

THE RoHS STAMPEDE – Does It Effect You?

If you are a manufacturer, and you haven't heard of **RoHS** — The **R**estriction of the **U**se of **H**azardous **S**ubstances — you will in the near future. Enacted by the EU (The European Union), RoHS Regulations went into effect on July 1, 2006 and are reverberating across the manufacturing world. Many independent laboratories are trumpeting RoHS testing as a “make or break” requirement on websites and in marketing mailings. These warn of catastrophic consequences for your company if extensive testing is not performed immediately, but often provide little information on what RoHS actually regulates and requires.

What is RoHS?

RoHS regulates the amounts of six specific hazardous substances in certain products which are made in, or imported into, the EU market. The full name of the regulation is “The Restriction of the Use of Certain Hazardous Substances *in Electrical and Electronic Equipment*”. The italics are mine and are there for emphasis. Many testing labs have left this part of the regulation's title off in their discussion of RoHS requirements, giving the impression that all products are affected and should be tested.

The RoHS is a spin off of another EU regulation, the Waste Electronic and Electrical Equipment Directive (WEEE). WEEE deals with concerns over the introduction of hazardous substances into the environment resulting from recycling or disposal. The six substances regulated by RoHS are listed in the chart to the right.

Element/Compound	MCV*
Lead	0.1%
Mercury	0.1%
Cadmium	0.01%
Hexavalent Chromium	0.1%
PBB	0.1%
PBDE	0.1%

*Maximum Concentration Value

Hexavalent Chromium is a toxic form of this metal as opposed to non-toxic forms such as Trivalent Chromium. PBB (Polybrominated Biphenyl) and PBDE (Polybrominated Diphenyl Ether) are flame retardants that are added to some polymers.



The European Union's emblem (above) will become more familiar as the EU flexes its regulatory muscle.



RoHS applies only to products exported to the EU market, although similar regional regulations are immanent from China, Japan, Canada and a number of U.S. states.

RoHS does not apply to all manufactured products, contrary to a lot of the misinformation currently being floated, but rather to the “homogeneous” components (more on this later) of electrical and electronic products in eight specific categories. These are listed in the chart on the following page.

The RoHS Stampede

Continued from page 1

1	Large Household Appliances	Refrigerators, washing machines, etc.
2	Small Household Appliances	Vacuum cleaners, toasters, hair dryers, etc.
3	IT and Telecommunications	Computers, copiers, cell phones, calculators, etc.
4	Consumer Goods	TV's, radios, camcorders, DVD players, etc.
5	Lighting	Light bulbs and their controllers.
6	Electric Tools	Drills, saws, sanders, spray equipment, welders, etc.
7	Toys and Sporting Goods	Video games, electric trains, sport data loggers, etc.
8	Automatic Dispensers	Everything from ATM's to drink vending machines.

Medical devices and measuring and control instruments are expected to be included in RoHS in 2008 or 2009. They are, however, currently regulated by WEEE.

Homogeneous?

The term “homogeneous” has been universally accepted as a criteria for materials which are subject to RoHS. Webster defines it as “of uniform composition throughout.” For the purposes of RoHS, it has been defined as “A material that cannot be mechanically disjointed into separate materials.” However, for the purposes of RoHS, mechanically disjointed means the material *can in principal* be separated by “unscrewing, cutting, crushing, grinding or abrasion.” Clear? Let me give you an example. A microprocessing chip *can in principal* be mechanically separated into its individual components. Since it is encapsulated in plastic, this process would be difficult to say the least. RoHS, however, is not concerned with the difficult, and each “homogeneous” component in the chip, each “layer” in the circuit, must be individually tested and in compliance with RoHS.

The question of plating and coatings takes us still further down this path since they are considered a “homogeneous material” according to the EU Commission. Whether or not a 0.001” chromium plating on a fastener can *in principal* be mechanically separated, and would therefore be subject to RoHS regulation is “under consideration”. And yes, fasteners which are part of electrical or electronic products fall under RoHS requirements. The mechanical separation of printed circuit boards into homogeneous components begs an article (a long one) all its own.

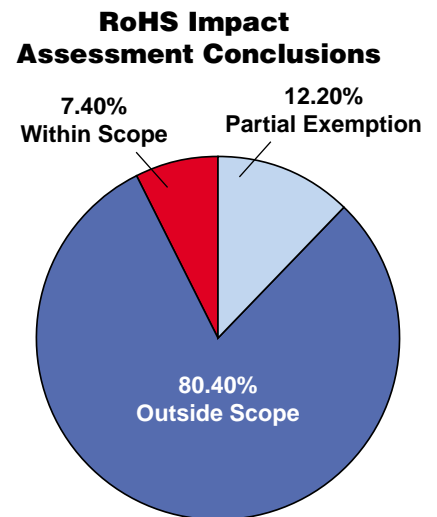
Amazingly, the word “homogeneous” does not appear in the RoHS Regulation, but is mentioned in the FAQ section of its supporting literature, which ends each page with a disclaimer notifying the reader that statements in the FAQ “are not legally binding”. The reality is that much of what RoHS does and does not regulate will not be determined until it passes through the European Court of Justice, the only legal institution with the authority to interpret RoHS. These rulings will take time, in many cases, years.

