

Erik Buell's Engineering Philosophy

At the Buell Motorcycle Company, our objective is to create motorcycles for enthusiasts who believe the fun of the actual riding experience is every bit as important as the destination itself. Every Buell motorcycle is designed, engineered and manufactured with this in mind. While a great many generic sports bikes use complex technology for the sole objective of license-eating top speed, our mission is to develop and employ innovative technology that enhances the enjoyment of the ride and does not lead to an irrelevant product which is too intimidating, sanitised or uninvolved to be fun to ride on the road. This is not to say that our motorcycles are lacking in exuberant, grin factor performance when the mood takes you - it's just that you don't have to be doubling the speed limit before you feel you're making good use of a Buell Motorcycle's considerable performance.

1. Our Motorcycles

Consistent with the above philosophy, Buell builds uniquely styled and engineered sport performance motorcycles for the street - with the sole purpose of offering riders an alternative riding experience that is involving, exhilarating and fun.

Every Buell motorcycle excels and rewards its rider under real road riding conditions, allowing both bike and rider to fulfil their potential - this is where Buell differs from many other manufacturers whose unquestionably great products have a potential that can only be realised on a race track or unlimited Autobahn.

Every Buell motorcycle has a combination of astonishing, torque performance right from low down in the rev range. This performance is harnessed and controlled due to a number of unique technical features which yield real benefits during everyday riding. On top of this, Buell motorcycles have outstanding, controversial looks and the feel and attitude of a real, raw motorcycle.

Every Buell chassis is graced with compact wheelbase and steep steering head angle in conjunction with a light but rigid frame design that keeps everything in shape during hard cornering. The Buell chassis also has a patented Uniplanar

engine isolation mounting system which smooths out the beating 45 degree V-Twin's vibes progressively as the revs rise from the lumpy tick.

And Buell's styling is unmatched - a study in simplicity with moulded parts that are dramatically sculptural in their design, beauty and finish combined with functional engineering features that look right because they were designed to do a job rather than please a styling committee. Distinctive form follows innovative function.

2. Buell Engineering Concepts – “Trilogy of Tech”

All Buell American Motorcycles feature company founder Erik Buell's “Trilogy of Tech” fundamental design concepts. Those concepts are:

Mass Centralization, Frame Rigidity and Low Unsprung Weight.

2.1 Mass Centralization is the practice of concentrating the greatest amount of mass as close to the centre of the motorcycle as possible. By concentrating parts like the exhaust muffler and/or suspension components of the motorcycle near the center of the bike, frame stress is reduced and there is a lower polar moment of inertia. To the rider all this engineering jargon adds up to more responsive handling on the road.

2.2 Frame Rigidity - The massive aluminium frame on the Buell XB models is also immensely rigid. Frame rigidity results in a machine that offers the rider greater control. All Buell motorcycles benefit the Uniplanar rubber engine mounting system. It allows the engine to participate in the already very impressive rigidity of the frame and to filter out the vibrations.

2.3 Low Unsprung Weight - Minimising the weight of those components not supported by the motorcycle's suspension springs is also critical to control and the feel of the ride. Low Unsprung Weight allows the tyres to maintain road contact on everyday, irregular surfaces. The six-piston, single-disc ZTL inside-out front disk brake on Buell XB models is one way in which unsprung weight has been reduced, saving around 4-6 lbs (2-3 Kg) compared with conventional twin disc set-ups. The ZTL (Zero Torsional Load) front brake design means that the braking forces are transferred optimally from the disc to the rim, rather than via

the spokes. This allows the weight-saving design of the front wheel, whilst saving weight, the 375 mm disc and six piston caliper offer immense braking power and feel.

3. Product Features

The Buell Firebolt XB12R and Lightning CityX XB9SX and Lightning XB12S models house the fuel in the frame and the airbox above the engine, where you normally find the fuel tank. This allows the intake system to feature a zero resistance very high volume airbox with a high flow filter, whilst enabling a slimmer profile.

Sinuous, big-bore stainless steel header pipes flow into a tuned large volume muffler. This enables exhaust gases to flow freely but the muffler internals are scientifically tuned to cancel problem noise frequencies whilst generating back pressure to enhance performance.

To keep the torque band even fatter, the XB1203 engine is equipped with Buell InterActive Exhaust. An electronic actuator activates a butterfly valve housed in the muffler to adjust back-pressure by alternating between two gas flow paths. The engine ECM monitors engine speed and throttle position while activating the valve to optimize torque and horsepower for the riding condition.

Both the 984cc and 1203cc engines fitted to the 2005MY Buell Firebolt and Lightning models are fuelled by Buell's unique Dynamic Digital Fuel Injection (DDFI) system. Its closed loop design monitors conditions inside and outside the engine, constantly checking fuel:air mixture, ambient air temperature and humidity, engine temperature, barometric pressure and exhaust output to ensure optimum performance.

The deep-section cast aluminium swingarm looks outstanding but was designed first and foremost with functional performance in mind, with increased torsional stiffness to minimise flex, it goes even further as it is also the oil reservoir.

All Buell XB models feature a Kevlar belt drive with an additional pulley that ensures a constant path length of the belt. With this pulley, the tension is always constant, meaning that no adjustment is required. It also results in an even more direct response from the throttle to the rear wheel. Its lightness also helps to minimise unsprung weight. The typical service life of the belt is 30,000 Km and the cost is no more than a good quality O-ring chain.

The patented Uniplanar engine vibration isolation system uses rubber mounts to isolate vibration from the engine, to which the swingarm assembly is bolted. Rose-jointed tie-rods restrict the movement allowed by the rubber mounts to a vertical plane to ensure constant wheel alignment.

All Buell suspension is supplied by *Showa*, a renowned suspension specialist with immense expertise, technical resources and GP racing experience.

The Buell XB models feature an incredible 375mm ZTL inside-out front disc brake with a six piston caliper to ensure the optimum braking power and feel which helps reduce the unsprung weight and therefore improve the agility, handling and roadholding of the bike.

4. A Whole New Development Process

In 2000, Buell Motorcycle Company introduced a brand new development process.

Designed to ensure the best quality products, it comprises 4 different phases:

4.1 Concept

The marketing, engineering, styling and service departments meet to discuss the first concepts. At this stage, a first experimental motorcycle is built.

4.2 Proof of Concept

The main goals are defined and approved. Several R&D motorcycles are built. This is a very detailed testing phase. High mileage, high speed, traffic jams, high and low temperatures. The bikes are tested in all conditions, including a specific

European duty cycle. A council made of Buell and Harley-Davidson engineers decides if the project moves to the next phase.

4.3 Concept durability

The bikes are still tested. The production line is set up and tested. The reliability of the bike but also of the assembly line is tested. Again, the council signs before the project moves to the final stage.

4.4 Validation

The final test. All parts are thoroughly inspected, all the tests reports are checked and signed off. All the departments sign off the final agreement.