

## ***ECCE 2019 Expo Will Showcase The Latest Tools For Developers Of Power Electronics, Motor Systems And Their Applications***

*by David G. Morrison, Editor, How2Power.com\**

This year's [IEEE Energy Conversion Congress & Expo \(ECCE 2019\)](#), the 11th edition of the IEEE's foremost conference in the field of electrical and electromechanical energy conversion, will be held Sunday, September 29 through Thursday, October 3 at the Baltimore Convention Center in Baltimore, MD. For those involved in the development of power electronics, electric machines and the numerous applications in which they are used, this conference offers a host of high-quality tutorials and technical sessions to bring attendees up-to-date on the latest developments.

On Monday and Tuesday of the event, ECCE 2019 also hosts an expo where attendees can see and discuss the latest test instruments, design and simulation software, electronic components and materials critical to the design and development of power electronics, electric machines and their applications. These applications include automotive, aerospace, industrial equipment, renewable energy, and power grid—just to name a handful that are prominent at ECCE. This article offers a sampling of some of the products that will be on display at the expo.

*For those new to ECCE, the conference program addresses a wide range of energy conversion systems and applications; as well as component, converter and subsystem technologies. The topics covered within these broad categories are listed in more detail in [ECCE's call for papers](#).*

*\*Note: The editor is Exhibition Co-chair for ECCE 2019 along with Magna-Power's Grant Pitel. Visit [How2Power.com](#) in booth 303 in the ECCE Expo to meet the editor and discuss any topics of interest.*

### ***Test Instruments And Tools For Motor Systems***

In booth 207, HBM Test and Measurement will be showcasing a new tool. Part of the company's innovative eDrive testing solution, eDrive Creator greatly simplifies the setup and testing of almost any unique and complex multiple motor/inverter drivetrain system. The tool will shorten test time, help easily acquire electrical, mechanical and bus signals with one system, help easily integrate solutions into HiL systems and allow users to do rapid drive efficiency measurements; inverter, motor or drive mappings and system analysis for any configuration and complexity. Several eDrive Creator application examples are shown in the figure below including examples of multiple efficiency maps, dual eAxe, full electric all-wheel drive and hybrid drive with eCVT.

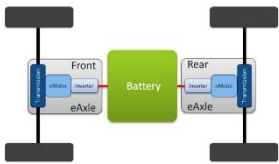
In addition to the eDrive Creator, the company will also showcase its T40B digital torque transducer, which is now available with higher rpm capability. This transducer delivers greatly increased revolutions per minute for a selection of measuring ranges of 1, 2, and 3 kNm—up to 23,000 rpm—making it well suited for many types of applications including test benches, end-of-line tests (EoL) and process monitoring. The sensor has an integrated, magnetic rotational speed measuring system, enabling automotive engineers to test the efficiency of the drive train with a range of motor vehicles.



*The ECCE 2019 Expo will be held at the Baltimore Convention Center on Monday Sept. 30 from 4:00 to 7:30 pm and on Tuesday, Oct. 1 from 11:00 am to 5:30 pm. Admission to the expo is free on Tuesday after 2:00 pm*

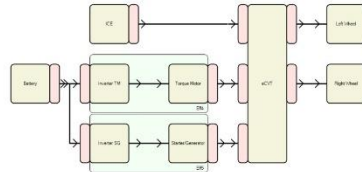
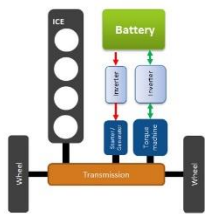
**eDrive Creator Example: Dual eAxle**

- Needs a total of 2 x DC power channels and 4 x Torque/ speed mechanical power channels



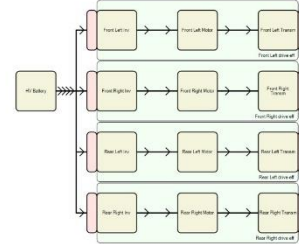
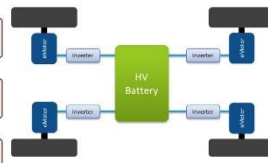
**eDrive Creator Example: Hybrid drive with eCVT**

- Needs a total of 6 x AC Power channels and 3 x DC power channels and 5 x torque/speed mechanical power channels



