DESIGN *for* DISASSEMBLY

What is DESIGN *for* DISASSEMBLY?

Designing a product with the intention of taking it apart and recycling or reusing the parts and/or materials it is made of.

Why DESIGN *for* DISASSEMBLY?

It's another step consumers and corporations can take part in to protect the environment.

It fits into future business and regulatory scenarios

Easy to disassemble = easy to assemble = cost savings

Awareness is growing and so is the desire to take action

Many corporations have already begun embracing sustainable business and product options

Efforts Grow to Design for Disassembly

It will be increasingly important to consider how products can be taken apart for easier recycling

Doug Smock, Contributing Editor -- Design News, November 19, 2007

Keep an eye on design for recycling. It's long been a backburner issue at the great majority of American companies, but that may change.

Two new directives require companies to take responsibility for their products sold in the European Union after their useful life. The **Waste Electrical and Electronic Equipment** Directive (WEEE), which was enacted as European Union Law in 2003 along with RoHS, is finally starting to grab hold after member states

OEMs and others are **required** to develop an infrastructure to collect computers, household appliances, cell phones, lighting equipment, medical equipment and other electronic waste and then to recycle or re-use as much of the material as possible. The law became **effective** in the United Kingdom on July 1. Manufacturers are paying a fee to cover the cost of collection and recycling of goods they produce.

Producers in countries such as Germany are already taking responsibility for post-consumer waste by collecting products at municipal waste sites. It behooves them to make their products as recycleable as possible to reduce costs of the process.

Three states in the U.S. have promulgated electrical waste legislation and bills are pending in a dozen others. The most important **law**, in California, requires

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Hewlett Packard has Design-For-Environment guidelines *(DfE)*

Part of this effort includes Design for recyclability

WAL★MART

Walmart has taken a very broad approach to sustainability.

Sustainable 360 includes redirecting waste and improving product packaging.

THE DESIGNERS ACCORD

Last updated: August 11, 2010

675 Design Firm Adopters
34 Educational Institution Adopters
36 Corporate Adopters
100 Countries
6 Continents
All design disciplines

The Designers Accord is a global coalition of designers, educators, and business leaders working together to create positive environmental and social impact

Why DESIGN *for* DISASSEMBLY?

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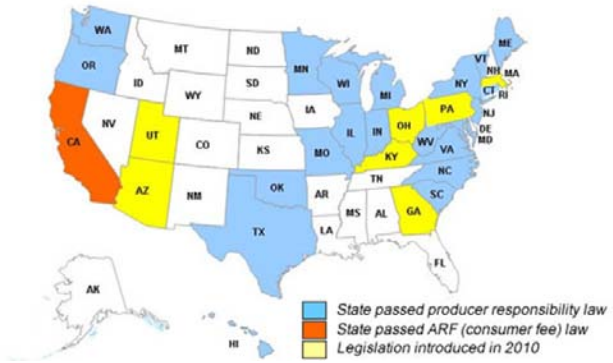
Take Back Laws

Currently in place across Europe

- **End of Life Vehicle Act** of 2002 for Extended Producer Responsibility (EPR) with cars

- **WEEE** – Waste Electrical and Electronic Equipment Directive
  - Places the responsibility of disposing electronic products with their manufacturers



States Are Passing E-Waste Legislation

So far, 23 states have passed legislation mandating statewide e-waste recycling.

