

It's shipped to a reseller, sold to a consumer and perhaps brought to a repair shop. But what happens before and after (and sometimes in between?) That little piece of technology you hold in your hand has an entire life beyond calls home to mom. Travel beyond borders, international intrigue and a prominent position in legislation are just a few of the things a cell phone may experience as it travels



From the Cradle to the Grave

the little-known life of cell phones

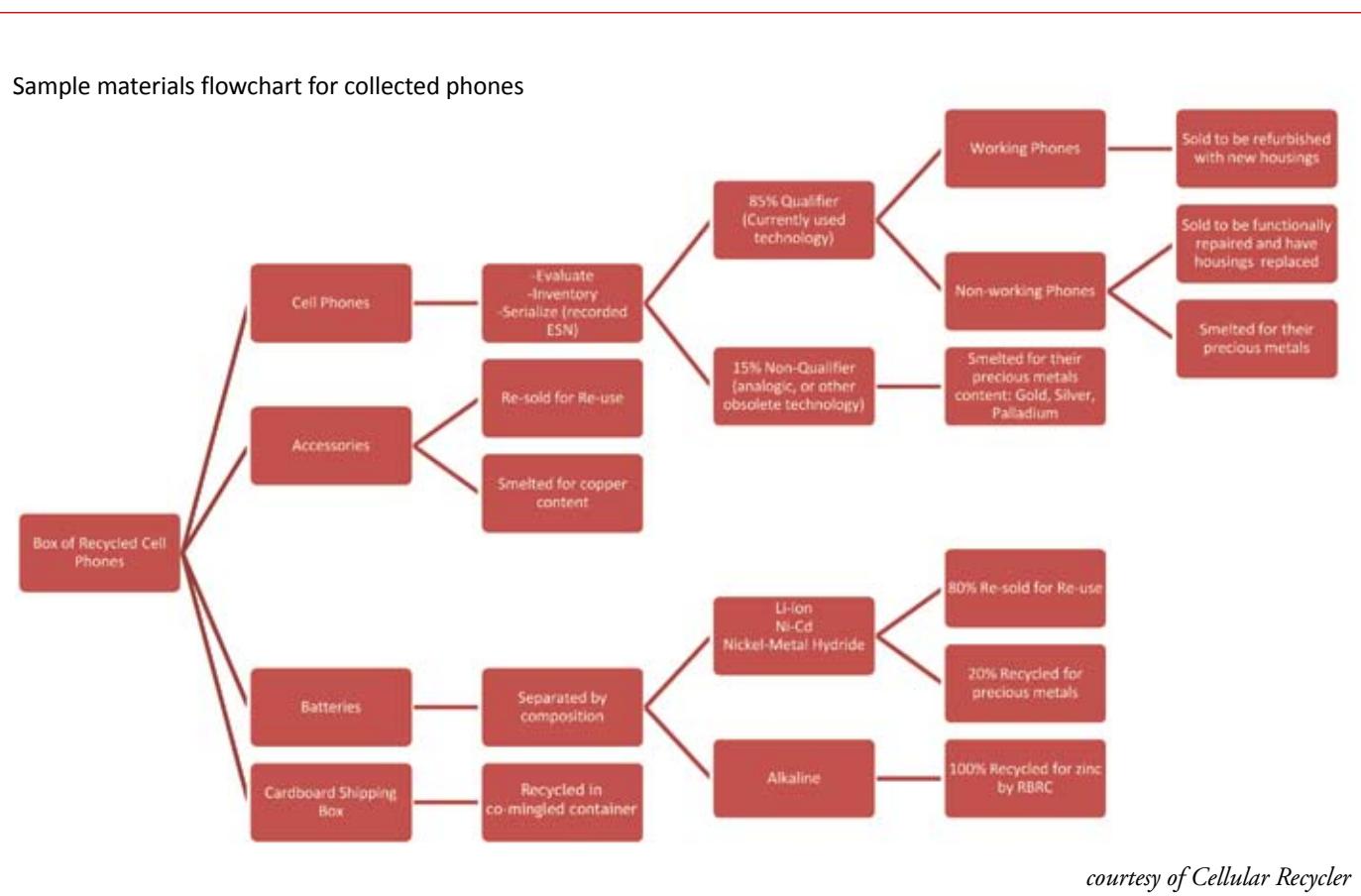
by Amy Weiss

With the number of wireless devices in the United States approaching the 300 million mark and the period of use of a cell phone averaging 18 months, simple math leads to the conclusion that there are a lot of cell phones being replaced each year; 170 million according to one study by environmental awareness group INFORM. The U.S. Environmental Protection Agency estimates less than 20 percent of those phones are recycled. Many sit in drawers. Some go into landfills as e-waste. Often that e-waste is exported to China, India or other developing countries, where, if not handled correctly, it then affects local workers as well as the environment by releasing dangerous toxins. The life of a cell phone, ultimately, is a short but eventful one, passing through many hands and geographic regions as it travels from cradle to grave. ►►

The life cycle of the average cell phone begins when the various raw materials used for its manufacture are mined. The United States Environmental Protection Agency has a large section of resources devoted to the manufacture, life cycle and disposal of cell phones purely because there are so many renewable resources in such a small package. According to the EPA's website, "Cell phones and accessories are made from valuable resources such as precious metals, copper, and plastics - all of which require energy to extract and manufacture. Recycling cell phones reduces greenhouse gas emissions, keeps valuable material out of landfills and incinerators, and conserves natural resources. Recycling just a million cell phones reduces greenhouse gas emissions equal to taking 1,368 cars off the road for a year."

The components in these small packages include copper, gold, lead, nickel, zinc, and beryllium in the circuit boards alone. Those raw materials are then processed in a variety of ways; crude oil, for example, is combined with natural gas to make plastic, and copper is

Sample materials flowchart for collected phones



treated with chemicals before being shipped to the manufacturer. Most of these materials are known as persistent toxins, able to remain in the environment for long periods of time after disposal.

