Section 3 Ecodesign Tools

INTRODUCTION

The need to integrate sustainable design into design practices is becoming increasingly more apparent. Any business that strives to remain competitive will recognise the opportunities involved with the new demands for environmental quality. Products that are more energy efficient, which reduce water consumption, are cheaper to produce and have decreased end of life waste, have a clear competitive edge in the consumer and business markets.

The implementation of sustainable issues can be difficult. Each shift towards sustainability however small requires innovation, creativity and support. Few companies have the knowledge or expertise to implement issues regarding sustainability throughout the product development process. Another problem faced by companies is finding suitable and descriptive methods of documenting their environmental activities and outcomes to others in a clear and comparable manner.

From the acknowledgment that many companies had difficulties implementing sustainable activities into the design process came the realisation of the need for developed strategies if sustainable design is to be effective throughout the design process. Many 'tools' have been developed to aid the integration of sustainable design into the design process. However, it is becoming a concern that the integration of sustainable design within design practices is arriving too late, and although the numbers are increasing, only a select number of 'forward thinking' businesses are concentrating on sustainable solutions and utilising these tools. A clear solution to this problem is to establish the knowledge and ability to create sustainable products (and stress their importance) before designers enter the design industry, thus beginning to create a prevention rather then correction methodology to non-sustainable product development.

A range of such strategies and ecodesign tools that students (and designers) can use to aid sustainable product development are described below.

3.1 SINGLE ISSUE (OR 'SWIFT') APPROACHES[1]

The aim of ecodesign, in addition to fulfilling all the usual production, functional and aesthetic requirements, is to minimise environmental impacts at ***every stage*** of the products life – from materials extraction and processing through to manufacture, distribution, use, recycling and/or disposal. It is this life cycle perspective that has formed the cornerstone of ecodesign and won the support of responsible governments, the global environmental movement and numerous influential companies. The following methods make no pretences about accuracy or depth; they are, as suggested in the title, swift single-issue approaches that concentrate on one element of ecodesign and relate to different stages of the life cycle. However, they do not take the time or expense involved in the more accurate and holistic ecodesign approaches that follow, and they may yield significant environmental benefits.

These single issue strategies can provide inspiring ideas, but it must be recognised that if only a 'single issue' is addressed without reference to the whole life cycle then there can be unintended 'side effects'. Consider reducing the weight of a component for example. Could this mean a weaker, more fragile component that breaks sooner? Or packaging that does not protect the product as effectively? It is to see that not fully thinking through the issues can lead to unintended and undesirable outcomes. Even extending the product life is not always the way forward … what if the result is the continued use of inefficient, obsolete technology which continues to be used to the detriment of the environment? The following table gives a range of single issue approaches, but it is an interesting exercise to think about each one and try to work out if there is any way you can imagine it 'going wrong'. Considering the whole life cycle is the only real way, but this needs a little more time effort and expertise. The next section describes whole life cycle methods, but read through the table of single issue approaches first and think carefully about their implications.

[1] References: IDSA 'Introduction to swift approaches'(http://www.idsa.com)

An overview of single issue approaches and some examples

Raw Materials	
Design for resource conservation	**Use the minimum amount of material required:** weight reduction is one of the critical objectives in the design of a product. It reduces the cost of manufacture, saves resources and energy, and there is less material to be recycled or disposed of at the end of the product's life. The amount of material used can be reduced in many ways, for example: • Achieving extra strength by adding bosses, gussets or ribs rather then using thicker material. • Designing product casings to fit over functional parts snugly **Use materials which are renewable:** renewable resources are those that can be easily replaced with no detrimental impact on the environment. They include materials that are made from plant or animal sources (which have been harvested on a sustainable basis). Typical raw materials that are considered renewable include timbers, paper, cardboard, starch or sugar based plastics, and soy based inks and vegetable dyes **Use recycled and/or recyclable material** commonly used materials can be easily found in recycled form, these include steel, aluminium, paper, cardboard, plastics, rubber and glass. The use of recycled material saves both resources, as raw materials are not being used, and energy, as those raw materials do not need to be extracted, processed and manufactured. **Examples … recycled aluminium uses 23 % of the energy required to make virgin aluminium. Recycled plastic uses 35% and glass uses 88% of the energy required to make their virgin equivalents** In many cases recycled materials perform as well as virgin materials. Plastics, however, have been seen to degrade during the recycling process. Processing temperatures are quite low for recycled plastic and therefore may inhibit their use in products that come in contact with food; this is as some microbial contaminants may not have been destroyed. It is, however, viable to use recycled material for the bulk of the product and then to

	encase it with virgin material to protect the food. **Example … coca cola uses multi-layered PET for their soft drinks bottles.**
Design for low impact materials	**Avoid materials made from toxic or hazardous materials:** toxic substances are those that cause serious health effects such as poisoning, respiratory problems, cancer, nervous system breakdowns or birth defects. Material suppliers have material safety data sheets on each material supplied that give information on the material including any health risks. Designers should specify organic pigments in colours, plastics and paints and use environmentally sensitive textiles such as organic cotton, hemp, polyester fabric made from recycled PET bottles, and wool.  **Recycled and spun in an innovative way, the 2-litre soda bottle works brilliantly as the base material for Synchilla®, a signature Patagonia fleece. More than 150 Synchilla garments are made from 3,700 recycled 2-liter bottles. This saves a barrel of oil (42 gallons) and avoids approximately half of a ton of toxic air emissions.** (Source: http:// www.patagonia.com) **Minimise use of greenhouse gases:** the major greenhouse gases are: carbon dioxide, methane, carbon monoxide, and oxides of nitrogen, some organic compounds and perfluorocarbons. The energy

	sector is the largest contributor of greenhouse gases. Emissions from production processes are also a high contributor. **Use materials with low embodied energy:** embodied energy is the energy used directly or indirectly to manufacture a material. The embodied energy of a material can vary dramatically between suppliers. Where possible the design should specify materials from the most energy efficient supplier.
Manufacturing	
Design for cleaner production	**Minimise the variety of materials used:** this not only simplifies ordering and stock keeping but can also reduce the amount of waste generated and makes it easy to recycle any waste produced. Minimising the number of materials within the product also makes recycling at the end of the products life easier. **Avoid waste of materials:** the cutting of material should be planned to ensure the minimum amount of waste from each sheet or roll of material. Using the same material for different components will allow greater flexibility in planning to avoid waste. **Reduce the number of components and assemblies:** this can be done in many ways, for example integrating many functions into one component or assembly, or simplifying the way in which the product is assembled. Reducing the number of components is not only environmentally attractive also reduces tooling and material costs and the amount of processing energy required.
Distribution	
Design for efficient distribution	**Reduce weight to save energy in transport:** reducing the weight of the load being transported can reduce fuel consumption. Reducing the number of components or the overall size of the product, by using alternative solutions to using thicker material for added strength and reducing the amount and weight of the packaging used can all reduce the overall load weight. **Design re-usable or recyclable packaging:** reusable packaging is desirable where there are short distribution distances, frequent deliveries, and a small number of parties involved and when companies own their own distribution vehicles. Recyclable packaging

