

Anti-lock braking system for e-bikes able to avoid the front wheel locking and the rear wheel lifting increasing cyclist safety during braking

HORIZON
2020

Anti-lock braking system for e-bikes able to avoid the front wheel locking and the rear wheel lifting increasing cyclist safety during braking

Sprawozdania

Informacje na temat projektu

BB6S Active

Identyfikator umowy o grant: 823116

[Strona internetowa projektu](#) 

DOI

[10.3030/823116](https://doi.org/10.3030/823116) 

Projekt został zamknięty

Data podpisania przez KE

18 Lipca 2018

Data rozpoczęcia

1 Czerwca 2018

Data zakończenia

31 Maja 2020

Finansowanie w ramach

INDUSTRIAL LEADERSHIP - Innovation In SMEs

Koszt całkowity

€ 3 263 500,00

Wkład UE

€ 2 284 450,00

Koordynowany przez

BLUBRAKE SPA

 Italy

Periodic Reporting for period 2 - BB6S Active (Anti-lock braking system for e-bikes able to avoid the front wheel locking and the rear wheel lifting increasing cyclist safety during braking)

Okres sprawozdawczy: 2019-03-01 do 2020-05-31

BluBrake represents a high-tech European SME specialized in active braking control in two wheeled vehicles, with the mission to increase safety and riding experience for cyclists and become a worldwide reference technology provider of ABS technology in the e-bike industry.

In fact, there is an important demand for safety-relevant products because the number of people riding electric bikes is growing every year, and safety for cyclists is a decisive factor to enhance this modern form of mobility on the market. The EU, in its policy orientation on road safety, is launching recommendations to institutions and Member States in order to adopt legislations to increase the cyclists' safety.

There are two situations every bicycle rider is afraid of during braking: front wheel lockup and nose-over, (liftoff of the rear wheel and the driver being thrown over the handlebars). Common cause of these accidents is the fact to activate the front brake too hard. Thus, the strong market penetration of modern hydraulic disc brakes with enhanced brake power and the widespread diffusion of e-bikes that guarantee ease of movement while driving, has dramatically increased this danger.

These risks can be mitigated by introducing an active technology able to constantly monitor bike dynamics and support the cyclist during deceleration. Already the norm on cars and motorcycles, Antilock Braking System (ABS) is no doubt, the most promising technology for modulating a bicycle's brake during an emergency stop or when traction is limited.

Nowadays, ABS technology is widely spread in car and motorbike markets: the shift of this technology to electric bike market requires great efforts in terms of portability and integration and foresees more criticalities in terms of system weight and energy consumption compared to the motorbike market. Nevertheless, the ABS has the potential to become a safety standard equipment in premium electric bike market, as confirmed by the ultra-high willingness to spend from target customers.

To respond to this market demand and with the final aim of providing an innovative solution in the field of safety on the road, BluBrake has developed BB6S Active, the lightest ABS system for electric bikes. The performance of the prototypal system has been verified and tested on several real road surfaces (such as dry and wet asphalt, gravel, off-road, wet conditions) in operational environment. The goal of the initiative is that of making BB6S Active the standard safety equipment in the e-bike industry. To reach this goal, the following objectives have been set out by the company for the H2020 project:

- Fault analysis, functional safety and legislative framework: this will include the performance of a FMEA analysis to detect the system faults and use the results to guide the following engineering phase of the product; the legislative framework will be reviewed so as to reach compliance with relevant EU standards and directives.
- Engineering and industrialization of the BB6S Active main components: the beneficiary will proceed with a redesign of the electronics and of the firmware and with the industrialization of the actuator to make production as easy as possible. The ABS indicator light will be developed, and the external case industrialized to allow for mass production. The whole ABS system design will be then validated with the support of braking system manufacturers.
- Extensive product testing and pre-series validation in both simulated environment (bench testing) and real scenario (road testing with pre-series), achievement of product certifications for global commercialization.

