



### Case Study: Motorola

#### Managing Chemicals of Concern in Products and the Supply Chain

**M**otorola<sup>1</sup> was founded in 1928 by Paul and Joseph Galvin as the Galvin Manufacturing Corporation. Their first product was called a battery “eliminator” as it allowed battery powered radios to run on electric current. Sears Roebuck and Company sold this product to household consumers. In 1930, the company introduced the Motorola car radio. Over the years, the company has developed many other communications products including: radio receivers for police use, home radios, 2 way radios, televisions, transistors, pagers, satellites for space exploration, cellular telephones, computerizing engine controls and digital radios. The company changed its name to Motorola in 1947. Motorola is headquartered in Schaumburg, Illinois. Net sales in 2008 were \$30.1 billion.<sup>2</sup>

Motorola now has three main business segments. The first is enterprise mobility solutions—this group designs, manufactures, installs and services two-way radios, voice and data communication products/systems for private networks, bar code scanners, Electronic Digital Assistants, and related products. The second segment is home and networks mobility—this group designs, manufactures, installs and services digital and IP video and broadcast network set-tops, broadband access infrastructure systems, wireless access systems and related products. The third segment is the mobile device group that designs, manufactures, sells and services wireless handsets and related products.<sup>3</sup>

#### IDENTIFYING, PRIORITIZING AND EVALUATING MATERIALS OF CONCERN

Motorola has created a list of 65 substances (including classes of substances such as BFRs) that the company has identified as “banned”, “controlled” or “reportable”. As described on Motorola’s web site, “banned” substances are not allowed for use in any Motorola product at any level. Controlled substances are limited for use in manufacturing processes or certain product applications. The use limitations are typically defined by national or international environmental regulations. Reportable substances are not currently banned

#### Substances Banned From Motorola Products

- Asbestos
- Chlorofluorocarbons and halons
- Halogenated dioxins and furans
- PCBs and PCTs

#### Controlled Substances in Motorola Products

- Arsenic
- Cadmium
- Hexavalent chromium
- Lead
- Mercury and mercury compounds
- Ethylene glycol monomethyl ether and its acetate
- Brominated flame retardants
- Phthalates
- PVC
- PBBs
- PBDEs
- Nickel and nickel compounds
- Azo dyes in textiles and leather

or controlled for use, but a ban or voluntary phase-out is likely or they have an impact on the end-of-life management of the finished product.”<sup>4</sup>

Development of this list began in the 1990s, when the End of Life Vehicle Directive (ELV) was being adopted in Europe. Motorola saw the “writing on the wall”, i.e., that the company would need better information from their suppliers about chemicals in parts and that they would need to begin to phase out certain hazardous chemicals of concern such as the heavy metals lead, mercury, cadmium, hexavalent chromium and brominated flame retardants



including PBB and PBDE (required by the ELV Directive). Scientists at Motorola reviewed regulatory requirements, authoritative lists of hazardous chemicals from US, EU and other government sources, considered hazard data and availability of alternatives, and consulted with toxicologists and engineers when data were conflicting or limited. When this list was first developed, Motorola **recommended** that suppliers meet these requirements; now, all component suppliers are **required** to meet Motorola's materials disclosure requirements. Motorola uses this list to address current regulatory requirements as well as to prepare for future restrictions and other stakeholder concerns.

One challenge has been setting reporting thresholds, as current analytic capabilities allow for analysis to minute levels. The default reporting threshold is 0.1% or 1000 ppm. The banned substances on Motorola's list do not have reporting thresholds (technically no amount is allowed). The "controlled" substances have a reporting threshold at or below the regulatory limit and an acceptance threshold, which is the regulatory limit. The reporting threshold is generally 10 times lower than the acceptance threshold.

Motorola has found it valuable to collect data on "reportable" substances that are not regulated, especially for recycling purposes. For example, it is valuable to know that palladium or gold is in a product, for disassembly and recycling efforts. Also, as regulations change, it has been valuable for Motorola to have these data, as the database can be screened for substances of concern, e.g., phthalates. Motorola can identify which parts and components contain phthalates and work with that part of their supply chain to find alternatives.

In prioritizing this list of 65 substances and substance classes for phase out or elimination, Motorola considers a variety of factors, including regulatory requirements, risk, stakeholder concerns, availability of alternatives, market issues, and costs of making a change. In some cases the cost factor is very large, especially if there are significant testing requirements to meet UL or other certifications. Motorola makes a wide range of products. Some are highly customized, such as a multi-million dollar communications infrastructure, and others are much less customized, such as a cell phone for consumer use. Depending on the type of product, it may be more or less costly to make these changes. In some cases, customer requirements state that Motorola eliminate certain chemicals and materials in a product.

