



CONSUMER PRODUCTS LITIGATION & EVALUATION SUPPORT



Engineering Systems Inc.
Engineering Consulting and Forensic Investigation

INTRODUCTIONS



Brian May, Ph.D.

ESi Staff Consultant
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Dr. Brian May is experienced in the areas of chemistry and materials science. His background encompasses a wide array of characterization techniques, and he is also well versed in experimental design and execution, data interpretation, and communication of findings. Dr. May has developed cutting edge methodologies for characterization of battery materials and investigated a number of failures involving lithium-ion cells and batteries. He has published in peer-reviewed journals and given several technical presentations.



Jonathan Jordan, P.E., CFEI

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Jonathan Jordan is an electrical engineer with extensive experience in product safety failure analysis resulting in design and ODM changes and recalls. His projects have included electronics, printed circuit boards, appliances, HVAC/R, residential and commercial wiring, motors, power supplies, and battery failure analysis, with an emphasis on lithium-ion battery chemistry.



Jessica Crosby

Senior Staff Consultant
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Jessica Crosby is an electrical engineer specializing in automotive and electrical investigations. Ms. Crosby performs root cause analysis of electrical wiring and control module defects, electrical certification, new software and hardware validation, defect containment, and warranty analysis. She is skilled in Shainin black belt methodology, and six sigma reactive analysis.

ABOUT ESi

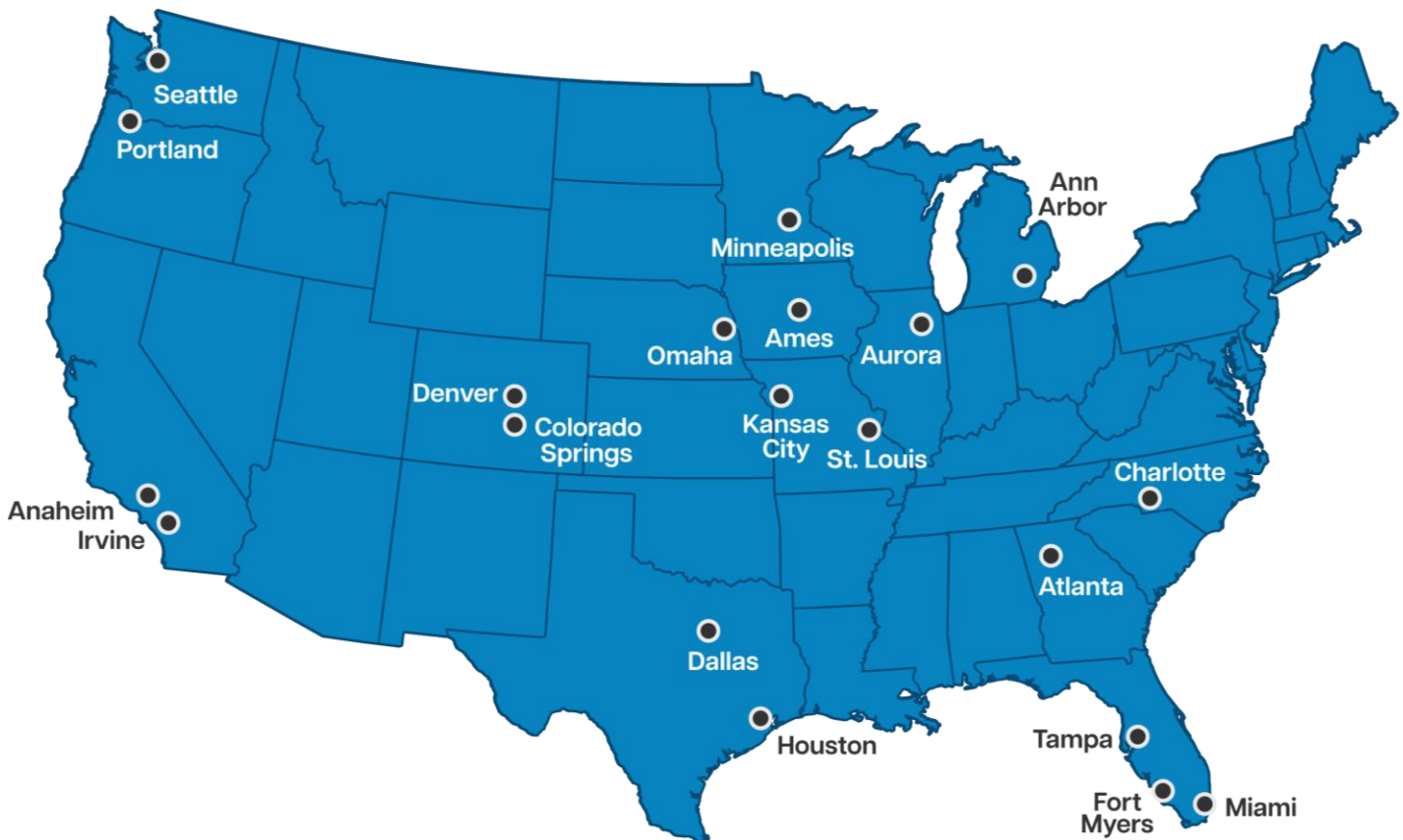
ESi (Engineering Systems Inc.) is an engineering consulting and forensic investigation firm with experienced technical consultants who cover almost every industry, discipline, and geography. We can provide rapid response to large, complex losses and high-profile investigations virtually anywhere in the world.

