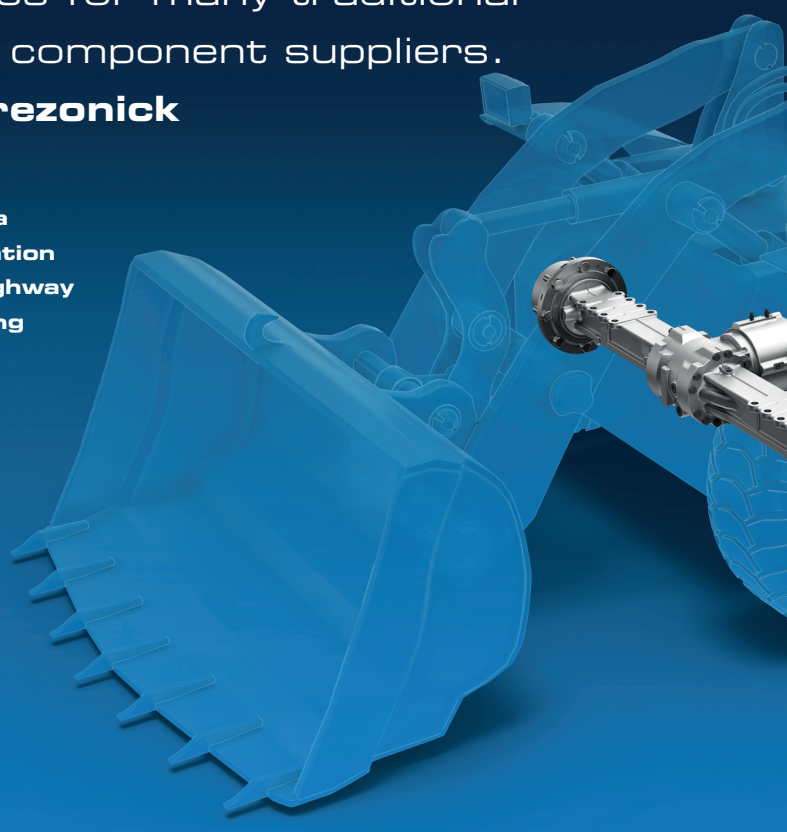
IN GEAR FOR ELECTRIFICATION

Trends toward e-machinery offer opportunities for many traditional powertrain component suppliers.

By **Mike Brezonick**



ZF has developed a range of electrification systems for off-highway equipment, including the eTrac driveline that incorporates a 48 V motor developed by ZF, front and rear axles, drives, inverters and an electric drive control unit is engineered to achieve the same output as conventional drivetrains.

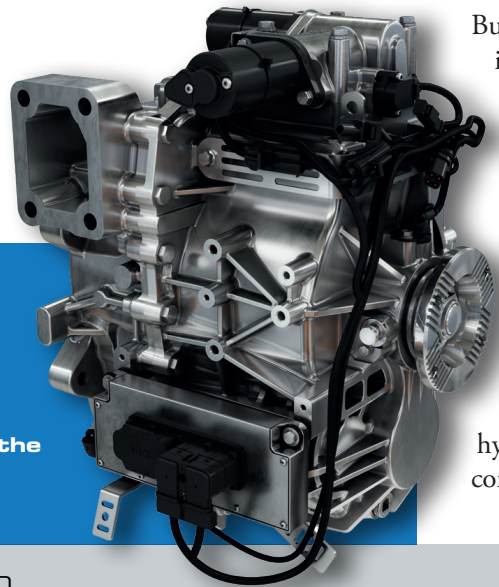
The growing trend toward electrification of vehicles and equipment has been perceived by some as a kind of shot across the bow for certain conventional technologies. Engines, it is thought, may ultimately be replaced by batteries or power-generating fuel cells. Hydraulic pumps and motors could, in some scenarios, be supplanted by electric motor-driven actuators.

What then, for some of the most basic of traditional powertrain components – transmissions, axles, gearboxes, driveshafts, etc.? Is the clock also ticking for them, with "e-components" poised to muscle in on their territory in trucks, buses and off-road machinery?

Not so much. In fact, in many cases, quite the opposite. Just as a growing number of engine manufacturers embracing electrification, many of the suppliers of traditional powertrain components – both large and small – are viewing the prospects of electrification as more opportunity than obstacle.

