Bromine- and Chlorine-Free Hard Disk Drives

COMPANY PROFILE

SEAGATE TECHNOLOGY

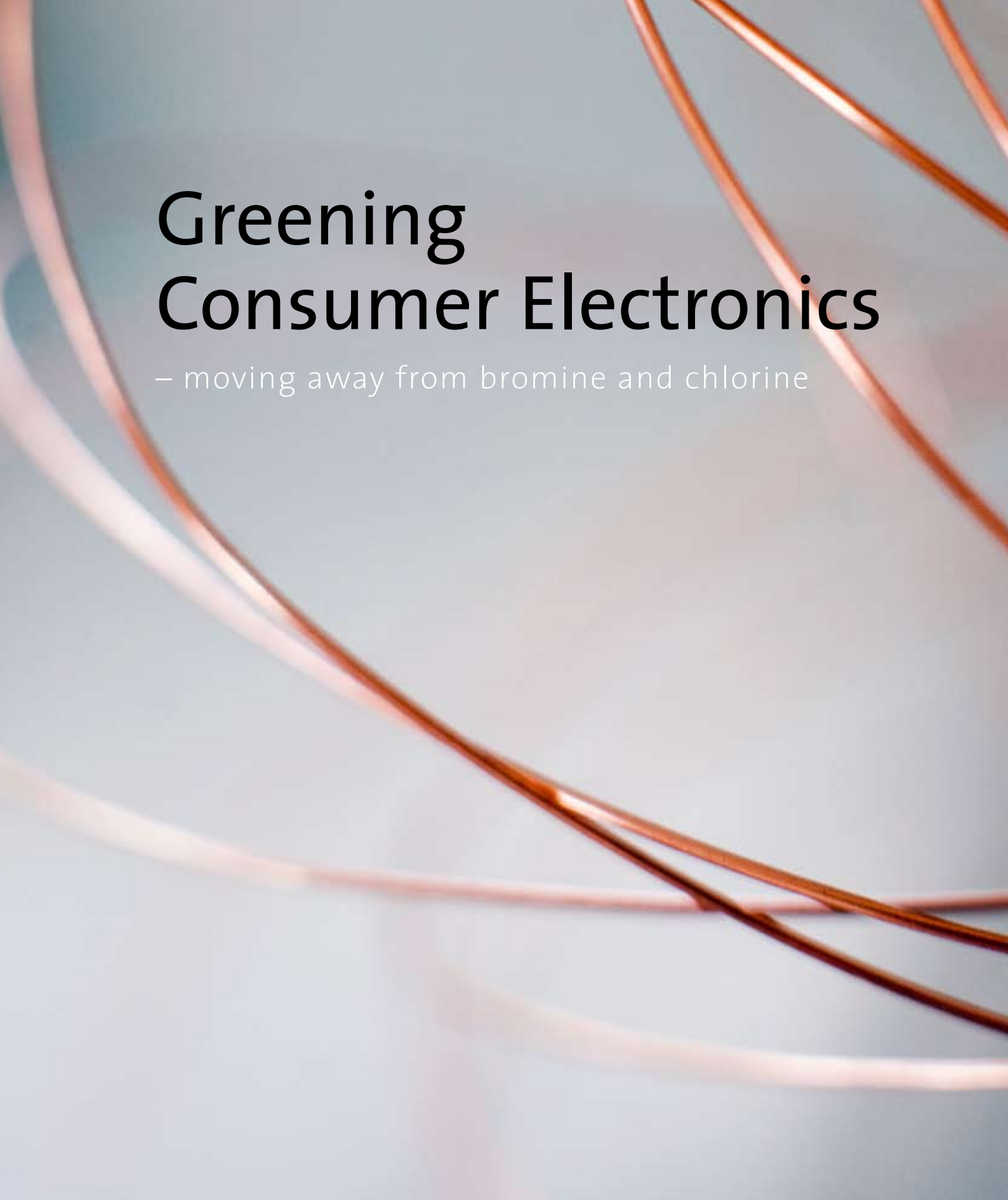
Manufacturer of hard disk drives and storage devices.

Seagate is the world's largest manufacturer of hard disk drives. Hard drives are the primary medium for storing electronic information in systems ranging from desktop computers and consumer electronics to data centers. The company produces a broad range of hard drive products, and it currently holds a 34% share of the overall market, the highest in the industry. The company leads the world in every segment of the storage market but the notebook segment, where it is in the top three.

Headquarters:	Scotts Valley, CA, USA
Design Centers:	Colorado, Minnesota, and Singapore
Sales:	$2.1 Billion (US dollars, Q3 2009)
Employees:	43,000 worldwide

www.seagate.com

Seagate



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.

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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.