Collaborative Teamwork

ESi applies a multidisciplinary approach that allows us to help with virtually any type of project, no matter how large or complex. We have engineers in almost every technical area including: Aeronautical, automotive, biomechanical, chemical, electrical, civil, marine, materials, mechanical, metallurgical, and structural engineering. We also have experienced fire and explosion investigators and environmental scientists. Our consultants pair technical expertise with in-depth industry knowledge and litigation experience.

ESi Locations

ESi locations have expanded over the past 35 years to include 20 offices in 14 states across the country. ESi has over 400 in-house technical personnel, including licensed Professional Engineers (P.E.s) with advanced degrees (both M.S. and Ph.D.). ESi is uniquely positioned, both professionally and physically, to provide our clients with superior results.



PRODUCT LIABILITY CAPABILITIES



ESi brings its breadth of engineering specialties to product development and product liability issues. Our team provides technical consulting and analysis related to alleged user injuries, product design, materials selection, technical and safety manuals, and on-product labels.

Assisting Manufacturers in Safety Analysis

ESi engineers, scientists, and technical professionals can reconstruct and test accident scenarios and assist manufacturers in safety analysis and pre-release product testing.

When unexpected product performance issues arise, ESi applies its expertise to finding root causes and recommended solutions. We have experience with the Consumer Products Safety Commission and assist clients making recall, back fit, or notification decisions.

State-of-the-Art Laboratories

ESi has state-of-the-art laboratories, test facilities, and analysis tools enabling us to conduct multidisciplinary investigations on most consumer products.

Materials and Product Testing

ESi conducts a wide range of materials and product testing. We can create both digital and physical demonstratives. ESi can facilitate complete investigations from inception to litigation.

Areas of Specialization

- Children's Products
- Heavy Equipment
- Statistical & Reliability Methods
- Consumer Products
- Recreational Products
- Sports & Exercise Equipment
- New Product Development & Manufacturing Support
- Industrial Products
- Medical Devices

For more information visit: www.engsys.com/areas-of-expertise/products

866.596.3994

CT SCANNING & VISUALIZATION



Radiographic Investigation

Computed tomography (CT) imaging is a nondestructive method to quickly identify internal material flaws or failed components. CT imaging provides high resolution 3D images of an object and its internal structures. These images can be viewed from any angle, manipulated, and graphically deconstructed and reconstructed layer-by-layer. A CT scan creates a virtual copy that preserves the internal and external features of an object and is dimensionally accurate, permanent, and a complete record.