- Refinement of the IPR and commercialization strategy for preparing the product launch and revision of the company structure and organization for production purposes.
- Finalization of strategic partnerships with brakes manufacturers and signing of commercial agreements with OEM/bike makers.

Prace wykonane od początku projektu do końca okresu sprawozdawczego oraz najważniejsze dotychczasowe rezultaty

During P1, the activities performed by BluBrake produced the following results:

- Functional safety analysis on the ABS electronic system: first of all, the reference standard applying to electronic devices on vehicles was chosen (ISO 26262): the test protocol to verify BB6S Active's correct functioning was developed in order to fully comply with the standard. Then, a Hazard Risk Analysis and a Failure Mode Effects Analysis were carried out, and the results used to activate the due countermeasures to the ABS.
- Design and engineering of the control board: the final design of the BluBrake ABS electronic system was released. It necessarily included new functionalities in order for the board to be more compact, functional, low-cost at the same time satisfy the requirements derived from the FMEA.
- Implementation of the microcontroller and related Firmware: the control architecture and algorithms have been defined and software safety measures implemented to detect faults of all critical elements of the system.
- Executive design of the actuator: the design and bench testing of the actuator was performed. Two possible solutions have been evaluated, and the one representing a trade-off between cost requirements and performance was selected.
- Plastic case and ABS indicator light executive design finalization.
- Pre-series production process definition: the phases of pre-series production for design validation, industrialization and marketing purposes have been defined.
- Development of a preliminary design of the STTE equipment for simulating the behaviour of the wheel when subject to different road surface conditions.
- Preliminary IPR protection strategy: definition of an IPR protection route for the next months in the view of extending the company patent portfolio and protect the IP generated in the project.
- Project website design and development.

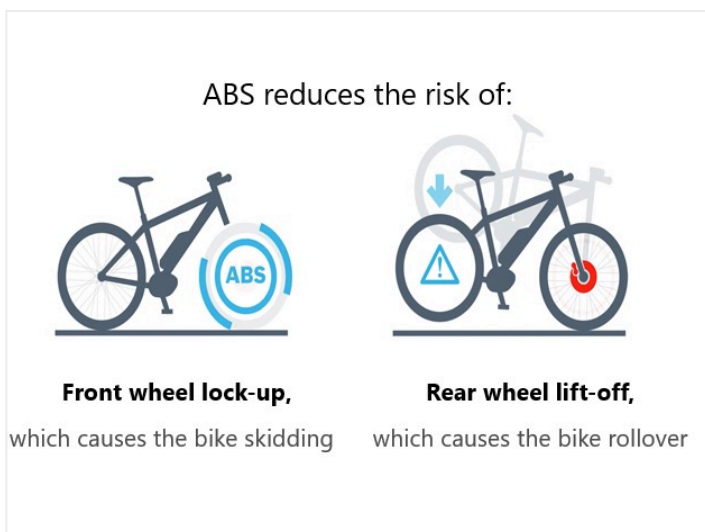
Innowacyjność oraz oczekiwany potencjalny wpływ (w tym dotychczasowe znaczenie społeczno-gospodarcze i szersze implikacje społeczne projektu)

At present time, no ABS solution for bike industry is present on the market and only another company is working on the topic. BB6S Active has been designed following these constraints:

- Be lightweight: Bosch ABS adds around 800g to the bike, while BB6S Active ABS only 330g;
- Be braking system agnostic and easy to integrate with every bicycle: we already tested the ABS with the most important hydraulic braking system for bicycles in the world and never had integration issues.