US companies begin take-back programs

Standardized
identification symbols

Existing infrastructure in place for recycling

Recyclebank

Using incentives to inspire recycling

01 Recycle
02 Record *(RFID garbage cans)*
03 Reward *(Recyclebank points)*

New industries are emerging

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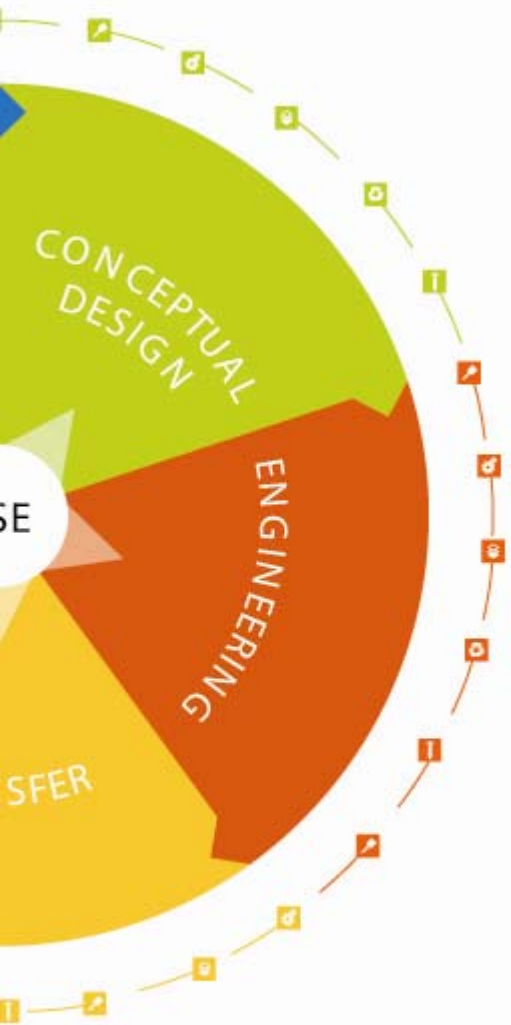
Designing for easier disassembly requires embracing simpler solutions to assembly.

Most disassembly time is spent on fastener removal.
Changing tools cost time.
Many adhesives cause contamination of parts for material recycling.

Reduces maintenance and repair time



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Design Concepts' guidelines

Labeling

Choosing Materials

Fastening & Connecting

Finishing

Process

Labeling

Provide Standard and permanent identification of material types on the product.

The Society of the Plastics Industry, Inc. (SPI) introduced in 1988

Permanently identify points of disassembly on the product.

Provide guidance to customers within manuals.

ISO International standard 11469 states plastic over 25g gets a label

Choosing Materials

Minimize the number of different materials.

Avoid composite materials and make inseparable subassemblies from the same material.

Use recycled and recyclable materials.

Avoid toxic and hazardous materials.

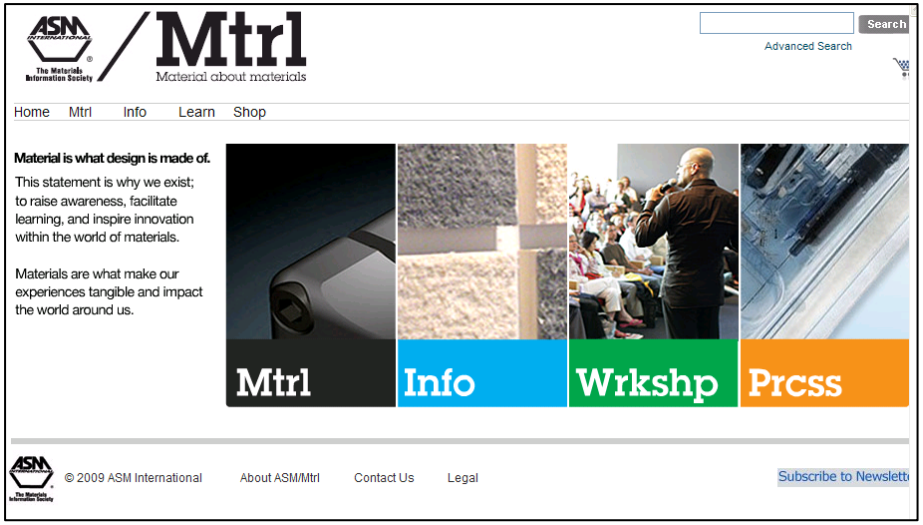
Consider alternative materials.

Choosing Materials

Sources:

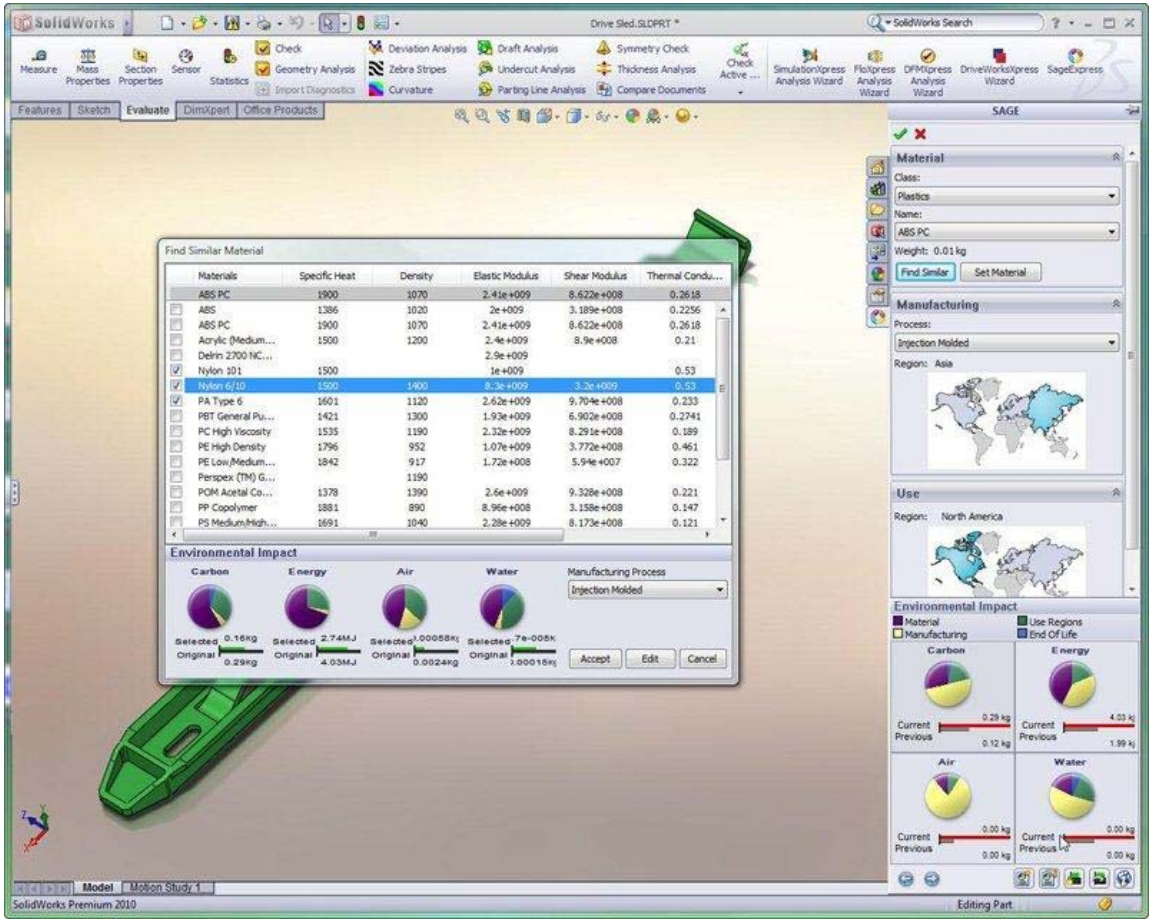
Material vendors

ASM/Mtrl is an industry initiative to support designers making material choices
http://mtrl.asminternational.org/portal/site/mtrl/



Choosing Materials

Solid Works



Fastening & Connecting

Use mechanical connections between dissimilar materials.

Use the minimum number of fasteners or connectors.

Use the minimum number of fastener and connector *types.*

Fastening & Connecting

Best Option

1. *Snap fits*
2. *Fastener*
3. *Heat stake*
4. *Ultra Sonic*
5. *Hot Plate Welding*
6. *Solvent Bond*
7. *UV Cured*
8. *Adhesives*
9. *Hot Wire*

Worst Option

Finishing

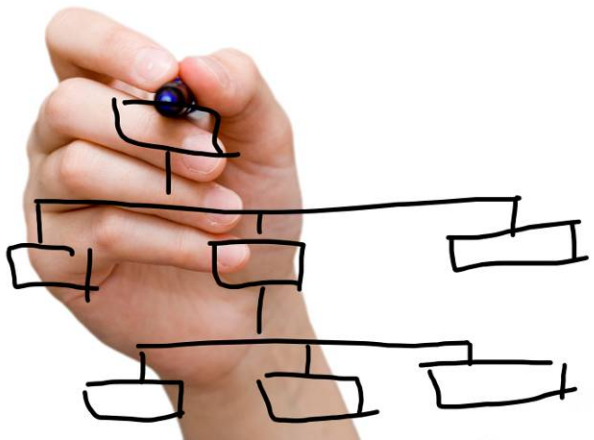
Avoid secondary finishes to materials.

