



San Diego-Tijuana High Tech Waste Prevention & Recycling Workbook

**A Look At Producer Responsibility Trends,
e-Waste, and Concepts To Keep Your Technology
Company Competitive**

Developed by the San Diego Regional Technology Alliance
Under contract with the U.S. Environmental Protection Agency

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The San Diego-Tijuana High Tech Waste Prevention & Recycling Workbook is one of a series of reports developed by the San Diego Regional Technology Alliance (RTA) aimed at supporting the development and competitiveness of high technology companies in San Diego and the surrounding region.

This study was researched and developed by Crossborder Business Associates (www.crossborderbusiness.com). It is a joint effort of the San Diego Regional Technology Alliance and this report's sponsor, the United States Environmental Protection Agency.

The RTA

The San Diego Regional Technology Alliance is a non-profit corporation supported in part by the State of California and other funding sources to assist San Diego's high technology industries. Our primary goal is to empower businesses and entrepreneurs to develop emerging technologies with San Diego resources. For more information about the RTA San Diego and its technology support programs, please visit us at www.sdrta.org , or contact us through the information below:

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Technology, E-Waste & Climate Change

We've all heard the familiar "e"-phrases giving many of our standard activities new significance in this electronic and technologic world: e-Commerce, e-Business, e-Hotels, e-Filing, e-Books, e-tcetera, e-tcetera. Less discussed by the leaders of technological innovation, however, is the "e" at the end of a product's life cycle: e-Waste.

e-Waste can be generally categorized as the electronic equipment, components, and related composite materials that have either become obsolete, or have been generated through consumer or business activity. Manufacturers of technology-related products, in particular, can be a concentrated source of both e-Waste, as well as more standard non-hazardous industrial wastes like cardboard, metals, and plastics.

The San Diego-Tijuana region is home to dozens of the world's leading companies involved with high-tech electronics, communications, software, and recreational goods manufacturing – Qualcomm, Sony, Hewlett-Packard, Ericsson, Callaway, Samsung, Canon, Sanyo, Titan, and Kyocera among them. Our region enjoys a unique competitive edge, in fact, due in part to a binational blend of advantages that each side of the border has to offer.



However, mature technology industries, such as electronics manufacturing, compete globally, not locally or even regionally. Research and development is done in more developed countries, components are sourced from several continents, assembly may occur in another, and the final products may be sold throughout the world. This global nature of many technology-related industries leaves them prone to *causing impacts* to the environments of multiple nations at once, as well as *being subject* to a variety of environmental regulations that can either impede a company's growth – or allow environmental innovators to lead the marketplace.

Technological innovations add another level of environmental concern: the ever-increasing speed of product obsolescence and the movement toward "disposable" electronic products. As high-tech products are manufactured, packaged, and consumed, solid waste is produced at each step. Greenhouse gas emissions resulting from both the solid waste and the energy used in manufacturing and distributing these products are also an ever-increasing concern in our global

environment. The U.S. Environmental Protection Agency estimated, in fact, that recycling programs in the United States in 1996 prevented the release of 33 million tons of carbon (a greenhouse gas) into the air.¹ On a more “local” scale, Dell Computer’s estimates that between 1997 and 2000, the recycling and waste reduction efforts of their manufacturing operations “created the equivalent reduction in greenhouse gas emissions of over 35,500 metric tons....”²

This workbook has been designed as a helpful aid for technology manufacturers (particularly those in the electronics sector), outlining some of the major international regulatory trends, electronics recycling activities in the San Diego-Tijuana region, and some guidelines for implementing waste prevention and recycling activities in your production area.

Technology Products & Obsolescence

High-tech products related to the San Diego-Tijuana region have been increasingly demanded by business and consumers. Many of the products researched, designed, or manufactured here include products from various technology sectors, such as telecommunications, electromedical equipment, and – of course – consumer electronics. Of particular note is the fact that Baja California and San Diego make up the largest concentration of television set manufacturing in the world, with more than 26 million sets produced in this region in 2000 alone³.

The sheer size of our demand for technological products is, in fact, amazing⁴:

- Americans reportedly own more than 1.6 billion consumer electronics products
- Over 98% of US households have a color television set and 91% have VCRs
- 73% have a cordless phone
- 54% have CD players
- 44% have personal computers

To underscore the future tidal wave of e-Waste hitting our shores, we’ll look a little more closely at that last product –



Hundreds of computer monitors at San Diego recycling facility being prepared for shipment to out-of-region recycler.

¹ USEPA Office of Solid Waste: www.epa.gov/epaoswer/non-hw/muncpl/facts.htm

² Dell Corporation: www.dell.com/us/en/gen/corporate/vision_031_enviro.htm

³ Baja California maquiladora industry figures from February 2001, and estimate from Crossborder Business Associates

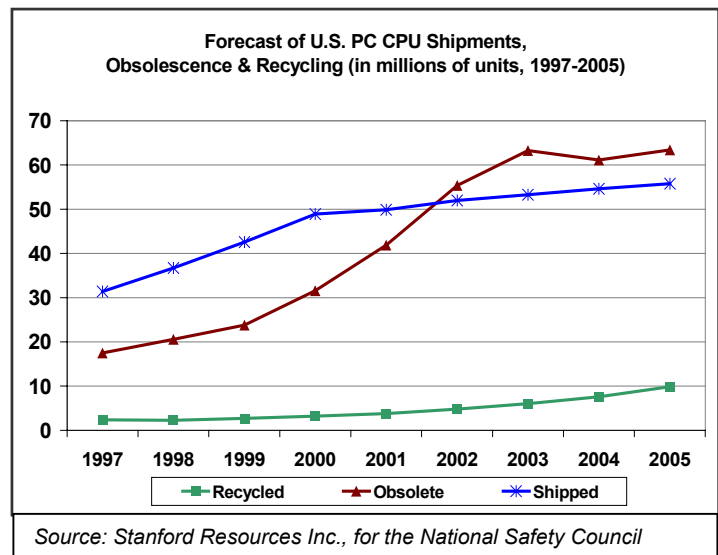
⁴ Consumer Electronics Association, “Consumer Electronics and the US Economy”

personal computers (PCs) – since both businesses and consumers must cope with its unique disposal challenge.