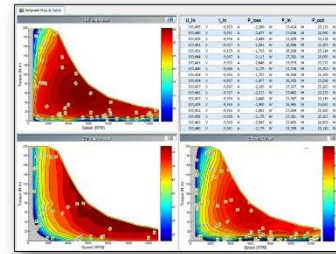
**eDrive Creator Example: Full electric all wheel drive**

- Needs a total of 16 power channels and 4 torque / speed channels



**The eDrive Creator: Enable multiple Efficiency maps**

- Third step is to set up the desired maps
  - User selects x, y, z from power results
- Multiple efficiency maps can be drawn
  - Motor map, inverter map and drive map can be done simultaneously
  - Maps for multiple machines at the same time
- Maps "grow" as new set points are done
  - Live feedback about test process
- Also creates CSV files for further analysis



*eDrive Creator application examples.*

Visitors to the HBM Test and Measurement booth will also see innovative testing solutions from the merger of HBM and sister company Brüel & Kjær to become HBK. HBM offers innovative dynamic power analyzers, mobile-rugged and high-speed data acquisition systems and torque sensors. It also provides Prencia software including nCode for fatigue and durability analysis and ReliaSoft for ensuring reliability. Brüel & Kjær offers NVH solutions for the sound and vibration industry through comprehensive engineering services.

In booth 412, Teledyne LeCroy will launch a significant new product for engineers working on power conversion, though no further details are yet available. In addition to this anticipated announcement, the company will be showing its 12-bit, 8-channel, 1-GHz MDA800A Motor Drive Analyzer. The Motor Drive Analyzer acquires power and control system signals and performs three-phase power analysis of the power section waveforms. Correlation of drive system behaviors to embedded control loop signals enables debug and analysis of all aspects of the complete motor drive.

Hioki describes its benchtop power meters and power analyzers as best in class power measuring instruments for measuring single- to three-phase lines with a high degree of precision and accuracy. In booth 301, the company will show its flagship power analyzer, the PW6001. This instrument features high accuracy, wide bandwidth, and high stability for measuring electrical power from dc to inverter frequencies.

The PW6001 provides up to 12 channels (when synchronizing two 6-channel models connected via optical link) to support single- and three-phase inverter motor system measurements and next generation devices such as SiC-based inverters. Among the key specs associated with this analyzer are a basic accuracy of  $\pm 0.02\%$  for power measurement and  $\pm 0.07\%$  when the current sensor accuracy is included.



*Teledyne LeCroy's Motor Drive Analyzer.*



*Hioki's PW6001 power analyzer.*

### **Simulation And HIL Testing Of Power Electronics**

In booth 218, MathWorks and Speedgoat will partner to show hardware-in-the-loop (HIL) testing systems using MathWorks' Simulink and Speedgoat's real-time target machines. MathWorks is the developer of MATLAB and Simulink, a leading software for engineers modeling and developing embedded software for controlling the power electronics at the heart of renewable energy and power transmission, efficient motor control, and electrified transportation.

Speedgoat offers state-of-the-art solutions for customers working in the power electronics domain, offering rapid control prototyping and hardware-in-the-loop (HIL) simulators that can run and test complex controls and electrical HIL simulations with a bandwidth of several megahertz.

In booth 313, Plexim will be showing the latest iteration of its simulation software PLECS and real-time testing platform the RT Box. PLECS is described as the tool of choice for high-speed simulations of power electronic systems. It is available in two editions: PLECS Blockset for seamless integration with MATLAB/Simulink, and PLECS Standalone, a completely independent product.



*Speedgoat's real-time target machine.*

The PLECS RT Box is a modern real-time simulator that can be programmed and operated from PLECS. With its 32 analog and 64 digital input/output channels and its 1-GHz dual-core CPU it is a versatile processing unit for both real-time hardware-in-the-loop (HIL) testing and rapid control prototyping. The RT Box offers a cost-effective and flexible platform that is fully-integrated into the PLECS toolchain.