Utilize finishes with minimal Volatile Organic Compounds (VOC's).

Process

Use modular design to minimize different types of components.

Use manufacturing technologies that are compatible with standard, simple, ‘low-tech’ practices and tools.



Process

Work with external certifying organizations and standards.

Optimize energy use during all pre and post production transportation, actual production and end use.

Optimize water use throughout pre and post production processes, actual production and end use.

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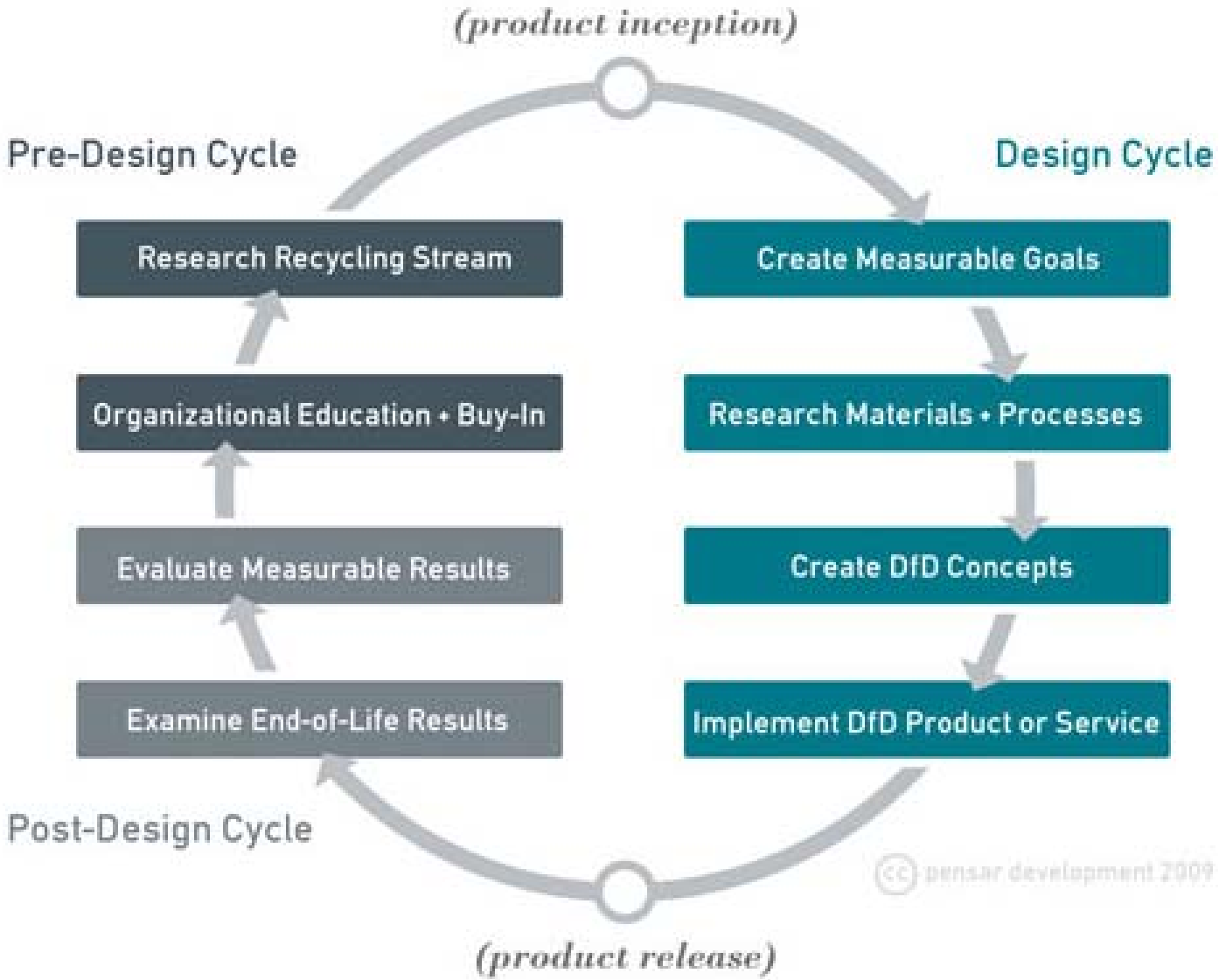