According to studies, an estimated 49.4 million personal computers were shipped in the US during the year 2000 – 10% more than had been shipped in 1999⁵. Incredibly, approximately 252 million personal computers were shipped worldwide during 1999 and 2000 combined⁶ – underscoring the huge demand for PCs.

While the demand for PCs is increasing, so is the rate of their manufacture and their rate of obsolescence. According to industry sources⁷, in 1992 the average PC had an average useful life of about 4.5 years. By 1999, that average useful lifespan had dropped to 3.1 years. By 2004, a PCs average useful life will be approaching 2 years, as both the rate of innovation increases and the price to manufacture PCs drops.

As seen in the figures at right⁸, the result of this growing PC obsolescence factor will be that in the year 2002 and beyond the number of PCs that will become obsolete will outstrip the number of units actually shipped in the United States. Should one consider the number of PCs falling into obsolescence worldwide, or the other myriad of technology-related products in the market, then the picture becomes even more worrisome.



International, National & Local Regulatory Trends

Given that the average lifespan for new personal computers is only 3-4 years, many countries and regional governments are beginning to implement various legislative or regulatory initiatives that will impact both the design of electronics and other technology-related products, as well as their global marketability.

⁵ Gartner Dataquest, "Worldwide PC Market Growth Less Than 15% in 2000" (January 19, 2001).

⁶ Gartner Dataquest

⁷ Based on research by Stanford Resources, Inc., for the National Safety Council (1999)

⁸ Based on research by Stanford Resources, Inc., for the National Safety Council (1999)

These initiatives include:

- **Product Takeback** -- requires the collection by the manufacturer at the product's end of life⁹, and
- **Extended Producer Responsibility (EPR)** – related to “product takeback”, EPR requires both collection by the manufacturer at the product's end of life, as well as specified management of the products and/or materials collected.

Perhaps the most well-known product takeback regulation, Germany's Green Dot system (www.gruener-punkt.de/en/), focused on requiring manufacturers and importers to essentially guarantee a product's packaging was recycled. More recent developments, however, have looked not only at the recycling of packaging but the products themselves – shifting the burden of waste management from governments to the private sector. As foreign governments consider these options, US companies may be less competitive due to either fewer “environmentally-conscious” design considerations in their products; a lack of understanding of the takeback requirements and the reverse logistics needed to collect outdated products; or simply a higher cost to comply with such regulations.

Even in the US, manufacturers have started to see both voluntary and involuntary efforts to collect and recycle electronics and related technology products:

- **San Diego, California:** in 2000, the City of San Diego began a series of collection events for e-waste, collecting 12 truckloads of electronics and CRTs during a one-day event in December 2000. Since then, the City of San Diego

Product Takeback & Producer Responsibility Initiatives

In addition to the nearly worldwide adoption of the 1989 Basel Convention controlling transboundary movements of hazardous wastes (including, in some cases, those resulting from electronics and technology manufacturing operations), several major countries have either implemented or are considering significant product takeback requirements, including:

European Union (EU): the 15 members of the EU adopted a draft “waste electrical and electronic equipment” (WEEE) policy in mid-2000. Although the policy is still undergoing debate, proposed amendments made in February 2001 demonstrate the EU's intent to enact regulations requiring recovery or recycling of appliances, electronics, telecommunications and IT equipment beginning in 2004. Additional environmental policy positions were also adopted in early-2001 related to the European Commission's Integrated Product Policy, which calls for:

- Stimulating consumer demand for greener products through eco-labelling.
- Promoting business leadership in supplying more green products through eco-design guidelines and product life cycle analysis.
- Using price mechanisms, including differentiated taxes, to promote green products.

Japan: new Federal regulations went into effect in April 2001 requiring consumers to pay an advance disposal fee for electronics and appliances. The fees will support product collection efforts by retailers and, ultimately, recycling by manufacturers. Companies like Hitachi and Sony have joined together to create recycling networks in order to comply with the requirement.

⁹ American Plastics Council, “A Design Guide for Information & Technology Equipment”, p. 32

has held three other such events, including two in 2001 that resulted in more than 150 tons of used electronics and small appliances. In January of 2002, working with Goodwill Industries, NxtCycle, Pacific Coast Recycling Services, and 140 volunteers (including a group from the U.S. Marine Corps) the City was able to collect 76 tons of CRTs, and 85 tons of discarded electronic products from nearly 3,000 San Diegans in a period of only six hours¹⁰.

