RoHS/WEEE Overview and Recommendations

January 2006

(Revised May 2008)

DATA COMMUNICATIONS COMPETENCE CENTER

Abstract

The increasing global awareness of the impact of products and manufacturing processes on the environment has prompted efforts to control and minimize this impact. In 2006, the European Union implemented a set of requirements for the production of specific families of products and materials with the intent of reducing and eventually eliminating negative environmental impact. These requirements, generally known as RoHS and WEEE, have been referenced or adopted by many nations as they move toward increased environmental responsibility. Specifically, a recent change to RoHS affecting data communications cable -- the elimination of the decabromodiphenyl ether exemption on July 1, 2008 -- will be discussed in detail, and the ramifications of this change will be examined.

What are RoHS and WEEE?

The Restriction of the use of Hazardous Substances (RoHS) is a legal standard issued by the European Economic Union in 2003 (Directive 2002/95/EC). The directive bans the sale of new electronic equipment into Europe if it contains more than trace amounts of six substances defined as hazardous. This ban came into force throughout Europe on July 1, 2006.

The Waste Electrical and Electronic Equipment initiative (WEEE) sets recovery, reuse and recycling targets for each of ten categories and took effect on December 31, 2006 (Directive 2002/96/EC). Information Technology and Telecommunications Equipment comprises one of these ten categories within WEEE and specifically addresses the markets for data and telecom cabling products. However, the primary material content concerns for cabling products are addressed under RoHS, so RoHS will be the focus of this article.

Although RoHS is a European Union Directive that currently applies only to Europe, global efforts to reduce usage of hazardous substances have accelerated. Since the goal of RoHS is to restrict the use of these substances in equipment that will eventually accumulate in local landfills or local dumpsites resulting in environmental contamination concerns, it is gaining wider attention throughout the world.

For instance, in the United States, several states have enacted legislation that requires equipment manufacturers to comply with RoHS requirements. Many states are also considering bans or restrictions on materials and products regulated by RoHS. Requirements for verification of product or material compliance to RoHS standards have become more common in the United States.

Globally, Japan has had a program to reduce lead contamination for a number of years. China has adopted RoHS. Korea has enacted voluntary RoHS compliance

programs. Although adoption of a program of the magnitude of RoHS may not be global, most nations conduct, or will conduct trade with partners that have adopted such a program. As such, it is incumbent upon commercial or national entities to review their product portfolios in light of RoHS (and similar) program requirements.

What Materials are Restricted?

RoHS restricted substances, listed with their Maximum Concentration Values (MCV), are:

Cadmium (Cd)	0.01%
Mercury (Hg)	0.1%
Lead (Pb)	0.1%
Polybrominated biphenyls (PBBs)	0.1%
Polybrominated diphenyl ethers (PBDE's)	0.1%
Hexavalent Chromium (Cr6+)	0.1%

These MCV limits apply to each "homogeneous material," defined by the European Commission as a material that cannot be mechanically disjointed or separated into different materials. Understanding this distinction is important. For example, the total concentration of PDBE by weight in a 100-strand cable may only be 0.02%. Since the limit is 0.1%, this cable initially appears to be RoHS compliant. However, the PDBE concentration in the separatable flame retardant jacket of that cable may be 0.4%, well above the 0.1% limit specified by RoHS. Therefore, this cable would not be considered RoHS compliant under the directive. The "homogeneous materials" in a data cable are located within all the element of the cable, including (but not limited to) cable sheaths, strength yarns, armor layers, water blocking powders/yarns/tapes/gels, strands or optical fibers. This distinction regarding "homogeneous material" is crucial to the manufacturer or vendor as they may be required to prove "due diligence" in ensuring that their efforts towards RoHS compliance include knowledge of the compliance of all materials used in the final product.

For example, cadmium, a RoHS restricted substance, is used in pigments and colorants for plastics in the wire and cable industry. Mercury is used in batteries, electrical switches, computer equipment relays and in some thermometers. Hexavalent Chromium has been used in pigments, dyes, inks, chrome plating and as a wood preservative.