Visualization

ESi is often engaged early in a project to explore scientific facts long before a trial ever begins. In many cases, opposing counsel quickly understands their weakened position when visualizations are developed that capably communicate their client's liability.

ESi has a unique blend of scientific and artistic expertise that is the creative force behind compelling and technically accurate images in the courtroom. Our scientific experience and visualization methods have proven useful in exploring the technical details of a case in preparation for litigation.

Data collected from laser and CT scanners can be combined with data from a wide array of other sources to produce accurate, dynamic depictions of events. By providing a 3D digital vision of a mechanical device or still graphics that expose the details of a plaintiff's injuries, images can help make the nuances of the science in a case accessible to everyone on the legal team and allow the layperson and expert viewers alike to experience data-driven, scientifically constructed scenarios with the element of time included. ESi visualization products can be used in expert reports, deposition exhibits, mediation tools, and courtroom presentations.

- Data Collection & Scene Preservation
- Technical Illustrations & Drawings
- Drone Services
- Trial Exhibit Preparation
- Digital Video Editing
- Virtual Reality
- Graphic Design Services
- Scale Models

ESi now offers ESi LIVE, a technology-driven remote inspection service that delivers live inspections and post-inspection analysis sessions remotely using live streaming and advanced communication and visualization tools. For more information visit: <https://www.engsys.com/esi-live>

BATTERY CAPABILITIES



ESi battery experts have a broad range of hands-on experience in the design, construction, testing, safety assessment, and failure analysis of batteries and battery-powered consumer products. We also possess the expertise to analyze how a battery's internal chemistry can contribute to a fire event or other failure. Our experts can help resolve whether a battery, or battery-powered device, was an ignition source.

No amount of design, testing, or careful manufacturing can prevent attorneys, insurance personnel, and investigators from implicating a battery as the cause of a fire, even if the battery was not at fault. ESi can scientifically evaluate these claims due to our expertise in fire investigation, failure analysis, and testing. Even after a fire, our advanced laboratory capabilities can help identify the battery model and signs of failure in the evidentiary remains.

When batteries are falsely accused, we can provide an evidence-based defense. When design or manufacturing issues arise, we can propose corrective action and if needed, help guide the recall.

Battery Management System Testing & Evaluation

- Prevent over-charging, over-discharging, and short circuits
- Evaluate circuit design and component selection
- Provide guidance on fault condition handling
- Test performance during fault conditions