- **Minnesota:** in late-2000, the State implemented a voluntary statewide electronics recycling effort for Sony products, in conjunction with Sony, Waste Management Inc., and the American Plastics Council¹¹. Since this announcement, state representatives have also initiated discussions with other electronics manufacturers to begin additional e-waste collection efforts¹².
- **Massachusetts:** the state has banned all CRTs from landfill disposal. In addition, Massachusetts has widened its definitions of a regulated items to include any device that contains a tube, including televisions, monitors, and terminals. Individuals have been granted some exemptions from the disposal requirements of this regulation, although the Commonwealth intends to issue new mandates on CRT management in the 2002 legislative session.¹³

California's CRT Regulations

In 2001, the California Department of Toxic Substances Control banned the disposal of CRTs in landfills, due to their high concentration of lead, phosphorous and barium. Discarded CRTs are now considered a *universal hazardous waste* under California law.

California identifies *universal wastes* as common, lower-risk hazardous waste products (such as batteries, fluorescent lamps and CRTs). The new regulations mandate that anyone who "generates, handles, collects, transport or recycles CRTs, or CRT-containing devices in California," are subject to the regulations.

However, California grants an exemption for most hazardous materials management requirements to low-volume generators, such as households and small businesses – provided that they produce five or fewer CRTs per calendar year and store waste CRTs safely.

Generators of more than five CRTs a year must:

- Mark, package and store CRTs in a manner to prevent CRT glass from being released;
- Limit on-site storage of CRTs to one year;
- Immediately clean any broken CRT glass, treating it as universal hazardous waste;
- Maintain records of all CRT shipments; and
- Comply with all regulations governing export of CRT to other countries if waste is shipped internationally.

Violators of these regulations are subject to fines of \$25,000 and up to one year in jail as a civil penalty.

For more information, see "Managing Waste Cathode Ray Tubes Fact Sheet" (August 2001, California Department of Toxic Substances Control). Also, contact DTSC at 916-324-8286, or www.dtsc.ca.gov.

¹⁰ Interview with John Theroux, , City of San Diego Environmental Services, Recycling Program (March 2002)

¹¹ International Association of Electronics Recyclers, "IAER Electronics Recycling Newsletter" (November 2000).

¹² Brenda Platt, "Local Initiatives Leverage Extended Producer Responsibility", Institute for Local Self-Reliance (November , 2000).

Legislative proposals have also been made in the States of Colorado, Georgia, Maryland, New Jersey, and New Hampshire, among others¹⁴, that relate to electronics and high tech products. In fact, in February of 2002, a legislative proposal was introduced in the State Senate of California that would require that:

“...on and after January 1, 2004...every manufacturer of hazardous electronic devices be able to demonstrate that it has labeled...all hazardous electronic devices produced by it and has been certified by the [California Integrated Waste Management Board] as having a recovery and reuse or recycling system for hazardous electronic scrap that meets specified recovery and recycling goals.”¹⁵

Although it remains to be seen if California and others states adopt regional “e-waste take-back” requirements, it is likely that such programs are inevitable.

IMS Recycling – A Regional Leader in Electronics Recycling

One of San Diego’s oldest recycling companies, IMS Recycling, is also one of the region’s leading e-waste recycling companies. Over the past decade, IMS has increased the throughput of their e-waste collection efforts to about 3% of their operations.

“Currently we handle between 100,000 to 200,000 pounds of electronics scrap each month, most of which comes from institutional and municipal generators, although about one-third comes from manufacturers,” explains Ed Siegal, Manager of Electronics Division for IMS Recycling.



Drives and other e-waste at IMS Recyclina

According to Siegal, the trend is toward recycling of e-waste, rather than reuse: “Products are becoming obsolete more quickly, and with new awareness of these wastes people are cleaning out their closets. Older items, though, don’t have reuse value. On top of that, reuse markets are becoming saturated, making it less economic for us to collect some items – since reuse provides about 60% of the revenues for e-wastes but takes up only 10% of the throughput.” The result: companies often must “bundle” all of their recyclables – paper, plastic, metals, and e-waste – in order to get a recycler to pick them up.

Another trend Siegal sees: “Circuit board manufacturers are becoming more efficient and using less gold, meaning that with newer scrap the value can be much lower than in the past. We also don’t see much effort being made in designing this stuff for disassembly, although there’s definitely more plastic being used in place of aluminum these days.”

Although local markets don’t exist for e-waste recyclables, so far non-local markets have allowed IMS to earn between 6¢-8¢ per pound for computers, although the closest market for monitors and CRTs is in Arizona. “We have to send some of our materials to the Philippines, China, and Pakistan. But, apart from CRTs, so far, the market’s been there.”

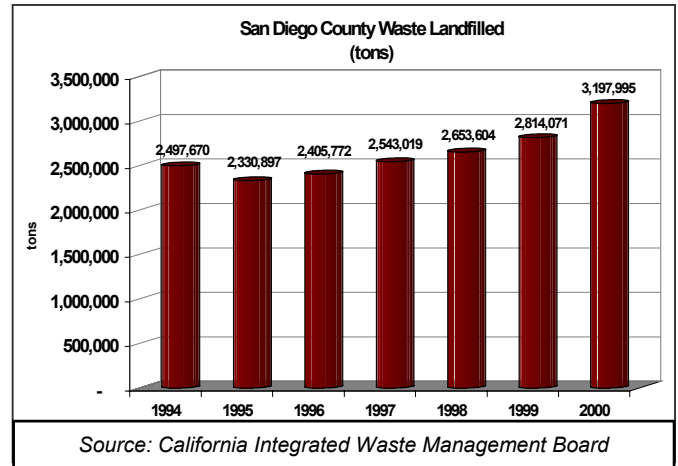
¹³ For more information, see Massachusetts’ CRT web site: www.state.ma.us/dep/recycle/crt/crthome.htm

¹⁴ International Association of Electronics Recyclers, “IAER Electronics Recycling Newsletter” (January 2001).