Lead was the predominant thermal stabilizer for PVC in wire and cable applications five years ago. However, the availability of cost effective alternatives to lead stabilizers as well as regulatory efforts such as RoHS have greatly diminished its use

in PVC. PBBs were commonly used as flame retardants but manufacturers ceased utilizing them in the United States in 1976 and globally in 2000. PDBEs are commonly used as flame retardants in a variety of plastics and were granted a RoHS exemption by Commission Decision 2005/717/EC. However, a legal challenge by the European Parliament resulted in the elimination of this exemption as of July 1, 2008.

These examples of restricted materials do not comprise an exhaustive list. The vendor should not assume the absence of these prohibited materials, and if they are present, the vendorneeds to determine the concentration. Certain materials are used because of their effectiveness and/or economic cost advantages. Unfortunately, replacement of these materials with RoHS-compliant materials may not yield the same level of effectiveness and efficiency.

RoHS has granted exemptions for specific applications or product groups and additional exemptions have been identified for consideration during the next review of the RoHS directive. The status of exemption requests that have been accepted for review has not been defined, but reliance upon eventual adoption is not recommended.

Loss of the Decabromodiphenyl Ether Exemption

In 2005, the European Commission exempted from RoHS the use of decabromodiphenyl ether (DBDE) flame retardants in plastics. This exemption was driven by the public safety benefits of flame resistant plastics along with the lack of scientific data showing these materials constituted a health risk when incorporated into plastics. The European Parliament challenged this exemption in court claiming that the European Commission did not follow the correct procedure as stated in Article 5.1b of the RoHS Directive. The European Court of Justice agreed and ruled on April 1, 2008 that the DBDE exemption would end on July 1, 2008.

It should be emphasized that the loss of the DBDE exemption was not due to the discovery of scientific evidence indicating that these materials pose a threat to human health. Instead, the loss of the exemption was due to a procedural technicality related to the exemption process. Although alternatives exist for DBDE flame retardants in plastics, the short three month period from when the exemption elimination was announced to when it takes effect will make timely conversion difficult for wire and cable manufacturers.

What do I need to test and how is it tested?

If you are a material manufacturer, you must establish the compliance of your product against these declared substances. If you use materials in the manufacture of your products, you may attempt to get certification of compliance from the material vendor. This certificate should detail the content percentage (or declare the absence) of RoHS proscribed materials. (This answers my earlier question, but I think this needs to be briefly referenced above.)

The American Society of Testing and Materials (ASTM) International has created Committee F40 on *declarable substances* in materials to help industries develop standards and test methods to be used in verifying compliance. Until such developments yield results, most labs are using current tests to establish concentrations of these substances in homogeneous materials.

How can I identify a RoHS compliant Product?

There is no current requirement, globally or in the United States, for the implementation of a RoHS compliance application mark, nor have third party auditing procedures by independent bodies been specified. At present, vendors are required to self–declare compliance to RoHS for products entering Europe.

Data Communications Competence Center

Nexans' Data Communications Competence Center, located at the Berk-Tek Headquarters in New Holland, Pennsylvania, focuses on advanced product design, applications and materials development for networking and data communication cabling solutions. The Advanced Design and Applications team uses state-of-the-art, proprietary testing and modeling tools to translate emerging network requirements into new cabling solutions. The Advanced Materials Development and Advanced Manufacturing Processes teams utilize sophisticated analytical capabilities that facilitate the design of superior materials and processes. The Standardization and Technology group analyzes leading edge and emerging technologies and coordinates data communication standardization efforts to continuously refine Nexans' Technology Roadmap. An international team of experts in the fields of cable, connectors, materials, networking, standards, communications and testing supports the competence center. The competence center laboratories are a part of an extensive global R&D network that includes eight competence centers, four application centers and two research centers dedicated to advanced technologies and materials research.

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