	should be made from only one material (or compatible or easily separable materials) and those materials should have an established recycling system. **Maximise efficiency of packaging to save space:** efficiency can be improved by reducing the amount of material required to contain a given shape, packing products in their concentrated form and using flexible rather than rigid packaging. **Example … flat pack furniture requires less packaging and allows many more units to be contained in a transport vehicle than would be possible in the products assembled state. This enables more products to be transported at once, reducing the number of fuel consuming journeys that have to be made.** **Choose an efficient transport system:** rail is more efficient over long distances than road, while road travel appears more efficient for short distances or multi-destination loads. Efficiency must also take into account the transport systems proximity to the production centre, the volumes and densities of the loads and the type of load being carried.
Use	
Design for energy efficiency	**Use renewable energy supplies where feasible:** these include wind, solar, hydro and tidal power, rechargeable batteries and kinetic energy.  **Example … many windfarms are based off shore to allow many wind turbines to be placed together without becoming a land-based eyesore.** Source: www.ten–ten.org/windfarm.htm

Minimise standby power consumption: energy used to maintain an appliance in readiness for operation, or to run digital displays or indicator lights, can often be significant.

Example … the 5 watts often required to run the digital displays of a microwave oven can, over its life, exceed the amount of electricity used for cooking in the appliance.

Minimise warm up time: when a system starts up and shuts down there are often transient losses as components heat up or cool down.

Example … household water pipes may hold several litres of water that must be replaced before the user receives hot water, yet this water was once heated.

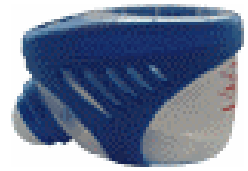
Evaluate usage patterns: to identify potential to store useful heat, carry over energy for next task

Example … improving a product's insulation may allow a smaller compressor or heating system to be used

Example …fans and lights within refrigerators create heat loads that must be removed by the compressor system, optimising the efficiency of these processes is essential.

Lightweight moving components: heavy components require more energy to be moved, by creating lighter moving parts energy can be saved.

Design for water conservation	**Use filters to allow water recycling:** wherever possible water should be recovered and reused. This may require the instillation of filters or more sophisticated cleaning mechanisms. **Use customer feedback mechanisms to encourage efficient use:** by finding out how much water is being consumed at certain times, efficiency can be improved. Providing feedback for the user may also lead to increased awareness and reduced water consumption. **Example … the 'Axis' Ecokettle designed at RMIT has the water gauge situated on the lid of the kettle making it easier to read. By only boiling the required amount of water substantial energy savings are achieved. An indicator was also added to show the user that the water is still sufficiently hot to make a beverage without having to re-boil.**  Source: www.co–design.co.uk/eco.htm
Design for minimal consumption	**Minimise the use of disposable components:** the quantity of other products consumed during use should be minimised (e.g. coffee filters, batteries, toner etc.) All of these products consume materials and energy in manufacture and contribute to solid waste once used. **Design consumables for end of life:** consumables should be designed for reuse, remanufacture or recycling. **Examples …Ni-Cad batteries can be recharged by users and reused, toner cartridges can be sent back to the company for remanufacture and plastic water filter cartridges are recyclable.** **Provide clear instructions on use, and end of life:** consumers should be provided with clear information about dosage, how often the consumable must be

	replaced and/or how the product can be recycled.[2]   **Example … laundry detergents now commonly come with dosage indicators to ensure the correct amount is used**
Design for low-impact use	**Minimise or avoid the use of formaldehyde;** formaldehyde from particleboard and other VOCs from paints and other products contain solvents that contribute to pollution and health problems. Composite timbers are available without harmful solvents for example the dulux breath easy range of decorative paints. Composite timbers are also available that use urea based glue to reduce off gassing. **Avoid products that emit volatile or organic compounds:** information on the safety of materials can be requested from suppliers.
End of life	
Design for durability	**Use durable materials:** the designer should specify durable materials and avoid colours or designs that may go out of fashion quickly. **Eliminate potential weak points in the design:** careful analysis of designs to identify and address weak spots will reduce the rate of damage, particularly to operational parts. **Ensure that the product is designed for likely misuse:** designing the product to withstand misuse will extend the life of the product. **Design for easy maintenance and repair:** it is preferable that this maintenance can be carried out by the owner. **Use modular designs to enable future upgrades:** products can be upgraded easily if components can be removed and replaced easily. Electronic parts such as audio equipment, computers, and other household

[2] pics from www.fairynonbio.co.uk

	appliances become old very quickly. The ability to remain current cheaply will be seen as an advantage by consumers and lead to commercial advantage as well as being of environmental benefit. It allows the product to remain current without the need for total product substitution. This will also reduce the amount of solid waste being produced.
Design for re-use	**Minimise life cycle impacts of reuse:** products that can be reused have a lower impact on the environment then single use products. Life cycle environmental impacts need to be considered during the design process to minimise the impacts of reuse; for example from collection and cleaning. **Use durable materials to protect against damage:** the more durable the product, the more likely it can be reused. It must be able to withstand repeated collection, handling, washing and refilling. It must also meet health and safety standards each time it is reused; this is especially important for food and beverage containers. **Use in mould labels for packaging rather than paper or plastic labels:** additional labels can 'wear off' over time and may prohibit reuse. Packaging can be reused in many ways including: • return to the manufacture for refilling; • return to the retailer for refilling, or; • re-use in the home.
Design for re-manufacture	**Use a modular design so that damaged components can be replaced:** remanufacture involves the collection of used products, disassembly, replacement or repair of damaged components, assembly and resale. 

	Examples … old toner cartridges can be taken to a retailer where they will be sent back to the manufacturers for refilling and resale. Dairies collect some milk bottles for refilling. The body shop offers a return system for selected products. An alternative example is refillable containers that the consumers refill themselves at home, such as fabric conditioner. **Use fasteners and joints that will not be damaged by assembly and disassembly:** any disassembly and assembly that is required must be easily done and not break parts of the product unnecessarily. **Use decorative finishes which are easy to maintain:** see design for durability above.
Design for disassembly	**Minimise the number of separate components:** therefore reducing the time taken to disassemble them. **Avoid glues, metal clamps and screws. Use snap fits for fastening and joining parts:** 'push, hook and click' assembly methods are preferred over additional materials as products are easier to pull apart. **Provide break points for separation:** designing interconnections points and joints to be easily accessible for opening, loosening or separating by hand allows components to be disassembled quickly. **Make fasteners from compatible materials:** fasteners that can be recycled with the components that are being joined will considerably reduce the disassembly time. (See Design for recycling below.) **Use ultrasonic welding for compatible plastic parts:** ultrasonic welding fuses two plastic components together, omitting the need for additional materials. This allows the whole component to then be recycled without any disassembly. **Design the product as a series of accessible modules:** these modules can then be disassembled quickly and easily for replacement, reuse or recycling. **Minimise the number and length of connecting cables and wires:** the fewer wire connections, the less time to disassemble them!

