



EXECUTIVE SUMMARY

Greening Consumer Electronics

– moving away from bromine and chlorine

Report by ChemSec (the International Chemical Secretariat)
and Clean Production Action
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THOUSANDS OF SUBSTANCES are used to meet the highly complex and technical performance requirements of today's electronic products. As growing volumes of consumer electronic products enter the waste and recycling streams, substances of high concern are unintentionally released into the environment. At present, the infrastructure to safely reuse and recycle obsolete equipment is insufficient. In addition, electronic waste, one of the fastest growing waste streams in the world, is increasingly exported to developing countries with even less capacity for appropriate waste management. In 2003, the European Union responded with two precedent-setting directives: WEEE, the Waste from Electronic and Electrical Equipment directive, which requires companies to take back and recycle their equipment; and RoHS, the Restriction of Hazardous Substances directive, which restricts the use of certain heavy metals and brominated flame retardants.

ROHS ESTABLISHED A DE FACTO GLOBAL ENVIRONMENTAL AND HUMAN HEALTH STANDARD that prompted companies to internally gain control over the chemicals used in their products. The directive required companies to better understand what chemicals are used in their products, how they are used, and to a lesser extent, what adverse effects they potentially have on human health and the environment. It also showed the importance of establishing chemical information systems throughout their supply-chains, as well as improving communication of these efforts and standards with customers, regulators, and consumers.

ENGINEERS THROUGHOUT THE ELECTRONIC SUPPLY CHAIN found ways to redesign products and develop new material streams to assure compliance with RoHS. Finding environmental solutions to RoHS restrictions did not curtail the continued development of reliable, new, and improved products with enhanced performance. Now many manufacturers are looking beyond RoHS and are restricting a more ambitious set of chemicals of high concern.

OF PARTICULAR CONCERN within the electronics sector is the widespread use of bromine- and chlorine-based compounds in many different electronic applications. High volume uses of bromine and chlorine in flame retardants and plastic resins like polyvinyl chloride (PVC) gained worldwide attention when scientific studies documented their link to the formation of dioxin, one of the most toxic chemicals synthesized. Dioxins and other harmful chemicals are released into the environment during the burning and smelting of electronic waste. Even the most sophisticated incineration facilities generate low levels of dioxin, but the most significant dioxin contribution occurs in developing countries whose facilities are not designed to handle toxic materials. Some of the unintentionally produced compounds are highly toxic, endocrine disrupting, and persistent, and are banned by the Stockholm Convention on Persistent Organic Pollutants (a treaty signed by 152 national governments).

THIS REPORT FEATURES seven electronics companies (two major consumer electronics companies, and five component suppliers) that have moved beyond compliance with regulatory mandates and engineered environmental solutions that negate the need for most – and in some cases all – uses of brominated and chlorinated chemicals. The case studies provide examples of how companies have addressed industry-wide technical performance challenges associated with this material change, while upholding quality, reliability, and product performance at an acceptable cost.

THIS MATERIAL conversion was initially led by electronics manufacturers, like Apple and Sony Ericsson (both featured in this report). Both companies are now offering consumers a wide range of products free of most uses of bromine and chlorine. Apple achieved this with all of its computer products, cell phones, and music devices. Sony Ericsson achieved this with all of its cell phone products.

APPLE AND SONY ERICSSON WORKED CLOSELY with their suppliers to develop new components that met the necessary technical and safety performance specifications, as well as material restrictions on bromine and chlorine use in products. This has led the largest disk drive manufacturer in the world, **SEAGATE**, to create new drives that no longer use chlorine- and bromine-based chemistries. This success was largely facilitated by the company's full material disclosure system, which allows its engineers to know the complete chemical content of their products. **DSM ENGINEERING PLASTICS**, a leading plastic material manufacturer, is among the first chemical companies to offer a complete portfolio of engineering plastics that are free of these substances. The company produced a brand new generic polyamide for connectors and sockets and a new thermoplastic copolyester that can be used as a replacement for PVC-based wires and cables. **NAN YA**, a major laminate manufacturer, and **INDIUM**, a high-end manufacturer of solder paste and flux, both overcame major technical challenges to produce bromine- and chlorine-free components for printed circuit boards that met the same reliability standards of their halogenated counterparts. And finally, **SILICON STORAGE TECHNOLOGY, Inc.**, a semiconductor manufacturer, was the first in the industry to supply Apple and others with bromine-free chips.

WHILE THIS REPORT DOCUMENTS HOW FAR COMPANIES HAVE COME in addressing a major environmental and human health problem, many electronic manufacturers have yet to make the transition to bromine- and chlorine-free products. In certain situations, there is great potential to undermine the success that has been achieved by these companies. New standards and regulations will play a very important role in maintaining the momentum established by these companies and leveraging best industry practices in terms of defining and verifying products that are free of most bromine- and chlorine-based compounds.

IT IS ALSO IMPORTANT to note that concerns have been raised about the environmental and human health impact of alternatives to brominated and chlorinated compounds. This report provides references for NGO and government studies that assess the viability of safer alternatives. While some non-brominated and non-chlorinated chemicals are of equal risk to their brominated and chlorinated counterparts, there are many viable alternatives that have a less hazardous profile. For all companies making this material conversion, thorough hazard assessments of the alternatives is critical to ensuring that safer alternatives are being used to replace bromine and chlorine compounds.

TO MAINTAIN AND LEVERAGE THE MOMENTUM FOR GREENER ELECTRONIC PRODUCTS achieved by companies such as those featured in this report, widespread industry alignment will be needed to define technical specifications for bromine- and chlorine-free products. This will need to happen at a global level with stimulus from regulations like RoHS that influence worldwide chemical and material standards for the electronics sector. New supply chain specifications that employ a verifiable and implementable approach to removing these substances of concern from the electronics supply chain also have a critical role to play. And finally, new green procurement criteria defining toxic-free products need to be incorporated into standards differentiating environmentally preferred products in the marketplace like EPEAT (Electronic Product Environmental Assessment Tool). With the appropriate procurement, regulatory, and supply chain standards in place, it is more likely that the work started by companies such as the seven featured in this report will become mainstream in the consumer electronics sector.

Electronics manufacturers, standards bodies, and legislators have begun to take notice of the human health and environmental concerns associated with the use of brominated and chlorinated compounds in electronic products. CPA and ChemSec have compiled case studies that provide examples of seven companies that have removed most forms of bromine and chlorine from their product lines. The report demonstrates the level of conformance that can be met today by the electronics companies, while providing a tool for engineers designing the next generation of greener electronic devices.

CHEMSEC – FOR A TOXIC FREE WORLD

ChemSec (the International Chemical Secretariat) is a non-profit organisation working for a toxic-free environment. Our focus is to highlight the risks of hazardous substances and to influence and speed up legislative processes. We act as a catalyst for open dialogue between authorities, business, and NGOs and collaborate with companies committed to taking the lead. All of our work is geared to stimulating public debate and action on the necessary steps towards a toxic-free world.

CPA – STRATEGIC SOLUTIONS FOR GREEN CHEMICALS

Clean Production Action, CPA, designs and delivers strategic solutions for green chemicals, sustainable materials, and environmentally preferable products for a closed-loop material economy.

CPA engages with businesses and NGO leaders to hasten the transition to an economy without harm. We coordinate the US-based Business NGO Working Group for Safer Chemicals and Sustainable Materials and we research and promote companies' efforts to transform the toxic chemical economy.

The full report can be found at www.chemsec.org and www.cleanproduction.org.

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