Driving changes in automotive safety

by administrator on May 13, 2011

The total number of cars produced worldwide in 2010 surpassed the 70 million mark. Europe is home to 27 per cent of this total, and with the number of new cars and drivers on the road increasing each year, the need to improve efficiency and safety has become imperative.

Over 40,000 lives are lost in the EU in 2008 as a result of road traffic accidents, with a further 1.7 million citizens injured in such incidents. The European Commission has highlighted passive safety devices, such as electronic stability controls, speed limitation systems and seatbelt reminders as essential tools in reducing this figure. While the automotive industry is continually seeking innovative solutions to improve the functionality of such electrical systems, they are placing greater demands on existing technology, which can compromise reliability and result in costly product recalls.

A collaborative approach

ELIAS, a highly collaborative research project consisting of 11 partners from five countries, addressed this issue and has already produced highly promising results which could have a substantial impact our cars, helping to save money and, more importantly, lives. The EUREKA-supported project was comprised of circuit designers, experts in semiconductor technology and reliability, a computer-aided design (CAD) provider and the German car manufacturer Daimler AG, who all offered insight into the various demands placed on modern electrical systems employed in car design. Together, they worked to develop new test and simulation-based methodologies to improve product reliability and reduce failures.

While the initiative benefited greatly from its highly collaborative nature, project leader Charlotte Rohr (Robert Bosch GmbH, Germany) is eager to assert that the influence and support of EUREKA has been fundamental to their success: "Throughout the project the MEDEA+ review committee within the EUREKA bodies has offered support and recommendations in order to ensure that the investigations are of the highest possible quality." The ELIAS team was awarded the Jean-Pierre Noblanc Award as the most innovative MEDEA+ project in 2009.

ELIAS partners have developed common agreed test methods and quantitative ageing models for the major stress mechanisms at silicon and package level. In addition, they have validated these models using diverse semiconductor technologies, casting light on the various ageing effects that electrical devices are likely to experience, such as high temperatures and voltage. As a major outcome, an ageing simulator suitable has been developed, integrated fully in the project partners' design environments, and introduced into the CAD marketplace.

Improving reliability, cutting costs

ELIAS has also produced a set of international guidelines for Fast Wafer Level Reliability (FWLR) monitoring. This is an innovative method used to test the reliability of semiconductor components in a very short time frame, providing improved cost efficiency while upholding quality requirements. Rohr believes that the results will be beneficial to road safety, as well as the competiveness of the European automotive industry: "Since device ageing effects and circuit lifetime estimation can now be validated at the design phase, we can better forecast projected savings in redesigns, speeding up the devices' time-to-market while also saving lives," she affirms.

The European automotive industry is renowned for its innovative approaches to product development and testing, but has been challenged by the Asian and North American markets in recent years. With the continued integration of

smart-power technologies and the need to maintain high quality standards, the ability to permanently monitor production lines and reduce time-to-market is a growing concern. ELIAS simulation-based methodologies have, therefore, made a direct contribution to European competitiveness, of which Rohr is understandably proud: "ELIAS outcomes will definitely place European players at the forefront of automotive safety research for coming product generations. Our competencies are also suited to upcoming markets for green power generation and smart grid power distribution."

The efforts of ELIAS have yielded tangible and significant results; the team has harnessed an enhanced understanding of the roots of component failure. Failure mechanisms are now being assessed using ELIAS's physical degradation models to ascertain its safe operating area, demonstrating the immediate impact of the project, as Rohr elaborates: "This functionality has been significantly improved by ELIAS and will help to achieve the 'zero-per-million' goal of field failure rates and to reduce the risk of product recalls, thereby strengthening the competitiveness of European automotive product generations in the future."

Wide-ranging benefits

ELIAS has enabled the rapid introduction of new smart-power technologies with proven reliability. The newly developed systems, thus producing competitive products for the automotive microelectronic industry, as well as industrial and consumer markets. However, the benefits will not only be experienced by the project's partners; they will extend to foundry customers of ELIAS partners ? including SMEs across Europe ? who will profit from the enhanced design kits produced by ELIAS which can be used for reliability screening in the design and manufacture of their own products.

The developments made to date are also likely to have a notable bearing on consumer confidence in highly reliable and affordable passive safety devices, such as Electronic Stability Programme (ESP) technology, which is commonplace in most small-medium sized cars and has, since the start of 2011, become mandatory in newly manufactured cars in both the EU and the USA. The impact of increased consumer confidence in the safety of vehicles cannot be underestimated.

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