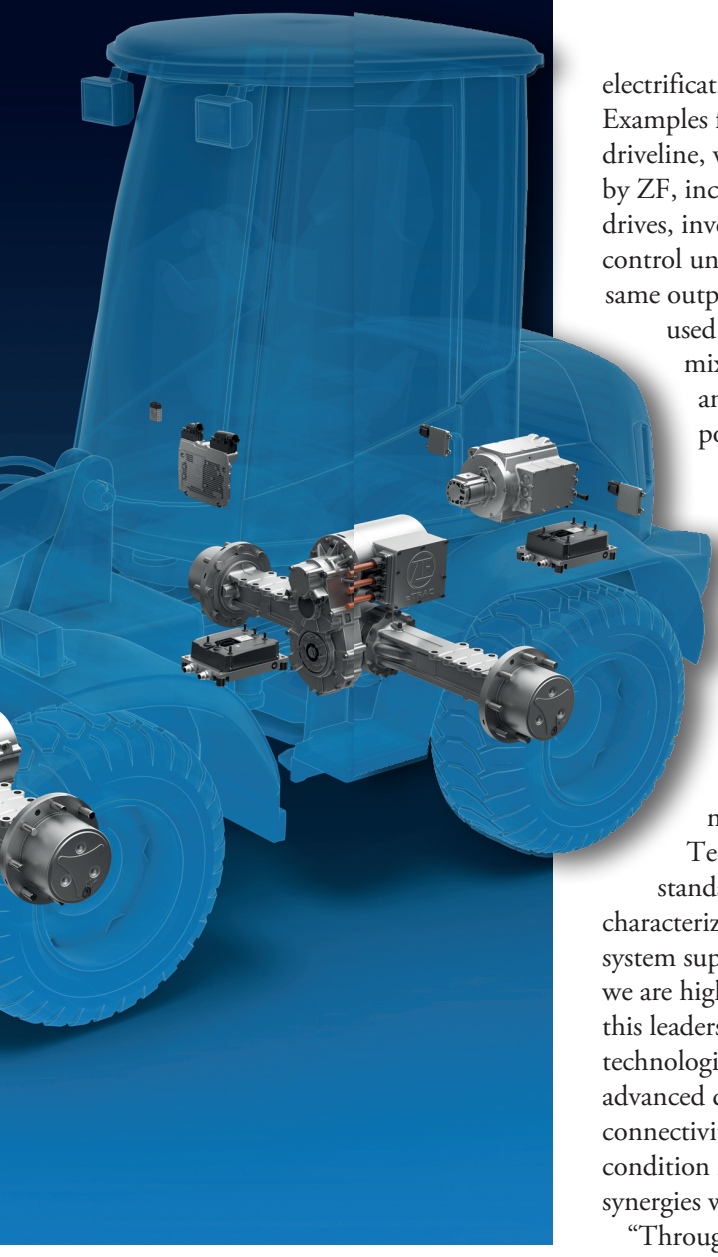
"Clearly electrification is an opportunity," said Dave Genise, Global Product Strategy manager, Power Systems, Eaton Vehicle Group North America. A longtime supplier to truck and bus markets with transmissions and axles and other components, Eaton was among the first to develop products specifically targeting e-vehicles and in 2018 established its eMobility business unit, which consolidated the electrified vehicle-related businesses and expertise from its Electrical Sector and Vehicle Group into a single organization.

"Eaton has been embracing the trend to electrification for many years," Genise said. "More than 10 years ago, the Vehicle Group developed hybrid electric transmissions for transit bus applications. Vehicles with those transmissions have accumulated more than 2 billion operating miles in service throughout the world. Eaton Bussmann fuses, for example, are found in seven of the top 10 electric vehicles sold last year.



Eaton's four-speed EV transmissions for on-highway vehicles incorporate lightweight countershaft gearboxes that offer a range of torque capacities and electric gearshift actuation that enables the use of smaller electric motors.

"The eMobility business is growing a portfolio of power electronics, power protection and powertrain technologies to support the needs of vehicle manufacturers as they move quickly to introduce world-class electric cars and commercial vehicles. For example, Eaton has leveraged experience from hybrid transmissions and now offers commercial vehicle automated manual



transmissions specifically designed for use with an electric traction motor.

