

Bromine- and Chlorine-Free Mobile Phones

COMPANY PROFILE

SONY ERICSSON

Mobile Phone Manufacturer.

Sony Ericsson is a world-renown provider of mobile phones. The company is a 50:50 collaborative effort between Sony Corporation and Telefonaktiebolaget LM Ericsson.

Headquarters: London, UK

Sales: €1.736 billion (Euros, Q1 2009)

Employees: 9,400 worldwide

www.sonyericsson.com



The GreenHeart phones are bromine- and chlorine-free, and Sony Ericsson has pledged that the GreenHeart concept will be rolled out across its entire product portfolio in the coming years.



Sony Ericsson



Greening Consumer Electronics

– moving away from bromine and chlorine

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.

Published in September 2009

Authors: Nardono Nimpuno, Alexandra McPherson, and Tanvir Sadique

Companies highlighted in this report have kindly contributed to the information provided in the substitution case studies. ChemSec and Clean Production Action are solely responsible for all other texts in this report.

INDEX

Preface	1
Index	3
Executive Summary	4
1. Bromine and Chlorine Use in Electronic Components	6
2. Human Health and Environmental Concerns	10
3. E-waste and Recycling Infrastructure	14
4. Establishing Verifiable Bromine and Chlorine Restrictions	20
5. Alternatives to Bromine- and Chlorine-Based Compounds	22
6. Case Studies	24
• Apple, <i>Restriction of Elemental Bromine and Chlorine to Achieve Elimination of BFRs and PVC in Consumer Electronic Products</i>	26
• Sony Ericsson, <i>Bromine- and Chlorine-Free Mobile Phones</i>	32
• DSM EP, <i>Bromine- and Chlorine-Free Plastic Components</i>	36
• NanYa/Indium, <i>Bromine- and Chlorine-Free Printed Circuit Boards (PCBs)</i>	40
• Seagate, <i>Bromine- and Chlorine-Free Hard Disk Drives</i>	46
• SST, <i>Bromine-Free Semiconductor Chips</i>	50
References	54
Conclusion	56

Sony Ericsson has been working on sustainability issues since its October 2001 formation. Ericsson was a pioneer in this area and started researching halogen-free devices in 1999. Sony Ericsson's decision to cease using halogens in its phones was motivated by the fact that a large proportion of electronic waste is exported for inappropriate waste-management, in spite of ambitious regulations and product take-back systems developed by producers and operators.

In 2000, Ericsson released its first phone (T28) that did not use brominated flame retardants (BFRs) in the casing and the printed wiring board. However, at this time, BFRs were still used in other components of the phone. The first phone produced after the Ericsson and Sony handset divisions merged also avoided the use of BFRs in the same components. Since then, the joint company's continuous improvement programs have enabled it to extend this approach to all of the mobile phones it produces. In addition, BFRs and halogenated polymers have been removed from most of the components in the phones. The only remaining uses of BFRs are in small electrical components such as resistors and capacitors. Sony Ericsson's phones are now 99.9 % halogen-free, and all chargers except one are free from PVC but the company plans to be totally PVC free by the end of 2009.

TIMELINE OF SUSTAINABLE PRODUCT DEVELOPMENT

- 1996 Phased out use of NiCd
- 1999 First BFR-free phone (Ericsson)
- 2002 First BFR-free phone as joint company
- 2004 First in the industry to introduce RoHS compliant phone
- 2009 Launch GreenHeart™ platform

ENVIRONMENTALLY CONSCIOUS DESIGN

Sony Ericsson employs a structured approach to creating sustainable designs. The company's design process starts with the consideration of customer requirements and regulatory demands, as well as business goals and targets. The product design cycle also includes a structured environmental compliance phase, where the environmental impact of new designs is reviewed. The items considered in such reviews include data from the company's "COMET" (Compliance on Materials and Environment) material declaration database and an evaluation

ABSTRACT

Sony Ericsson's phones are now 99.9 % bromine- and chlorine-free, and the company plans to end its use of PVC in external charging systems by the end of 2009. Sony Ericsson's decision to cease using halogens in its phones was motivated by the fact that a large proportion of electronic waste is exported for inappropriate waste-management, in spite of ambitious regulations and product take-back systems developed by producers and operators.