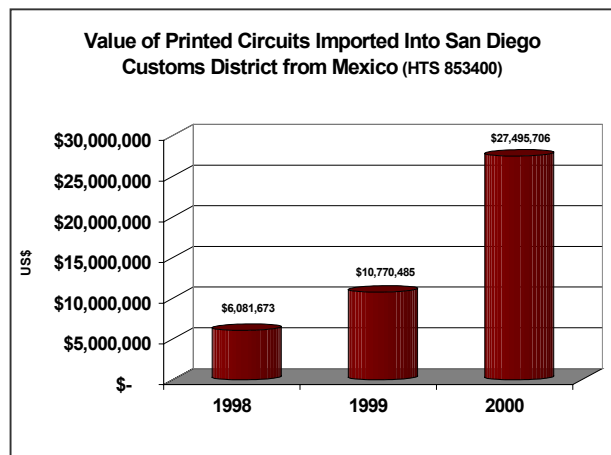
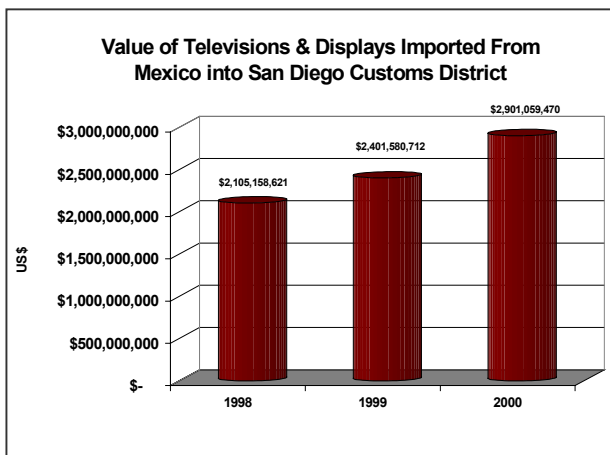
¹⁵ California Senate Bill 1619 (Romero), introduced February 21, 2002.

Implications for the San Diego-Tijuana Region

As seen above, environmental regulations are forming in both the United States and in major foreign markets that will affect high-tech manufacturers in the San Diego-Tijuana region. On top of that are San Diego's own waste management challenges, highlighted by the ever-increasing amount of solid waste disposed of in County landfills (graph at right). Although San Diego regional landfill capacity exists until beyond 2015, sooner or later, high-tech companies may either be forced to consider options related to e-waste and environmental design, or to take strategic leadership in these issues.



To illustrate the potential impact on companies in the San Diego-Tijuana region, it may be helpful to understand the size of the regional high tech industry. In 1998 – before much of the growth of San Diego's telecommunications and electronics companies – more than 250 electronics component and communications firms operated in San Diego County¹⁶. In late-1999, approximately 130 maquiladoras in the electronics- and television/display-related sectors operated in Baja California¹⁷. The strong inter-relationship of the San Diego-Tijuana electronics industry can be seen in regional import data (below), showing the great scale of television and display product imports from Baja California (almost \$3 billion dollars worth in 2000!), as well as imports of printed circuit boards and assemblies¹⁸.



¹⁶ Bureau of Labor Statistics, ES-202 Series data for 1998

¹⁷ Proprietary estimates from Crossborder Business Associates (2000)

An Emerging E-Waste Recycling Industry

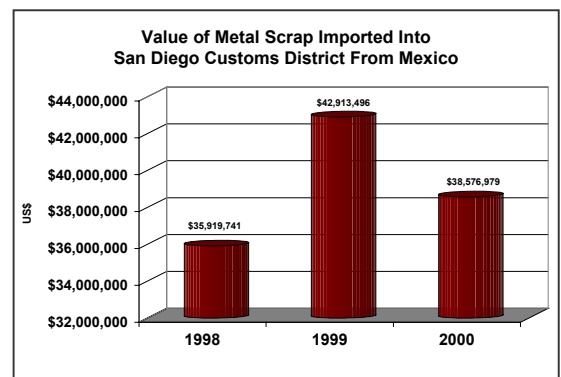
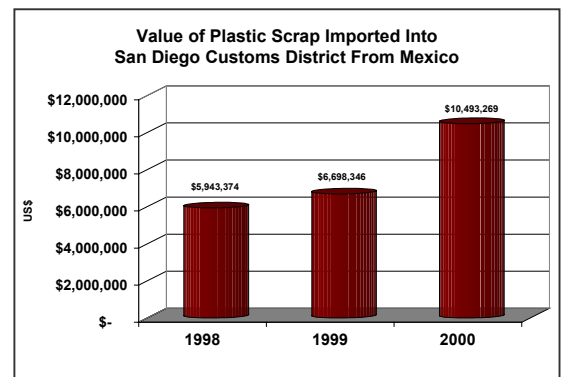
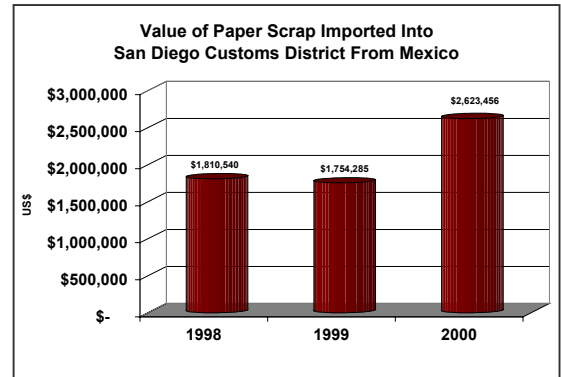
Although specific regional collection data for e-waste is unavailable, local recycling companies claim increased interest from both industrial and residential customers. According to representatives of these companies, “no markets in Southern California exist, to speak of”¹⁹, with the result that e-waste tends to be shipped to Asian end markets.

