



Dell Design for Environment

This technical paper provides an overview of Dell's product design methodology with complete life cycle in mind



Deliver environmentally responsible products and services

Dell designers actively pursue innovative design methodology for developing environmentally-responsible products

Recognized for sustainable product design and leadership

- Accenture Circular Economy Pioneer,
- Keep America Beautiful - Vision for America Award
- ISRI's Design for Recycling Award,
- US Environmental Protection Agencies SMM Electronics Champion Awards,
- TCEQ – Texas Environmental Excellence Award.

“As we prepare for a future with 9.6 billion people in it, it’s imperative that we take a good, hard look at the impact we individually and collectively have on the earth we share.”

Michael Dell,
Chairman and CEO

Introduction: We are a company that personifies entrepreneurial spirit, celebrates it every day, and embodies it in everything we do. We are focused on winning at Dell, but winning the right way. Dell’s Environmental Policy commits us to deliver environmentally responsible products and services that prevent waste and pollution, demonstrate environmental responsibility, comply with the law and provides us tools to continually improve.

We consider environmental opportunities and challenges at every stage of the product life cycle- from design and development, manufacturing and operations, to product use and recovery. Product design efforts are guided by corporate environmental policy and governance set to continuously improve the environmental performance. Dell follows the ISO 14001 standard for managing environmental programs throughout the product life cycle. Dell Product Design for Environment specifications is written in alignment with the life cycle model. This methodology encourages reduction of the most significant environmental aspects of the life cycle without unnecessarily burdening the supply chain. Environmental specifications act as a guide to product designers for compliance to global regulations and standards, voluntary environmental initiatives and eco-label

requirements. Products are designed to include environmentally-responsible materials, using efficient designs that require fewer materials and maximize reusability and recyclability.

At product end of life Dell offers consumers free take back and ensure that equipment is recycled in an environmentally-responsible manner using our stringent global recycling guidelines.

DESIGN GUIDELINES:

A. *Environmentally-responsible materials*
Dell’s vision is to avoid the use of substances in its products that could seriously harm the environment or human health and to ensure that we act responsibly and with caution. Dell material restrictions are based on consideration for legal requirements, international treaties and conventions, and specific market requirements. We work with



Figure 1: Dell's sustainable product life Cycle



our supply chain to develop substitutions, modify our specifications and verify compliance with these requirements. Dell has phased out the use of several sensitive materials such as Arsenic, Medium Chained Chlorinated Paraffins (MCCPs) and certain Phthalates and Polycyclic Aromatic Hydrocarbons (PAHs). Dell continues to make progress towards our commitment to eliminate BFR & PVC from PC products, as acceptable alternatives are identified. For example, we eliminated all polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDEs), including decabromodiphenyl ether (decaBDE), from all Dell products four years before the EU RoHS directive took effect. As for PVC, we have been restricted in our products since 2002 – and also banned its use in our packaging that year. See our publicly available Dell Material Restricted for Use document [Link:

http://www.dell.com/downloads/global/corporate/enviro/restricted_materials_guid.pdf]

B. Dell's Effort to Advance Circular Economy

Dell recognizes the importance of material selection, with the goal of designing and manufacturing products so the resources needed to manufacture those products are minimized, the use of recycled and/or renewable materials is maximized. With the launch of the OptiPlex 3030 All-in-One, Dell became the first in the industry to offer a computer made with third party-certified closed-loop recycled plastics. For more information visit www.dell.com/closedloop

In 2015, Dell launched the first laptop containing post-industrial recycled (PIR) carbon filled polycarbonate developed by SABIC. In 2016, the use of PIR recycled carbon fiber will continue to expand to other commercial and consumer laptops. For more information visit :

<http://www.dell.com/learn/us/en/vn/press-releases/2015-09-28-dell-launches-industry>

In 2018, Dell took another leap to advance circular economy in electronics. Dell proudly launched Latitude 5285 2-in-1 convertible notebook with closed loop gold. This product is industry-first pilot that integrates recycled gold from used electronics back into new computer motherboards.

