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TBS 2024: Innovations for Batteries, EVs and More

What's new in battery technology, energy storage, and electric vehicles? EEPower visited The Battery Show to find out.

Exhibition floor. Image used courtesy of The Battery Show

More than 1,150 manufacturers showcased the latest battery, energy, electric vehicle, and infrastructure technologies at The Battery Show and Electric & Hybrid Vehicle Technology Expo in Detroit, Oct. 7-10. The exhibit floor highlighted product launches and innovations, and EEPower was on-site to view them. Here's a roundup of the latest.

Honeywell: EV Battery Safety

The Honeywell introduced two technologies designed to enhance electric vehicle battery safety and efficiency. Developed by Honeywell Process Solutions and Honeywell Sensing Solutions, the products promise significant improvements during battery production and for vehicle safety. Titan Advanced Energy Solutions, in partnership with Honeywell, has designed an ultrasound-based battery interrogation technology for integration into Honeywell's Battery Manufacturing Excellence Platform (MXP). This real-time scanning technology can detect defects in battery cells during production that traditional methods might miss, enabling gigafactories in the early stages of startup to trace and correct problems more efficiently.

Figure 1. The Li-ion Tamer detects battery faults and prevents thermal runaway. Image used courtesy of Honeywell.

Honeywell Sensing Solutions has also developed the Battery Safety Electrolyte Sensor (BES), a lithium-ion battery safety sensor using electrolyte gas detection technology (Honeywell calls it Li-ion Tamer) to detect "first vent" events or early indicators of battery fires. The Li-ion Tamer detects the gases released by failing battery cells before thermal runaway starts and warns between 5 and 20 minutes before a fire starts.

Rockwell Automation, Inc.: Solving Supply Chain Issues

Rockwell Automation has teamed up with Circulor to create a Digital Product Passport to enhance supply chain traceability for various automotive products, including EV batteries. The collaboration, announced at The Battery Show, will help customers trace the origin of raw materials from their initial source to the final product, allowing a high level of transparency and promoting more sustainable practices.

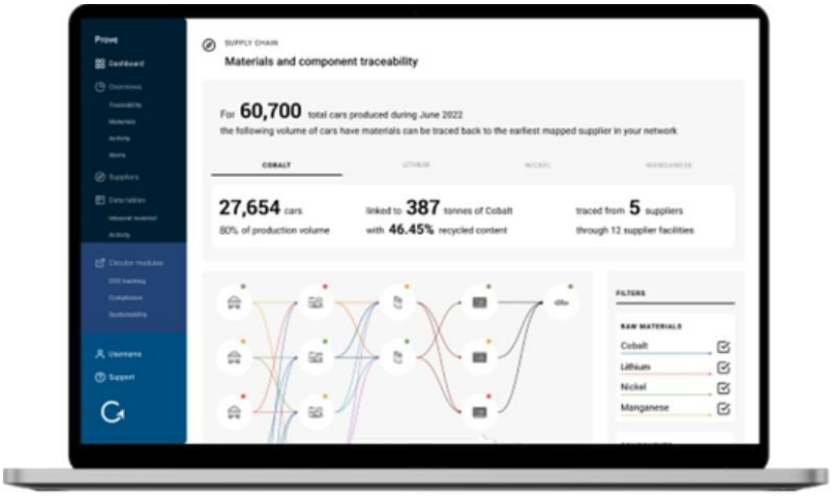

Figure 2. The Circulor platform for supply chain tracing. Image used courtesy of Circulor

Using Circulor's traceability platform with Rockwell's proven automation systems provides actionable information to reduce costs while improving efficiency and giving a competitive advantage in a world with evolving global regulations and sustainability goals.
Rockwell will use its Kalypso Automation business to deploy the solution globally across the automotive, tire, battery, metals, and mining industries. Kalypso will provide consulting services and user support in the rollout of this technology.

ENNOVI: Battery Cell Connectors
Headquartered in Singapore, ENNOVI is a mobility electrification solutions company specializing in prismatic and cylindrical battery cell contacting systems. Its release of the ENNOVI-CellConnect-Pouch offers a vertically integrated production solution to battery manufacturers using the pouch cell form factor. The system allows them to produce a part at a lower cycle time using cold lamination.

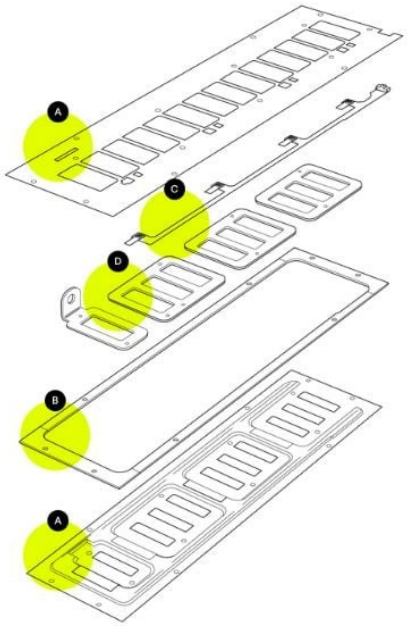

Figure 3. The ENNOVI CellConnect-Pouch Connect.