	Locate non- recyclable parts in one area: this is especially helpful if these form their own module as it can then be easily removed for reuse or disposal. **Locate parts with the highest value in one area:** if it is impossible to disassemble the whole product (due to time or cost for instance) designers should ensure that components of highest value are in one easily accessible area to ensure that they are removed for reuse, remanufacture or recycling.
Design for recycling	**Minimise the number of materials used:** if it is necessary to use more than one material, use as few as possible and make them easily separable. For plastic products ensure the compatibility of the different materials. **Avoid the use of composite materials:** composite materials are those made of one or more materials. The materials used may not be compatible with each other and therefore may eliminate the possibility for the product to be recycled. **Avoid using labels, adhesives, and finishes that may contaminate recycling** **Use water-soluble adhesives for labels:** these can then be easily removed to allow the material to be recycled. **Use integral finishes rather than paint or coatings;** this allows the product to be ready for recycling without having to go through any extra processes. **Use water based rather than solvent based coatings:** solvent based coatings are not only environmentally unfriendly but also reduce the ability of the product to be recycled. **Ensure compatibility of ink where printing is required:** incompatible ink will contaminate and ruin the recycling process. **Eliminate incompatible labels on plastic parts:** it is preferable to create 'in-moulding' labels for plastic components as these do not require any extra material or processing energy (as well as reducing visible signs of wear and tear and promoting reuse) Otherwise ensure the use of compatible labelling material or labels that can later be removed.

	Ensure that hazardous parts are clearly marked and easily removed: this will reduce the possibility of contamination that will ruin the recycling process. **Use in-mould identification symbols for plastic resins:** there are standard international codes for each type of plastic which enable them to be identified for recycling. **Use only one material or compatible materials:** these are the easiest and cheapest to recycling. This is of particular concern with plastics, which have different specifications and processing requirements.
Design for degradability	**Identify likely disposal routes and use biodegradable materials wherever possible:** design for degradability is only viable if the product is likely to be disposed of in a composting facility or a bioreactor landfill (normal landfill are sealed and capped to prevent degradation and leaching into the environment). Materials that degrade easily include paper, cardboard and starch based plastics. **Provide instructions for composting or collection:** it is important to educate the user about how to dispose of the product in the best possible manner.
Design for safe disposal	**Avoid the use of toxic or hazardous materials:** products should be designed for safe disposal at the end of their life. Toxicology combines knowledge of chemical composition, dosage, background levels, and their multilevel effects on animals (including humans) and other biotic systems. It is beyond the realm of most industrial designers; however, we can follow a few basic guidelines. Does the reference product create large quantities of chemical waste over its lifetime (disposable batteries, film waste, water emissions from metal plating, exhaust from fuel combustion, ozone layer destroying chemicals, etc.)? How can the same quality of product be delivered, that eliminates or significantly reduces these emissions? Inks, dyes, pigments, stabilisers, solders and adhesives that contain toxic substances that can contaminate surface or ground water and should be avoided. **Provide disposal instructions:** if toxic materials are used ensure that the product is adequately labelled with instructions for decontamination and disposal.

Provide the service in an innovative way	**Redesign the way in which the need is addressed.** reflect on the primary service that your product delivers, and conceptualise possible ways that this service can be delivered with lower ecological impact. For instance, alternatives to automobiles include public transportation and bicycles. The service of a television with a 30-inch cathode ray tube can also be had with a more energy efficient projection TV or LCD display. An alternative to the wasteful daily half-pound newspaper is accessing your most wanted news via the World Wide Web.

3.2 WHOLE LIFE CYCLE APPROACHES

Whole life cycle approaches require more time and expertise than just considering a single issue, but their results are significantly more useful. Life Cycle Analysis (LCA) can have both 'full' and abbreviated or simplified forms. Full life cycle analysis is too complex and time-consuming to be used by designers, and it is the abbreviated and simplified forms that offer designers the best way forward (unless a specialist is conducting a full LCA on their behalf)

Full LCA normally involves three stages:

- an inventory of all the materials and energy used during all stages of a product or service's life.
- an impact assessment, examining all environmental and health effects (actual and potential) connected with the product or system.
- an improvement assessment, identification of the changes required to bring about environmental improvements.

The life cycle of a product or service includes raw material acquisition, manufacture, distribution and transportation, use (including the use of any consumables) and end of life considerations. Each stage of the product's life cycle consumes material and energy and releases wastes into the environment.

Simplified LCA

The main aim of LCA is to gain an understanding of the major environmental impacts of a product or service and to identify the environmental priorities that must be addressed by the design team. Described below are the elements of simplified LCA methods that help designers to achieve this aim. Namely:

- process trees;
- qualitative methods of analysis; and
- quantitative methods.

Establishing an ecodesign strategy is discussed in the next section.

Process trees

A process tree describes all the stages of the product's life cycle in a visual form. An example for a coffee machine is shown below (source: *The Eco-indicator 99 manual for Designers*, http://www.pre.nl). Drawing up a process tree helps you to think about all the stages of the product's life cycle that you need to take into account. It also makes you think about the boundaries of your study (the shaded area in the diagram below).

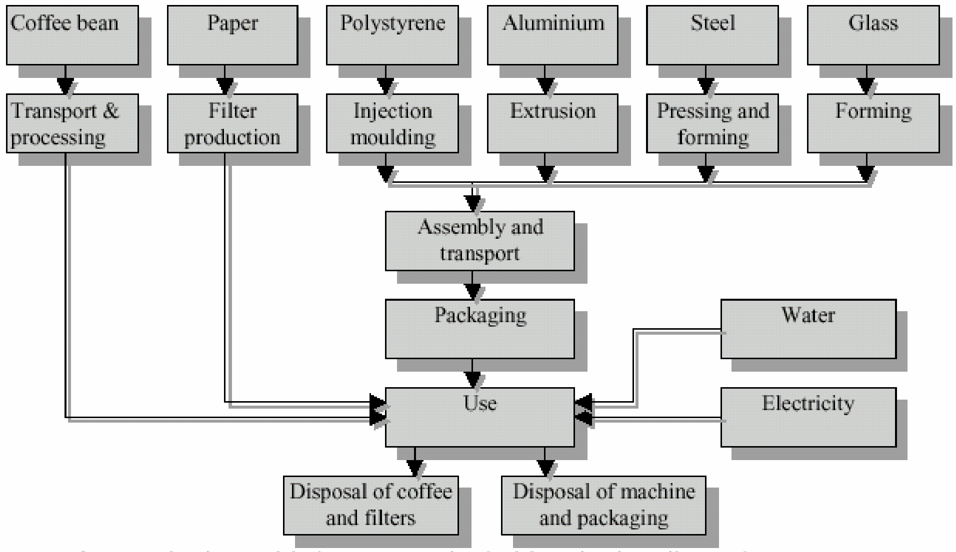


Figure 2: Example of a simplified process tree for the life cycle of a coffee machine.

