MOTORCYCLE WHEEL BALANCING
The Ongoing Debate Between Static and Dynamic

Introduction

One of the most common causes of vibrations felt during riding is wheel imbalance. When a wheel is unbalanced, centrifugal forces, vibrations, and noises are generated during rotation, and these tend to intensify as speed increases. These effects not only impact riding comfort and safety but can also cause accelerated wear of certain vehicle components. In motorcycles, components prone to premature deterioration include wheel and steering bearings, as well as fork tubes, which may experience abnormal stress due to these vibrations. Wheel imbalance occurs when the axis of rotation does not coincide with the geometric axis derived from the mass distribution of the wheel. Balancing serves to correct this misalignment by adding weights to ensure that the wheel's geometric axis coincides with the rotation axis imposed by the bearings.
This introduction is crucial to understanding the relationship between the imbalance measured on a wheel and its axis of rotation. It is clear that the axis of the wheel mounted on a balancer must align with that of the wheel on the motorcycle, with tolerances reduced to just a few hundredths of a millimeter.

Types of Imbalance

Wheel imbalances can be divided into various types depending on the mass distribution causing them and the effects perceived. These effects increase with speed.

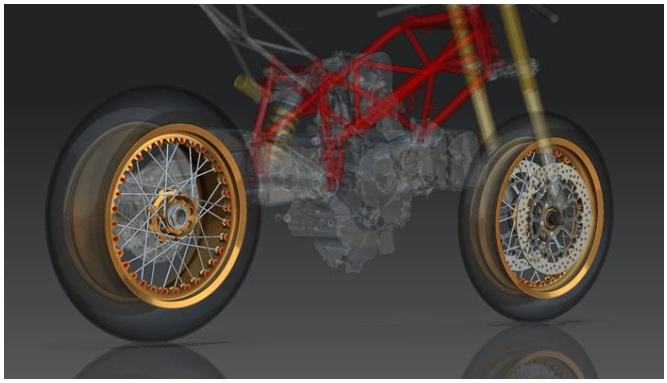
Static Imbalance: This type of imbalance causes the wheel to oscillate, resulting in an annoying 'bouncing' during riding. It occurs when the mass is symmetrically distributed around the rotation axis but uneven along the circumference. When the wheel is free to spin, it will tend to stop with the center of mass in the lowest position.

Couple Imbalance: This imbalance causes the wheel to wobble. It happens when two equal masses are symmetrically positioned relative to the wheel's median plane, generating two equal but opposite forces.

Dynamic Imbalance: This is the type of imbalance actually felt when a wheel is unbalanced due to a combination of static and couple imbalances. Dynamic and couple imbalances only manifest when the wheel is in motion and require specific measuring tools, such as wheel balancers, to detect and correct them by applying counterweights on two planes.

Motorcycle Wheel Balancing: A Necessity

Balancing requirements differ between the front and rear wheels of a motorcycle. Paradoxically, balancing the rear wheel is often more critical than the front. While front rims rarely exceed 3.5 inches, rear rims can reach up to 6 inches. In these cases, dynamic balancing, which accounts for mass differences outside the wheel's median plane, becomes essential. For front wheels, static balancing is usually sufficient, whereas for rear wheels, dynamic balancing is often necessary as well.



Balancing Methods

Drop Balancer: The wheel is mounted on a horizontal shaft and allowed to spin freely. The center of mass naturally positions itself at the lowest point, and weights are added to the opposite side until the wheel stabilizes. This method has significant limitations, such as being unable to balance single-sided swingarm wheels. Additionally, even minimal friction in the wheel bearings can compromise accuracy. Lastly, this method only corrects static imbalance.

Rotating Shaft Balancer (Automotive Type): Suitable for single-sided swingarm wheels, this method uses equipment with a reduced shaft on which the wheel is centered using cones. However, this method can introduce substantial errors due to the pressure exerted by the holding arms of the drive tool, which

can slightly deform the shaft, altering the dynamic balancing results.

Fixed Shaft Balancer: This is the most precise method available on the market. The wheel is rotated on its bearings using a motorized roller, ensuring that the axis of rotation corresponds to the actual one on the motorcycle. This system detects both static and dynamic imbalance and is the only solution that guarantees complete elimination of vibrations

Conclusion:

Drop Balancer: Static correction with low precision, not suitable for single-sided swingarm wheels.

Automotive-Type Balancer: Acceptable for static imbalance but imprecise for dynamic imbalance.

Fixed Shaft Balancer: The most reliable solution for measuring and correcting both static and dynamic imbalance, suitable for any type of wheel.

CEMB Reinvents the Legendary K22 with the New ER BIKE: Ergonomics, Innovation, and High Performance for Motorcycle Wheel Dynamic Balancing

CEMB introduces the ER BIKE, the modern evolution of the historic K22, designed to offer a perfect balance between precision and reliability with every launch. Featuring ergonomic design and cutting-edge technological solutions, the ER BIKE stands out as one of the few solutions on the market for dynamic balancing of motorcycle wheels. Backed by CEMB's decades of experience, it represents the perfect synthesis of tradition and innovation, ensuring excellent performance for industry professionals. For those working in the two-wheel world, dynamic balancing is now an essential requirement to guarantee safety and top performance.