Exemptions. Does Your Product Need To Be Tested?

In addition to many vague interpretations, RoHS is riddled with exemptions. Contrary to popular belief, these exemptions are not limited to a few privileged

military or medical OEM's, but apply to a wide range of electronic/electrical manufacturers, excusing them from compliance with RoHS, WEEE, or both.

This was illustrated in an Impact Assessment conducted in 2005. OEM's were selected from a broad cross section of the electronics industry, with exempt military producers excluded. The results, shown in the graphic below, were revealing.



- Thousands of individual products in 150 product categories were assessed. Over 80% of these fell outside the scope of RoHS or were eligible for legitimate RoHS exemptions.
- An additional 12% were eligible for partial, though significant, RoHS exemptions.
- Only 7% of the products fell unquestionably within the scope of RoHS, and required testing and compliance.

RoHS was written for the purpose of regulation and there are many products that clearly and decisively fall under its jurisdiction. There are, however, numerous exemptions which may or may not be obvious, that eliminate the requirement for compliance.

More On The Way

RoHS is just the latest in an on going progression of regional environmental regulations. The disruptive impact of these regulations has increased with the



Six specific categories of electrical/electronic products are regulated by RoHS including large household appliances such as washing machines.

expansion of the global economy. There are more on the way, with similar “green” regulations at varying stages of consideration, formulation or enactment pending in China, Japan, Canada, California and twenty-one other U.S. states. This has resulted in the expenditure of billions of dollars in resources to interpret and conform to overlapping or contradictory regulations. The obvious solution would be uniform regulation, approved by the World Trade Organization (WTO), a function for which the WTO was ostensibly created. Don’t expect this to happen any time soon. Although the member nations of the WTO have approved the Agreement on Technical Barriers to Trade (TBT) to minimize cost and disruption to global industry, this lumbering bureaucratic behemoth has not shown the slightest interest in fulfilling this function.

With the dramatic increase in the production of electronic products in the last two decades, combined with their relatively short service life before becoming obsolete, the objective of these regulations in protecting health and the environment is laudable. Their piecemeal implementation, however, has created costly confusion.

And with the growth of subcontracting and outsourcing by large global corporations, compliance requirements will likely work their way down the supplier chain and the greatest burden will fall on small and medium sized manufacturers, who can least afford the added costs.

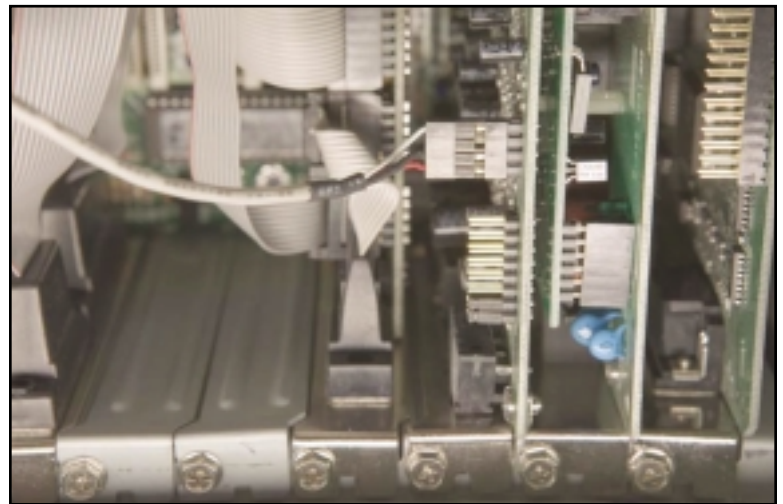
Complying With RoHS

For these small and medium sized manufacturers, figuring out the intricacies of RoHS and whether or not it applies to your product is expensive and time consuming. Your most economical course of action, if faced with possibility of extensive RoHS testing, may be consultation with a company whose business is understanding the ins and outs of RoHS. It is critical when selecting such a company that you choose one that *does not provide laboratory testing*. This will avoid any conflict of interest in the answers you receive. A Google search on the internet for “RoHS consultants” offers numerous specialists for consideration. Other RoHS sites of interest include:

www.buyusa.gov/europeanunion/weee_rohs_services.html

www.dti.gov.uk/innovation/sustainability/rohs/page28846.html

http://ec.europa.eu/environment/waste/weee_index.htm



RoHS regulates electrical/electronic products. However, much of what exactly falls within the scope of RoHS — such as plating on fasteners — is an unresolved question.