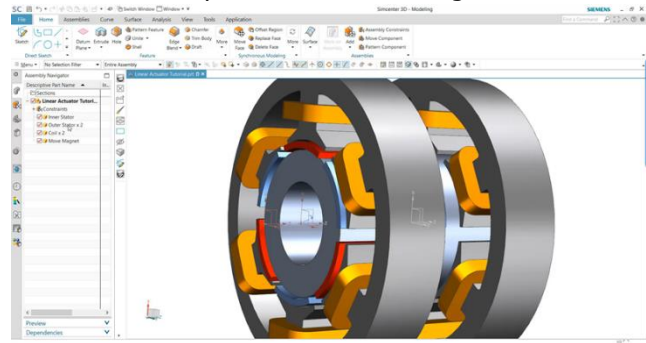
The Target Support Package framework of the PLECS Coder has recently been extended to facilitate code generation and external mode operation for embedded targets, including for Texas Instruments C2000 family MCUs.

In booth 107, Mentor, A Siemens Business and Siemens PLM are introducing solutions in electromagnetics and power electronics thermal design. On the electromagnetics side, the companies will showcase Simcenter 3D, which introduces low- and high-frequency electromagnetics, so engineers can perform EM simulations faster than with traditional tools and streamline multi-discipline workflows between each physics domain.

The low-frequency solver for motors, actuators, transformers, loudspeakers and the like is based on Simcenter MAGNET, which continues over 40 years of development and comes from Siemens' acquisition of Infolytica. The high-frequency module can help maximize antenna and sensor performance and assess EMC/EMI risk; it can simulate multiscale models of highest complexity (from one electronic component to an entire large scale system) in a reasonable time.

Visitors to the Mentor booth will also gain insights into how to achieve the highest accuracy power electronics thermal prediction with automated thermal model calibration using thermal transient testing and 3D electronics cooling simulation. Using a calibrated model helps to better avoid reliability risks of under-design of thermal management systems or the potential of higher costs associated with overdesign.

The process of automatically calibrating IGBT and MOSFETs package models to improve power module system level thermal simulation will be shown starting from Simcenter T3STER thermal transient measurement data to simulation implementation. Automatically calibrating models is now available in Simcenter Flotherm, Flotherm XT electronics cooling software and most recently in Simcenter FLOEFD, CAD embedded CFD software.



Siemens PLM's Simcenter 3D.

### Programmable Power Supplies

In booth 800, TDK-Lambda Americas will present the Genesys+ Advanced DC Programmable Power Supply series, which delivers power ratings from 1.7 kW to 15 kW with output voltage ratings from 10 V (170 A to 1500 A) to 600 V (2.8 A to 25 A). This series provides advanced features and functions in a high power density and lightweight mechanical profile.

All models can operate in constant-current (CC), constant-voltage (CV) as well as the newly offered constant-power (CP) limit. Advanced features include an arbitrary waveform generator (with auto-trigger capability), programmable slew-rate control (Vout/Iout), internal resistance simulation and constant-power limit programming. These power supplies operate with conversion efficiencies up to 92% with cooling fan speed control.

Built-in standard interfaces include the LAN (LXI 1.5), USB and RS-232/RS-485. Other interfaces include the built-in standard Isolated Analog Interface and the optional IEEE (IEEE 488.2), ModBUS-TCP and EtherCAT.

In booth 212, Magna-Power will be showcasing its new 4U/8U 20/25-kW and 40/50-kW TS Series and up to 95% efficient 1U 1.5-kW to 8-kW SL series MagnaDC programmable dc power supplies. Major improvements in power density and efficiency across Magna-Power power supplies follow the company's adoption of SiC semiconductor devices, unique power layouts, and internally manufactured innovative heat sinking solutions. In addition, the MagnaLOAD DC electronic loads will be on display, which span 1.25 kW to 100 kW+, feature digital control, MagnaWEB browser-based software, and unique control modes for handling a variety of testing scenarios.



Magna-Power's TS series programmable dc power supply.

**SiC Devices, Drivers, Modules And Power Converters**

In booth 700, Infineon Technologies Americas will showcase its range of EiceDRIVER driver IC products suitable for use with its CoolSiC MOSFETs, which are capable of switching at extremely high frequency. Together, CoolSiC MOSFETs and EiceDRIVER gate-driver ICs take full advantage of the superior characteristics of SiC technology: improved efficiency, space and weight savings, parts count reduction and enhanced system reliability. This gives designers great scope to lower system cost, reduce operating expenses and total cost of ownership, and devise new solutions for an energy-smart world.

