
Implementing ISO 14001 - Sustainable Design

Exploring Existing Products for Reuse

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What is ISO 14001?

An international standard for companies that provides a framework which central goal is to reduce pollution. In other words to ensure that an organization's actions are such that they improve its compliance and minimize its environmental "footprint". There are specific steps to realize this goal an organization must commit the following goals.



Steps to Implementing ISO 14001

- Establishing a strategic position
- Defining an environmental policy and committing to a formal environmental management system (EMS);
- Designing a plan to fulfill the environmental policy;
- Developing the human, financial, technical, and other capabilities to achieve the policy initiatives;
- Measuring, monitoring, and evaluating environmental performance; and
- Reviewing and continually improving its environmental management system.

Operationalizing ISO 14001 is achieved by employing concepts like product life cycle analysis, life cycle costing, and product take-back.



What is Product Take-Back?

One of the most contentious areas is the idea of “product take-back”. It is the idea that the cost burden moves from the environment to the company and consumer. The company has the know-how to properly handle the disposition of the product.



ISO 14001 – Product Take-Back

Commercial amphoras are large ceramic vessels that were used from 1500 B.C. to 500 A.D. to ship wine and other products throughout the Mediterranean, supplying the ancient Greek and Roman empires. Although their form is much different from our own packages, the shape and design were clearly the result of the same reasoning that we use to design successful packaging today.



ISO 14001 – Product Take-Back

The evaluation of technology and sophisticated engineering techniques coupled with and engineered materials allow for sophisticated design and function. However it was also the illusion of inexpensive mass produced materials that led to their disposal and dumps - not that dumps did not exist in ancient times.

Regardless, these same technologies and engineering techniques can be used to ensure that products can be readily reused and/or recycled ensuring ease of product take back.



Sustainability Practices

- Reduce
 - Reuse
 - Recycle
 - Compost
 - Simplify



Product Reuse

Many products already have inherent design features which lend themselves to reuse or can easily be redesigned for reused.



Product Reuse

We will explore some examples from simple to complex:

- Reusable envelopes (billing envelopes– concept should be revisited and re-introduced)
- Dental Floss (good to go – no changes necessary)
- Deodorant Dispensers (good to go – no change necessary)
- Safety Razors (minor redesign & tooling alterations)
- Water Filters (minor redesign & tooling alterations)



Student Learning Objective

Rationale:

It is critical for technology and engineering educator to help students understand the dynamics of sustainability via reuse and recycling coupled with environmentally friendly materials.



Reusable Envelopes

Public utilities designed and deployed reusable envelopes when refolded could be used to send back payments.

Although a simple concept these envelopes are no longer in use, it may have been too inconvenient for consumer to use, however, times have changed.



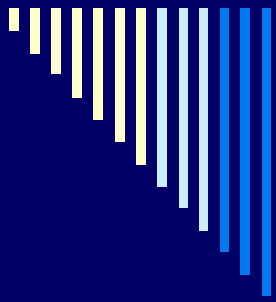
Dental Floss Case

This package is simple to open and close due to a unique design features and is called a “living hinge” possible only with polypropylenes. All dental floss cases share this important design feature.

Dental Floss Case

Because these cases have a “living hinge” designed into the product there are only three components: the case, spool, and cut-off allowing easy assembly and disassemble.



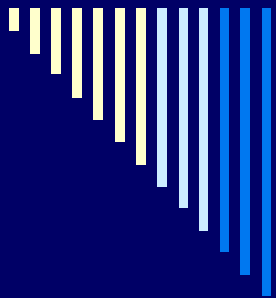


Dental Floss Case

Simply sell replacement floss.

This product is good to go!





Deodorant

These dispensers, like dental floss cases are highly engineered and require no modification. Simply sell new deodorant sticks eliminating wasteful repackaging.

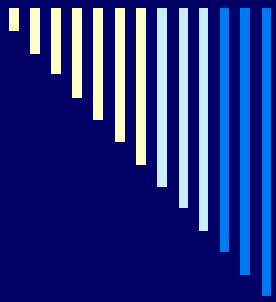
This product is good to go!



Safety Razor

Safety razors are constantly redesigned with increasing sophisticated characteristics and packaging. Single edged designs simply involved replacing a double-edged blade when it became dull. New designs followed.

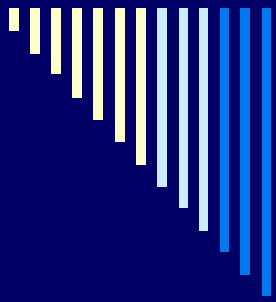




Safety Razor

This model used a rotating blade (ribbon) which you indexed into position using a handle Gillette's Techmatic ©





Safety Razor

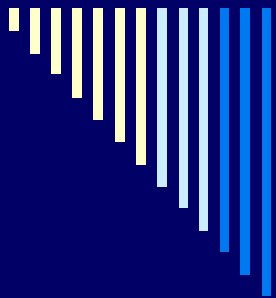
Today's safety razors have multi-blades and are fairly expensive. To make this product more eco-friendly will require some redesign and retooling - but it can be done. How?



Injectable Safety Razor

Older technology: This earlier model injects one blade at a time. This old technology can be reapplied to today's razors. Simply provide a clip of multi-blade inserts and inject into blades the used blades can be saved and recycled. Nothing is wasted.





Home Water Filter

This home water filter is sealed. Therefore the filtration element cannot be removed and recycled. This situation creates a major disposal and environmental problem.

Redesign: Allow for replaceable inserts. How?



