ZF Technology Day in Friedrichshafen

Expansion from Components to Concepts

Article and photos by Larry Plachno

This year's ZF global press event continued the traditional Ride & Drive event but offered a wide range of new technology. Shown here is the line of vehicles on the ZF test track that were available for the Ride & Drive event. The first of the two buses in the line was standard length and was powered by the new CeTrax driveline electric motor while the second bus was an articulated powered by the ZF AVE 130 portal axle with built-in electric motors.

Every two years, ZF holds a global press event to highlight their new developments in components and products. To a substantial extent this serves as an early preview of what the company will be showing at the IAA show in Hanover, Germany later in the year. Recent past events were held in Aachen, Germany but were moved this year to corporate headquarters in Friedrichshafen in late June, possibly because of new developments and directions. While this year's event included the traditional vehicle Ride & Drive, it also showcased new technology, new concepts and new partnerships for ZF.

Many of our readers probably think of ZF as a master builder of larger vehicle components. The company started out in 1915 as a high-quality gear factory for airships and subsequently developed a line of well-regarded transmissions, steering, axles and similar components for automobiles, heavy-duty vehicles and other applications, putting it among the top of worldwide vehicle components suppliers.

You now need to change your thinking because ZF has started to move way beyond that with new technology, products and concepts that are state-of-the-art. We saw the start of this at the ZF Global Press Event in 2014 that featured the ZF AVE 130 portal low-floor axle for electric buses. That same event saw the introduction of the ZF Innovation Truck that could park itself and two trailers without a human driver on board. This same trend increased at the ZF Global Press Event in 2016 and included an improved self-docking ZF Innovation Truck, an autonomous truck and Evasive Maneuver Assist.

The acquisition of TRW in 2015 combined with increased research and technology has moved ZF in entirely new directions. While Technology Day this year continued ZF's progress with automotive and heavy-duty vehicle components, it also showed a substantial expansion in technology and concepts where ZF is providing components, support and control systems for state-of-the-art products and systems.

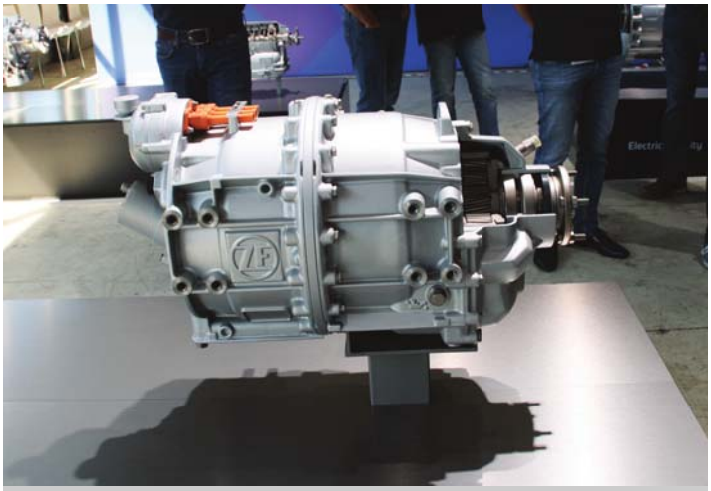
Here is a list of some of the impressive things we saw, rode on and were sometimes beyond what we expected.

The evening prior to technology day, the press was given an opportunity to meet with Wolf-Henning Scheider, the new CEO of ZF. He had been in the "driver's seat" at ZF for five months. One of his first comments was to list the areas where ZF was currently trying to focus and present at the forthcoming IAA show in Hanover. These included: 1) Vehicle Motion Control, 2) Integrated Safety, 3) Automated Driving and 4) Electric Mobility.

He then explained about new developments and new directions at ZF. New products included the Traxon hybrid transmission and the new versions of the CeTrax electric drive, the CeTrax lite and the CeTrax mid. He also mentioned new developments and concepts. Included was the world premiere of the Terminal Yard Tractor or Auto Tug and the ZF Innovation van. Also new was the e.GO people mover that will go into production soon.