In May 2008, Sony Ericsson began implementing a materials declaration system, which requires its suppliers to disclose all the substances used in Sony Ericsson products.

Sony Ericsson... has now shipped over 350 million BFR-free phones, as well as accompanying chargers and other accessories.

of chemical analysis data to ensure that new products do not contain any chemicals on the company's lists of banned and restricted substances.

Sony Ericsson's banned substance list and its restricted substance list are both central to the company's sustainability work. Both are posted on the company's Web site for interested customers, suppliers, competitors, and consumers to view. The purpose of Sony Ericsson's lists is to prevent hazardous substances like certain halogenated compounds from entering the company's production system and products, as well as to publicly state its intention to phase-out or restrict the use of other substances that are already in the system or in existing products.

Sony Ericsson's initial criteria for determining whether or not a substance should be include global legislation, stakeholders' input, and market requirements. Sony Ericsson does not perform its own scientific studies on the human and environmental health effects of the chemicals it considers for inclusion in its banned or restricted substances lists. Instead, the company gathers information from a variety of sources, including NGOs, customers, governments, and other industry stakeholders. The first step for considering whether a substance should be included in the non-compliance lists requires Sony Ericsson to determine whether substitution with less-hazardous alternatives is feasible, either in the short or long term. For example, if Sony Ericsson finds out that it is using a possibly carcinogenic substance and that substance can be readily substituted or phased out, then Sony Ericsson will put the substance on one of its lists.

ADDRESSING DATA GAPS

While Material Safety Data Sheets (MSDSs) can provide some useful information, especially on "work environment" issues, Sony Ericsson has found that more information on material content is often needed. For instance, an MSDS may not indicate whether or not plastic parts are halogen-free. As is the case for many downstream users, Sony Ericsson can sometimes encounter difficulties in getting basic information about the content of different materials. This often happens simply because the supplier does not understand what the company is asking for. To be sure that there are no misunderstandings about such product content, Sony Ericsson sends its mobile

phones out for external analysis of their chemical content to verify supplier information.

There are two possible methods for Sony Ericsson to ensure that the items produced by its suppliers do not contain hazardous substances. Historically, the company relied solely on suppliers to verify that their products did not contain the substances included on Sony Ericsson's banned or restricted substances lists. In recent years, however, it became apparent to the company that using a materials declaration system would allow it to take a more proactive strategy as new hazards become known. Such a system would also inform the company as to exactly what is in its products and also enable it to monitor for known hazards.

In May 2008, Sony Ericsson began implementing a materials declaration system, which had been in development for several years. The new system uses a standard industry format (IPC-1752) to collect information from suppliers. This means that Sony Ericsson wants full disclosure concerning all substances in Sony Ericsson products from all suppliers. The company estimates that it should have full disclosure on all components in its products by the end of 2010.

PROVEN RELIABILITY AND MATERIAL SUPPLY

Sony Ericsson has been working on reducing BFRs in its phones since 1999, and the company's products demonstrate that it is possible to manufacture halogen-free electronic devices that can withstand the extremely rigorous, industry-required physical reliability testing that is conducted prior to releasing a new product. Reliability testing of handsets often consists of harsh physical tests, such as a "drop test," in which an electronic device is tested to see how much force it can withstand, and a "shake test," in which engineers determine how well the electronic components fair after being literally shaken at a specified frequency and duration. These tests are conducted to simulate the rigors of the harsh conditions to which phones may be subjected to during daily use.

Sony Ericsson's engineers, in partnership with their suppliers, were able to resolve commonly known issues with halogen-free plastics, such as brittleness, and what was initially a limited supply of raw materials. The company has now shipped over 350 million BFR-free phones, as well as accompanying char-

gers and other accessories. The company was able to produce these devices without sacrificing their world-class reputation for selling reliable products. Sony Ericsson's leadership role in producing halogen-free devices provided incentive to their suppliers to develop reliable alternatives. As a result, there is now a reasonably large supply of alternatives available for a variety of plastic-based components, including BFR-free enclosures and printed circuit boards.