This situation is reflected in the significant flow of recyclables and scrap from Mexico into San Diego – in many cases from electronics and other manufacturing operations. According to interviews with Baja California based recycling companies²⁰, most of the recyclables collected from manufacturing operations in Tijuana are shipped to Southern California for further processing and, ultimately, shipping to foreign markets (typically Asia).

The increasing amount of scrap coming into San Diego from Baja California underscores a growing recycling effort within Tijuana’s technology manufacturing sectors. Waste reduction and recycling efforts are often, in fact, correlated with the growing presence of ISO 14000/Environmental Management System certified factories in Tijuana.

ISO 14000-certified companies in Tijuana include:

- Canon
- Casio
- JVC
- Kyocera
- Kyushu
- Matsushita
- Maxell
- Philips
- Samsung



¹⁸ US Department of Commerce (2001)

¹⁹ Interview with Ed Siegal, Manager/Electronics Division, IMS Recycling (San Diego, CA)

²⁰ Interview with Felipe Osornio, Manager of AMPLAST (Mexicali, BC)

But, despite the encouraging growth of ISO 14000 certified companies, and the apparent growth of e-waste recycling in Tijuana and San Diego, what's absent, and what could lead to future potential market problems for recyclables, are end-markets. As electronics and similar products are manufactured using more plastics and low-value materials, the recovered value from recycling these products is decreasing over time. Since the vast majority of both San Diego's and Tijuana's recyclable materials leave the region for off-shore markets, it is likely that at some future date the collection of these materials may be even less cost-effective than today. As such, local technology manufacturers should strongly consider waste prevention efforts in their processes, as well as designing their products to minimize environmental impacts and maximize reusability or recyclability.

ViewSonic, IBM & Best Buy: Taking E-Waste Recycling Local

ViewSonic has partnered with a leading electronics recycler, Anything IT, to have computer equipment picked up and processed at a discounted rate when customers upgrade or trade in approved equipment. Anything IT accepts any equipment in working order, and issues the consumer a cash reimbursement check that applies to any ViewSonic display purchase. Much of ViewSonic's program targets mid- and large-sized companies that can be faced with significant costs when recycling.

Although **IBM** has been a leader in environmental and recycling issues for years, it took waste management one step further in late-2000 by offering PC recycling services when a new product was purchased. The service, available for a \$30 fee, allows individuals and small businesses to recycle any manufacturer's computer hardware – including monitors, printers, and system units. The goal is to reduce the amount of e-waste the company sends to landfills by 10% each year.

“As customers have invested in new technology to better serve their needs, there has been an increase in the amount of older IT equipment that is either obsolete or that they no longer want”, states Wayne Balta, IBM Director, Corporate Environmental Affairs. “IBM's services help facilitate the recycling of this equipment.”

Reusable equipment is donated to the group, *Gifts in Kind International*, with non-reusable items recycled. This service supplements IBM's ongoing recycling efforts, which resulted in more than 120 million pounds of equipment parts and machines recycled in 1999 alone. IBM also estimates that it will gain a profit of as much as \$500 million from its refurbishing programs.

In 2001, consumer electronics retailer, **Best Buy**, tested their first recycling program in Minnesota. The program was a success, and is being implemented at Best Buy stores throughout the country.

During designated "Take It Back!" periods, consumers were able to return TVs, CRTs, and laptops to the parking lots of participating stores, where a recycler collected and sorted the equipment to facilitate transfer to local centers. Consumers paid recycle fees ranging from \$10-25, depending on the item, although cell phones, VCRs, audio equipment were collected at no charge at the stores.

Better Than Mandates: Best Practices

Technology companies planning for environmental design, waste prevention or recycling aren't necessarily putting themselves at a disadvantage. Rather, these efforts in manufacturing settings are often correlated with more efficient operations and continuous-improvement quality activities. As noted in total quality management (TQM) literature, as well as more "environmentally-oriented" discussions about sustainability (see sidebar at right), reduction in the use of materials (through more efficient design, waste prevention, and recycling), reduction in the use of toxics, as well as increasing the serviceability of a product can add significant results to a company's bottom line and brand image.

One way to start is to consider the "best practices" – or above-standard performance metrics – that exist in your specific industry. Most manufacturers have established benchmarks for their operations that can be independently used to identify areas of improvement. For instance, according to results from the Georgia Manufacturing Survey of over 700 manufacturers, the median scrap rate for electronics manufacturers is 4%. This is, of course, not a "best practice" – just the median. However, the top 10% of electronics manufacturers reported a scrap rate of .4% for their operations – a goal that not only has a positive economic benefit for the manufacturer, but also a significant reduction in raw materials used and scrap generated for recycling (or disposal).

