Syfer Technology Limited
Old Stoke Road
Arminghall, Norwich, Norfolk
NR14 8SQ England

Tel: +44 (0)1603 723300
Fax +44 (0)1603 723301
Email: sales@syfer.co.uk
Web: www.syfer.com

THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION 2008

Restrictive labelling for restricted materials

UK component supplier, Syfer Technology, is concerned that increasing demand for 'leadfree' devices will add to confusion over the terms of the RoHS Directive.

Awareness is growing of the upcoming European legislation constraining the use of a number of hazardous materials used in the electrical and electronics industries. Equipment manufacturers worldwide are preparing to comply by talking to materials and components suppliers and developing and testing new processes. Though some countries, particularly those in the Far East, are considerably further ahead than others, it is encouraging to see that most firms now seem to have the Restriction of Hazardous Substances (RoHS) Directive on their business agenda.

The most worrying recent development, however, is the way in which the industry has dubbed the legislation 'the lead-free' directive. While lead may be of most concern to the electronics manufacturing sector, there are several reasons why this terminology should not be widely adopted. First, the RoHS Directive covers a number of materials including lead, cadmium, mercury, hexavalent chromium, PBB and PBDE thereby making 'the lead-free' label misleading.
Second, the core of the Directive, is the restriction of these substances. The Directive itself clearly states that there are a number of exceptions to the total ban on the use of lead.

The overall aim and spirit of this legislation is to address serious environmental concerns about increasingly large quantities of obsolete electronic goods destined for disposal in land-fill sites.
The real danger is that, over time, the materials used in these assemblies can enter the ground water with a high risk of contaminating the public water supply. While total elimination of hazardous substances is preferable, the Directive recognises that in certain cases, the potentially hazardous substance has been rendered to a form that is no longer an environmental risk.

Lead in glass – no danger

Take the case of multilayer ceramic capacitors, for example. Lead is commonly used in glass form in the fabrication of various dielectric materials and terminations for these capacitors. In this form, the lead is totally

inert and however finely it is crushed and however long it is buried, it will not revert to a water-soluble state. In short, it is of no danger to the environment. For this reason, the RoHS Directive clearly states that lead in glass and lead in ceramic electronic components is exempt.
The current trend among equipment manufacturers, to demand ‘lead-free’ products from their component suppliers, is unnecessary and potentially restrictive. Further, it could be dangerous, as a device could be declared to be ‘lead-free’, but may still not comply with the RoHS Directive if it contains another banned substance (such as cadmium).

Further, the latest draft of the Directive contained a phrase specifying a maximum of 0.1% lead allowable in the ‘homogenous material’ of a component. Notwithstanding the current controversy over whether the definition of ‘homogenous material’ means device, subassembly or end product, such components may not qualify as ‘lead-free’ though maybe RoHS-compliant. Compounding the problem, some major manufacturers are beginning to demand that RoHS-compliant parts are labelled as ‘lead-free’, which will surely only create confusion as the terms are simply not synonymous.

Within the ceramics industry there is always research ongoing into new dielectric materials.
Passives manufacturers, such as Syfer, are constantly seeking new methods and materials to make higher performance and extended range devices, at lower prices for their customers. But such work can take many years. Recently, lead-free dielectrics have been developed and tested, and some are already proving suitable for certain ranges of ceramic chip capacitors, with neglible compromise on performance. However, for a number of important applications, particularly in the high voltage arena, it is not yet possible to manufacture ceramic capacitors based on a lead-free dielectric. In truth, this should not matter as existing parts are fully compliant with the RoHS Directive; the allowable lead in the dielectric is not a danger to the environment. However, companies insisting on 100% lead-free components may be unnecessarily restricting their choice and potentially compromising their designs. If, instead, they require RoHS-compliant components, then this is what they should be asking for.
Many firms have compiled detailed questionnaires to send to component suppliers, requiring a full breakdown of the material content of devices. Each customer has their own format of questionnaire, requiring the same data but presented differently. Some want a form completed for very different type of device they buy, others want a declaration with every shipment made. Syfer offers thousands of component types, each available in dozens of different material combinations to provide the fullest range of capacitance values. Component suppliers are in danger of spending more time and effort filling in forms than the customer order is truly worth! Some rationalisation is required here, with a standard form for any (potentially) RoHS-compliant component from any component manufacturer, acceptable to any component buyer.

Lead-free solder processes

Questions are constantly raised on the compatibility of lead-free solder processes with components such as multilayer ceramic capacitors. In fact, capacitor terminations have been 100% tin for many years, and these are fully compatible with both conventional tin-lead and lead-free soldering processes. There continues to be a lively debate on whether 100% tin solder processes are more likely to cause ‘tin whiskering’ problems. But instances of ‘tin whiskering’ are not related to the devices themselves or the termination style, but rather to the assembly process and the end application.

The more critical issue with 100% tin and tin alloy solders, which require a much higher temperature process than conventional tin-lead solders, is that the resulting solder joint is far more solid. Stresses caused by high temperatures and/or flexing during the PCB manufacturing process are far more likely to cause cracks in the capacitor itself, now, than in the solder joint.
Unsupported PCBs will flex more at the higher soldering temperatures and may apply additional stress, increasing the chance of mechanical cracking. Syfer has performed extensive testing of its devices in this environment and for all X7R dielectrics, the use of a polymer termination (such as Flexicap) is recommended in order reduce the amount of stress transferred to the ceramic capacitor itself.

Meanwhile, in reality, despite all the demands being made by the equipment manufacturers and assemblers, very few seem to be ready to start ‘lead-free’ production lines – in Europe at least.
Far Eastern manufacturers, on the other hand, appear to be far more aggressive, though are frustrated by the confusing terminology and difficulty in interpreting the terms of the Directive precisely. Sony is already trialling lead-free processes which are driving the contract manufacturers to follow suit. While some in Europe claim to have defined new processes and specified new equipment, there is precious little feedback so far. Most seem to be in the early stages, putting pressure on the supply chain for small quantities of compliant parts.

To avoid a potentially chaotic and commercially damaging situation as the 1 July 2006 deadline for compliance draws nearer, it would be wise to see demand growing for ‘RoHS-compliant’ rather than ‘lead-free’ components.