All Motorola EU products comply with the RoHS Directive. Motorola's consumer products including mobile phones meet the hazardous substance limitations of the RoHS Directive globally with respect to lead, mercury, cadmium, hexavalent chromium, PBB's, or PBDE below the allowed thresholds. Motorola has eliminated BFRs in the wiring boards of some

of their mobile phones. The company plans to eliminate phthalates, PVC and BFRs from mobile phones and accessories and have products available by 2010.<sup>5</sup> In April 2008, the company began to eliminate these substances from mobile phone parts.

### **TRACKING MATERIALS OF CONCERN AND COMMUNICATION WITH THE SUPPLY CHAIN**

Motorola requires its suppliers to fully disclose information on the materials composition of parts and components, including information on substances of concern and recycled material content. Suppliers must report "homogeneous materials", defined by the EU as a material "that cannot be mechanically disjointed into different materials; homogeneous materials are materials "of uniform composition throughout."<sup>6</sup> Materials and substances can be listed by %, ppm, or mass and must add up to 100%. Up to 10% can be reported as miscellaneous, if they are non-listed substances. Motorola's materials disclosure specification document is called 12G02897W18 and is commonly referred to as the "W18" specification. Suppliers must provide the information requested in W18 in order for a part to be approved. These requirements are included in Motorola's contract with suppliers. Motorola expects their Tier 1 suppliers to pass these requirements on to Tier 2 suppliers.

To report this information, suppliers are required to use a software tool called Compliance Connect. This spreadsheet was developed from the automotive industry's IMDS reporting systems and adapted for the electronics industry. Motorola was familiar with IMDS as the company was part of the automotive industry in the 1990s.

Motorola has set up a service center in Malaysia to assist suppliers in meeting the W18 requirements. This center sends requests for information to suppliers, provides assistance with the use of the Compliance Connect spreadsheet, reviews data submitted by suppliers, and checks to see if any of the parts submitted are exempted from meeting requirements.

Although all suppliers in the electronic industry are required to submit information on materials of concern, the industry does not have a harmonized reporting system. Some electronics companies are using a system called EMARS—Environment Monitoring Aggregation and Reporting System developed by Synapsis Technology, Inc. Other suppliers use the Joint Industry Guide (JIG) Material Composition Declaration for Electronics Products with form IPC 1752, which are the electronic industry standard reporting requirements. Motorola will accept IPC 1752 on a limited basis, but this reporting form does not provide the level of detail that Motorola prefers as specified in the company's W18 materials disclosure process.



According to Motorola, it has been very challenging to educate suppliers about these reporting requirements and get them to buy into this process. This requirement is a culture change and many suppliers are resistant to providing the information requested.

In addition to the materials disclosure requirements, suppliers are required to comply with Motorola's Supplier Code of Conduct which includes the following elements: compliance, anti-corruption, no unfair business practices, anti-discrimination, no harsh or inhumane treatment, freely chosen employment, no child labor, freedom of association and collective bargaining, fair working hours, wages and benefits, safe and healthy working conditions, and environmental sustainability. In order to meet these requirements, suppliers are expected to have an Environmental Management System such as ISO 14001 or equivalent.

### MANAGEMENT STRATEGIES TO IMPROVE ACCOUNTABILITY FOR MANAGING MATERIALS OF CONCERN

Motorola has set ambitious long-term objectives that reflect their "vision of a sustainable world."<sup>7</sup> There is no timeline associated with this vision as Motorola acknowledges that there are technological and financial constraints to achieving it. These objectives include:

- **Product Stewardship:** Design all products for the environment and for safety.
- **Zero waste:** Reuse or recycle all waste materials.
- **Benign emissions:** Eliminate from plants all emissions that adversely impact the environment.
- **Closed loop:** Conserve natural resources by fully integrating products and processes in the recycling loop.
- **Zero Occupational Injuries and Illnesses:** Create a workplace free of occupational injuries and illnesses.
- **Green energy:** Use energy in highly efficient ways at sites and use renewable energy where practical.

Motorola is actively participating in the Global E-Sustainability Initiative (GeSI). The mission of GeSI is to promote sustainable development in the Information and Communications Technology (ICT) sector by sharing information and identifying best practices. Twenty-four companies are currently members of GeSI. The three focus areas of GeSI are climate change, supply chain and e-waste. Motorola co-leads the supply chain working group of GeSI and has collaborated with the Electronic Industry Code of Conduct (EICC) to identify best practices.<sup>8</sup> A recent product of this group is a report commissioned by GeSI on environmental, labor and human rights impacts of metals extraction for the electronics industry.<sup>9</sup>

### DESIGN TOOLS FOR EVALUATING CHEMICALS OF CONCERN AND DESIGNING GREENER PRODUCTS

Motorola has also set bold product design goals. As

described on their web site "from conception to end-of-life, we have established environmentally conscious goals for designing new products. These include: design our products to be recyclable; reduce, eliminate or substitute the use of hazardous substances; reduce energy use by our products; increase the use of recycled materials in our products; minimize the ratio of packaging material to product volume; and label all plastic parts weighing more than 4 grams to aid future recycling."<sup>10</sup>