It is possible for example if were comparing two designs, that some aspects might be the same for both and consequently the process tree might be further simplified as shown below (where the coffee 'consumables and packaging have ben excluded from the analysis).

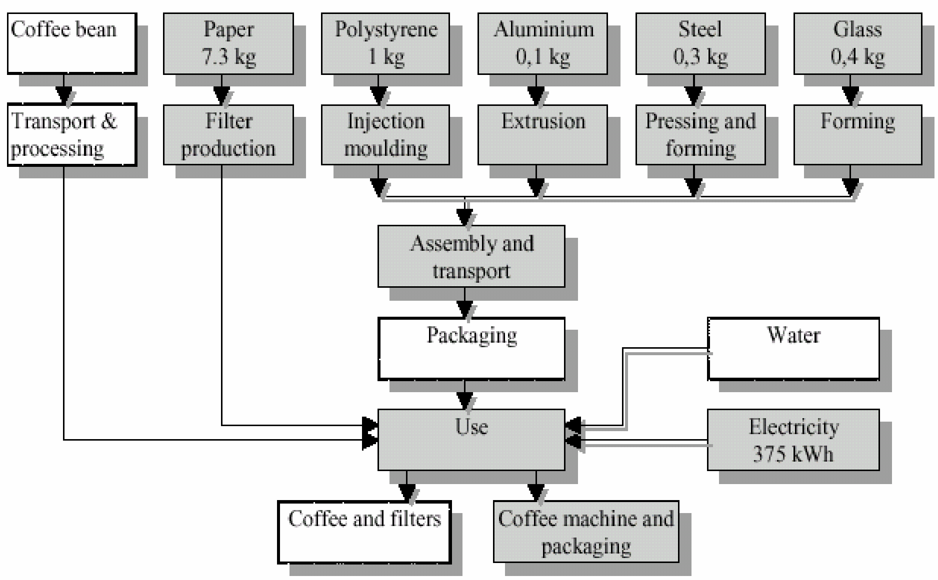


Figure 3: Process tree of a simplified coffee machine model with amounts and assumptions. White boxes are in the analysis.

Qualitative methods: the MET Matrix and ecodesign checklists

The MET Matrix is made up of five rows and three columns that help the design team look at all environmental aspects throughout a product's life. The rows correspond to the five different product life-cycle stages and the columns concentrate on three important environmental issues; the material used, the energy used and waste, including toxic emissions. Hence, of course, the name of the method 'MET' (materials, energy, toxicity). The table below shows a MET matrix that has been prepared by experts at The Royal; Melbourne Institute of Technology (RMIT)

MET MATRIX for a kettle

	MATERIALS	**ENERGY USE**	**WASTE/TOXIC EMISSIONS**
PRODUCTION AND SUPPLY OF ALL MATERIALS AND COMPONENTS	Total weight = 1100kg 20 materials including Polycarbonate (290kg Polypropylene (419kg) PVC (105kg) Copper (186kg)	15 materials or components are transported by ship - energy for transport	PVC - chlorinated waste and some mercury residue in water discharge PC and PP wastes are insignificant Copper smelting is a polluting process - air emissions = acid rain
MANUFACTURING + IN HOUSE PRODUCTION	Negligible	Assembly uses compressed air - energy consumed is negligble Testing kettle uses .05 megajoules	Wastes and emissions insignificant
DISTRIBUTION	Packaging uses Cardboard (520g) Paper (12g) Polyethylene (16g) Transport packaging = wooden pallets	Kettles transported to retailers by truck - average distance 400km Fuel = diesel	Emissions from transport include CO_2, NO_x, Ozone etc
USE **OPERATION** **SERVICING**	Water heated in kettle over 5 years approx 12,775 litres	Kettle used around 7 times per day - energy required to heat 1 litre is 0.355MJ Over 5 years consumption = 4084 MJ	Air emissions, solid waste and waterborne waste from electricity production
END OF LIFE SYSTEM **RECOVERY** **DISPOSAL**	Negligible	average life 5 years 20% packaging is recycled Transport to landfill site by diesel truck	Additions to landfill

It might seem that a lot of knowledge and expertise is required but it is a lot easier than you think to have a go. As in many areas of ecodesign, checklists are used as prompts to your memory and to go and find things out. The following checklist was devised for this purpose by Dr Tracy Bhamra of the Ecotechnology Innovations Centre at Cranfield University.

An ecodesign checklist

Needs Analysis

How does the product system actually fulfil social needs?
What are the product's main and auxiliary functions?
Does the product fulfil these functions effectively and efficiently?
What user needs does the product currently meet?
Can the product functions be expanded or improved to fulfil user needs better?
Will this need change over a period of time?
Can we anticipate this through (radical) product innovation?
What is the technical lifetime ?
How much maintenance and repairs are needed?
What is the aesthetic lifetime of the product?

Life cycle stage 1: Prod. & Supply of Materials and Components

What problems can arise in the production and supply of materials and components?
How much, and what types of plastic and rubber are used?
How much and what types of additives are used?
How much and what types of metals are used?
How much and what other types of materials (glass, ceramics, etc.) are used?
How much and which type of surface treatment is used?
What is the environmental profile of the components?
How much energy is required to transport the components and materials?

Life cycle stage 2: In-house Production

What problems can arise in the production process in your own company?
How many and what types of production processes are used (including connections, surface treatments, printing and labelling)?
How much and what types of auxiliary materials are needed?
How high is the energy consumption?
How much waste is generated?
How many products don't meet the required quality norms?

Life cycle stage 3: Distribution

What problems arise in the distribution of the product to the customer?
What kind of transport packaging, bulk packaging and retail packaging are used (volumes, weights, materials, reusability)?
Which means of transport are used?
Is transport efficiently organized?

Life cycle stage 4: Product Use

What problems arise when using, operating, servicing and repairing the product?
How much, and what type of energy is required, direct or indirect?
How much, and what kind of consumables are needed?
What and how much auxiliary materials and energy are required for operating, servicing and repair?
Can a layman disassemble the product?
Are those parts often requiring replacement detachable?

Life cycle stage 5: Recovery and Disposal

What problems can arise in the recovery and disposal of the product?
How is the product currently disposed of?
Are components or materials being reused?
What components could be reused?
Can the components be disassembled without damage?