Another study, from the United Kingdom, cites that the top 10% of electronics manufacturers reported a scrap rate of only .2%. The important point is to identify an appropriate and applicable benchmark and (using practices common with TQM and environmental management systems) work toward both economic and environmental benefits.

Seven Dimensions of Eco-Efficiency

Eco-efficiency is achieved by the delivery of competitively priced goods and services that satisfy human needs and improve quality of life while progressively reducing environmental impacts and resource intensity....

There are seven key dimensions of eco-efficiency that every business should take into account when developing products, introducing process changes, or taking other actions with environmental implications. They are:

1. Reduce the material intensity of goods and services.
2. Reduce the energy intensity of goods and services.
3. Reduce toxic dispersion.
4. Enhance material recyclability.
5. Maximize sustainable use of renewable resources.
6. Extend product durability.
7. Increase the service intensity of goods and services.

Source: Livio D. DeSimone and Frank Popoff, with the World Business Council for Sustainable Development, *Eco-Efficiency: The Business Link to Sustainable Development* (MIT Press, Cambridge, MA, 1997), p. 47, 56-57. Via the website of the World Resources Institute: www.wri.org

STMicroelectronics Inc. – Total Environmental Quality Management

Stating “the world is priceless; ecology is free”, STMicroelectronics (with an R&D and manufacturing facility in San Diego’s Rancho Bernardo community) has not only grown to be the sixth largest semiconductor company in the world, but has gained a world-class reputation as a leader in TQEM – total environmental quality management. The company, with ISO 14000 certified facilities throughout the world, has received the Malcolm Baldrige National Quality Award, as well as the US EPA’s Climate Protection Award for its outstanding accomplishments.

As clearly outlined by the company: “At STMicroelectronics, we believe firmly that it is mandatory for a TQM driven corporation to be at the forefront of ecological commitment, not only for ethical and social reasons, but also for financial return, and the ability to attract the most responsible and performing people. Our ‘ecological vision’ is to become a corporation that closely approaches environmental neutrality.”

This emphasis on incorporating environmental activities such as waste prevention and recycling as a standard practice within technology manufacturing operations has been further explored through innovative partnerships between government agencies and private companies, such as the *Border Waste Wi\$e* project funded by the US Environmental Protection Agency. In this project, the City of San Diego, the City of Tijuana, the California Integrated Waste Management Board, and representatives of Science Applications International Corporation, San Diego State University and the Universidad Autónoma de Baja California undertook waste audits and provided training to a variety of maquiladoras and manufacturers in both Tijuana and San Diego. This project determined that “...Many companies, both large and small, have embraced waste reduction as part of their total quality management and continuous improvement programs.”²¹ In fact, technology manufacturers identified four specific areas as critical for waste reduction efforts:

- **The product design phase:** waste prevention & recyclability.
- **In-plant product handling and processing:** reduce rejects & make reuse/recycling convenient.
- **Product packaging:** revise specifications to eliminate unnecessary packaging, or utilize durable, reusable in-process containers.
- **Purchasing:** use “affirmative purchasing” to increase recycled materials content, and reduce use of non-recyclable or toxic materials.

²¹ Border Waste Wi\$e training materials, “Waste Reduction Guide for the Electronics Industry”, www.borderwastewise.org

Making Progress: A Local Solution

Working with local industry groups, peers from local manufacturing companies, and technical assistance resources often available from government agencies (such as the City of San Diego's Environmental Services Department, or the California Integrated Waste Management Board), San Diego and Tijuana high tech manufacturers can make a difference in not only reducing the solid waste they generate, but also the amount of greenhouse gases that their activities and products ultimately create.

Waste prevention and recycling efforts not only add value to a manufacturer's bottom line, they can also create a more competitive and strategic position from which to do business globally. Given the already unique competitive advantages that technology companies can find in the San Diego-Tijuana region, it may only take a small effort on the part of your company to turn e-waste into e-efficiency!

New Solutions for CRT Recycling in the San Diego-Baja California Region

According to David Cauchi, Director of Operations for NxtCycle, a CRT recycling operation may soon be open near you – if you live in the San Diego-Baja California region. Initial plans included opening a 20,000 square foot CRT processing facility in Mexicali, Baja California, in 2002 – barring any unforeseen problems. In addition to this facility, NxtCycle is considering additional operations in either San Diego or Calexico, California.

"We're primarily targeting OEMs and their suppliers", states Cauchi, "although we might also be taking some materials from service centers and collection events". The facility would likely be permitted as a maquiladora, and managed as a transfer facility for leaded glass, following strict requirements of both the State of Baja California and the Mexican Federal government. Another plant is being considered in Ciudad Juárez, Chihuahua.

Such an operation may provide the large concentration of television and display manufacturing plants in both Baja California and San Diego with a solution to a pressing – and costly – problem of how to recycle the glass, plastics, and metals resulting from their operations. In addition, the operation may also be part of a regional solution for an increasing number of obsolete CRTs and computer monitors discarded by businesses and individuals in our binational region.