Later, we were able to meet with Scheider in a smaller round table session and ask questions. He said that it was not ZF's intention to compete with customers by building vehicles or to control entire systems. ZF's primary goal is to supply components for both current and new technology. Scheider did mention that there were a lot of new

Moving ahead with high-tech products, ZF is now offering this line of various sensors including cameras and lidar. They are the "eyes" of the new autonomous vehicles.



Your editor was particularly interested in the new CeTrax electric motor from ZF. It can be installed in virtually any drive line to turn most any bus into an electric bus.

developments with many of them dependent on modern computer power.

The actual Technology Day took place on June 27. In common with previous ZF events like this there were a number of stations, each showing a different class of product or new development. Attendees were split into smaller groups with guides to facilitate explaining the products and answering questions. I might note that half of the stations were dedicated to products or technology that does not directly impact the bus industry. However, I will include at least a brief mention of these because it will give you some idea of where ZF and technology is going.

See - Think - Act

Our group started out at the section showcasing popular and new ZF products and components. The ZF people liked to call this area "See - Think - Act" because virtually all of the products shown could be said to do one of these three things.

In what you might call ZF's more traditional products, we got to see a cutaway display of ZF's increasingly popular AVE 130 portal axle with electric motors for powering electric buses. Also shown was the CeTrax, an electric motor that can be placed into a bus with a standard driveline to turn it into an electric bus. We were able to see the new CeTrax lite and CeTrax mid models that now offer this same type of product for smaller vehicles.

ZF's TraXon transmission, the successor to the AS Tronic, is already available as a hybrid and will have increasing remote diagnostics in 2019. I expect to see this transmission dominate the European coach market. Being introduced was the ReAX EPS electric steering system. This is not yet in its final configuration, but it will be an important component for autonomous vehicles.

Qualifying in the "See" category were several examples of radar and cameras to guide drivers or for use on autonomous vehicles. These marked a vast departure from ZF's traditional heavy metal components and were most likely a development from recent mergers and new technology. This wide range of products was often called "sensors" since they were mechanical eyes for the vehicles.

All of these devices that I saw were small enough to be held in your hand and hence could be easily added to a vehicle by an OEM. Included in this group are both a short range radar as well as the AC1000T Radar System. Similar but different was the 3D solid state Lidar. ZF also offered an S-Cam 4T dual lens camera as well as a 360-degree remote camera head. Knowing that ZF now makes and offers these components will make more sense as we talk about the autonomous vehicles.

Falling under the "Think" category is the ZF ProAI (Artificial Intelligence) control system that can be used to control this state-of-the-art chassis technology. Although only about the size of a laptop computer, the Pro AI can actually control and integrate all of these components in a single vehicle.

Digitalization and Material Handling

While this does not pertain to buses, it was fascinating to see. Since August of 2017, ZF has been retrofitting a portion of one of their plants in Friedrichshafen with intelligent systems to streamline delivery and

ZF is moving ahead with new technology in many areas. Shown here is the new Innovation Forklift that uses ZF components to operate autonomously. It is already in use at the ZF facility in Friedrichshafen to show that it could stock and retrieve pallets or boxes without human assistance while keeping track of items.

material flow. While this system actually works, a major reason for going this route was to gain experience in sensor, camera and intelligent control systems.

Major parts of the system include ZF's Innovation Forklift that is equipped with radar, cameras, electrical mechanical steering and ZF's ProAI central computer. Add to this ZF's Openmatics connectivity solution and deTAGtive hardware tag. The result was an autonomous forklift that could stock and retrieve pallets or boxes with asset tracking and easy control. This may well be the inventory solution for the future.

Test Drives

Continued from previous events and a favorite station for many of us was the Ride & Drive event. This primarily gives the press an opportunity to ride along on vehicles equipped with ZF components or even drive them if they want to. This year the weather was excellent with bright sunshine and good temperatures. Some of us remember the 2014 event that was plagued with cold temperatures and rain. This activity was located at the adjacent test track in Friedrichshafen. In addition to the expected straight runs with loops at both ends, we had two hills for testing climbing and hill-holding.