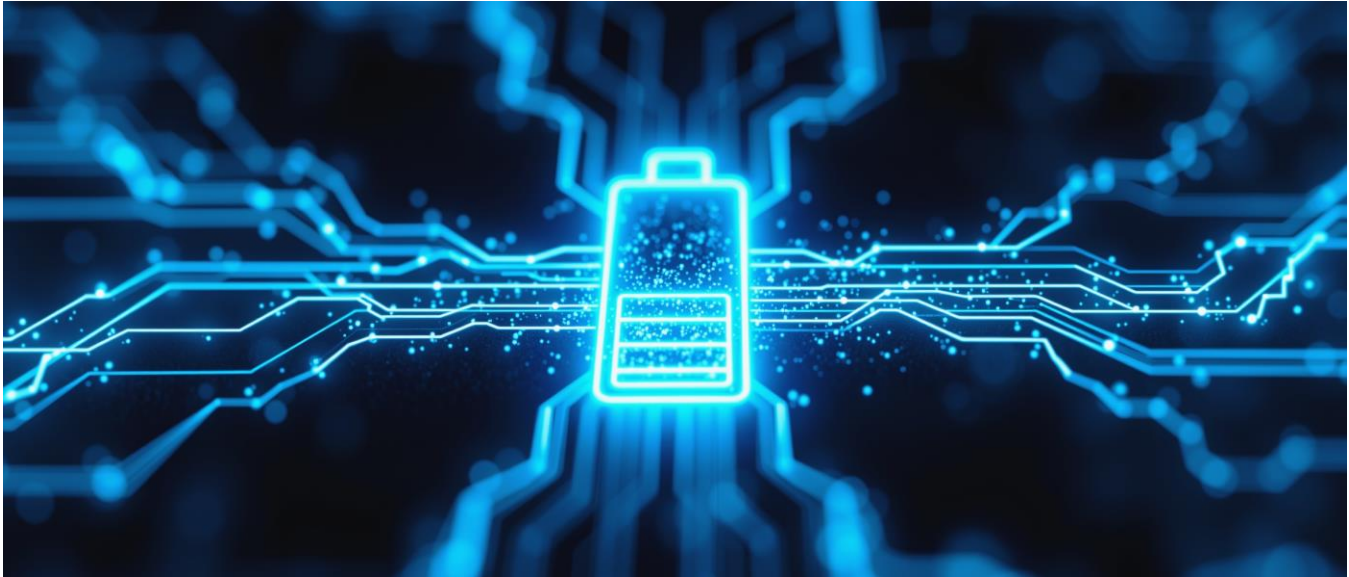
Product Charge & Discharge Evaluation

- Review safety features of charge circuitry
- Analyze charging technique and discharge controls
- Recommend methods to improve battery life

Battery Design & Manufacturing Methodology

- Evaluate battery cell design and construction
- Review manufacturing process methodology
- Audit manufacturing facility
- Test mechanical and electronic safety features

BATTERY TESTING



Lithium-ion batteries are appealing for many applications due to their ability to store a lot of energy in a small cell and their long cycle life, but they also pose complex risks and challenges. Rigorous testing and analysis of lithium-ion batteries is crucial for risk mitigation and to promote the safe and sustainable adoption of this technology.

Supply Chain Considerations

- Batteries, battery materials, protective software, and system components are global and increasingly complex.
- Cell quality can vary widely, which may have significant harmful impacts on performance.
- Scarcity of raw materials, problems with suppliers, and inventory issues add to risk.
- Top-tier battery manufacturer's cells have limited availability.

Risk Considerations

- Lithium-ion batteries may lead to fires and explosions.
- Not procuring top-tier battery cells brings increased risk of defects leading to poor performance, personal injury, litigation, recall, and property damage.
- Assess the quality control, processes, and maintenance of battery cell manufacturers through independent cell testing.

Independent Battery Cell Testing

ESi conducts battery cell testing that can measure the cell efficiency, lifespan, and safety characteristics under various operational scenarios. ESi's Battery Testing capabilities include:

- Simulate real-world usage across a wide range of voltages and current loads.
- Measure energy storage and release capacity.
- Evaluating battery performance under high-current discharge rates
- Assess changes in capacity and performance over time.
- Test several individual cells from the same battery pack or lot to assess consistency.
- Analyzing performance across range of temperatures to evaluate thermal management and safety features.
- Assess battery responses to unusual or extreme conditions, such as over-voltage, under-voltage, and rapid cycling.



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JOIN US – POSTER PRESENTATION

Best Practices in Evaluating Lithium-Ion Batteries

Monday February 17

4:40pm - 5:10 pm

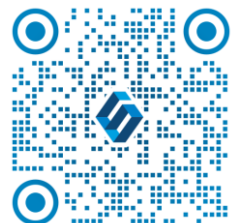
Exhibitor Hall (Grand Cypress Ballroom Level)

The poster presentation focuses on an investigation into the evaluation of batteries for various properties that impact performance and safety. The batteries tested have been sourced from a variety of manufacturers for comparative analysis. The audience will gain knowledge in what potential pitfalls exist within lithium-ion batteries, and what is necessary to identify those, prior to implementation in a product.

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