

BrakeForceOne CEO Frank Stollenmaier on e-bike safety & security

# 'ABS Is Just Start of New E-Bike Brake Technology'

TÜBINGEN, Germany - The company was one of the highlights of last September's Eurobike as it presented here ABS (Anti-lock Braking Systems) and b-EBS (Electronic Braking Systems) for e-bikes. BFO - BrakeForceOne claims to be the inventor of such e-bike brakes. Recently the company announced a joint venture with ZF, Magura and Unicorn Energy. Bike Europe asked CEO Frank Stollenmaier to present his views on the actual status and the future of e-bike safety and security.

GERMAN ESLAVA

Everybody knows what ABS stands for. Electronic Braking Systems however are not that well-known. These adjust the brake power electronically from one locking wheel of the vehicle to the other(s) in order to stabilise the vehicle while braking resulting in extra safety. This modern automotive technology is now also being applied to e-bikes by BFO. They call it b-EBS (bike-EBS) and can be applied on any e-bike or motorbike. BFO CEO Stollenmaier explains b-EBS further.

**When did you present ABS for e-bikes?**

"Since we have been working with the automotive industry for a while it was a logical step for us to develop ABS for e-bikes. We presented our e-bike ABS during the 2016 Eurobike show and in doing so we were the first company presenting it worldwide. We have developed the system further which will be available in 2018/2019. Other companies have followed suit presenting their own ABS solutions during the 2017 Eurobike."

**What is the difference between ABS and b-EBS?**

"On two-wheeled vehicles e.g. on motorbikes ABS is normally applied only to the front wheel of the vehicle to avoid locking it. It brings already a high safety-level to the bike, but it is actually only the first step in braking safety for two-wheeled vehicles. As BFO our view is that ABS is also required for the e-bike rear wheel. We have presented it on a test e-bike with Continental-Brose drive system at the 2017 Eurobike show. Both wheels communicate with each

other since the locking/unlocking of one wheel brings similar opposite reactions on the other wheel. This solution represents the first step of b-EBS. The next step is linking the two wheels to communicate with each other for applying electronically controlled brake-force distribution (EBD). This brings maximum control of the bike when braking; even when cornering. All this can be operated by just one brake lever and would be very simple for us to implement. Actually, with b-EBS we are developing exactly the same for bicycles as was done by the automotive industry for cars.

"Since two-wheeled vehicles are more difficult to control than cars when cornering we had to advance b-EBS further. For that we needed additional parameters provided by accelerometers that also detect the side inclination of the bike. For that we created virtual ESP; electronic stability program. We call the system b-EBS; bike-electronic-braking-system."

**What more comes with b-EBS? How is it integrated in e-bikes?**

"The system comes with a check program with warning lights to inform the rider on malfunctions. This is needed as the rider could depend on the safety features of b-EBS. He must be informed when something is not working properly. The check program and the warning lights are on the e-bike display as the BFO b-EBS is integrated by CAN bus to the control unit of the drive system."

**What are the next steps for b-EBS? Is it suited for motorcycles?**

"I think we are just at the start of this new technology for bikes. The next logical step is to use only one brake lever to activate all brakes. Electronics control and operate this brake system. As for motorcycles b-EBS should be a good option while it offers a good solution for motor scooters as well. Currently the main difficulty is the need to adapt legal e-bike regulations to this new technology."

**Is b-EBS compatible with all e-bike drive systems?**

"Actually it is relatively simple for us to adapt our b-EBS to e-bikes using different motors and drive systems. We just need to interface with the CAN bus of the system. We did this by connecting with the Continental-Brose system. With the connection the e-bike display 'sees' BFO's b-EBS and the host system as a unit. We as a R&D company would be happy to work for any e-bike company or drive system supplier wishing to integrate b-EBS in their products."

**Which other areas are important for bikes and micro-mobility security?**

"Modern security means using all available tel-



'As BFO our view is that ABS is also required for the e-bike rear wheel.'

Photo: German Eslava

ecomunication protocols of the vehicle for live-data-tracking and operation. It includes warnings on system errors e.g. when the e-bike battery needs servicing or if firmware updates are urgently required. An automatic online accident recognition and call to emergency services e.g. an assisted ambulance will be a must in the future. Since e-bikes are expensive vehicles they also need online theft protection as

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well. To cover all such security features we have founded a subsidiary named BFO-Mobility. Our specialised engineers do hardware and software R&D for any third party. They have developed the basic hardware and adapted various communication protocols (BLE, GPRS, GSM 3G, LTE 4G, Sigfox)."

**You call your company a R&D centre for micro-mobility. What do you mean by that?**

"The future of individual mobility will be based on the integration of long range transportation like trains, buses, cars with short range mobility. For that we have taken over the start-up company 'urbanmates' and integrated it into BFO. This subsidiary will manufacture the

Flynn kick-scooter which is to be marketed in 2018. It's a very light foldable e-kick-scooter (with 180mm/7" wheels) weighing just under 6 kg which can be carried in a rucksack. Its rechargeable batteries are good for some 30 km and speeds of up to 25 km/h.

"Additionally to ABS disc brakes we will integrate all telecommunication goodies from BFO-mobility into the Flynn like GPS-positioning, online theft protection and accident recognition. We will continue to develop and industrialising new e-micro-mobility vehicles either for us or for any other company. One good example of our R&D work is the industrialisation of the NEOX F8.18 mid-motor with integrated sequential 8-speed gear box for e-bikes. We have presented the first prototype at this year Eurobike and it will become available in 2018."

**You are participating in a new joint venture with ZF and Magura. What's the objective here?**

"The market situation is very tight and the competition is very strong, but at the same time it brings lots of new possibilities. That's why we are participating in the joint venture with ZF and Magura. We want to develop new light electric vehicles and e-micro-mobility solutions for two, three and four wheeled vehicles. Since we all are specialised in different mobility areas, it makes sense to unify our knowledge for future developments. Obviously I cannot give you more detailed information at this stage, but you will hear from us soon."

## Company Profile BrakeForceOne

Company: BrakeForceOne GmbH  
(founded 2010)

Subsidiary: BFO mobility GmbH  
(founded 2017)

Employees: 41 (per October 2017)

Working areas:

- Design and R&D for LEVs and e-micro-mobility vehicles
- R&D for electric vehicle components
- FEM calculations & manufacturing documents
- Production of prototypes & small quantities
- Hard & software R&D for mobility
- Secure connectivity

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