HERIOT WATT UNIVERSITY

Design & Manufacture of 3D Miniaturised Integrated Products

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3D Minitigation Challenge Case Study.indd 1 12/05/2011 12:02

3D-Mintegration Challenge

This project is destined to revolutionise the way small, complex products and components are manufactured by providing a radical, new way of thinking for the end-to-end design, processing, assembly, packaging, integration and testing of complete 3D miniaturised/ integrated ("3D-Mintegrated") products.

The work of this Grand Challenge will form the basis for next generation automotive, aerospace, telecommunications, medical and consumer products that will combine significantly improved performance with higher added value, sustainability and eco-efficiency. The 3D-Mintegration project will also give companies valuable insight into how evolving practices in this field worldwide may be adopted and adapted for optimal exploitation in the UK. Over twenty companies have shown an interest in the technology including: BAE Systems, Unilever, AstraZenica and GlaxoSmithKline.

Current micro engineering techniques are based upon those used for semiconductors, and so tend to permit only the manufacture of products based on single materials, typically in planar configurations. There is a need to address the restrictive issues of materials and very high capital costs by developing entirely new design and manufacturing techniques underpinned by modelling, simulation and risk mitigation procedures to ensure that these new manufacturing techniques can be exploited by industry with confidence.

The research carried out by Prof Marc Desmulliez at the James Watt Institute for High Value Manufacturing led to the manufacture of a proof-of-concept device for variable frequency microwave heating and curing of Micro electro Mechanical devices (MEMS). The design of this device permits its easy installation on to existing packaging technology for high accuracy alignment capability.

The project has demonstrated that a set of process conditions can be achieved so that variable frequency microwave heating and cure technology can be implemented successfully into electronic component manufacture, assembly and packaging. New science-based engineering has also emerged to understand the cure kinetics of pastes used in MEMS packaging, which is radically different from the curing achieved by heat convection as the heat rate is orders of magnitude larger at microwave frequencies.

This project enabled the creation of a unique, patentable RF-cure apparatus for insertion into novel bonding equipment that will permit a more efficient packaging technology. A series of electronics industry associations across Europe have identified the applications of the technology and are to push the commercialisation of the device to their members in November 2010.

"The groundbreaking work carried out in the FAMBOS project had led to securing European funding to further develop the technology and that significant industrial interest was being shown in the technology."

Dr Harald Egnar, The Fraunhofer Institute

Further information

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