What materials are recyclable?
Are the materials identifiable?
Can they be detached quickly?
Are any incompatible inks, surface treatments or stickers used?
Are any hazardous components easily detachable?
Do problems occur while incinerating non-reusable product parts?

The hope is that by looking at where the major environmental impacts occur during a product's life cycle in terms of material, energy and toxic waste (by filling in a MET matrix), that the areas where environmental improvements are needed become evident. An alternative is to try a quantitative method as described in the next section.

Quantitative methods - The Eco–Indicator Method

Eco-Indicators provide a simple process for dfesigners to calculate the ecological impacts of products and services. The 'eco–indicators' are numbers assigned to every material and process used by designers and can be found in a series of tables available from the Pre website (http://www.pre.nl). The process requires that the total energy and material use of the product to be defined over its lifecycle. The product elements are each quantified in relevant units and multiplied by their respective eco-indicator factors. The resulting numbers are eco-indicators, revealing which elements of the product create the most significant impacts and hold the greatest potential for impact reduction.

The study weekends which are part of the Sustainable Awards Scheme have been designed to teach you how to do this kind of analysis, but you can always teach yourself by downloading the manual from the website.

In the coffee machine example shown, it is clear that the major impact is in the use of the machine, and it is to this that the designer must turn their attention.

Product or component	Project
coffee machine	*example*
Date	**Author**
14-04-00	*PRé*

Notes and conclusions

Analysis of a coffee machine, assumptions: 5 years' use, 2 x per day, half capacity, keep hot for 30 minutes

Production

Materials, treatments, transport and extra energy

material or process	amount	Indicator	result
Polystyrene	1 kg	360	360
Injection moulding PS	1 kg	21	21
Aluminium	0.1 kg	780	78
Extrusion Al	0.1 kg	72	7
Steel	0.3 kg	86	26
Glass	0.4 kg	58	23
gas-fired heat (forming)	4 MJ	5.3	21
Total [mPt]			536

Use

Transport, energy and possible auxiliary materials

Process	amount	Indicator	result
electricity low-voltage	375 kWh	37	13,875
Paper	7.3 kg	96	701
Total [mPt]			14,576

Disposal

Disposal processes for each material type

material and type of processing	amount	Indicator	Result
municipal waste, PS	1 kg	2	2
municipal waste, ferrous	0.4 kg	-5.9	-2.4
household waste, glass	0.4 kg	-6.9	-2.8
municipal waste, paper	7.3 kg	0.71	5.2
Total [mPt]			2

Total [mPt] (all phases)	15,114

3.3 DEVELOPING AN ECODESIGN STRATEGY

Ecodesign strategies have been usefully classified into 7 areas, largely as a result of work done at Delft University in The Netherlands. A manual for designers- commonly known as the 'Promise Manual' has been published by UNEP based around the work at Delft (*Ecoredesign:a promising approach* is its full name). The table below shows this classification and the meaning of all the terms is fully explained in the manual.

The @ symbol is used to imply that the need for the product is being met, but in a different way … not just a 'better kettle'. For example the Internet provides significant new opportunities for the de-materialisation of current means of music delivery. The other 'numbered strategies concern ways of improving the existing product, which is sometimes known as ecoredesign.

@. **New Concept Development** De-materialisation Increase shared use Provide a service	4. **Optimise Distribution** Less/cleaner/reusable packaging Energy efficient transport mode Energy efficient logistics
1. **Physical Optimisation** Integrate functions Optimise functions Increase reliability and durability Easy maintenance and repair Design for modularity Promote product-user relationships	5. **Product Use** Lower energy consumption Cleaner energy sources Reduce consumables Cleaner consumables Reduce consumable waste
2. **Material Selection** Cleaner materials Renewable materials Low energy content materials Recycled materials Recyclable materials Reduce material use	6. **End of Life** Reuse of product Re-manufacturing Refurbishment of product Recycling of materials Safer incineration Design for disassembly
3. **Optimise Production** Choose alternate production processes Fewer production steps Lower/cleaner production energy consumption Less production waste Fewer/cleaner production consumables	

Ecodesign Strategy Wheels

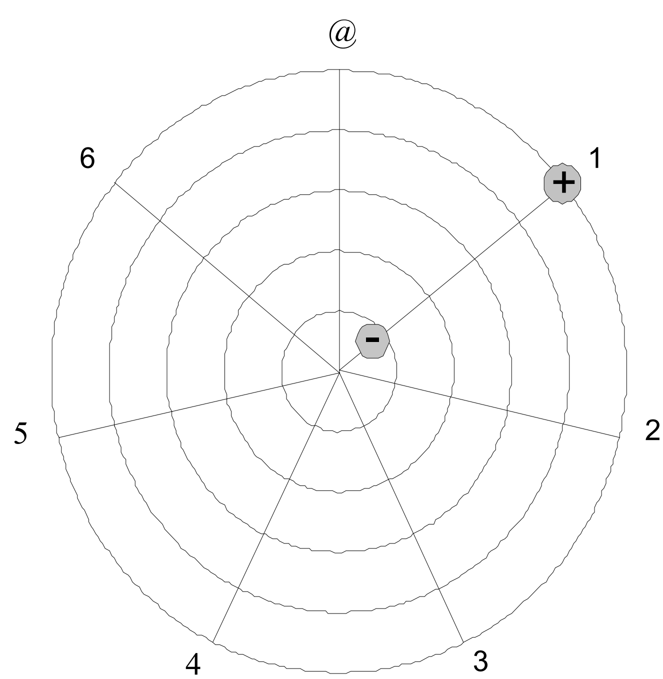
One of the best ways to develop and describe your ecodesign strategy is to complete an ecodesign strategy wheel. Apart from this use, the wheel has many functions, it can be used:

- as a visual representation of the existing products
- environmental profile;
- to provoke new improvement options;
- to visually represent the scope of new product development;
- to aid improvement option decisions, tradeoffs etc;
- as a visual representation of before and after environmental profiles.
- as a communication tool between employees, suppliers and end users (consumers).

