Recasting the RoHS Directive: An Opportunity to Solidify its Scientific Basis in Support of Comprehensive Environmental Regulation

Summary

IPC – Association Connecting Electronics Industries® members are strong supporters of the environment and the important role of the electronics industry in promoting sustainable manufacturing. IPC members manufacture printed boards and electronics assemblies — the foundation of the world's consumer electronics, high technology products and industrial electronics, including defense, transportation and telecommunications systems. IPC has more than 2,600 global members, with nearly 400 located in Europe. IPC maintains offices in Bannockburn (headquarters), Taos, Arlington, and Garden Grove, USA; Stockholm, Sweden; Moscow, Russia; and Shanghai and Shenzhen, China.

The electronics industry continuously strives to improve manufacturing processes and products so that materials of concern are minimized or eliminated where feasible. The industry has invested an enormous amount of time and resources to comply with the existing European Union (EU) Restriction on the Use of Hazardous Substances (RoHS) in Electrical and Electronic Equipment Directive[1] restrictions while its full technical, social, and cost implications of are still being discovered.[2,3]

While the electronics industry continues to struggle with the complexities of RoHS compliance, the RoHS Directive is currently being revised. Unfortunately, an amendment proposed in the EU Parliament that bans all brominated and chlorinated flame retardants, polyvinyl chloride (PVC), chlorinated plasticizers and three phthalates[4] would weaken the scientific basis of the RoHS Directive and directly contradict the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) regulation, a comprehensive chemicals regulation that is setting a global standard for chemical safety. It is critical that these amendments not be approved. The Recast of the RoHS Directive should improve the scientific basis of RoHS and unify the European chemicals regulations by aligning the RoHS Directive with the REACH regulation[5].

A Revised RoHS Directive Should Be Scientifically-Based

Revisions to the RoHS Directive should follow a rigorous scientific methodology to ensure that the RoHS Directive results in genuine benefits to the environment and human health. Electronics manufacturers use specific materials because of their unique energy efficiency, safety or performance characteristics. The decision to prohibit a substance should not be undertaken lightly. Commitment of scarce societal resources should instead be guided by the best available science. Otherwise resources will be wasted and the environment and human health will suffer as resources are squandered pursuing goals that do not provide an

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[1] Directive 2002/95/EC http://www.rohs.gov.uk/Docs/Links/RoHS%20directive.pdf

[2] "Danger to lead-free electronics: tin whiskers," Associated Press, 2007 http://www.msnbc.msn.com/id/21151552/wid/11915829/

[3] Long Term Reliability Analysis of Lead Free and Halogen Free Electronic Assemblies, Gregory Morose, Sc.D., Toxics Use Reduction Institute (TURI), Lowell, MA. IPC APEX EXPO 2009 Proceedings, IPC, 2009.

[4] http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+COMPARL+PE-430.424+03+DOC+PDF+V0//EN&language=EN

[5] EC 1907/2006 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:396:0001:0849:EN:PDF

environmental or health improvement over the status quo. Elimination of specific substances requires a great deal of research and development of alternative substances, requiring the investment of time and resources by electronics manufacturers. Similarly, implementing and enforcing regulations requires significant investment by authorities. It is essential that any substance restrictions added to the RoHS Directive be supported by strong scientific evidence in order to accomplish the goal of maximum human health and environmental protection.

The restriction of substances can also result in unintended consequences, leading to a net effect of no increased environmental benefit or even worse, an outcome that harms the environment and human health. For example, the EU did not study the alternatives when they restricted the use of lead in electronics under the RoHS Directive. The U.S. EPA lead-free solder study[6] evaluated the environmental impacts of tin-lead solder versus lead-free alternative solders. The study found that the increased energy use associated with the higher operating temperatures required for manufacturing lead-free soldered electronics would cause higher air pollution, acid rain, stream eutrophication and global warming impacts than tin-lead soldered electronics. EPA's study serves as an important reminder that there are environmental trade-offs when substituting one substance for another. Before additional substance restrictions are included in the RoHS Directive, there should be clear and compelling scientific evidence that potential substitutes are better for the environment and human health.

The Proposed Amendments to Restrict Brominated and Chlorinated Flame Retardants are not Based on Sound Science

Amendments to RoHS Directive proposed by Member of Parliament (MEP) Jill Evans would restrict an entire class of compounds — brominated and chlorinated flame retardants — without scientific basis. There are more than 75 brominated and chlorinated flame retardants, each with unique properties. While some brominated flame retardants (BFRs), such as Polybrominated Biphenyls (PBBs), have been identified as toxic and have been withdrawn from the market, other BFRs such as Tetrabromobisphenol-A (TBBPA) have been safely used in electronic products for decades. Each flame retardant is unique and therefore should be evaluated on an individual basis prior to instituting any restriction. To do otherwise is bad science and, at a minimum, risks a waste of societal resources to develop and implement substitutes and, at worst, risks unintended consequences associated with alternative substances.

By proposing to restrict an entire class of substances, BFRs, the amendment proposed by MEP Evans would require manufacturers to replace safe, well studied substances, such as TBBPA. TBBPA is the primary flame retardant used in printed boards. The World Health Organization[7] and the European Commission Scientific Committee on Health and Environmental Risks (SCHER)[8] conducted separate, comprehensive scientific assessments of TBBPA and both found TBBPA to be safe for human health and the environment. TBBPA should not be banned under a revised RoHS Directive because scientific evidence has not shown any risks to be associated with the use of TBBPA in electronics.

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[6] U.S. Environmental Protection Agency. August 2007. Solder in Electronics: A life Cycle Assessment. Available at http://epa.gov/dfe/pubs/solder/lca/index.htm.