Cell phone manufacture is a truly global enterprise. Market leader Nokia, for example, has factories in 10 locations around the world. With more than 40 percent market share, the Finnish company reportedly produces 900,000 handsets per day; the company shipped an estimated 122 million units in the second quarter of 2008 alone. Samsung, Motorola, LG Electronics and Sony Ericsson combined have nearly the same percentage of the market as Nokia alone. That's a lot of phones entering into the marketplace – 2005 estimates had global cell phone usage at well over 2 billion, and research firm Strategy Analytics estimated 1.1 billion phones sold in 2007 – a 10 percent increase from the previous year. That's also a lot of cell phones exiting their first life as primary devices and entering the next phase of their life. The question is, what phase is that?

Closing the loop

A closed-loop system, in which no new materials go in and no waste comes out, is considered to be the ideal. It's difficult, if not impossible, to achieve. But the "three Rs" are generally considered to be a strong first step in achieving such a system.

Reduce, reuse, recycle — it's a phrase few people haven't heard in today's environmentally conscious world. But there is a specific reason those words are used in that order. "Reduce" is the first line of attack: reduce the materials used in the manufacture of electronics and components to minimize the impact on the environment during the product's life and afterlife. After that comes "reuse," meaning exactly what the name implies – a device that is reused stays in active use, with none of its parts or components heading to landfills or factories to be repurposed. Many markets exist for such reuse. Cell phone recycling is big business; a report from ABI Research forecasts the market for recycled handsets will generate more than \$3 billion in revenue by 2012. It's estimated that more than half of phones received by recyclers can be refurbished. Personal data is removed, new software is loaded, and the phones can then be resold in the U.S. to other carriers, distributed as replacements for broken phones under warranty, or sold internationally. The last option is a popular one; in many countries the model of "get a cheap phone with a contract" doesn't exist as it does in the U.S., leaving open a wide door for inexpensive, refurbished cell phones.

Other options are available for unused cell phones. While the popular "Cell Phones For Soldiers" recycling program donates phone cards to soldiers serving abroad, some members of the military stationed in the Middle East report a need for actual unlocked cell phones that can be used with local prepaid SIM cards.

Regardless of method, the end result of most cell phone recycling programs is that refurbishers maintain a steady supply of product and working devices are kept out of landfills. It's a win-win for those in the business of collecting phones as well as for the consumer. Of course eventually all phones come to the end of their useful life. What then?