Sony Ericsson product development teams are confident that their BFR-free products fulfill, or exceed, the performance requirements for similar products that are not halogen-free. This confidence is reflected in its launch of the GreenHeart concept in June 2009. The GreenHeart phones are bromine- and chlorine-free, and Sony Ericsson has pledged that the GreenHeart concept will be rolled out across its entire product portfolio in the coming years. This will require that all Sony Ericsson's suppliers provide full material declarations. Sony Ericsson met some resistance from its suppliers when it began requiring these full declarations for their two GreenHeart phone models launched in June 2009. However, by working with the supply-chain, Sony Ericsson expects to achieve full compliance for all its phones by 2010.

DEFINING HALOGEN-FREE

In order to achieve flame retardancy through the use of halogenated material, such as brominated flame-retardants, one must typically use very high concentrations of bromine. It is not uncommon to find BFRs concentrations of 50,000 parts per million (ppm) in plastics. However, Sony Ericsson's experience is that traces of halogen can still be found in today's halogen-free applications. This is often due to issues associated with companies that supply products not only to customers who demand halogen-free materials but also to customers who have not yet made the transition to halogen-free products. In such cases, residues of halogenated material can be spread throughout the supply-chain, due to contamination in the production process. However, these residues are present in quantities that are much too low to fulfill a flame-retarding function. Sony Ericsson has therefore chosen to apply thresholds to their halogen-free applications. By establishing thresholds on elemental bromine and chlorine, such as the 900 ppm limit currently set for each element, the company is able to uphold a high halogen-free standard that excludes the intentional use of bromine and chlorine.



To verify compliance with Sony Ericsson's halogen-free or low-halogen standards, the company requires an analysis of products' elemental bromine and chlorine concentrations. If the bromine levels are below 900 ppm, no further testing is necessary. However, if test levels indicate a presence above 900 ppm, further testing using advanced equipment like gas chromatography and mass spectrometry is needed to identify the compound or compounds that are the source of the bromine.

In order to achieve full supplier compliance with the company's chemical restrictions, Sony Ericsson works closely with its suppliers. This takes the form of site visits, assessments, and audits, as well as education, training, and workshops. Educating suppliers in providing full disclosure also takes time. However, this education may actually be beneficial for both the suppliers and the industry since this facilitates compliance. In addition, Sony Ericsson predicts that the requirement for full disclosure will become more standard in the industry. A few other electronics companies are already starting to follow suit.

MOVING FORWARD

The experience of Sony Ericsson has proven that halogen-free devices can be manufactured on a mass scale for the mobile phone industry. The company's success could be optimized and leveraged across the industry if other major electronics manufacturers adopted their approach for full material disclosure and applied the elemental bromine and chlorine definitions to ensure cost-effective compliance with BFR and PVC restrictions. Also critical is the development of clearly defined restrictions in the next iteration of the Restriction of Hazardous Substances (RoHS) directive. Sony Ericsson has supported the development of additional substance restrictions to ensure industry-wide changes and to reduce the cost of compliance for those companies who led the industry in overcoming technical challenges to produce reliable halogen-free products.

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. An array of conflicting definitions and policies have emerged to address these concerns at various levels. This report is intended to show the feasibility of re-engineering consumer electronic products to avoid the use of these compounds and recommends a definition to address human health and environmental concerns that is implementable by industry.

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 purpose of this report is to allow parties outside the industry to see the level of conformance that can be met today, as well as provide a tool for engineers designing the next generation of greener electronic devices.

International Chemical Secretariat

Box 7005, SE-402 31 Göteborg, Sweden

Tel: +46(0)31-711 04 95

E-mail: info@chemsec.org

www.chemsec.org



CPA (North America)

P.O. Box 153, Spring Brook, NY 14140, USA

Tel: +1 716-805-1056

E-mail: alexandra@cleanproduction.org

www.cleanproduction.org