The system's design removes the need for traditional glass-reinforced plastic cell carriers and eliminates carrier storage and molding lines and heat-staking processes. The advanced lamination technology improves the battery pack's structural integrity and durability, while flexible die-cut circuit (FDC) technology for low voltage signal traces lessens production time and costs and minimizes environmental impact compared to conventional flexible printed circuits.

The upper dielectric layer incorporates the FDC copper traces, while the lower layer is pre-cut to the shape of the battery current collectors. Automotive-grade PI or PET materials with good electrical insulation and temperature stability properties comprise the upper and lower layers. All built-in fuse traces, surface-mount fuses, and NTC temperature sensors are laminated between the two layers. This streamlines material usage and creates a thin design that helps mitigate battery thermal runaway by achieving a fast exhaust release time.

TDK Corporation: EVs and Fast Charging

TDK Corporation displayed solutions for fast charging and EVs. Among those were film, ceramic, and aluminum electrolytic capacitor technologies, temperature and pressure sensors, protective components and solutions, and magnetics, including inductors and transformers.

Featured solutions at TDK Corporation of America's Battery Show booth included:

- Sensor products for EV motor controls, including a new fast response temperature sensor for battery coolant, refrigerant loop, and EV motor cooling systems. Other products include high-voltage temperature sensors for BDU/BEC, e-motor, and charging control, and high-accuracy TMR angle sensors.
- Permalloy Flexield film material used for low-frequency noise suppression in EVs. It is ultra-thin and lightweight, offering highly effective shielding against unwanted interference.
- SMD hybrid polymer capacitors with very high ripple current capability and very low ESR for use in demanding automotive applications.
- High-power transformers and other inductors for in-vehicle networking applications for power over coax, onboard chargers, HV inverters, and other uses.
- Distributed air gap ferrite cores featuring increased power density and improved thermal behavior. They also allow cost-efficient automated production.
- Standardized modular xEV film capacitors for DC links in powertrain inverters designed to meet varying capacitance and current requirements.
- A HV45 Series of high-voltage contactors with high short-circuit current ratings of 12 kA, meeting the demands of high-voltage and high-current DC applications.
- High-performance neodymium and ferrite magnet solutions to improve the efficiency of EV drive motors.

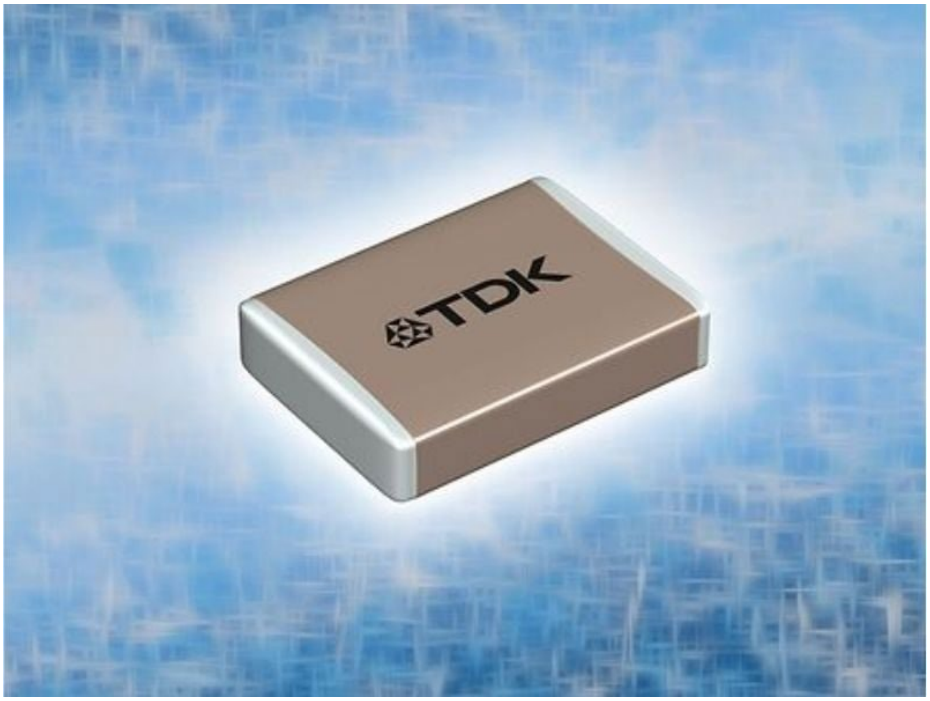

Figure 4. Compact CeraLink capacitors. Image used courtesy of TDK

TDK announced adding two 900 V types to its CeraLink capacitor series B58043 line, one with standard and one with soft termination. These devices provide fast-switching power converters and inverters for EVs with 800 V battery voltage, renewable energy, and industrial drive applications.

The small 5.7 x 5.0 x 1.6 mm SMD capacitors have an effective capacitance of 33 nF, but at the operating voltage of 800 V, 56 nF is achieved in large-signal applications such as power converters and inverters. This positive DC bias is due to the PLZT (lead lanthanum zirconium titanate) ceramic dielectric, which behaves fundamentally differently from the Class II dielectrics in MLCCs with a negative DC bias effect.