Method for plotting an existing products environmental profile

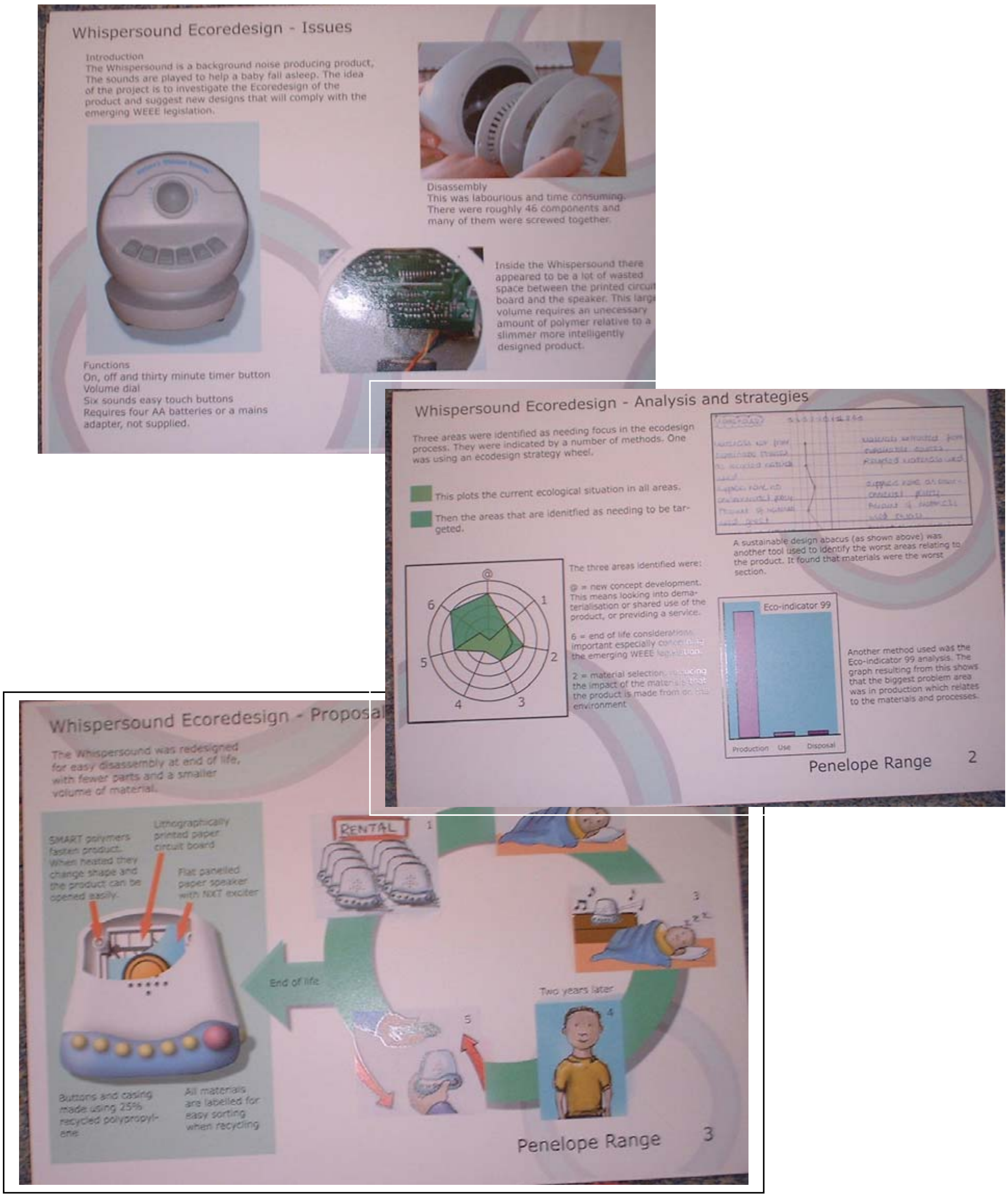
1. Assign a rating (0 is poor and 5 is excellent) as to how the existing product relates to each of the seven strategies.
2. Plot each of the seven points on the strategy wheel along the corresponding axis.
3. Connect all seven points.

The area that is generated is a visual representation of the existing products environmental profile.



3.4 EXAMPLES OF YEAR 2 LOUGHBOROUGH STUDENTS' PROJECTS

In order to help you get the idea, some examples of projects completed by Loughborough students are shown below.



In this case Penelope Range was working on the ecoredesign of a whisper sounds unit. Having established that most of he environmental impact occurred in relation to production, Penelope set about designing a unit for leasing that included the latest available 'green technology'. You will see many more examples of this kind on your study weekend, and that might soon be available on the Department of Design and Technology's website at Lopughborough.

Section 4 Inspirational Current Work

Introduction

Much of the responsibility for change lies at the designers' doorstep, many companies have started incorporating more sustainable ideas into their current design work and plans for the future. But what are the drivers for designers in other companies to follow in the footsteps of the likes of 'Remarkable' and 'Phillips' to include sustainability issues into their designs?

'Global temperatures across the world are rising faster than ever before'
1) To improve the environment for future generations

'More than 100 million people live in cities where the air is unsafe to breathe'
2) Rising customer and consumer demands

'In the last ten years, environmental disasters have resulted in over £600 billion worth of damage, more than in the previous four decades combined'
3) The demands from manufacturers

'The economy uses about 50% of the earth's natural production per year'
4) Competition from other companies and emerging technology

'Continuing to burn fossil fuels at current rates will result in greenhouse gases increasing by 50% within 15 years, risking catastrophic climate shifts'
5) Present and forthcoming legislation

'The number of pupils studying Design and Technology at GCSE level has increased by 7.6% over the last three years'
6) Because of inspirational current work?

Inspiration

This 'Spacepen' from Fisher illustrates a current product that considers **durability**, its able to write for over 30 miles that equates to over 80 years worth of ink for the average user.

Battery company Energizer (www.energizer.com), have recognized that

batteries can be a problem when it comes to sustainability. The batteries disposal would seem to be the main problem area with most batteries having a bad environmental impact, furthermore most portable handheld products need the use of batteries at present. Sustainable design and redesign, as it stands, is not about making everything totally sustainable, that would be impossible, but more about improving the current climate of design and hoping that the benefits of using more sustainable methods in the future outweigh the use of non-environmental products.

Energizer are in the category of a company seeking a more sustainable product. One method is the phasing out the use of mercury in batteries, Energizer have achieved this by a disposable mercury free battery design that although is not rechargeable, it meets current EPA disposal requirements. Sanyo are another company that have developed these mercury free batteries with a more environmentally friendly alkaline equivalent, with the aim to achieve a longer lasting, more durable battery. Both companies are now producing rechargeable batteries that aid this, obviously the lifespan is improved with any one battery lasting for over 1,000 charges thus the emphasis is on reuse and lifespan rather than redesigning a whole product without a battery.

More information on the Energizer battery can be gathered from their website.

Cyclic Products

Many current design projects are starting to consider the issue of cyclic

design, considering recyclable materials when looking at material selection. Bicycle designers ‘Hermes’ have taken on this idea of cyclic products and are now producing bicycles made from rattan and bamboo, they’re also making use of other natural resources such as wood, leather and wool, making their design more compostable.

This watch from ‘Mondaine’ is made totally from post-consumer brass. Any glass, metals or polymers used on the watch are recyclable making the product cyclic.

Improving a products’ sustainability is often thought to be solved by just making the product recyclable. Sure that is one aspect but much of the sustainability is about seeking more environmental methods to achieve the same or improved functional outcome. Sustainable design is centered around changing peoples’ perspectives, opening their eyes to alternative methods, it doesn’t always have to be like that.