"Eaton EV transmissions multiply the electric motor torque so the vehicle has uncompromised grade climbing capabilities with smaller and lighter electric motors, and match with the same proven axles in today's trucks. Fewer gears are necessary than with a diesel engine, and the optimum gear is automatically selected to operate the electric motor at its most efficient point to extend the range of each battery charge."

EXPANDING ELECTRIFICATION

Similarly, global powertrain giants ZF and Dana Inc. have made significant investments in expanding their electrification components and systems. Examples for ZF include the eTrac driveline, with a 48 V motor developed by ZF, incorporates front and rear axles, drives, inverters and an electric drive control unit is engineered to achieve the same output as conventional drivetrains used in compact vehicles. For mixer trucks, ZF offers the CMe, an electric drum mixer drive powered by a battery.

"We are in the middle of a revolution in the automotive market, and this is shifting also towards the adjacent Off-Highway business," said Piergiorgio Di Francesco, who heads ZF's North American Off-Highway business, which is part of the German manufacturer's Industrial Technology Division. "Besides the standard products that have always characterized ZF leadership as a drivetrain system supplier for best-in-class efficiency, we are highly committed to extend this leadership to new and innovative technologies like electric drivetrains, advanced driver assistance systems, connectivity, autonomous driving, condition monitoring, etc., through synergies with other ZF Divisions.

"Through synergies with other Group Divisions, the Off-Highway Business Unit has started to develop and produce complete systems for electrified vehicles by leveraging in-house competencies and partners' support. We are now able to supply a wide range of drivetrains - electric motor, inverter, transmission, ECU and of course axles, for a vast variety of applications such as compact wheel loaders, telehandlers, mini-dumpers, mixers, backhoe loaders, etc., for construction equipment, along with forklift trucks and other material handling applications and implements and trailers in agricultural machinery."

CORPORATE STRATEGY

Dana has been active in expanding its capabilities and products for both on- and off-road e-vehicle development. Among the company's e-Propulsion system are applications in Kenworth and Peterbilt medium-duty trucks, as well as with Hyliion on Class 8 hybrids. On the off-highway side, Dana developed a customized e-Propulsion system for Mecalac's new e12 electric compact wheeled excavator.

"Electrification is already having a tremendous impact on our business which is why it's deeply embedded in our corporate strategy," said Jeroen Decleer, vice president of global off-highway sales, product planning, and strategy for Dana Inc. "Dana has made seven acquisitions since 2017 to position us for success amidst the shift toward electrification, and we are the only supplier capable of delivering all the elements of a complete, fully integrated electrified system across all mobility markets in any region of the world.

"Today, we are focused on developing electrification technologies for applications that are most impacted by zero-emissions initiatives, such as compact construction equipment, material-handling vehicles and access equipment.

"It's important to understand that the move toward electrification will be an evolution, not a revolution, which is why we are continuing to develop new and enhanced products that improve the performance of traditional diesel-powered off-highway equipment."

JEROEN DECLEER,
vice president, Dana Inc.

Mining equipment also provides an immediate opportunity for us to deliver solutions. These are the areas where our OEM customers are focused, so we are focused there as well."

Dana has developed an electrified powertrain for telehandlers with load capacities up to 6600 lb. incorporating Spicer e-Axles, motors, inverters and controls to provide electrified propulsion within established vehicle architectures.

NICHE PLAYERS SEE OPPORTUNITY

Outside of the global powertrain giants, smaller and even more niche providers of powertrain products and systems are viewing electrification as an opportunity for growth.

"(That is) 200% correct," said Alain Charlois, vice president of Strategic Partnerships at CVTCorp. Based in Quebec, Canada, CVTCorp specializes in the design and manufacturing of mechanical continuously variable transmissions (CVT) used primarily in ag, construction and material handling equipment. Along with its own products, CVTCorp also supplies transmission technology to Bonfiglioli for its ECGenius powertrains for telehandlers and other mobile machinery.