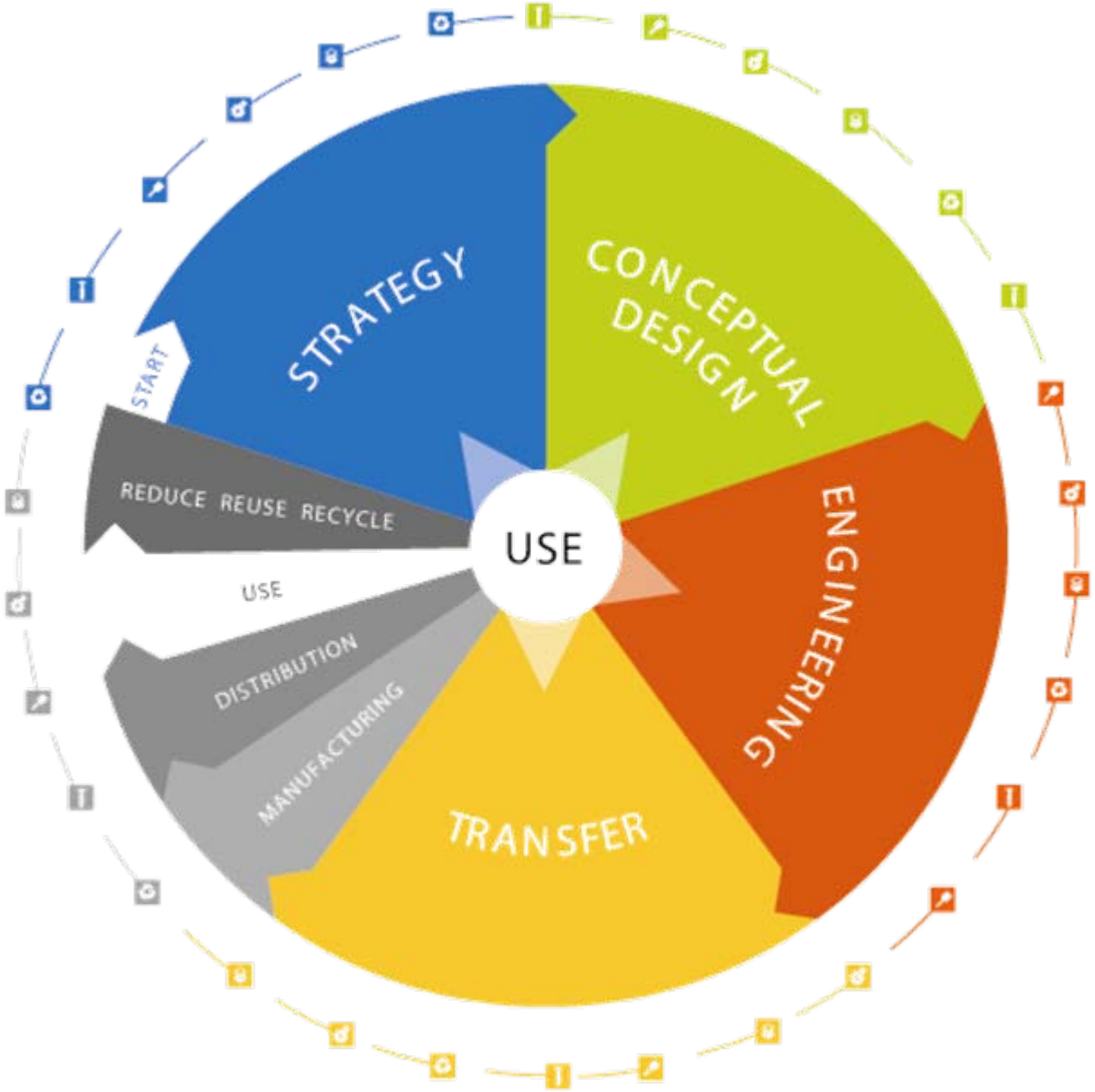
Process and implementation



The Design for Disassembly roadmap.


STRATEGY
CONCEPTUAL DESIGN
ENGINEERING
TRANSFER
MANUFACTURING
DISTRIBUTION
USE
REDUCE REUSE RECYCLE
START
USE

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Be prepared to…

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To make tough decisions

Understand trade offs and compromises

Break old habits

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Thank you!

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Any questions?