Photo: Niklas Maupoix

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ABSTRACT

Seagate is the world's largest manufacturer of hard disk drives, and approximately 50 % of the disk drives Seagate ships today meet halogen-free specifications. Hard disk drives comprise several hundred individual components that Seagate sources from between 250 to 300 suppliers, and bromine and chlorine had to be eliminated from the hard drives' printed circuit boards, circuit cabling, adhesives, and plastic housings. Seagate's implementation of an automated Compliance Assurance System for tracking the use of all materials in hard-drive components helped with its transition to chlorine-and bromine-free materials.

According to Seagate's Global Citizen Annual Report, first produced in 2005, the company adopted product stewardship principles to mitigate the impact of its products on the environment throughout their lifecycles, from design and manufacture to end-of-life management and disposal. The objective of Seagate's product stewardship program is to meet or exceed requirements of product-related environmental legislation and customer environmental requirements related to its products, packaging, user documentation, and manufacturing processes. This program ensures global compliance with all current regulatory requirements, such as RoHS, as well as its customers' requirements for bromine- and chlorine-free devices.

Seagate faced the same issues as many other manufacturers in producing bromine- and chlorine-free hard drives. Suitable materials had to be acquired from multiple vendors, and testing had to be conducted to ensure the high level of field reliability demanded by the company's customers. In addition to developing the requisite technology, the company's engineers needed to ensure that they could effectively integrate the necessary changes into their streamlined high-volume manufacturing systems. To tackle this challenge, Seagate followed its customary approach of forming a multi-discipline taskforce to study the issue and develop solutions. The team was so successful in resolving the technical and cost issues that approximately 50 % of the disk drives Seagate ships today meet bromine- and chlorine-free specifications. Seagate is also ready to scale-up and meet the higher volume demands that will arise as more OEMs adopt these material specifications.

OVERCOMING TECHNICAL CHALLENGES

Seagate's corporate culture, which focuses on meeting or exceeding customer requirements, helped make it possible for the organization to tackle the challenges of redesigning disk drives to avoid the use of bromine and chlorine. Hard disk drives comprise several hundred individual components that Seagate sources from between 250 to 300 suppliers. In addition to the hard drives' printed circuit boards, which can contain TBBPA, the halogen-containing components include the circuit cabling, adhesives, and plastic housings. The company had to also address another banned substance, antimony trioxide, which was used on certain bearing surfaces, although not as a flame retardant.

Environmental liabilities were not the only concern with bromine use in printed circuit boards. Bromine can pose potential reliability problems in a hard drive's printed circuit boards. Bromine-containing materials, specifically the acoustic foam commonly used in hard drives, may convert to a gaseous form and subsequently precipitate onto circuit boards, which can pose a corrosive hazard. Such bromine contamination can eventually corrode critical electrical components and circuitry to the point of failure.

Although Seagate drives have not succumbed to this type of bromine contamination, such drive failures have been reported in hard drives from other manufacturers. This issue is being resolved by advances in drive acoustics, as well as by the use of halogen-free substitutes in instances where the acoustic foam is necessary.

OPTIMIZED MANUFACTURING TO MEET LOGISTICAL CHALLENGES

Seagate's business strategies to adopt new materials and honor chemical restrictions, which were developed as early as 1998, has streamlined the company's manufacturing processes in a way that enables it to be sufficiently flexible to meet the demands of a wide variety of customers. In Q3 FY2009, the company shipped over 38 million hard drives into markets ranging from personal computing to cutting-edge applications intended to provide digital support throughout all facets of modern life, from home to office to automobile. Since the company owns, develops and manufactures the underlying technology, it is able to leverage technological innovations and changes across multiple product lines. Because many of Seagate's products share the same components, the company can also more easily optimize its manufacturing. A halogen-free component can be manufactured using the same line, manpower, and tools simply by exchanging one printed circuit board for a halogen-free variant. This allows Seagate to have the flexibility to scale-up manufacturing of the halogen-free products to meet emerging market demands while still adhering to the principles of just-in-time manufacturing.

ESTABLISHING STRONG MATERIAL COMPLIANCE PROGRAMS WITH SUPPLIERS

Seagate's implementation of an automated Compliance Assurance System for tracking the use of all materials in hard-drive components also helped with the transition to bromine- and chlorine-free materials. The system was based on an industry-standard reporting form developed by IPC (originally the Institute for Printed Circuits), the association representing companies in the electronic interconnection industry. Seagate used it to launch a full material reporting and disclosure requirement across its supply chain. The system requires component suppliers to report on all substances present, regardless of whether or not the substance is restricted. To do so, the vendors provide the Chemical Abstracts Service, or CAS, registry numbers assigned by the American Chemical Society for each compound they use. Seagate also specified that suppliers provide