"This (electrification) is clearly a megatrend in the market and we are really looking into it," Charlois said. "We've initiated work on electrification with partners to look at what the value proposition is when you associate the CVT with an electric motor. That gives you the torque multiplication of the CVT, which gives you an ability to downsize motors and downsize drives.

"You don't want to draw too many parallels but look at the electric car - you had people saying you don't need a transmission. Now you see more and more of them with electric axles with two and three speeds because the motors were running too fast. They saw there could be a value to downsizing motors and using a transmission to optimize.

"When you move into off-highway, you're going to see some of the same thinking.

MECHANICAL POWERTRAIN PRODUCTS AND NEWS

NEW MERITOR AXLE FOR WHEEL LOADERS

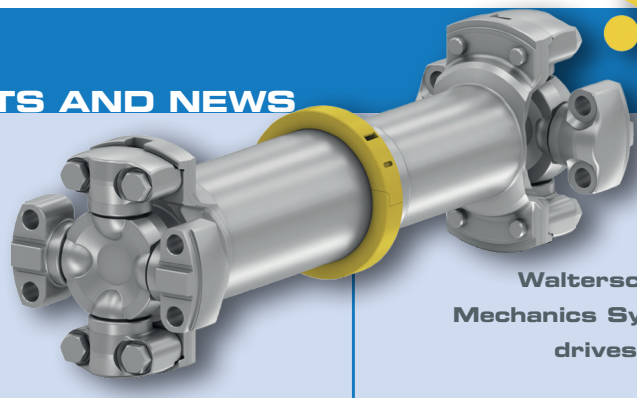
Meritor Inc. launched its MCL 541 planetary axle for wheel loaders at ConExpo-Con/Agg. Designed for machines with up to 4 m3 bucket capacities, the MCL 541 planetary axle is the first model of a wheel loader axle series, the company said and it incorporates established components, such as Meritor's 14X carrier and Family 5 planetary wheel-ends. The axle's interchangeable architecture also opens the door for future compatibility with electric vehicles, Meritor said.

Meritor's MCL 541 axle.

"This axle serves as the entry point to a new segment and represents Meritor's ongoing commitment to the off-highway market," said Steve Luepke, senior director of Off-Highway for Meritor. "Our focus on continuous product innovation, combined with the company's global footprint and support network, has made it possible for us to address the demands of this dynamic segment and expand our product offering for customers."

WALTERSCHEID LAUNCHES POWERTRAIN SERVICES NA

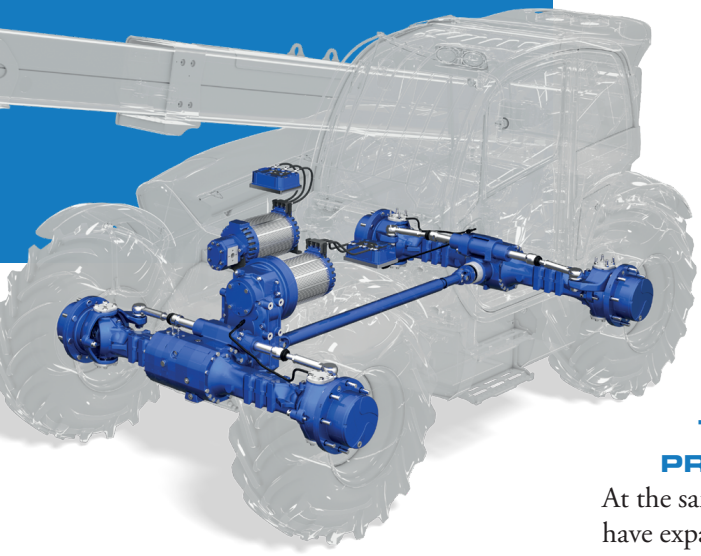
Walterscheid Powertrain Group used ConExpo to announce the launch of its new Powertrain Services North America business, which will offer comprehensive through-life service and the complete Walterscheid Powertrain Group product range, the company said.



Walterscheid's Mechanics Synergy driveshafts.

The new service business will have three segments: Aftermarket Parts Distribution, with more than 130 distribution partners throughout North America; Value Added Services, such as repair, exchange, modification and customization of shafts and powertrain solutions; and Field Services & Condition monitoring, which includes field service, preventative and predictive maintenance along with condition monitoring and technical consultancy on demand.