Appendix 1: Regional Contacts & Links For More Information

If you would like more information about electronics recycling, waste prevention practices, environmental benchmarking, and other related topics, please consider the following contacts and website sources:

Regional Contacts:

- **City of San Diego Environmental Services Department**, Electronics Recycling:
John Theroux: (858) 573-1284 jtheroux@sandiego.gov
- **California Integrated Waste Management Board**, Electronics Program:
Terri Cronin: (916) 341-6618 tcronin@ciwmb.ca.gov

Websites of Interest:

Electronics Recycling & Related

- International Association of Electronics Recyclers: www.iaer.org
- USEPA Common Sense Initiative/Computers & Electronics Sector:
www.epa.gov/ooaujeag/csi/computer/index.htm
- National Recycling Coalition's Electronics Recycling Initiative:
www.nrc-recycle.org/resources/electronics/
- California Integrated Waste Management Board/Electronic Product Management:
www.ciwmb.ca.gov/Electronics
- University of Tennessee's Center for Clean Products and Clean Technologies
eerc.ra.utk.edu/clean/

General Recycling, Waste Prevention & Climate Change

- USEPA Waste Wi\$e – waste prevention & recycling, and its relation to Climate Change: www.epa.gov/wastewise
- USEPA Global Warming & Waste:
www.epa.gov/globalwarming/actions/waste/index.html
- Pew Center on Global Climate Change/Business Environmental Leadership Council:
www.pewclimate.org/belc

Design for Environment

- USEPA Designing for the Environment: www.epa.gov/dfc
- USEPA Extended Product Responsibility: www.epa.gov/epr

- Consortium on Green Design and Manufacturing: greenmfg.me.berkeley.edu/green/Home/Index.html
- Carnegie Mellon Engineering School Green Design Initiative: www.ce.cmu.edu/GreenDesign
- American Plastics Council's *Design Guide for Information and Technology Equipment* www.americanplasticscouncil.org/apcorg/newsroom/technical_reports/design_for_environment.html

Benchmarking & Metrics

- Environmental Accounting Resources: www.epa.gov/opptintr/acctg/earesources.htm
- *The Lean & Green Supply Chain – A Practical Guide for Materials Managers and Supply Chain Managers to Reduce Costs and Improve Environmental Performance* (January 2000/Adobe Acrobat/PDF direct download): www.epa.gov/oppt/acctg/Lean.pdf

Electronics & Technology Industry Groups

- IPC – Association Connecting Electronics Industries: www.ipc.org
- Printed Wiring Board Resource Center – environmental resources for the PWB manufacturing industry: www.pwbrc.org
- Electronic Industries Alliance – Consumer Education Initiative: www.eiae.org
- Consumer Electronics Association: www.ce.org

Appendix 2: San Diego, Southern California & Tijuana Based Recycling & Reuse Companies

