A SAFER, MORE SUSTAINABLE FUTURE FOR TWO-WHEELERS

CONNECTOR PARTNER NAVIGATES TWO-WHEELERS IN LOW- AND NO-EMISSIONS FAST LANE

By: Dan Cantrell
Industry Manager
Vehicle Components & Recreational Markets
TE Connectivity - Industrial & Commercial Transportation

Designers need to look carefully for the best inter-connect solutions in today's harness and wiring designs. Emission regulation compliance requirements add complexity and reliability elements to designs. The developing "e-bike" market creates new connectivity challenges, requiring new solutions.

Designers of two-wheel vehicles meet new emission regulations by adding electronic sensing and control systems. As two-wheelers move to battery-driven powertrains, designers must place the highest priority on sealing, electrically shielding and physically protecting the quality of their signal and power connections.

EMISSION REGULATION UPGRADE

When the European Union put out its stricter Euro 5 and Euro 6 emissions directives, it became clear motorbikes would increasingly need to turn to electronic control units (ECUs) to meet and stay in compliance. Already, motorbike manufacturers have started to incorporate anti-lock braking systems (ABSs), starting in 2016 with bikes above 125 cc in Europe. Japan and India will do so in 2018.

Compared to Euro 4, Euro 5 and Euro 6 impose tighter limits on emissions such as carbon monoxide, unburned hydrocarbons and oxides of nitrogen from exhausts. Euro 5 equivalent starts in Taiwan in 2018, and is required in Europe and Japan by 2020. In India, the government is determined to jump to Euro 6 equivalent directly from Euro 4 in 2020 to reduce air pollution. China will implement Euro 4 equivalent in 2019, which is also a significant improvement. New and registered vehicles will need to be equipped with electronic fuel injection systems as well.

The impact of the changes required to be compliant with the new regulations should be considered in light of the total worldwide market production for motorcycles, which was estimated at 53 million units in 2018. India and the Asia-Pacific market made up around 95 percent of the total market. This translates to significant electronic content upside with upgraded sensors, relays, on-board diagnostics (OBDs), ECUs, metering and ABS connectors, wiring and tubing to meet the required emission regulations and differentiation features.

> *"connectors and cables must be robust enough to ensure long-term signal and power integrity in the face of extremely harsh environmental and stressful mechanical operating conditions."*

The many connectors and cables must be robust enough to ensure long-term signal and power integrity in the face of extremely harsh environmental and stressful mechanical operating conditions. Motorbike designers are already aware of the delicate nature of electronic devices, boards and connectors relative to their mechanical counterparts. As such, they have learned to choose their connectors and route their cabling carefully, accounting for wide temperature ranges (minus 40 to 135 degrees Celsius), vibration, rain and humidity.

ELECTRIC TWO-WHEELERS

While designers of internal combustion engine (ICE) motorcycles work to meet compliance requirements, another more organic trend has consumed the two-wheeler market: the rise of electric motorbikes and e-bikes. These are being adopted rapidly worldwide, not just as ICE motorbike replacements or for push-bike assist, as some cases are providing consumers an alternative to four-wheel passenger vehicles. E-bikes have one unique advantage over passenger vehicles in that users can pedal if the vehicle runs out of battery power.

E-bikes have other advantages too: they are smaller and nimbler than passenger vehicles, which is useful on congested roads. They also cost less, and pedal-assist e-bikes encourage users to ride bikes who might otherwise be concerned about their ability to cycle long distances. Advances in e-bike electronics and control are also helping in their adoption. For example, smoother motor-control algorithms and the use of microelectromechanical systems

(MEMS)-based accelerometers and gyroscopes have led to improved handling and balance. The placement of the motors and battery compartment has also improved balance with a lower center of gravity. Yet, proximity to the ground makes the battery and motor more susceptible to water ingress and mechanical shock, making the choice of connector particularly important.

