Overview: Mid-drive e-bike systems

Bosch and Shimano race on as other mid-drive motor makers give chase

Bosch may still be the leader of the fast-growing market for mid-drive e-bike systems, but company officials had better not look back—someone might be gaining on them.

Leading the chase to catch Bosch is Shimano, whose Steps system has, in less than two years, gone from a small-scale test program to a full-fledged system that will be used by some 40 major bike brands for 2016.

“There are pros and cons to being first to the market, but there’s also plenty of space in the e-bike market as it’s now fragmenting quite quickly,” said Ben Hillsdon, a spokesman for Shimano Europe. He suggested that future mid-drive systems would become increasingly specialized.

Shimano believes the e-bike market is growing fast enough to give it a fighting chance.

While the e-bike market is relatively mature in Germany and the Netherlands, Hillsdon said, “there’s lots of unrealized potential in countries like the UK and Scandinavia, where a big e-bike expansion should naturally follow the rapidly growing commuter markets.”

Although Shimano at press time had said nothing about a speed pedelec version or smartphone connectivity, its Steps system, with a light, 3.2kg motor and electronic Di2 hub gear shifting, has won over many fans.

Brands that are adopting the system include KTM, Trek and Raleigh U.S.

The light Steps system could help bring about a lighter future for e-bikes.

Taiwan’s Edge is launching the Steps-equipped Pinnacle with a carbon frame. Edge said the complete bike weighs 14.5kg (32 lbs.).

Swedish start-up brand Walleräng is launching a line of Steps-equipped bikes that will be built in Gothenburg, and durable enough to handle the rigors of the Nordic climate.

Bosch isn’t letting the grass grow around its feet. It has embraced the growing popularity of e-mountain bikes (see related story, page 56) by enhancing its e-MTB-focused Performance Line CX system. Bosch said it’s given the system a “perceptible improvement,” increasing the torque to 75Nm from 60NM, and enhancing pedal assist in turbo mode to 300 percent from 275 percent.

Battery capacity also jumps to 500Wh without increasing the size of the housing. Its Nyon display is now available as a retrofit kit, while smartphone updates give it more robust navigation functions.

Plenty of brands are using Bosch, Haibike alone is expanded the number of Bosch-equipped models in its Xduro line to 41 models for 2016, up from 29 this year.

Waiting for the big wave. Several other brands are surfing the wake created by Bosch and Shimano.

Chinese giant Bafang is launching a new mid-drive at Eurobike it calls Max Drive (see related story, page 14).

“Our new Max Drive mid-drive should make a splash at the show. It is powerful, having beaten off competition from Bosch to win the recent 24 hour race at the Nurburgring, but can also offer practical

Mid Drive Motor MD250

Dapu is proud to introduce its second generation of Mid Motor. Generating an astounding 100Nm max torque, the MD250 still achieves a peak efficiency of ≥80%. The torque sensor and motor controller are integrated within the motor body. The MD250 offers a high quality, yet very affordable option to other mid motors on the market. Dapu motors are renowned for producing high torque with exceptional reliability, which is why they are used by some of the leading ebike brands in over 40 countries across the globe. Our motors are brushless and dual planetary-gearred which allows for higher torque and improved efficiency at low speed.

www.dapumotors.com
Several German manufacturers are attempting to capitalize on the popularity of e-bikes in their home country. Kalkhoff, a brand of the Derby Cycle Group (now owned by the Dutch conglomerate Pon Holdings), has completely reworked its Impulse mid-drive system. From 2015, it’s called the Impulse Evo system and will include two model lines, Include and Integrale.

Kalkhoff’s flagship model is the Integrale S11 with Impulse Evo RS Speed system. The $3,999 bike weighs in at 22 kg, has a claimed range of 120 km, and features a powerful 48V Lithium-Ion battery. Kalkhoff says the Impulse Evo motor delivers maximum torque of an impressive 100Nm. It says it has managed to reduce “background noise” by half, and has added an additional cadence sensor and quicker data transmission. The RS version for speed pedelecs is more powerful. Kalkhoff’s new smart display is compatible with smartphones. An Evo Impulse navigation app, based on open-source Naviki software, provides GPS capabilities. The Integrale model line undoubtedly shows the most pronounced upgrade. Built-in batteries, which remove for charging, are available up to a capacity of 612Wh, which Kalkhoff says is enough to go up to 127 miles (204 km) on a charge.