Both buses and trucks were available to the press and each featured one or more components from ZF. Components being showcased included the increasingly popular AVE 130 portal axle with built-in electric motors for electric buses. The trucks were generally diesel-powered and equipped with ZF's newer TraXon modular transmission including a 12-speed hybrid. We also had an opportunity to see the new ReAX EPS electric steering in operation.

I was particularly interested in the new CeTrax electric motor for driveline power. It was recently introduced and will presumably be used to turn conventional bus models into electric bus models. Each of the vehicles has an assigned driver who can take you for a ride around the test track while explaining the ZF features of the vehicle. However, you could also talk your way into getting a chance behind the wheel to drive the vehicle yourself. Unfortunately, there were only two buses in the group of vehicles available, but I spent time with both of them.

The ZF articulated test bus was photographed while making a run down the ZF test track. This bus was powered by a ZF AVE 130 portal axle with built-in electric motors in the third axle position. The AVE 130 axle has been in production for a while and is in regular use in several countries.

The larger of the two was an articulated ZF test bus. I think it was 18 meters long (about 59 feet). Power was provided by a hybrid diesel engine. I was told that the middle and rear axles were both the AVE 130 from ZF with the built-in electric motors. They were controlled by ZF software. However, only the rear axle was being used so the bus in effect became a "pusher."

Expectedly, the bus handled well and had no difficulty with the hills. Both the smooth operation and the lack of noise and vibration were obvious. These are several good reasons why passengers like electric buses. I had driven buses equipped with the AVE 130 axle in the past and continued to be very pleased with what I found.

I will admit that my main interest was in the new CeTrax driveline electric motor. The second bus in the group was a conventional transit with a Higer body from China. There was a hole in the floor in the rear covered by a clear panel so you could actually see the placement of the CeTrax in the driveline. What makes the new CeTrax particularly attractive is that you can build it into a bus designed with a conventional driveline. Hence, a bus originally designed for a diesel or CNG engine for power, could easily be

Your editor borrows the keys to the bus so he can drive a CeTrax-equipped electric bus for the first time. It handled much like the buses equipped with the AVE 130 axle.

This standard-length bus was equipped with the new CeTrax electric motor that can be installed into a conventional drive line to turn most any bus into an electric bus.

The new Last Mile Delivery system from ZF is a delivery van equipped with ZF components to make it run autonomously in connection with the delivery person.

ZF's new Autonomous Depot system uses ZF components on currently available tractors to shift trailers and swap bodies around a truck yard autonomously.

modified into an electric bus. I can see where the CeTrax will help the manufacturers move along quickly to offering electric buses.

I was allowed to jump behind the wheel and take the bus for a spin around the test track as well as over the hills. Frankly, I noted very little difference between the CeTrax and the AVE 130 buses I had driven in the past. Both operated very smoothly and without noise or vibration. I almost had to laugh when the man in charge of the bus mentioned that I actually drove like a bus driver. Apparently, the press people with truck and car experience do not.

Autonomous Depot

While the autonomous depot does not impact buses to any serious extent, it should be at least briefly mentioned so you know where ZF and the automotive industry is going.

Trucking companies have been complaining about the difficulty in finding and hiring good drivers – a situation that also impacts bus operators. With the trucking companies, they have a particular problem with drivers moving swap bodies and trailers around terminals because of the precision needed and the fact that the long distance trips pay more. Hence, ZF put together a system utilizing their components, sensors and controls that could be added to existing trucks to substantially automate a truck terminal.

One was a terminal yard tractor that was equipped with ZF Openmatics, a sensor set (radar, camera, Lidar) as well as a ZF ProAI central computer. We saw it operate on its own to pick up semi-trailers around the yard and move them where needed. The second was a truck equipped with several ZF components including a sensor set, Openmatics, the ZF ProAI central computer, a ReAX electrically assisted hydraulic steering system and the TraXon hybrid automated transmission system. In spite of the precision needed, this truck could move autonomously around the yard to pick up swap bodies and bring them to other locations.