COMPANY	PHONE	FAX	ADDRESS	CITY, STATE, ZIP	REGION
Aurora Electronics, Inc.	619-597-3536	619-642-4865	9477 Waples St., #150	San Diego, CA. 92121	SD
Cactus Recycling	619-661-1283	619-661-1285	1703 Cactus Rd.	San Diego, CA. 92173	SD
California Metals	619-444-3111	619-444-1845	297 S. Marshall Ave.	El Cajon, CA. 92020	SD
Cerplex	760-839-9320	619-552-1219	9477 Waples Ave.	San Diego, CA. 92121	SD
Detwiler Foundation	619-456-9045	619-456-9918	470 Nautilus st. Suite 300	La Jolla , CA. 92037	SD
Edco Waste and Recycling	619-287-5612	619-287-4097	6670 Federal Blvd.	Lemon Grove, CA. 91945	SD
Fibre Resources	619-462-0098	619-462-0092	3833 Bancroft Dr.	Spring Valley, CA. 91977	SD
IMS Recycling Services Inc.	619-231-2521	619-238-1429	1345 S. 27th St.	San Diego, CA. 92113	SD
Pacific Southern Environmental	800-PAC-PULP	619-221-8211	3495 Hancock St.	San Diego, CA. 92110	SD
Paper Recovery of San Diego	619-291-5257	619-299-3670	5222 Lovelock St.	San Diego, CA. 92110	SD
San Diego Fibres Corporation	619-262-8090	619-262-8178	4040 Lockridge St.	San Diego, CA. 92102	SD
San Diego Pallet	619-426-1441	619-426-2422	676 Moss St.	Chula Vista, CA. 91911	SD
Smurfit Recycling	619-268-3533	619-268-4943	4033 Ruffin Rd.	San Diego, CA. 92123	SD
Waste Management	619-596-5100	619-596-5175	1001 W. Bradley Ave.	El Cajon, CA. 92020	SD
A & H Services	818-576-0755	818-576-0746	8745 Remmet Ave.	Canoga Park, CA. 91304	SoCA
A&S Environmental Recovery, Inc.	213-623-9443	213-488-9854	2261 E. 15th St.	Los Angeles, CA. 90021	SoCA
A&S Metals Recycling	800-548-1946	213-488-9854	2261 E. 15th St.	Los Angeles, CA. 90021	SoCA
All Tech Computer Recyclers	310-782-0970	310-782-0864	22122 S. Vermont Ave. unit A.	Torrance, CA. 90502	SoCA
American-America Trading International	310-577-4472	310-677-1553	5441 Crenshaw Blvd.	Los Angeles, CA. 90043	SoCA
Am-Mex Recycling Co.	323-268-9933	323-268-8866	3315 E. Washington Blvd.	Los Angeles, CA. 92335	SoCA
B & M Machinery Co.	909-352-4740	909-352-4984	PO Box 5170	Riverside, CA. 92517-5170	SoCA
Daily Planet	310-559-9334	310-837-3899		Los Angeles, CA.	SoCA
Eco-Media Recycling Centers	818-884-8292	818-884-9962	8012 Remmet Ave.	Canoga Park, CA. 91304	SoCA
Ecoplast/Western Gold Thermoplastics	213-235-3387		840 E. 60th st.	Los Angeles, CA. 90001	SoCA
Englehard West	800-779-4873	714-523-2552	5510 E. La Palma Ave.	Anaheim, CA. 92807	SoCA
FP International, LA area	800-304-7805		6195 E. Randolph St.	Commerce, CA. 90040	SoCA
Golden State Metals	661-327-3559	661-327-5749	2000 E. Brundage In.	Bakersfield, CA. 93307	SoCA
Goodwill Industries of Orange County	714-547-6301		410 N. Fairview	Santa Ana, CA. 92703	SoCA
Harley Metals Recycling Company	213-264-0646	213-264-9931	3315 E. Washington Blvd.	Los Angeles, CA. 90023	SoCA
HMRUSALA, Inc.	310-329-3458	310-329-4185	19010 S. Vermont Ave.	Gardena, CA.	SoCA
Industrial Pipe and Steel	818-443-9467	818-579-4602	9936 E. Rush St.	South El Monte, CA. 91733	SoCA
Jack Engle and Company	323-589-8111	323-589-9189	8440 S. Alameda St	Los Angeles, CA. 90001	SoCA
LA Shares	213-485-1097	213-485-9237	3224 Riverside Dr.	Los Angeles, CA. 90027	SoCA
Lazarus Foundation	805-563-1009		30 W. Mission St., Suite 4	Santa Barbara, CA. 93101	SoCA
National Polystyrene Recycling Co.	909.736.7040		720 S. Temescal St.	Corona, CA. 91719	SoCA
NETI Initiative	818.780.3344		PO Box 55303	Sherman Oaks, CA. 91413	SoCA
NICR	714-443-9620	714-443-9724	2 Vialoas.	San Clemente, CA. 92633	SoCA
P. Kay Metal Supply	213-585-5058	213-585-1380	2448 E. 25th St.	Los Angeles, CA. 90058	SoCA
Peripherals	800-468-6888		1363 Logan Ave.	Costa Mesa, CA. 92626	SoCA
Polycycling of California	714-646-7879	714-646-7879	240 E. Alton Ave.	Santa Ana, CA. 92707	SoCA
Product Destruction Service	800-500-4483	800-500-4483	8745 Remmet Ave.	Canoga Park, CA. 91304	SoCA
Recycle Free	805-499-3840	805-499-2233	618 Artisan Rd.	Thousand Oaks, CA. 91320	SoCA
SCS Engineers	562-426-9544	562-427-0805	3711 Long Beach blvd., 9th floor	Long Beach, CA. 90807	SoCA
Silicon Salvage	714-523-2425	714-523-2552	1500 N. Dale St.	Anaheim, CA. 92801	SoCA
Talco Plastics	562.699.0550		11650 Burke St.	Whittier, CA. 90606	SoCA
Teaknor Apex	626.968.4656		420 S. 6th Ave.	City of Industry, CA. 91746	SoCA
Tropical Media Services	626-357-1305	626-357-1175	2300 E. Central ave.	Irwindale, CA. 91010	SoCA
WCS Company	805-486-8434	805-486-8523	PO Box 248.	Newbury Park, CA. 91319	SoCA
West Pacific Industries	213-722-0751	213-722-0751	5849 Smithway	Commerce, CA. 90040	SoCA
Compra y Venta de Chatarra Los Reyes	(66) 89-45-12		Fraccionamiento Los Reyes Av. Garcia, #48	Tijuana, BC.	TJ
Industria P Kay. de Mexico	(66) 25-83-65	(66) 25-83-66	Calle de la Brea, #3 Meseta del Chema, La Presa	Tijuana, BC.	TJ
Industrial Recicladora de Tijuana	(66) 25-84-72	(66) 25-83-65	Asfalto #5 Meseta del Chema, La Presa.	Tijuana, BC.	TJ
Industrias Dibran	(66) 84-50-25	(66) 84-54-13	Calle Granate #10B Fracc. El Rubi	Tijuana, BC.	TJ
Materiales Arjamex	(66) 89-31-33	(66) 89-04-52	Bld. Diaz Ordaz #713. Fracc. Las Huertas	Tijuana, BC.	TJ
Metales Simarron	(66) 82-44-12	(66) 82-81-67	Calle 15 y Av. Juan Garcia #1433, Colonia Libertad	Tijuana, BC.	TJ
Metales Tres V.	(66) 89-47-58		Carretera Vieja a Tecate #2500, Fracc. Los Venados	Tijuana, BC.	TJ
Papeles Reciclables	(66) 88-30-11	(66) 85-37-57	Calle Guadalupe #13, Fracc. Los Venados	Tijuana, BC.	TJ
Procesadora Reciclables La Calera	(66) 23-05-17		Final Canal Norte #100, Colonia Alamar	Tijuana, BC.	TJ
Recicladora Cachanilla, S.A. de C.V.	(66) 89-41-08	(66) 89-54-42	Carretera a tecate km. 14.5, #1647	Tijuana, BC.	TJ
Recicladora de Materiales el Rubi	(66) 84-59-46	(66) 84-59-46	Calle Perla #5405., Colonia Valle del Rubi	Tijuana, BC.	TJ
Recicladora del Norte	(66) 84-44-69	(66) 84-38-97	Canon de la Pedrera #207-1	Tijuana, BC	TJ

