

BLOG - Measurement Bicycle Concept

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Use of bicycles has strongly evolved latest years. Strong segmentation from regular use of the bicycle has been emerging almost a decade. At first there is the significant impact of upcoming and settling of e-bikes and e-mobility. Furthermore, strong signals that a new mobility revolution is gradually taking place. A strong contributor is bicycle commutation, expanding its use base from pure fanaticism to realism and pragmatism: avoiding traffic congestions add to a larger certainty and flexibility between destinations. At the same time and complementar to that, the recreational use of bicycle is growing. People love to stay in physical shape and healthy condition. Add to that the e-bikes reaching the user markets expanding the action radius of the recreational cyclist with wider regional destinations within similar saddle times. These evolutions also have resulted in new ways of exploitation rising beyond to ownership or usual bicycle renting as we seen an intensive nucleation of share bike platforms the latest years in regional capital cities. Finally, new functionalities of bicycle transport and commutation are emerging with the advent of cargo bicycles for last mile delivery of loads, e.g. strongly connected to e-commerce.

Needless to underline that the bike and the cyclist is put under stress when one is navigating through types of road surface (concrete road, asphalt, cobblestone) and obstacles present (pits, bumps, ...) on the local road network. Recent research has revealed that the current state of the Belgian roads has an impact on bicycle comfort, bicycle strength and behavior (material strength, material deformation, vibration propagation, ...) due to the high exposure to a spectrum of events. The bicycle manufacturing industry revealed signs that one can no longer wait and wants to take steps in the direction of mapping the behavior of the bicycle on the wide variety of road surface profiles, by linking it to the propagation of amplitudes and frequencies of forces to which the bicycle may be subject to. On the one hand, this should lead to the design of more targeted bicycle tests in bicycle test centers, whereby circumstances of bicycle use will be recorded in so-called use profiles. On the other hand, an intelligent monitoring system is envisaged, in which the history of use of the bicycle is monitored, e.g. as part of damage analysis or warranty provisions for legitimate use or not. Or where the impact on the bicycle user of the load caused by the road surface (via the bicycle) is mapped.

BikeLabs has taken steps in this direction to perform pioneering work in making the translation of forces and force effects in function of the conditions of use of the bicycle. A measuring bike concept is currently being developed, whereby acceleration, vibration at critical places of interaction on the bike (for example the front fork, handlebar, bottom bracket, saddle, etc.) on the one hand and forces associated with it on the other hand, are measured by means of accelerometers, vibration sensors and force sensors. The sensor output is sent to a data logger in real time. This data must be meaningfully linked to conditions of use depending on the road type (surface condition, impact events), but also driving parameters such as speed, mass, ...

In a first webinar we've demonstrated a first simplified case of our measurement bicycle concept. When revealing a few applications, we see our work as an indispensable cycle to allow useful interpretation of e.g. a built-in accelerometer by relating the sensor output to the accelerometer output, providing the objective translation of the mechanical strength and endurance of the bicycle.