Last Mile Delivery

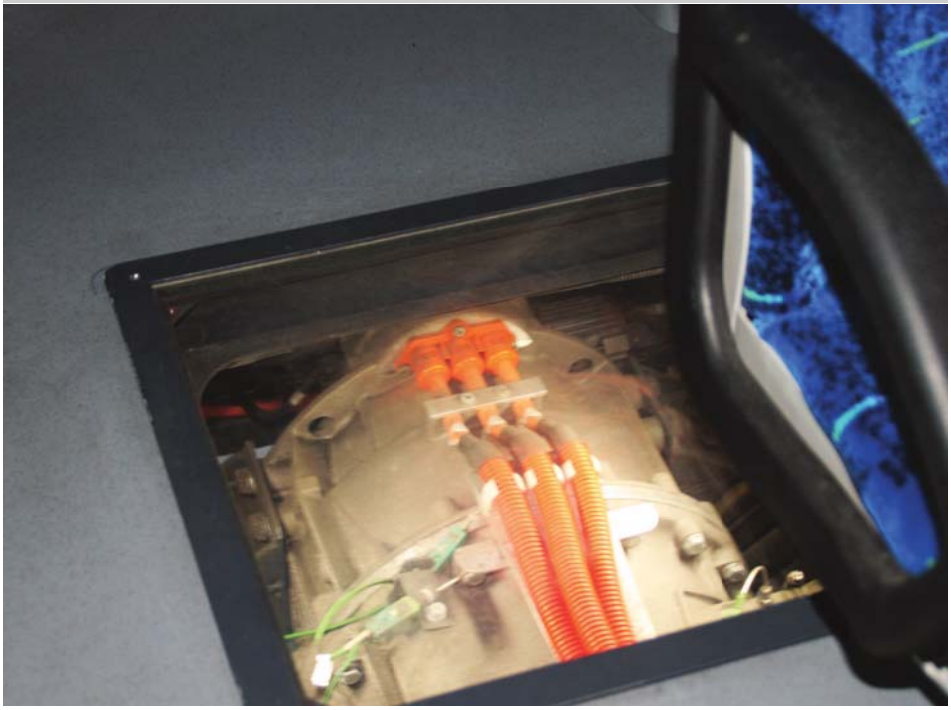
This is basically an autonomous delivery van that makes work easier for the human delivery person. What starts off as a relatively standard delivery van is equipped with several ZF components including a sensor set, Openmatics, the ZF ProAI central computer, an electronic parking brake, integrated brake control, electrically powered steering and electric central drive.

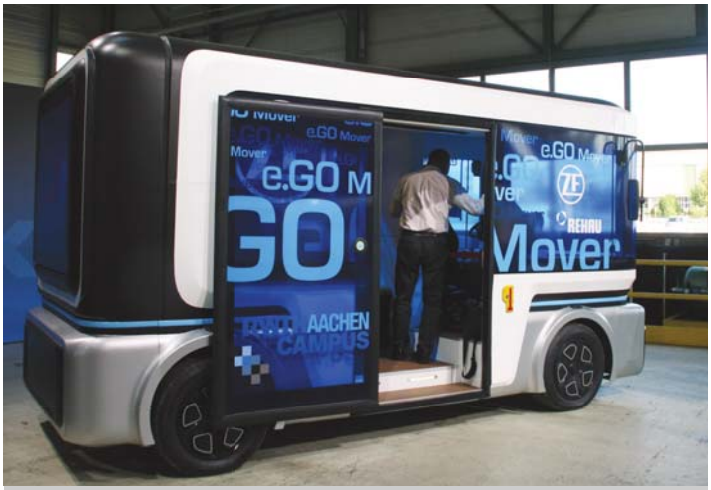
The resulting vehicle helps in several ways by planning the most economical delivery route, keeping track of inventory or parcels and driving autonomously where necessary. When a delivery is being made and there is no parking space, or when the delivery person is making two or three deliveries in a row, the delivery van can follow along autonomously. It will stop at red lights and for obstacles in its path. The ZF components can generally be added to standard vans regardless of make or model.