Home Water Filter

Redesign:

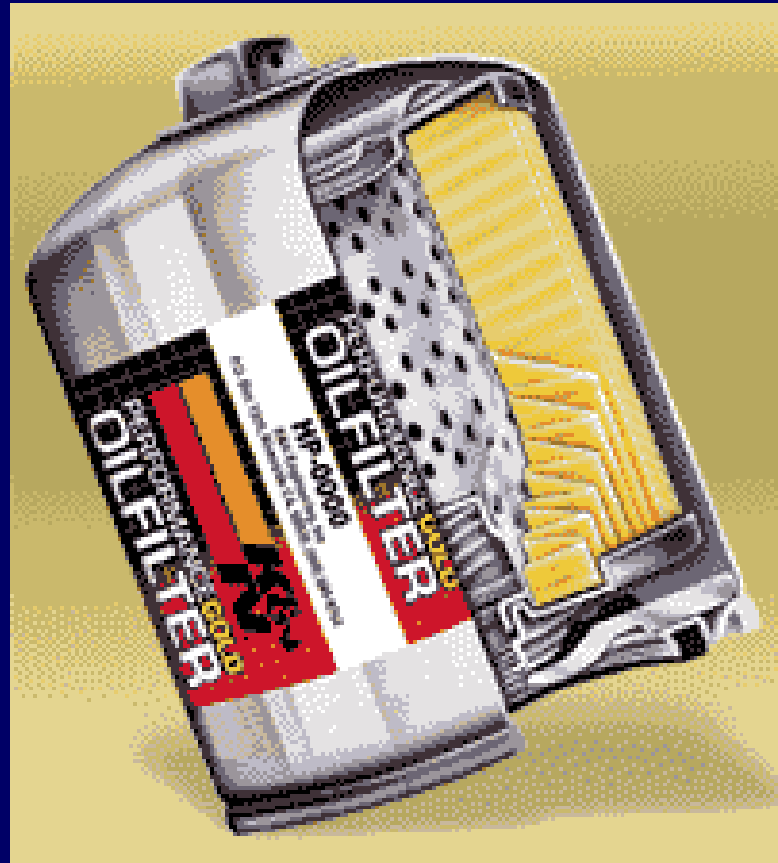
All water filters can be designed with a threaded feature which will enable the user to install a new filter, common on most industry and recreational vehicle filtration systems. Again this will require some redesign and some retooling for the water filter in the previous slide.



Auto Oil Filters

Recycling all the filters sold annually in the United States would result in the recovery of about 160,000 tons of steel, or enough steel to make 16 new stadiums the size of Atlanta's Olympic Stadium.

EPA recommends a “hot drain” to ensure all oil is removed and recycled.





Economic Rationale for Reuse

Regardless of the product, reuse of components makes perfect \$ and cents from a strictly business point of view.

- Raw material costs will stabilize or go down for both industry & consumers
- Switching Cost – consumers gets tied to your system
- Saving of raw materials reduces inflation
 - The bulk of cost for most high volume consumer products has shifted from labor to materials.
 - Raw materials (often bulk of cost)
 - Machine hourly rate (rapid cycle times)
 - Labor (automation)



Rationale from Life Cycle Analysis

When any product is produced a life cycle outlines the production phases enabling us to understand the activities that lead to our holding a product in our hands e.g. dental floss cases. Each stage has an environmental (pollution, energy, and human) cost.

1. Build infrastructure to extract oil other carbon based feedstock e.g. mining coal, drill and pump for natural gas.
2. Extract oil
3. Crack oil – fractional distillation
4. Polymerize monomers – grow long polymer chains - plastics
5. Mold plastics pellets into dental floss case



Product Reuse Steadily Increasing

Ink Jet Cartridges

Batteries

Cell Phones – Reused, Rebuilt, and/or Recycled

Cosmetic cases (good to go!)

Tires – Retreads (mature and stable technology)

Engines – Rebuilt (mature and stable technology)

Space Shuttle Booster Rockets - Reused



Emerging Technologies

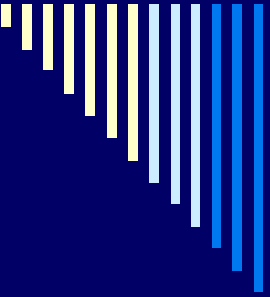
RFID (Radio Frequency Identification) – individual tagging and tracking of individual products and even their components.

Going Green – use of algae to recycling CO₂



Paradigm Shift - New Business Accounting for Sustainability

Management and Engineering Departments must move from unit cost analysis to **life cycle analysis coupled to life cycle costing**. This methodology looks at a product's cost holistically by capturing environmental impact from raw material extraction to the end of the products useful life cycle.



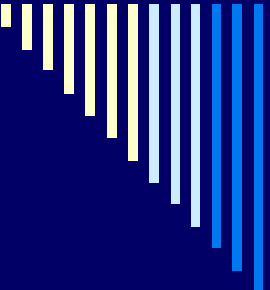
Product Design Consideration for Reuse Cradle to Cradle

Future product development must analyze useful life cycle of each components to evaluate depletion of critical contents (e.g. dental floss, deodorant) and/or critical component wear (e.g. razor blades, tires etc.) or simply materials failure (e.g. tungsten element – light bulb).



Product Design Consideration for Reuse

In other word what is at the heart of why product end their useful life cycle. We have explore a few here. This is how corporation must now begin the design process at the earliest stages of product design and development.



“Same dialogue same life
different dialogue different life.”

Words are powerful!

From Dumps to *Resource Reclamation Facilities*

From Waste Stream to
Value Stream to
Profit Stream



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