International Environmental Standards for the Electronics Industry

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Executive Summary

Industry associations, such as IPC, were quick to develop standards to help the electronics industry deal with emerging environmental regulations; however, for regulatory compliance, smooth international trade and international supply chains, we rely heavily on International Standards Organizations such as ISO and IEC. In 2004, the International Electrotechnical Commission (IEC) launched TC111 on Environmental Standardization.

IEC/TC111 has a comprehensive work program developing international standards and guidelines for Environmentally Conscious Design, analytical test methods, materials declaration, and guidance for evaluating products with respect to restricted substances, and recycling and reuse.

IEC recently published IEC 62321 on Analytical test methods; IEC/PAS 62596 with guidelines for sampling procedures; and IEC 62430 on Environmentally Conscious Design. The IEC62321 standard was considered crucial for International trade to ensure that manufacturers and authorities are using the same test methods for assessing conformity to RoHS. Obtaining accurate substance concentration levels near the legal thresholds is difficult and requires the use of the right extraction and test methods.

The ECD standard (IEC62430) specifies requirements and procedures to integrate environmental aspects into design and development processes. It provides a framework of ECD requirements and provides a level of alignment with emerging international regulations that will require an ECD process.

International Environmental Standards for the Electronics Industry

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Impact of Environmental Legislation

- Environmental Legislation worldwide is regulating an increasing number of environmental aspects and environmental impacts
  - Energy Efficiency
  - Hazardous Substances
  - eWaste
  - eco-design

- Organizations must adopt flexible processes to comply
- Communication through the supply chain is a key challenge

Environmental compliance has become a significant factor in the design, manufacturing, and marketing of electronic products.

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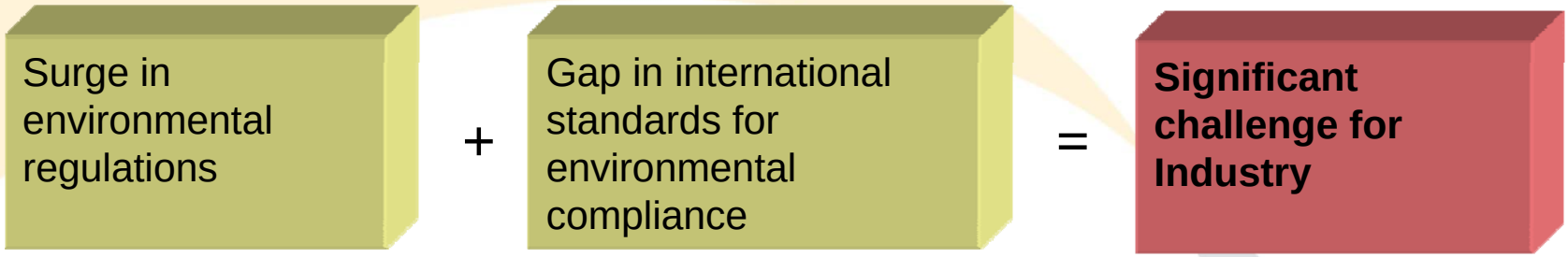
The Role of Standards in Environmental Compliance

Standards provide common definitions, framework, and method towards meeting requirements



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Environmental Standardization

The International Electrotechnical Commission (IEC) established Technical Committee TC111 in 2004

- Mandate to create international standards and guidelines in the environmental area for electrical and electronic products and systems.
- Membership and voting is by Country
- 27 participating countries; 4 observer countries

IEC/TC111: Environmental standardization for electrical and electronic products and systems

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IEC/TC111 Work Program

- Published
  - IEC 62430: Environmentally Conscious Design
  - IEC 62321: Analytical Test Methods
  - IEC PAS 62596: Sampling Procedure - Guidelines
- In Development
  - IEC 62474: Materials Declaration
  - IEC TR62476: Guidance for evaluation of product with respect to substance use restrictions in electrical and electronic equipment
  - IEC/TS62542: Standardization of environmental aspects - Glossary of terms
- Just Getting Started
  - Recycling, Reuse, and Recovery