Walterscheid also presented its latest innovations in the construction segment, including Smart & Connected Powertrain Solutions, which provides status data from powertrains in operation via smart technologies. Additionally, the company showed its latest Mechanics Synergy driveshafts and the ICVD (Integrated Continuously Variable Drive) hydrostatic propel drive, which is engineered to deliver high torque values down to output speeds of zero with a higher grade of efficiency and the potential of fuel saving in the powertrain.



electrification.

"For us, it's a little on the back burner at the moment because of the (Coronavirus) disaster, which is slowing things down. But it's very important to make sure we are positioned with that megatrend."

TRADITIONAL PRODUCTS IMPORTANT

At the same time powertrain suppliers have expanded their electrification product portfolios, they haven't done it at the expense of traditional product lines.

"There is steady growth in the number of electrified vehicles sold each year," Genise said. "But even so, Eaton predicts that about 85% of commercial vehicles in 2030 will still have an internal combustion engine, most likely a highly efficient advanced diesel as prime power.

"We remain committed to making sure those engines are as efficient as they can be and continue to introduce technologies such as advanced engine brakes, electric EGR pumps and engine valves to make those vehicles efficient, safe and reliable."

Decleer echoed that sentiment, adding "It's important to understand that the move toward electrification will be an evolution, not a revolution, which is why we are continuing to develop new and enhanced products that improve the performance of traditional diesel-powered off-highway equipment." ■

Of course, there are cost considerations and do you have a true value proposition? Are the benefits worth the additional costs? In some applications that will be true, some applications it may not be true. That's the normal study that need to be done by us and our partner Bonfiglioli, which has been pretty active itself in

The mCVT lateral drop transmission.

LATERAL DROP VERSION MCVT TRANSMISSION

CVTCorp. has developed a lateral drop version of its mechanical continuously variable transmission (mCVT), first introduced in 2018.

The lateral drop (LD) version of the mCVT offers similar capabilities to the vertical drop (VD) unit, including a maximum power rating of 134 hp, peak input torque of 608 lb. ft., maximum input speed of 2600 rpm, maximum output torque of 2950 lb. ft., and maximum output speed of 3100 rpm. It offers ratios from 8.27 to 0.6 forward and reverse ratios from 8.38 to 1.4.

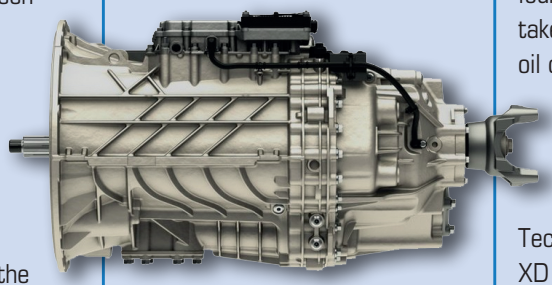
Both the LD and VD mCVT units are available through Bonfiglioli, which in 2019 entered into an exclusive licensing agreement that allows Bonfiglioli to manufacture and sell the unit under the ECGenius brand for telehandlers and other off-equipment applications.

NEW ENDURANT XD TRANSMISSION

Eaton Cummins Automated Transmission Technologies, the 50/50 joint venture between Eaton and Cummins dedicated to producing heavy-duty automated transmissions for the commercial vehicle market, announced it is expanding its Endurant transmission lineup with the introduction of the all-new Endurant XD series unit.

The Eaton Cummins Endurant XD series are purpose-built, high-performance automated transmissions designed for on-highway applications with high gross combined weight ratings, such as double and triple trailer trucks, and severe-duty on/off highway applications like dump and logging trucks.

The Endurant XD series has torque and horsepower capacity to cover all Class 8 North American engines, including the Cummins X15, the company said. Endurant XD transmissions will be available starting in 2021.



The Endurant XD transmission.

The Endurant XD series has 18 forward speeds and up to six reverse gears, along with optimized software designed to make smart shift decisions, the company said. It also incorporates provisions for bottom eight-bolt and rear four-bolt high-capacity power take-offs, and a transmission oil cooler provision is available when required.

Because reliability is critical, Eaton Cummins Automated Transmission Technologies said the Endurant XD series is currently going through an extensive development testing program.