With this announcement Dell introduced a closed loop recycling supply chain for precious metals and demonstrated its successful integration. This innovation is result of Dell's ambitious initiative to advance the concepts of Circular Economy for electronics industry. We chose to work with gold because tiny gold electronic components add up to a surprisingly big impact. In the U.S. alone, consumers throw away \$60 million in gold and silver annually by not recycling their phones. This treasure trove is even larger when considering that global e-waste recycling rates are still at about 15 percent. What's more, the gold recycling process we use does 99 percent less environmental damage than virgin mining operations. For more information visit www.dell.com/gold

C. Energy Efficiency

Dell is committed to leading the market in helping businesses achieve energy efficiency in their IT environment, from the client to the datacenter. For more than a decade, Dell has partnered with the U.S. Environmental Protection Agency (EPA) in support of ENERGY STAR. ENERGY STAR products reduce energy consumption, thereby reducing electricity costs for our customers. Dell currently leads the industry in energy efficiency with the inclusion of Dell Energy-Smart technologies across our PowerEdge Smart technologies across our PowerEdge portfolio. Dell Energy Smart combines the most relevant energy optimized hardware and software technology, energy-optimizing professional services and tools for customers, and partnerships with regulatory bodies and standards organizations to help drive future innovation around energy efficient products. For more information on Dell's energy efficiency efforts visit :

<http://www.dell.com/learn/us/en/uscorp1/dell-environment-energy-efficiency?c=us&l=en&s=corp&cs=uscorp1>

D.. Design for End-of-life, reuse

Dell designs its products with a cradle to cradle approach. Product designers work closely with asset recovery partners and recyclers. Best practices and learning about product design for easy disassembly are shared and considered at an early stage of product development. This partnership allows

Dell's Circular Economy Initiatives – First in the industry

Closed Loop Recycled Plastics

- Used over 24 millions pounds of Closed loop plastics from 2014
- Used in over 100 different products such as displays, Desktop, All-in-One.

Closed loop Reclaimed Carbon Fiber

- Prevented 2 million pounds of carbon fiber from entering in landfill from 2015
- Reclaimed carbon fiber has 67% lower carbon footprint

Closed loop Gold

- Launched in Jan 2018 in Latitude 5285 2-in-1 with closed loop gold in motherboard.
- Closed loop gold is 99 percent efficient than virgin mining operations and avoiding \$1.6M per kilo in natural capital costs



Dell to determine the most effective design features to facilitate product recycling. Some of the key design guidelines built into products include:

- i) Modular design: providing easy access and disassembly.
- ii) Products, parts and components are upgradeable to extend the technological life of the product.
- iii) Standardized fasteners when necessary along with snapfit assemblies and ease of access for easy removal
- iv) Single access service door to provide ease of accessibility for repair and recycling.
- v) Eliminate the use of glues and adhesives,
- vi) Disassembly instructions are provided in user documentation. For details visit Dell support site at support.dell.com

D. Design for Recycling

Today with research and technology much is known about mechanical recycling and other forms for material. We use ABS, PC-ABS polymer over other polymers as these are much widely recycled. All plastics parts greater than 25 grams are marked as per ISO 11469:2016(E) to aid recovery and sorting. Designers also use Thermoplastic elastomers (TPE) and Thermoplastics polyurethanes (TPU) as an alternative to PVC in cable insulation and jacketing. Dell designers when needed use compatible paint and promote integral (molded-in) finishes are preferred over exterior coating, paints whenever possible. Among metals Aluminum and Steel are regarded as highly recyclable. Dell products such as laptops, tablets, servers have been evaluated for recyclability per the IEC 62635 standard by an independent lab and are found to be highly recyclable.

CONCLUSION:

Electronic products have an effect on the environment, which may occur at any or all stages of its life cycle – raw material acquisition, manufacture, distribution, use and disposal. Design for the environment is a systematic way of considering the entire life or life cycle of a product up front, and during design.

At Dell, environmental aspects are integrated early into product during the design stage. This is a collaborative effort and involves assessing impact of product design, materials

use, recycling technology etc. to develop environmentally sound products.

In this white paper we presented a high level overview of the key aspects of this program to



show how designers evenly balance environmental aspects to deliver environmentally responsible products.

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More information:
See Dell's Legacy of Good Plan visit:
www.Dell.com/2020
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