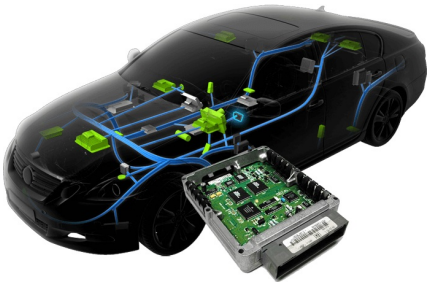
# Electrifying Vehicles at a Lower Cost



**Innovation and progress in ECU design specified for torque vectoring**

*The use of Electronic Control Units in commercial vehicles have increased exponentially over the years. Today, a typical car can have up to 100 ECUs with many different functions. Their designs are also getting more modern and complex, where talented hardware and software engineering teams are gaining more responsibility in the vehicle's design. Classic, mechanical solutions in regards to the engine and the steering functionality are rapidly being replaced with their electronic counterparts. Two engineering students from Lund University have now developed an ECU to control a vehicles wheel speeds during cornering in cooperation with BorgWarner. Their goal? To develop a torque vectoring system at a reduced cost in order to increase road safety. The design proves the possibilities of next generation ECUs and will lay the foundation for a faster change from mechanical to electronic solutions in vehicles.*

*"If you want something new, you have to stop doing something old."*

PETER F. DRUCKER

The main focus of the innovative design experiment was to determine if an electronic control unit could be designed by a small team, while pressing down the cost and the size of the physical ECU. The design is a further development of two master theses, where one had designed the mechanics of a dual clutch on the rear wheel axes, and the other determined what control sequence was needed to control the yaw moment of the vehicle correctly. Both the designs are developed for a Formula Student racing car.

The ECU-design consists of two Central Processing Units for computations and communication between the ECU and the vehicle. The electronic design is kept simple, and only uses the necessary signals for the system to function.

A design requirement for the team was to completely ignore the common design choices and the common procedure, in order to investigate new possibilities. While this design requires the software to function more effectively it also reduces the cost and the size of the hardware.

The design has been proved itself functional and fast enough for a torque vectoring system.

*"Intelligence is the ability to adapt to change."*

STEPHEN HAWKINGS

With the designed finished, and the concept proven, the hopes of the two-man team is to use the unit in a Formula Student car to further test and verify the design. Furthermore, they hope that this design will be used as an inspiration for future engineers when developing the next generation's Electronic Control Units. With many challenges facing the modern world, the hope that this example will help expand the market for electric cars by providing it with a rapid and low cost design methodology is strong.

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