[7] An Overview of Alternatives to Tetrabromopishenol-A (TBBPA) and Hexabromocyclododecane (HBCD). March 2006. http://www.sustainableproduction.org/downloads/AternativestoTBBPAandHBCD.pdf

[8] 2,2',6,6' – Tetrabromo-4,4'-Isopropylidene Diphenol (Tetrabromobisphenol-A) Environmental Part. January 15, 2008. http://ec.europa.eu/health/ph_risk/committees/04_scher/docs/scher_o_071.pdf.

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An often stated explanation for the proposed restriction of BFRs, CFRs and other chlorine and bromine containing materials is the formation of dioxins and furans during incineration. Regulated, controlled incineration of bromine- and chlorine-containing materials does not pose a problem for human health or the environment.[9,10] Dioxin formation occurs for low-temperature, uncontrolled incineration, such as that conducted in substandard recycling processes in developing countries. The proposed amendments to remove halogens from electronics will do little to change the health risks and environmental damages associated with improper disposal of electronics. A variety of toxic chemicals are released during open burning of electronics products, particularly toxic metals, cancer-causing polycyclic aromatic hydrocarbons (PAHs) and lung-damaging particulates. These materials are released during the open burning of wastes, particularly electronic wastes, even when halogens are removed.[11] Ms. Evans' proposed amendment to restrict BFRs and CFRs under the RoHS Directive will not eliminate the risks to human health and the environment that are associated with improper disposal of electronics.

The proposal to ban BFRs and CFRs will not remove the need to provide flame retardancy to electronic products. Because the very function of printed boards is to transmit electrical charges, flame retardancy is absolutely necessary to prevent fire. BFRs and chlorinated flame retardants (CFRs) are added to thermoplastics, insulation materials, component mold compounds, films, adhesives, solder masks, printed board laminates or other polymeric materials to achieve a necessary protection against the propagation of fire. Because of the complexity of electronic products, drop-in substitutes for any functional material, including flame retardants, are rarely feasible. The substitution of one substance for another can create a cascade of performance and functionality issues and the search for alternatives is complicated by limited alternatives, higher costs and possible risks posed by those alternatives.

Ensuring that alternative substances provide the same level of functionality, reliability, safety and environmental protection is a complex and time-consuming process that cannot be bypassed without risking damage to the environment and human health. The electronics industry is engaged in a multi-stakeholder partnership with the U.S. Environmental Protection Agency (EPA) Design for Environment (DfE) Project[12] to investigate the environmental, health and safety aspects of flame retardants for printed boards. The goal of the project is to identify and evaluate commercially available flame retardants and their environmental, human health and safety aspects in printed boards. Until alternative substances have been fully evaluated and shown to be better for the environment and human health, amendments to ban all BFRs and CFRs should be rejected.

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[9] Waste-to-energy: A review of the status and benefits in USA, C.S. Psomopoulos, A. Bourka , N.J. Themelis, Waste Management 29 (2009) 1718–1724.

[10] "The impact on health of emissions to air from municipal waste incinerators," Helath Protection Agency, September, 2009. http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/ 51473372175

[11] "Elevated levels of urinary 8-hydroxy-2'-deoxyguanosine in male electrical and electronic dismantling workers exposed to high concentrations of polychlorinated dibenzo-p-dioxins and dibenzofurans, polybrominated diphenyl ethers, and polychlorinated biphenyls." Wen, S, F-X Yang, Y Gong, X-L Zhang, Y Hui, J-G Li, A-L Lui, Y-N Wu, W-Q Lu and Y Xu. 2008.. Environmental Science and Technology 42:4202-7.

[12] EPA's Design for Environment Website http://www.epa.gov/dfe/pubs/projects/pcb/.

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A Revised RoHS Directive Should Fully Align with the REACH Regulation

The process by which substances are restricted under the RoHS Directive should follow a scientifically based methodology. The EU REACH regulation is the most comprehensive chemicals regulation in the world. The process by which substances will be restricted under the RoHS Directive should be revised to explicitly require alignment with the rigorous scientific assessment process in the REACH regulation. Utilization of the REACH methodology will introduce the scientific process into the RoHS Directive, ensure that changes to the RoHS directive will benefit human health and the environment, and support the unity of the EU regulatory scheme.

Adoption of the REACH methodology for the evaluation of substances under the RoHS Directive would help to avoid any overlap or inconsistencies between the two EU chemicals regulations. In accordance with this scientifically based decision making, we expect that certain substances such as Hexabromocyclododecane (HBCDD), and the phthalates Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), and Dibutyl phthalate (DBP), would be restricted under both the REACH Regulation and the RoHS Directive. However TBBPA, which has undergone a comprehensive EU risk assessment, does not meet the criteria for authorization under REACH, and should not be restricted under RoHS. Restriction of TBBPA under RoHS, as proposed by Ms. Evans, is seemingly incompatible with the desired REACH alignment and risks undermining the EU's emerging chemicals policy and law.

Conclusion

The recast of the RoHS Directive should improve upon the scientific basis of the RoHS Directive to ensure the regulation is effective in protecting human health and the environment. Substances of concern should be examined individually to assess their effects on human health and the environment. Those found to be harmful should be banned. Substances found to not be harmful to human health or the environment, such as TBBPA, should not be banned. Banning substances for reasons other than scientific would weaken the integrity of the EU regulatory scheme. The amendment proposed in the Parliament that would ban certain halogenated substances, including TBBPA, is not scientifically based and should not be approved.

IPC recommends that the EU look to the established rigorous scientific REACH methodology for substance evaluations to make certain a scientific process is used. Fully aligning the RoHS Directive and REACH regulation will ensure minimal regulatory overlap and affirm the EU's credibility throughout the world.

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