Environmentally Conscious Design

- IEC62430: Environmentally Conscious Design for Electrical and Electronic Products
  - Requirements and procedures to integrate environmental aspects into design and development processes
  - In development from 2005 to 2008
  - Published as International Standard in February 2009
    - Approved 25/0
- Supports increased focus on formalized Environmentally Conscious Design (ECD)
- Supports EU EcoDesign/EuP Directive and similar legislation

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ECD Overview

- Definition of ECD
  - a “systematic approach which takes into account environmental aspects in the design and development process with the aim to reduce adverse environmental impacts”.
- The standard focuses on general requirements, considerations and interaction of the ECD system as a whole.
  - Fundamentals of Environmentally Conscious Design
  - Environmentally Conscious Design Process

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Fundamentals of ECD

- Life Cycle Thinking
  - Need to consider significant environmental aspects of a product in all life cycle stages.
  - Significant environmental aspects may occur anywhere in the life cycle, including raw material extraction, manufacturing, packaging, transportation, installation, product use, reuse and end of life disposal.
  - Part of Organization's design and development processes
- Regulatory and stakeholders' requirements
- Integration into Management System

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ECD Process

- Analysis of Regulatory and Stakeholders' Environmental Requirements
- Identification and Evaluation of Environmental Aspects and Corresponding Impacts
- Design and Development
- Review and Continual Improvement
- Information Sharing for ECD

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Application of IEC62430

- IEC 62430 provides high-level requirements and procedures.
  - Requirements are generalized for coverage across all electrical and electronic sectors.
  - Annexes provide some additional details and examples
- Used directly by Organizations
  - Helps define an outline and requirements for their ECD Process
  - Additional detail is required to implement an ECD process for a specific electrotechnical organization.
- Used by sector specific standards bodies as a reference
  - International Standards being developed for several EEE vertical segments
    - IT and Communications equipment (IEC62075)
    - Medical Equipment (IEC 60601-1-9)

Benefits to an Organization

- There are key benefits to an organization using IEC 62430 when it is considering implementing an ECD process
  - Provides a framework / checklist of ECD requirements
  - Common terminology and requirements through an international supply chain
  - Ensures that key high-level expectations are not missed
  - Alignment with emerging International regulations that will require an ECD process and potentially mandate conformity assessment requirements.
    - National standards tend to be based on International Standards (where available)

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Test Procedures

- IEC62321: Procedures for the Determination of Levels of Six Regulated Substances (Lead, Mercury, Hexavalent Chromium, Polybrominated Biphenyls, Polybrominated Biphenyl Ether) in Electrotechnical Products
  - This standard specifies Internationally recognized methods to test for RoHS substances
  - Developed by Working Group TC111/WG3
  - Formally published December 2008

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Critical for International Trade

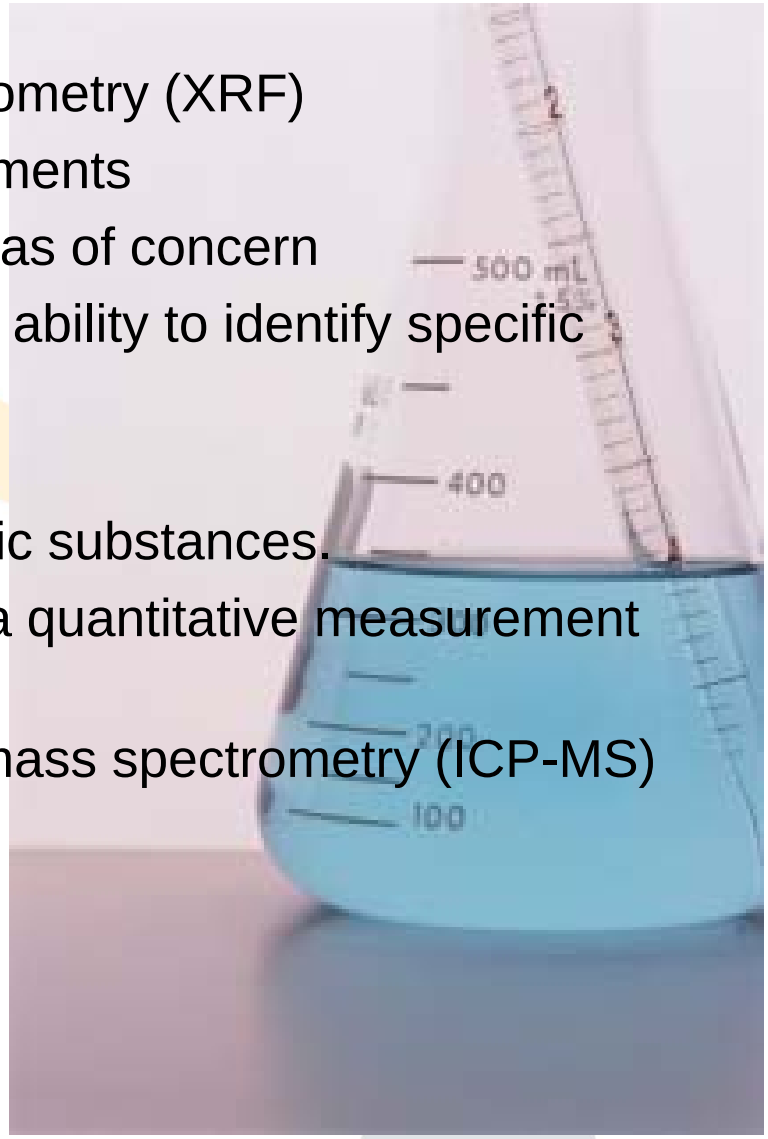
- Reliable analytical testing for RoHS substances was an early priority for IEC/TC111.
  - This has been a key concern for international trade.
- Accurate substance concentration levels near the legal thresholds are difficult to obtain
  - not unusual to get inaccurate results with incorrect test method or lack of rigorous controls
  - possible for both a manufacturer and an enforcement authority (or customer) to test a product and come to different conclusions about its RoHS compliance.
- When different test methods are being used, it is difficult to reconcile differences in test results.