Motorola's long-term product design goals are to achieve better than 90% recyclability, use more than 20% recycled material content, achieve high energy efficiency, use environmentally preferred materials, and minimize the ratio of packaging materials to product volume.<sup>11</sup>

Motorola has developed a product design process and detailed specifications for improving the environmental attributes of products. Motorola's marketing department evaluates customer, regulatory and market requirements and develops a "requirements" document. From here, Motorola's engineers will work to meet green design specifications. These specifications are the primary way that environmental considerations are integrated into product design. There are ten to twelve categories to consider including aspects such as carbon impact, hazardous substance content, resource usage, recyclability, recycled content, packaging, energy efficiency (in manufacturing and use and alternative energy), end of life management, and "eco-identity." An example of a product with eco-identity is the Motorola Renew cell phone that is made of plastics from post-consumer recycled water-cooler bottles, is 100% recyclable and is certified as "carbon-free."<sup>12</sup>

These green design specifications have been crafted to be flexible in their use. The categories are sorted into three tiers ("Good, Better and Best"). Motorola's engineers will review the "requirements document" and decide which tier to meet. If it is a product that will be used over a long time frame, Motorola designers may try to meet more stringent green design specifications to account for future requirements.

In the 1990s Motorola developed a very detailed software tool called the Green Advisor that was used to encourage green design. It is no longer very widely used, but was valuable in building the competence of design engineers to incorporate green design parameters. The knowledge gained from this tool was used to develop the current specifications for green design.

### LESSONS LEARNED

- **Setting visionary goals for greener products can provide a compass for an organization.** Motorola has set ambitious long-term goals including product stewardship, zero waste, benign emissions, closed loop, zero occupational illnesses and injuries, and green energy.



- **Green design specifications are important tools for implementing these goals.** Motorola has set bold product design goals and developed detailed green design specifications for engineers.
- **Data collected on “reportable substances” that are not regulated are a valuable source of information.** For example, it is valuable to know that palladium or gold is in a product, for disassembly and recycling efforts. Also, as regulations change, it is useful for Motorola to have these data to facilitate their work with their supply chain to find alternatives.
- **Providing full disclosure about materials composition is a challenging obligation for some suppliers.** Motorola requires that suppliers fully disclose information on the materials composition of parts and components, including information on substances of concern and recycled material content. Motorola’s service center based in Malaysia helps suppliers meet materials disclosure requirements.
- **Collaboration with other companies in the electronic sector is valuable.** Motorola’s active participation in GeSI, a collaborative effort to improve environmental and social responsibility in the electronics sector, has been a valuable means of sharing information and making improvements across the supply chain.

## ENDNOTES

- 1 For this research, we interviewed Matt Norton in Motorola’s Environmental, Health and Safety group, providing product and business support. Maya Komadina of Motorola’s Corporate External Communications arranged the interview.
- 2 See <http://www.motorola.com/content.jsp?globalObjectId=7632> and <http://www.motorola.com/content.jsp?globalObjectId=8892>
- 3 See <http://www.motorola.com/content.jsp?globalObjectId=8892>
- 4 See <http://www.motorola.com/content.jsp?globalObjectId=8509>
- 5 See: <http://www.motorola.com/content.jsp?globalObjectId=8509>
- 6 Motorola Controlled and Reportable Materials Disclosure #12G02897W18. Accessed at [http://www.motorola.com/mot/doc/1/1501\\_MotDoc.pdf](http://www.motorola.com/mot/doc/1/1501_MotDoc.pdf). See page 3 for definition of homogeneous material.
- 7 See: <http://www.motorola.com/content.jsp?globalObjectId=8506>
- 8 Motorola Corporate Responsibility Report 2007, pg. 11. Accessed at: [http://www.motorola.com/mot/doc/7/7130\\_MotDoc.pdf](http://www.motorola.com/mot/doc/7/7130_MotDoc.pdf)
- 9 Social and Environmental Responsibility in Metals Supply to the Electronics Industry. (2008, June 20). Prepared for EICC and GeSI by GHGm. Accessed at: [http://www.gesi.org/files/20080620\\_ghgm\\_ser\\_metalstolectronics.pdf](http://www.gesi.org/files/20080620_ghgm_ser_metalstolectronics.pdf)
- 10 See: <http://www.motorola.com/content.jsp?globalObjectId=8509>
- 11 Motorola Corporate Responsibility Report 2007, pg. 24.
- 12 Motorola has an alliance with carbonfund.org to offset the energy required to manufacture, distribute and use the phone.

This document is one in a series of five case studies prepared as part of a project assessing strategies for improving management of materials of concern for United Technologies Corporation. For more information or to download the other case studies, visit [www.chemicalspolicy.org](http://www.chemicalspolicy.org).

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