This importance rides atop the already demanding current-handling properties of e-bike connectors and relays, which must be able to carry or switch between 10 A and 100 A at voltages of up to 100 VDC, compared to 12 or 24 VDC for combustion-engine two-wheelers.

ADDED FEATURES, PUSH CONNECTOR DENSITY AND SIGNAL INTEGRITY

The emission regulation upgrade and the move to e-bikes coincides with users' demands for the integration of more multimedia entertainment, sensing, display and navigation systems on top of the basic two-wheeler platform. This combination of signal density and high power can compromise an electronic control system over time, a situation that is only going to get worse as more electronics are added to smaller chassis.

To meet the needs of next-generation two-wheelers, designers need to consider their connector, sensor and harness options early in the design cycle. With design requirements changing rapidly, it may be wise to find and partner with a supplier knowledgeable in standards compliance requirements, and with the breadth of experience to provide a more holistic approach to system design, safety, reliability and efficient signal and power routing.

To handle the increased pin density, for example, connector vendors have already developed a single connector with higher pin densities for analog or digital signals, with sufficient isolation to allow co-location of power rails.

Many of these connectors are available off-the-shelf and are adequate for most applications. However, in situations where a more advanced or custom connector design is required, a good connector and harness partner/supplier will already be tuned to the customers' needs and should be able to dispatch a team to develop a solution quickly.

> *"the move to e-bikes coincides with users' demands for the integration of more multimedia entertainment, sensing, display and navigation systems on top of the basic two-wheeler platform."*

Given the fast-changing design environment of modern two-wheelers, having a highly technical connector, sensor, relay and cable harness team available to provide design insight and rapid turnaround of custom connectors can make or break a design. This is especially true when it comes to safety, sustainability and innovation.

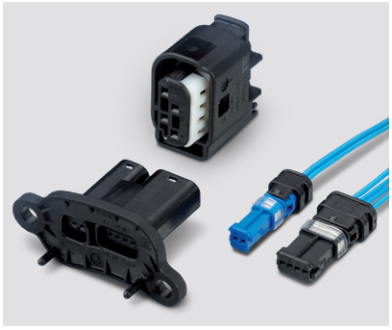
Specifically, being able to connect safety applications such as visual detection, ABS and anti-theft systems when and where they are needed most ensures that rider safety is not compromised due to lack of technical connector knowledge.

From a sustainability point of view, a good connector partner can enable a greener, more fuel-efficient future through the use of connectivity solutions for ECU/EFI, hybrid and electric applications, start-stop systems and on-board diagnostics.

Of course, design success requires constant innovation to meet the challenges of tomorrow. This has led to the realization of SmartSeal headerless ECU technology, Litealum crimp technology, modularization and nano/pico MQS interconnect miniaturization.

From compliance to safety and sustainability, next-generation two-wheelers are on the leading edge of electro-mechanical system design, making it critical that designers be confident in their connector partner's technical and innovation capabilities.

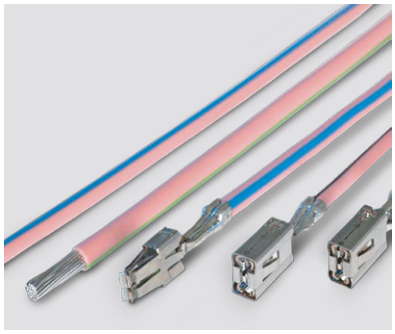
VISIT OUR LANDING PAGE TO LEARN MORE



NANOMQS

TE Connectivity's NanoMQS solutions support the need to reduce weight and space in two-wheel vehicles.

LEARN MORE



LITEALUM

Our LITEALUM wire-crimp termination enables a seamless, stable, secure solution for aluminum wire in motor vehicles.

LEARN MORE

SMARTSEAL

Our SmartSeal connector features a rugged, compact design with a lever slide lock mechanism that secures the connector to an electronic control unit (ECU)

LEARN MORE