Methods - IEC62321

- Sample preparation methods and analytical test methods
  - Lead, Cadmium, and Mercury in metals, polymers (plastic) and electronics;
  - PBB/PBDE in polymers;
  - Hexavalent Chromium in metal conversion coatings; and
  - Hexavalent Chromium in polymers.
  - It also provides guidance on XRF screening.
- A supporting document, IEC/PAS 62596, provides guidelines on methods and limitations on product dismantling and sampling in preparation for testing.

Types of Test Methods

- Screening
  - Example: X-Ray fluorescence spectrometry (XRF)
    - Presence/absence of specific elements
  - Cost-effective tool to help identify areas of concern
  - Generally limited in accuracy and the ability to identify specific substances.
- Verification tests
  - Measures the concentration of specific substances.
  - Destructive test of the sample using a quantitative measurement method
    - E.g. inductively coupled plasma mass spectrometry (ICP-MS)
  - Sample preparation methods



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The Role of Analytical Testing

- Confirming compliance of Materials / Parts with a high risk of containing a regulated substance
- Establishing or confirming supplier capability
- Supplementing incomplete supplier information or knowledge
- Random Testing as part of a quality assurance system
  - Incoming inspection
  - In-process testing
  - Outgoing inspection
- Some OEMs request objective evidence of compliance

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Ensure that appropriate sample preparation and analysis methods are being used for the material.

International Context

- Manufacturers and RoHS enforcement authorities have been waiting for the IEC62321 standard
  - Significant step towards reducing the potential for different conclusions on restricted substances.
  - Critical for smooth International trade
  - Several test labs were using this standard to test electronics from before it was published
    - Conformity Body Scheme (CB Scheme) setup for certifying test labs.
  - China's MIIT ministry has indicated that they will update their national China RoHS test method standard to align with the international standard.
  - Potential role in recast of EU RoHS Directive

Future Work on IEC 62321

- Restructuring of the standard into a family of standards. This simplifies the addition of substances and test methods.
- Refinement of existing test methods to improve accuracy and repeatability
- Incorporation of additional methods into the standard
- Test methods for additional substances that are being considered for restriction under RoHS-II and REACH
  - Phthalates
  - HBCDD

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Materials Declaration

- IEC 62474: Material Declaration for Electrical and Electronic Products
  - Under development in WG1 since 2006
  - US Convenorship
- The standard is being developed to leverage the work already done in the IPC1751/1752, JIG-101 and the JGPSSI (Japan Green) standards
- Forward looking requirements to support Environmentally Conscious Design.