**Brose** got a shot in the arm with the recent announcement that Specialized will spec Brose motors on its new line of e-mountain bikes. Meanwhile, Brose’s original launch partner, the German mountain bike brand Retwild, has updated its Brose-powered X+ e-mountain bike with a new 500Wh battery incorporated in the frame and a software upgrade. Brose motors also appear on new models from Protanium FG-O/406 and from Visiobike FG-O/210.

Brose is also gaining traction through its partner ContiTech, a division of the huge Continental tire company, which looks to e-bikes as an increasingly important means of urban mobility. “We consider e-bikes and pedelecs not only as an important market for us but as one significant building block of mobility in future megacities,” said Regina Arning, head of the industry division of the ContiTech Power Transmission Group.

ContiTech uses a Brose motor in a system built around a ContiTech belt drive. ContiTech calls its system CeBS, for “Continental e-Bike System.” The CeBS system includes integrated downtube batteries. The company said some 30 brands are showing CeBS-equipped e-bikes here at the show, including Eflow A6-205 and Rose Bikes A6-207. ContiTech, which along with Gates has pioneered the use of belt drives for bicycles, believes riders may become the norm for low-maintenance e-bikes.

**TQ** Systems A6-205 garnered headlines for its powerful and fast “pin drive,” which appears on the 75 kph (47 mph) M1 Sportech M1-207, Spitzing R-pedelec.

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In addition to Brose, other Asian motor manufacturers are looking to grow in Europe. Greenframes US (founded by CMC, a Taiwan Mitsubishi partner) is showing a new system at Eurobike. The 48V system is suitable for off-road use, while its 36V system was recently adopted by Dutch ID A4-703 for a commuter model.

**Bafang** offers the Max Drive in 250W and 350W versions, and battery options are unusual among e-bike brands. Kalhkoff’s new smart systems ranging from motors, batteries to connectors and controllers. It is the only Chinese company with independent intellectual property covering key technologies of drive systems. Bafang’s MAX is a powerful drive system, and batteries. The $3,999 bike weighs 22 kg, has a claimed range of 120 km, and features an additional cadence sensor and quick data transmission. The RS version for speed pedelecs is more powerful. Kalkhoff’s new smart display is compatible with smartphones. An Evo Impulse navigation app, based on open-source Naviki software, provides GPS capabilities. The Integrale model line undoubtedly shows the most pronounced upgrade. Built-in batteries, which remove for charging, are available up to a capacity of 612Wh, which Kalkhoff says is enough to go up to 127 miles (204 km) on a charge.

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Dapu, a Chinese motor manufacturer under Japanese management, is launching a mid-motor system for fat bikes and another second-generation mid-drive that generates 100 Nm of torque.

Nidec Copal, a Japanese company that specializes in precision motors, makes a mid-drive that is being spec’d by the UK’s Momentum Electric. Momentum claims that the 3.1kg motor, which delivers 700W of peak power and 95 Nm of torque, is the lightest mid-drive motor on the market. Momentum uses the motor on its high-end YTT-A e-road bike, while it is equipping its lower priced Model T and Upstart city bikes with Bafang’s Max Drive.

Out of the mainstream. One striking example of an innovative mid-drive system comes from Italian startup Neox. Neox developed a patented system that combines a mid-drive motor with a sequential electronic gearbox. The Neox system eliminates the seat stay. Instead, a reinforced, fully enclosed drivetrain also serves as a single-sided chainstay.

Germany’s Pendix is showing an ingenious gearless motor. Unusually, it mounts to the non-chain side crank arm of almost any bike and was created for the retrofit market. Pendix says the system weighs 5.5kg.

For manufacturers, this explosion of mid-drive options creates a problem. All of these different motor systems are incompatible with one another. A bike brand has to design a frame to fit a particular system.

But what if an OEM had the ability to swap out systems on the fly? Swiss designer Andy Muff says he has come up with a method for doing just that. Muff, founder of Andy Muff, developed the Integrated Size Adapter, which lets manufacturers fit different e-bike motors to one frame. The adapter fits Bosch, Shimano and Yamaha mid-drive motors among others.

By letting OEMs take a “pick and mix” approach to mid-motor drives, Muff said they could cut lead times and solve some of the logistical and delivery issues that have affected mid-drive supplies. — Richard Peace

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