- Be smart and responsive: the bicycle wheel locking dynamics is much faster than the motorbike ones. This is due to the fact that the wheel mass in a bicycle is much lighter than the one in the motorbike, thus in bicycle the wheel has less inertia and so locks faster.
- Be cost effective for OEMs (BBK customers) and end-users: OEM price for high volumes < 200€
- Retail price < 500€

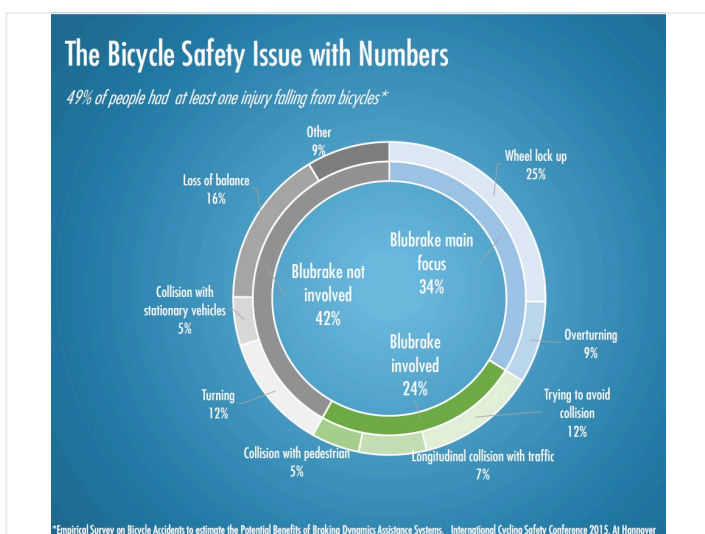
The product specifications are defined to be disruptive against the potential benchmark product: the ABS for e-bikes produced by Robert Bosch GmbH that will enter the market in Q4 2018 BB6S Active is the BluBrake pivotal entrepreneurial initiative, expected to boost magnitude of the SME business. The investment needed to industrialize the BB6S Active system and reach TRL9 is 3,25M€. The total addressable market is the one of e-bikes in EU, US, Canada, Japan and Australia (sales projections = 4,2M of e-bikes in 2022). In particular, BB6S Active targets the premium e-bike segment of the reference market BB6S Active sales forecast: BluBrake plans to sell approx. 250k units in 3,3 years (Q4 2019-2022) by reaching the 8,6% of market penetration and 24M€ of revenues in 2022.



Role of the ABS on e-bikes



BluBrake ABS device

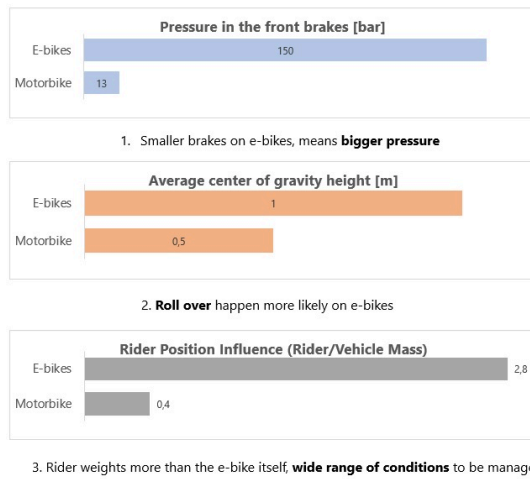


Bike safety issues in numbers



BluBrake components and their positioning on the bike

ABS is an active standard safety feature in motorbikes and cars. Developing such a technology for e-bike is not trivial, mainly for these 3 reasons:



Issues related to the development of ABS solutions
for e-bikes

Competitor analysis

Feature		Competitors
Anti wheel locking and anti overturning control	✓	✓
Works on asphalt and off-road	✓	✓
Compatible with all Urban and Trekking e-bikes	✓	✓
Compatible with MTB and All-Road e-bikes	✓	✗
Frame integration possibility inside top tube	✓	✗
Compatible with electric kits on the market	✓	✗
Works on standard e-bike brakes	✓	✗
HMI integration with the standard e-bike HMI	✓	✗
Digital services based on brake style and usage	✓✓	✗

Competition analysis

Ostatnia aktualizacja: 24 Września 2020

Permalink: <https://cordis.europa.eu/project/id/823116/reporting/pl>

European Union, 2025