TDK also highlighted its Advanced and General-Purpose Programmable DC power supplies for the automotive test and measurement market, specifically fin EV and hybrid vehicle systems, subsystems, and component testing.

TE Connectivity: High-Voltage Connection
TE Connectivity offers a comprehensive portfolio of E-mobility high-performance data and signal and power connectivity solutions for the automotive industry. The new technology on display at The Battery Show included:

- AMP+ ACI 800 Adaptive Charging Inlets TE now offers a plug-in-ready, safe, and reliable family of charging inlets that transfers up to 1,000 A at 1,000 VDC, achieving ultra-high-power (“boost”) charging speeds. The company’s newest inlets are fully serviceable, easy to install, and offer modular, serviceable 800-volt AC and DC flexibility.
- EVC “EVO” High-Voltage Contactors for Battery System Protection Leveraging TE’s vast experience in non-pressurized high-voltage contactors, the new EVC “EVO” contactor series represents the company’s next-generation battery protection solution. These

contactors provide improved short circuit capabilities and increased breakability, making them ideal for 400-volt and 800-volt EV architectures.

Figure 5. High-voltage contactor. Image used courtesy of TE Connectivity

ZAPI Group: Off-Board Charging
ZAPI Group, headquartered in Italy, launched its ZIVAN SG9, a 9 kW off-board charging solution for off-highway vehicles and machines. The company also featured its full range of on-board and off-board charging solutions, from 350 W to 36 kW.

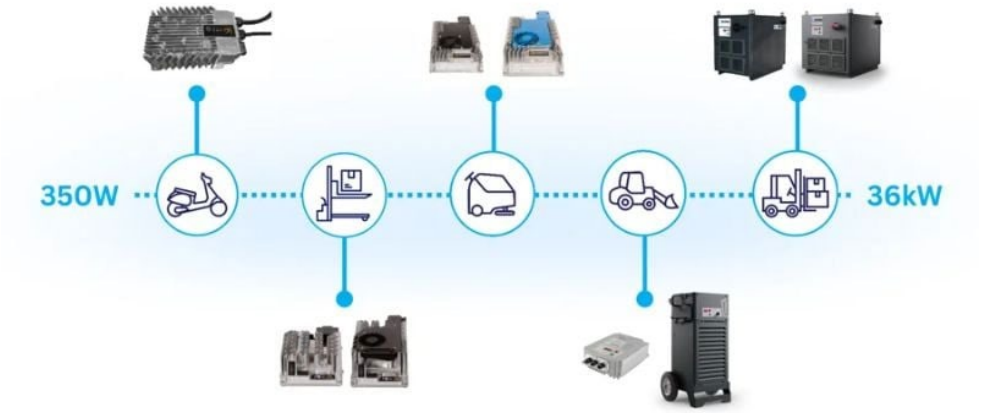

Figure 6. Charging solutions. Image used courtesy of Zapi Group

The 9-kW ZIVAN-branded SG9 industrial charger is a highly flexible off-board fast charger that can be configured for various AC input sources for global deployment, using single- and three-phase voltages. It offers multiple charge voltages (36 to 96 volts DC) to support a wide array of

battery packs. In addition, the team showcased other electric drivetrain solutions, including electric motors and motor controllers.

Marposs Corporation: Battery Leak Testing
Marposs Corporation has developed its Leak B-Tracer System for leak-testing lithium-ion batteries. The patent-pending leak test process is based on vaporizing and extracting volatile organic compounds from sealed battery cells in a leak event and then tracing and quantifying their presence in a vacuum chamber. Leak detection can take place throughout the battery assembly process.

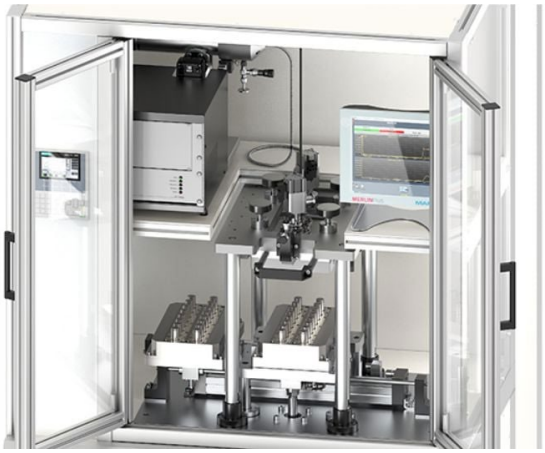

Figure 7. Leak B-Tracer. Image used courtesy of Marposs Corporation

Marposs also demonstrated its LT400 system, a laboratory windings quality analyzer designed to perform partial discharge measurements on components such as coils, motors, and generators. The LT400 allows companies to perform high-voltage tests to help find defects not detectable by standard tests. Marposs has a North American Headquarters in Auburn Hills, Michigan, while its parent company is in Bologna, Italy.