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Three Key Elements

- Standard list of Declarable Substances and Materials (maintained in a database)
  - Declarable Substances
    - Based on Substance Restrictions in IEC member countries
    - Industry Defined Declarable Substances
  - Material Classes (Groups)
    - Supports Environmentally Conscious Design
- Declaration Procedure
  - Declarable Substances
  - Material Classes (Groups)
- An XML schema for data exchange of material declaration information.
  - Closely aligned with IPC 1751/1752 Ed. 2

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New Challenges

Some of the key additional requirements being incorporated into the standard are:

- Declaration of each occurrence of a restricted substance in the product (homogenous material restrictions only).
  - Most declarations today only require the highest concentration to be declared.
  - Allows a high concentration of a restricted substance that is used under an exemption to mask all lower concentration levels.
- Material Classes: The high-level composition of product must be declared in general material group categories (e.g. thermoplastic, ferrous alloys, etc.).

Timeline and Impact

- IEC 62474, once published, will be an International Standard for supply chain declaration of materials and substances.
  - Second Draft recently reviewed by National Committees
  - Expects to have the standard ready for publication in late 2010.
- The declaration requirements push the boundary on Material Declaration
  - Significant impact on many equipment producers and their supply chains.
- Close alignment with IPC 1751 & 1752 Ed. 2

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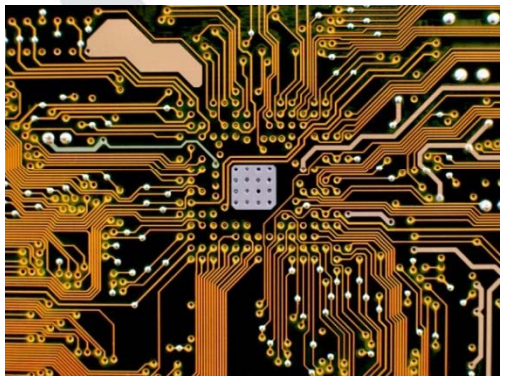
Evaluating Products for Restricted Substances

- IEC/TR 62476: Guidance for evaluation of product with respect to substance use restrictions in electrical and electronic equipment
  - Will provide a framework and guidelines for Restricted Substance Controls (RSC).
  - Under development since 2006
  - Has been a controversial document
  - Committee Draft currently out for ballot
  - If voting is successful, the guidance document will be published as a Technical Report in late 2009 or early 2010.



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Framework

- Establishes a framework for evaluation with respect to Restricted Substances.
  - Uses internationally accepted standards, tools and practices.
  - Applicable to finished product producer and supply chain
- Restricted Substance Controls (RSC) and Sources of Information
  - Supplier Documentation
  - Test Results
  - Manufacturing and Assembly Procedures
- Considers the risk of restricted substances in parts and materials.
- Considers the need for technical documentation

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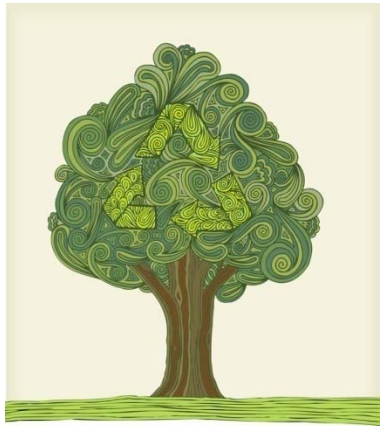
Recycling, Reuse, Recovery

- TC111 is considering development of standards related to recycling.
  - End of life recyclability calculation for electrotechnical equipment
  - Communication formats on recycling for electrotechnical equipment between manufacturers and recyclers



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Summary

- Environmental Standards provide a toolkit to Electronic Equipment Producers for Environmental Compliance
- International Standards are crucial for efficient flow of environmental information throughout an international supply chain.
- Development of International Standards has been challenging given the diversity in cultural practices, data systems, and environmental priorities.
- IEC/TC111 has published three environmental standards documents to begin to assist organizations, with several additional documents to be published in the next two years.

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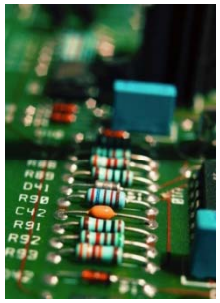
Thank You!!



Any Questions?

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