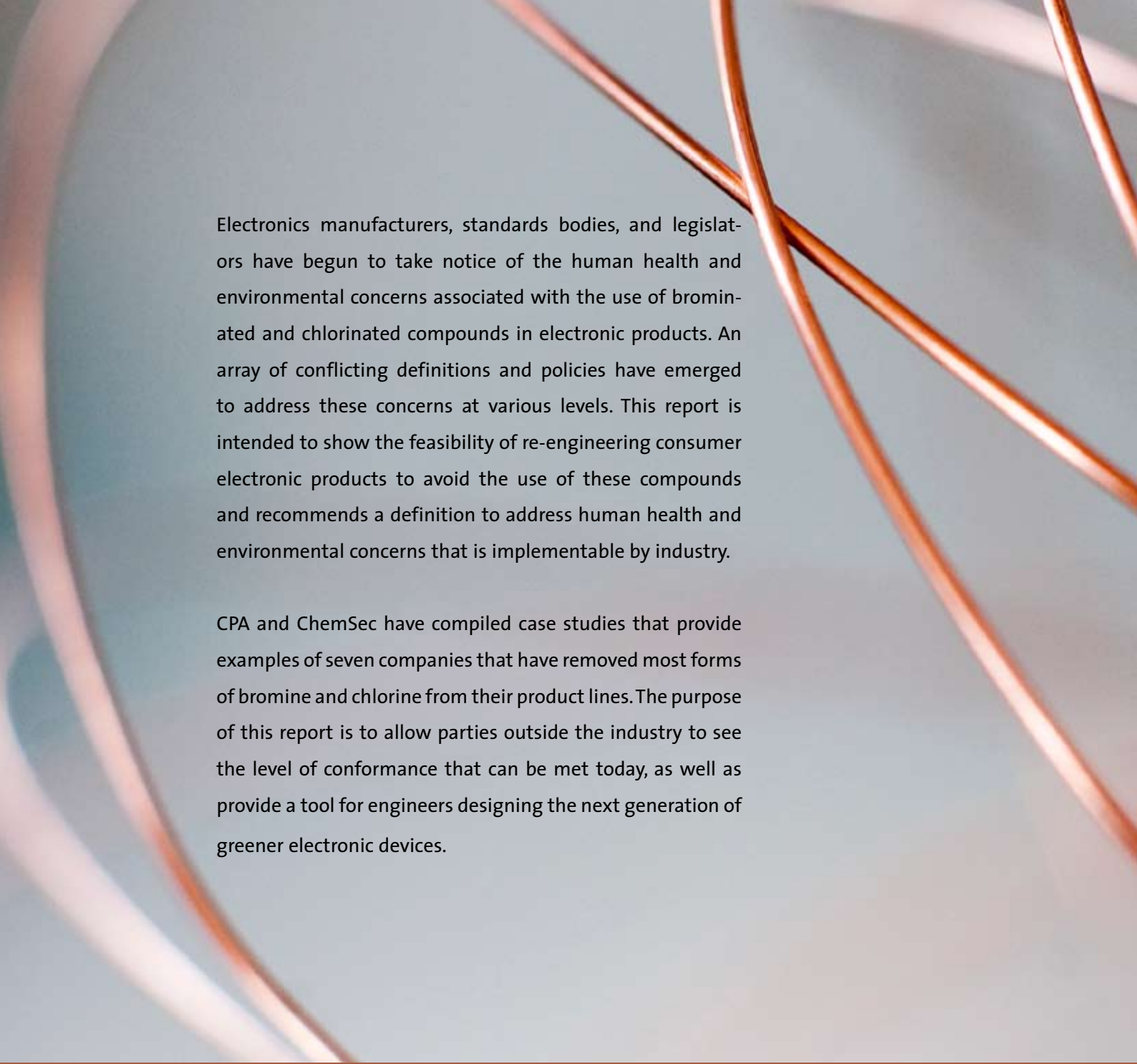
The team was so successful in resolving the technical and cost issues that approximately 50% of the disk drives Seagate ships today meet bromine- and chlorine-free specifications.

independent lab analyses to prove conformance to RoHS and low-halogen restrictions, as well as an official statement confirming that the materials conform to Seagate's list of several hundred banned substances.

This approach required upfront infrastructure investments that were initially time-consuming and resource-intensive for both Seagate and its vendor base. Once the program was developed, however, Seagate was able to reduce costs to both the company itself and to a vast number of its vendors. The use of automated tools and a standardized reporting format put Seagate in a good position to quickly identify if components contained certain banned substances. This allowed the company to address nonconformance with corrective resolutions. The system enables Seagate to assure its customer base that the products it supplies comply with specified material restrictions.

MOVING FORWARD

As is the case with other major suppliers producing bromine- and chlorine-free products, the cost of bromine- and chlorine-free materials remains a major challenge for Seagate. This cost premium can dampen the pace of adoption, particularly in an increasingly price-sensitive economy. Because Seagate has overcome the technical challenges, the company stands ready to scale up production to meet higher demand as more OEMs adopt bromine- and chlorine-free materials in their products. This will bring costs down, but it requires a commitment from some of the larger OEMs.



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.

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