Keeping the end of the road clean

Reports of electronic waste from the U.S. being sent to developing countries have flooded the media. In 2002 a groundbreaking report from the Basel Action Network, "Exporting Harm: The High-Tech Trashing of Asia,"

Cell phone recycling is big business ... the market for recycled handsets will generate more than \$3 billion in revenue by 2012.

showed shocking images of piles of electronic waste from North America that had been dumped in rural Asia. Export of hazardous waste from developed to undeveloped countries is prohibited by the Basel Convention, a United Nations environmental treaty ratified by virtually every industrialized country except for the United States. The report showed men, women and children in rural areas of China working with no protection on procedures like using acid to extract precious metals from circuit boards.

Similar reports have called for electronics companies to clean up their acts, and many reports indicated that was the case. For example, the Cathode Ray Tube Rule was enacted in the U.S. in early 2007, requiring that recyclers notify the EPA headquarters when exporting broken or used CRTs and CRT glass. The rule, designed to encourage the recycling of CRTs, exempted CRTs from all hazardous waste requirements if the recycler complied with certain conditions, and was supposed to preserve landfill space and lower the emission of greenhouse gasses into the atmosphere.

Legislation outside the U.S. has been enacted as well, one of the most significant being the Waste Electrical and Electronic Equipment Directive (WEEE), a directive passed by the European Parliament in October 2002. The Directive indicated what proper disposal would be for electrical and electronic equipment in European Union member states, and anyone who does business with European countries. The rule became European law in 2003, imposing the responsibility for the disposal of waste electrical equipment on its manufacturers. The WEEE directive was closely linked with the directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (commonly referred to as the

The Green Pages

“U.S. ... regulations do not consider most used electronic products, such as computers, printers, and cell phones, as hazardous ...”

Restriction of Hazardous Substances Directive, or RoHS). RoHS took effect on July 1 2006, restricting the use of six hazardous materials in the manufacture of various types of electronic equipment – lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ether.

Is all the legislation working? Many manufacturers keep RoHS status on their corporate websites; Nokia, for example, has a detailed environmental section on its site in which it states “currently all Nokia products are RoHS compliant not only in Europe, but globally.”

However, a report issued in August 2008 by the Government Accountability Office (GAO) throws into question how effective awareness and regulation really is. The 67-page report blasts the EPS, which is the agency responsible for exportation of e-waste. The report blames, among other things, the fact that the regulations “focus on only cathode-ray tubes ... Other exported used electronics flow virtually unrestricted – even to countries where they can be mismanaged – in large part because relevant U.S. hazardous waste regulations assess only how products will react in unlined U.S. landfills.”

“U.S. law allows the unfettered export of nearly all types of used electronic devices,” the report continues. “U.S. hazardous waste regulations do not consider most used electronic products, such as computers, printers, and cell phones, as hazardous, even though they can be mismanaged overseas and can cause serious health and environmental problems.”

The GAO also said that recent surveys made on behalf of the United Nations found that used electronics from the U.S. continue to be dismantled in many Asian countries under unsafe conditions. The report suggests, among

other things, that the EPA could amend RCRA (Resource Conservation and Recovery Act) regulations and revise the definition of “hazardous” to include products that can pose risks upon (improper) disassembly, including cell phones.

The EPA’s response to a draft of the report stated it “did not want to build an ‘extensive compliance monitoring and enforcement program’ around the CRT rule and it preferred nonregulatory, voluntary approaches to address the problems.”

As with so many things, government regulation of electronic waste disposal is a long and complicated road. Ultimately, it benefits an industry to be proactive and monitor itself, ensuring consumer safety as well as a healthy environment.

The cell phone that leaves a factory today is already well along in its life cycle. Whether you sell it new, repair it, unlock it, collect it or refurbish it, you can help prolong that life cycle by encouraging safe and responsible practices. With new handset releases occurring at a faster than ever pace, it becomes more and more critical to ensure that the “old” phones are disposed of safely and responsibly, in a way that extends their useful life as long as possible. Each person who handles a device throughout its life span becomes a representative of a diverse and growing industry – the cellular phone aftermarket. And in the same vein the entire market is a steward of our environment, and a responsible party in marketing that industry in the eyes of the public. The life span of a cell phone is far more than the 18-month period that the consumer keeps it in his pocket. It’s a long life cycle with effects that reach far beyond the product’s useful life. It’s up to each person involved to ensure that each handset lives a long and successful life, from cradle to grave. 

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