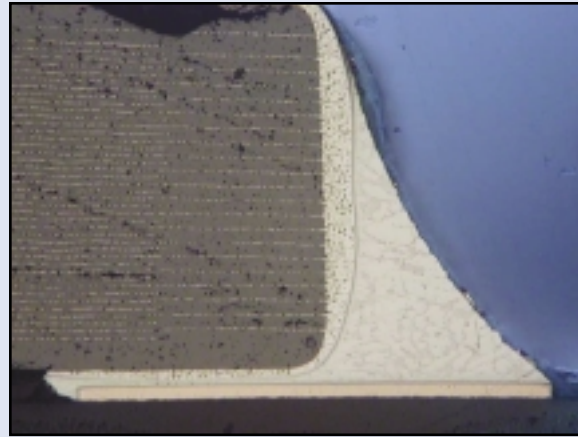
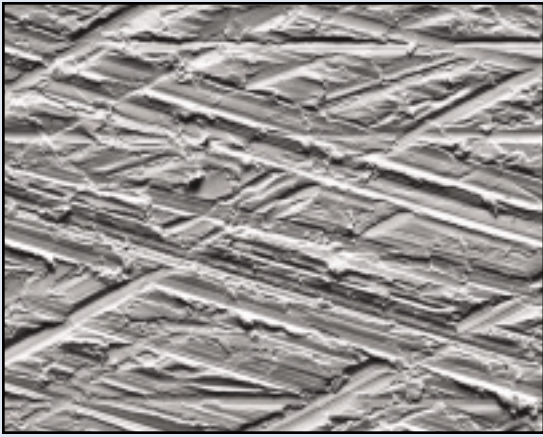
In The Works...

Recent analyses performed here at MAI have included a wide range of materials, applied processing and environments. Our thanks go out to all of our clients for their confidence in entrusting this critical work to us. A typical selection from these analyses included...

- Weld certification on heavy section steel plate for a leading manufacturer of mining equipment.
- Analysis of V-6 automotive engine cylinder bores using Scanning Electron Microscopy to characterize the quality of cylinder bore honing and relate the results to dyno performance.

- Specialized heated and ventilated drying conveyer barrels, used for the processing of dairy products, were examined by ultra-sonic inspection to identify any cracking and predict service life.
- Microstructural analysis of jet engine combustor case for commercial aircraft.
- Failure analysis of a fractured circuit breaker which resulted in an electrical fire.
- Failure analysis of a fractured check valve from a railroad tanker car.
- Analysis of commercial kitchen utensils produced in China to determine conformance to specification.

Continued on back page



Far Left
Automotive cylinder bore honing finish was analyzed by Scanning Electron Microscopy. (SEM) 200X

Left
Polished cross sections were prepared through microprocessor solder joints for analysis by optical microscopy. 100X

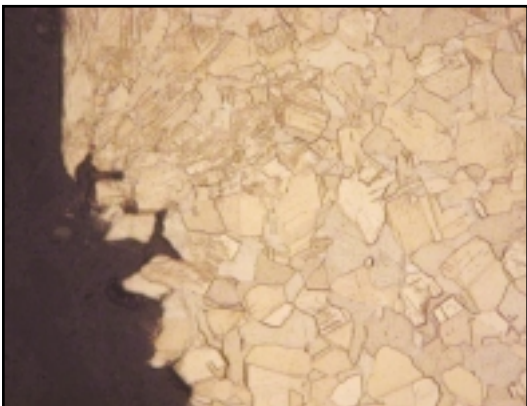
- Failure analysis of a cracked steering arm from a military vehicle.
- Analysis of debris particles which resulted in seizure of a hydraulic valve. By positively identifying the composition of the debris, we were able to identify

components upstream from the valve which were wearing excessively and about to fail catastrophically.

- Microprocessor solder joints were analyzed by optical microscopy to certify a new soldering procedure.
- Failure analysis of fractured stainless steel surgical implant used to secure two halves of a broken bone during the healing process.

Metallurgical Associates is an independent materials testing and engineering facility accredited by the American Association for Laboratory Accreditation (A2LA-ISO/IEC 17025). Our expertise includes failure analysis, process problem solving and process/material certification and selection. For a quote or discussion of your analytical requirements, please contact Tom Tefelske (tomt@metassoc.com), Erik Andersson (erika@metassoc.com) or Rob Hutchinson (robh@metassoc.com) or phone (262) 798-8098, or Toll Free (800) 798-4966.

Stress corrosion cracking in a bronze alloy, 500X



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