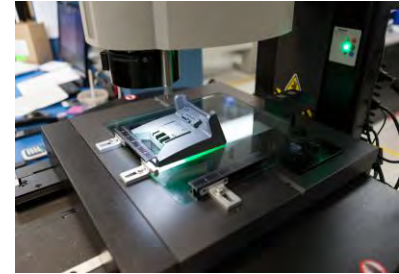
- Electrical
- Software
- Mechanical
- Documentation
- DVT
- PCBA Stencil
- PCBA Test Fixture
- PCBA Layout

Engineering Investments

- Certifications
 - UN38.3
 - UL2054
 - IEC62133
 - Environmental
 - Emissions
- Plastic Tooling
- Ultra Sonic Horn and Nest
- Custom Components
 - Ni Strips
 - Contacts
 - Retention Clips

Conclusion

- A well engineered product also needs a well engineered production process



Questions?



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