Autonomous Electric Vehicle Platforms

This last section was particularly interesting. While ZF is supporting existing manufacturers instead of building complete vehicles, the company is moving ahead with new concepts, new technology and new partnerships. Three of these were shown and explained at Technology Day.

The bus equipped with the new CeTrax had this window in the floor near the rear so you could see the CeTrax in the drive line. What makes the CeTrax so impressive is that you can essentially slide it into the drive line on virtually any bus designed for diesel or CNG to turn it into an electric bus. Smaller versions of the CeTrax are also being built for smaller buses.





ZF provides components for the e.GO people mover that will soon be built in Aachen, Germany. In addition to electric drive, it can also operate autonomously.

The Rinspeed Snap is interesting because the ZF components are in the lower operating section while the upper section can be changed for different purposes.

The e.GO People Mover is a small, pod-type bus designed for urban environments. Metropolitan areas are increasingly concerned about pollution and many are already restricting private automobiles. Hence, a vehicle like the e.GO People Mover can provide autonomous urban mobility for shorter trips without pollution.

ZF has partnered with vehicle manufacturer e.GO Mobile AG based in Aachen, Germany in this project. ZF provides many of the components including the sensor set, the ZF ProAI central computer, a ZF braking system and dampening system as well as an electric axle drive and the new mSTARS modular semi-trailing arm rear suspension. The e.GO can move people or cargo and can be automated. Regular production begins in Aachen, Germany in 2019 under e.GO Mobile AG.

Another interesting vehicle development is the Rinspeed Snap. This is basically a low, four-wheel autonomous chassis that will accept several different types of bodies. One body can provide an attractive environment for four passengers while another will carry freight. Other ideas include a shopping body and a pick-up and delivery body.

ZF provides many of the components for the Intelligent Dynamic Driving Chassis (IDDC) for this vehicle. These include the sensor set, ZF ProAI central computer, the mSTARS modular Semi-Trailing Arm Rear Suspension, the Active Kinematics Control (AKC), an EasyTurn Steering System, Integrated Brake Control, and an Electric Axle Drive. The relatively low chassis essentially contains all the components for autonomous driving so that the bodies can actually be changed as necessary.

The third vehicle on display showed a cockpit of the future. It was developed by a partnership of ZF with Faurecia and showed what could be done with an SUV or small van in the years ahead. There were no pedals or a steering wheel. Three digital screens replaced the normal dash. On the center console between the two front seats was a joystick type of control for manual operation. Pushing it forward would accelerate the vehicle while pulling it back would activate the braking. Pushing it left or right turns the vehicle. It was mentioned that the vehicle could come in very handy in delivering mail since the center console control would allow the driver to sit on the right side.

Information for the driver or passenger would be on one of the three front screens. Without a steering wheel, the screens would be fully visible and could include a number of different functions and operations. The "driving" screen could also be moved from the left side to the right if the driver or person controlling the vehicle sat on the right. This particular vehicle would also be very practical for delivery situations since the lack of pedals and steering wheel would make it even easier for someone to jump out and back in for numerous stops.

ZF In The Future

All of this goes to show that ZF is heading in new directions. The company is going beyond its traditional vehicle components by introducing new technology, new concepts and new partnerships. If you are interested in seeing all of this first-hand, then make a point of attending the IAA show in Hanover later this year. Or, stay tuned here at NATIONAL BUS TRADER as we highlight new technology and developments. ❑

ZF and Faurecia combined to develop this vehicle dashboard of the future. There is no steering wheel or foot pedals, but there is an impressive triple electronic dash. The joystick in the center would allow manual operation if the vehicle were not in autonomous mode.

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9698 W. Judson Road • Polo, Illinois 61064

Ph: (815) 946-2341

Fx: (815) 946-2347

www.busmag.com