Seiko (www.seikowatches.com) are a company that are taking their watch designs that one-step further by introducing kinetic watches at the upper end

of their market. As well as being water & splash resistant, made from light titanium, Seiko have pushed the concept of a watch that is powered simply by the movement of the wearer, requiring no battery, so instead of progressing the products recyclability they are improving its energy efficiency by seeking alternative methods.

SEIKO

Alternative energy sources

A way in which designers can improve a products' sustainability is to investigate the use of other energy sources for products.

Companies leading the way in this field are the likes of Motorola who are developing the use of Minature Fuel Cells in their products. The Methanol Fuel Cell now in use in selected products, lasts 10 times longer than a standard rechargeable battery. Methanol emits only water, carbon dioxide and heat giving a very efficient hydrogen powered energy alternative to standard battery sources. Methanol can be captured from composting various organic materials, it eliminates the use of regular toxic batteries that contain cadmium and lithium. Motorola are currently exploring the cells' possibilities and it could feasibly be used in a number of other products such as cameras and laptop computers.

Fellow leading electronics company, Sony, have also been investigating other energy sources for when the product is in use. Sony have developed the 'ICF – B200' that runs off the use of muscle power and solar energy. It works by winding up a small dynamo that recharges the internal battery. The product can be considered as solar as it generates electricity by using a renewable energy source during use.

Many companies like Sony are looking unto these alternative methods to achieve energy. Wind-up shavers are even being looked at! The idea is that by achieving a pump action on a rotary shaver the product may be used anywhere as it needs no electricity or batteries. Infact you have control of the head speed, as its dependent on how fast you pump!

Freeplay (www.freeplay.net) are developing the use of human powered portable products with an aim to reduce the consumption of power. Most of their products use human power as a mechanical energy source in a wind-up mechanism to run the portable device. An internal spring is engaged by the rotation of an external handle. The user therefore turns handle, and the energy is stored in the spring. Freeplay use a strip steel spring that offers excellent ergonomic power as well as a constant force for the product. The system converts energy to electricity, any extra could be stored in a rechargeable battery. Techniques like those used at Freeplay could be used on a number of other devices such as transceivers, cell phones, navigating aids and military equipment.

Freeplay have recently teamed up with various mobile phone companies to try and incorporate more sustainable products into the mobile phone world. In 2002 Freeplay and Motorola are releasing 'Freecharge', a lightweight, robust wind-up phone charger. It's billed not only as a sustainable product but one which puts an end to so-called dead mobiles as it works where ever you are. It uses a rugged generator wind-up system, wound up by a crank handle. For 45 seconds of winding the phone allows around 6 minutes of talktime and hours of standby time!

Further information on Freeplay and their products can be found on their website at: www.freeplay.net

For information on 'Freecharge' visit: www.motorola.com

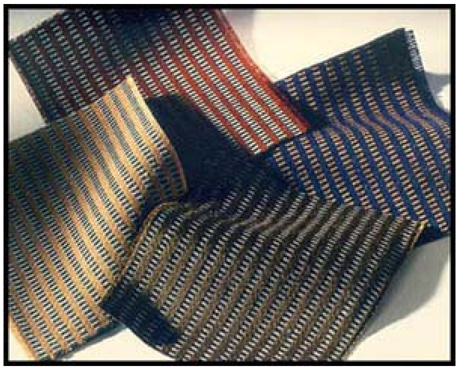
Philips(www.solar.philips.com) recognise that sustainability for them is achieving

a balance between ecological impact and economic growth. They and other companies are seeing it more and more as an opportunity to challenge present thinking, allowing greater creativity for eco-efficient solutions. They have started to achieve this by introducing a series of products that underline that statement. They are currently producing more sustainable items such as: Free-powered radios, Gyroscan Intera Medical scanners, Energy-saving e-Kyoto electronic ballasts and also flexible and mouldable solar panels. These solar panels have a large scope for products having low maintenance, no noise and a long life. Philips boast that it is guaranteed for 10 years with a minimum power of 90%, more work into other work that may come under the solar category is currently being undertaken by Philips and similar leading companies.

Alternative Energy sources do not just have to be from products in use. A food factory in Denmark 'Urtekran', use an alternative energy source during manufacture and distribution. The factory is powered by wind and hay, and can be considered more solar by using a renewable energy sources in the manufacturing process.

Alternative materials in products

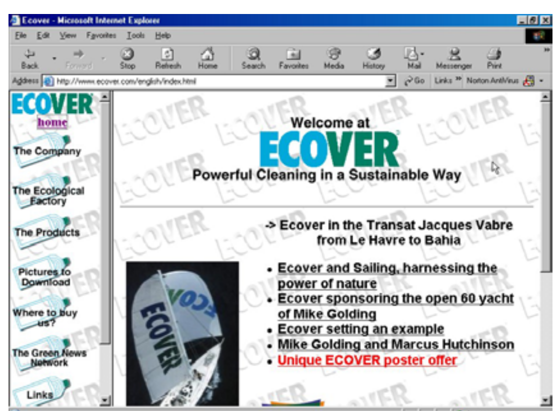
One way in improving a products' sustainability is to consider alternative, more environmentally considerate, materials when looking at material selection. William McDonough have developed a fabric called 'DesignTex' which has been reworked from the standard dyed synthetic material, that can be very toxic containing the likes of cadmium and giving off chemical gasses. 'DesignTex' now use sustainably grown natural wool and ramie fibers and low environmental impact dyes that are non carcinogenic, non toxic and include no heavy metals. Any scrap left over is used as non toxic compostable felt and used to insulate crops – it soon decomposes and nourishes the earth.



'Climatex' are another company that have explored these methods also using organic wool and ramie fabric, 38 of the dyes they now employ are totally safe. There aim is the same, to substitute toxic components with safer ones.

Various work is currently being undertaken into alternative materials to the ones in place today. One of the problems faced is that the majority of plastics cannot be broken down by bacteria and is burnt release poisonous gases, in other words they are non-biodegradable. Belgium based ecological company Ecover (www.ecover.com) have developed a wide range of environmentally friendly products, including biodegradable plastic bags that decompose by bacteria when buried in soil. They have not been introduced worldwide as yet but it's a start.

More information about Ecover can be found on their website: www.ecover.com



Biopolymers seem to be a distinct possibility for incorporation into future products that we may consider as sustainable, despite issues surrounding shelf life. Biopolymers are non-toxic and biodegradable polymers that have been generated from renewable natural resources, they can be produced using biological systems and also chemically synthesized biological starting materials. Biopolymers, which are starch-based, can be seen as an alternative to petroleum-based polymers as they allow for enhanced environmental properties. Current Biopolymers also come with various lifespans from a few weeks to a few months – this is where shelf life considerations are very important.