Cree's recently expanded product portfolio is said to offer industry-leading efficiency and power density, and includes the CPM3 Bare Die, C3M MOSFETs, C6D Gen 6 Diode and the XMS Power Module. In booth 402, the company will be showing the XM3 and the 300-kW three-phase inverter.



*Infineon's CoolSiC MOSFET.*

The inverter demonstrates system-level power density and efficiency obtained using Wolfspeed's new XM3 module platform. The XM3 is optimized for SiC MOSFETs in a high-density, low-inductance footprint, which can reduce system losses and simplify overall design for low-loss, high-frequency operation. The three-phase inverter has greater than 2X the power density of comparable silicon-based designs and greater than 98% efficiency.

Abstract Power Electronics develops advanced SiC-based power converters designed to spec for OEM, industrial, and military markets. Designs include all types of configurations for high frequency, high level isolation, high power, and high speed motors, with power levels of kilowatts through megawatts.

In booth 903, Abstract Power Electronics will be running a 4-kW Primate Power Source. This is part of a family of flexible, rugged, compact, efficient power supplies, motor controllers, and sources. They can be used as grid-tie systems, or to simulate grids, and to

test batteries, solar cells, motors, and more.



*Cree's 300-kW three-phase inverter.*



*Abstract Power Electronics' Primate Power Source.*

**Magnetics and Capacitors**

Planar magnetics specialist Payton (booth #315) offers complete design and production capabilities for planar magnetics in the Americas, Asia, the Middle East and the U.K. At ECCE, Payton will be displaying a complete line of planar magnetics from a few watts to over 100 kW.

*Payton Planar's exhibit at last year's expo. Numerous examples of planar magnetic components were on display.*



In booth 206, Electronic Concepts (ECI) will highlight its new capacitor products addressing the needs of power electronic designers. Specifically, it will display its LH3 series film capacitors, which provide the design engineer with dc link building blocks enhancing the performance of industrial inverters.



The LH3 employs Lo-Henry coaxial manufacturing technology, combined with innovative mechanical design techniques, to produce ultra-low ESL (< 10 nH) and ESR (typically in the micro-ohm range) capacitors, providing exceptional power performance and robust construction. These capacitors also feature a high-strength thermoplastic housing with mechanical mountings integrated into the base. The compact terminal configuration allows reduction of buss bar width.

Thermal coefficients of 1.6 to 2.2°C/W dissipated, minimize internal heating and extend the life and reliability of the capacitors in demanding applications. Capacitor values range from 1600 µF at 500 Vdc to 30 µF at 2400 Vdc, with an operating temperature range up to 105°C.

*Electronic Concepts' LH3 series film capacitors.*

*In addition to the companies highlighted in this article, there are many additional vendors planning to exhibit in the ECCE 2019 Expo. The following list of exhibiting companies is current as of the publication of this article. For more up-to-date information about the expo, see the conference [website](#) or contact the [editor](#).*

- [ELANTAS PDG](#)
- [Mentor Graphics](#)
- [Measurement Instruments](#)
- [Electronic Concepts](#)
- [HBM Test and Measurement](#)
- [Tektronix](#)
- [GE Research](#)
- [Magna-Power Electronics](#)
- [Powersim](#)

- [DEWESoft](#)
- [MathWorks](#)
- [Wiley](#)
- [GaN Systems](#)
- [Hioki USA](#)
- [How2Power.com](#)
- [5S Components](#)
- [OPAL RT](#)
- [Typhoon HIL](#)
- [Plexim](#)
- [Ganpower Intl](#)
- [Payton America](#)
- [Wolfspeed](#)
- [HVR Advanced Power Components](#)
- [Altair](#)
- [Teledyne LeCroy](#)
- [GMW Associates](#)
- [MagneForce Software Systems](#)
- [Torquemeters](#)
- [Infineon Technologies Americas](#)
- [Powersys](#)
- [PCIM Europe](#)
- [TDK-Lambda Americas](#)
- [EMWorks](#)
- [Cambridge University Press](#)
- [Abstract Power Electronics](#)

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