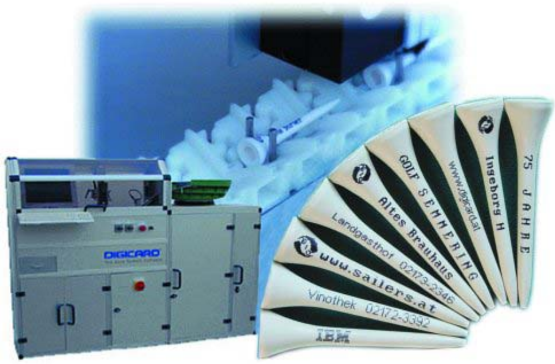
The ‘Vision Engineer’ website covers a range of technology advances related to such products as those produced by ‘Ecover’, it can be found at:

www.visionengineer.com

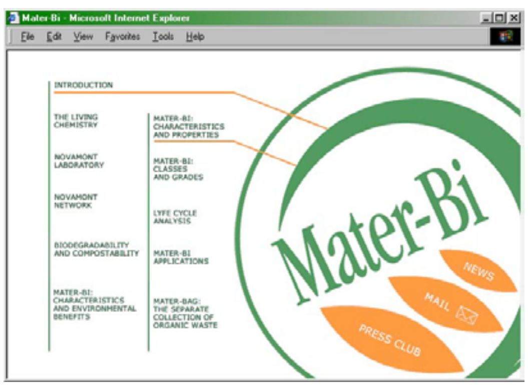
Co-operative Bank and Greenpeace have teamed up and taken steps to include more sustainability in a field perhaps often overlooked as an area that improvements could be made. Standard credit and debit cards are usually made from PVC and in manufacture & incineration release dioxins into the environment. To overcome this a Greenpeace card has been introduced mainly made from Biopol (an innovative, biodegradable plastic based on fermentation of sugar rather than fossil fuels). They are currently working on a long term totally PVC free card that includes the magnetic strip not covered in the current design.

The website for this product can be found at:
www.co-operativebank.co.uk/personal/personal_greenpeace.html

Companies have started producing products not only to work from an environmental stance but also to work for themselves as a business opportunity, identifying a niche in the market. One company 'Bio Golf Tees' (www.bio-golf-tee.com) are producing biodegradable golf tees that biodegrade within weeks of use if left in the ground, which is a common drawback among standard tees. They are billed by 'Bio Golf Tees' as a product that is 'dedicated to the maintenance, upkeep and conservation of golf courses'. They are moulded from a unique polytriticum of wheat resins and polymers that can be produced and used locally. The product and its marketing shows an angle that could be used to introduce more sustainable products that are not only of benefit to the user in the short term but also in the long term.

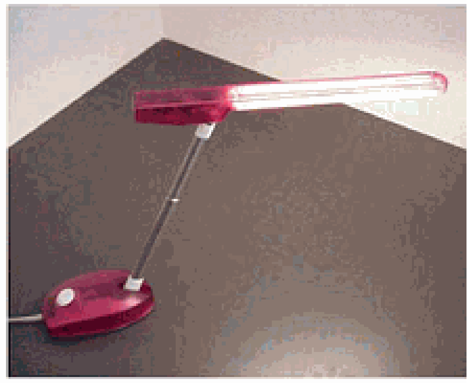


Novamont (www.materbi.com) are developing exciting new biodegradable polymers called 'Mater-Bi', as well as being biodegradable it's recyclable, compostable and can be used as conventional plastics. They can also be coloured with natural pigments of biodegradable master batches. Originating from the Umbria region in Italy where the production capacity is 8,000 ton per year, they can be applied to a range of products including: napkins, cutlery like that used in McDonalds, packaging, bags, toys and stationary.



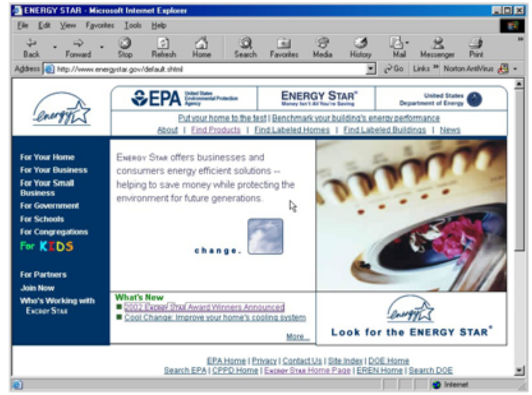
Efficient products

Various companies and their designers are looking at ways of making their products more efficient and therefore more beneficial to the user. The 'e.light' shown uses 90% less energy than the ordinary desk lamps, in fact it only uses 3 watts! It can be an example of more efficient design in both use and manufacture, with regards to energy, water and materials. The 'Tripp Trapp' chair also offers an efficient edge over similar products. It is designed so that it can be adjusted to fit a person throughout their childhood. This is considered to be more efficient as it has a much better utility for the user much like multi-functioning products or rented products.



Sustainable design can be about making products last longer giving more utility and being more efficient in the eyes of the user. The Stokke Tripp Trapp Chair exemplifies this, designed by Peter Opsvik and manufactured by Stokke of Norway, it is designed to last the average child from 2 years old until there teens. Made from natural European Beechwood, the chair allows varying heights to suit a range of table heights. It is produced to be durable and a product that gives its customer/consumer value for their money when purchasing such a product. Not only does the product successfully incorporate sustainability it also successfully integrates the necessities of safety and its primary function.

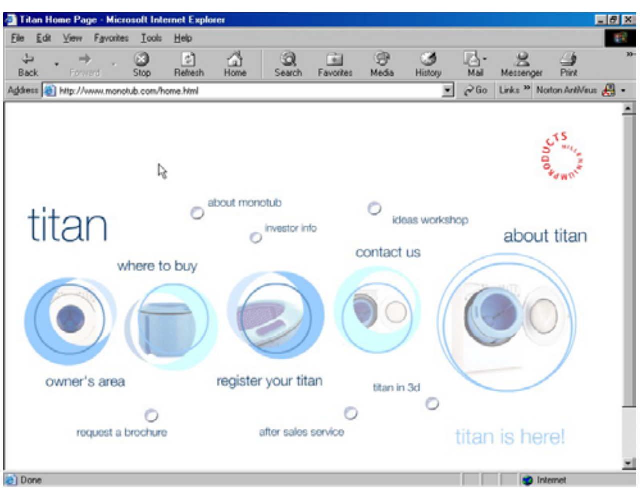
'Energy Star' (www.energystar.gov) are currently producing and developing more sustainable from common appliances to office equipment to ceiling fans! 'Energy Star' seem to be one of the companies that are leading the way in terms of improving energy efficiency in products and boast astounding statistics compared to less sustainable companies, which can only create healthy competition for 'Energy Star' and a healthier environment.



Statistics released on the 'Energy Star' Website boast that:

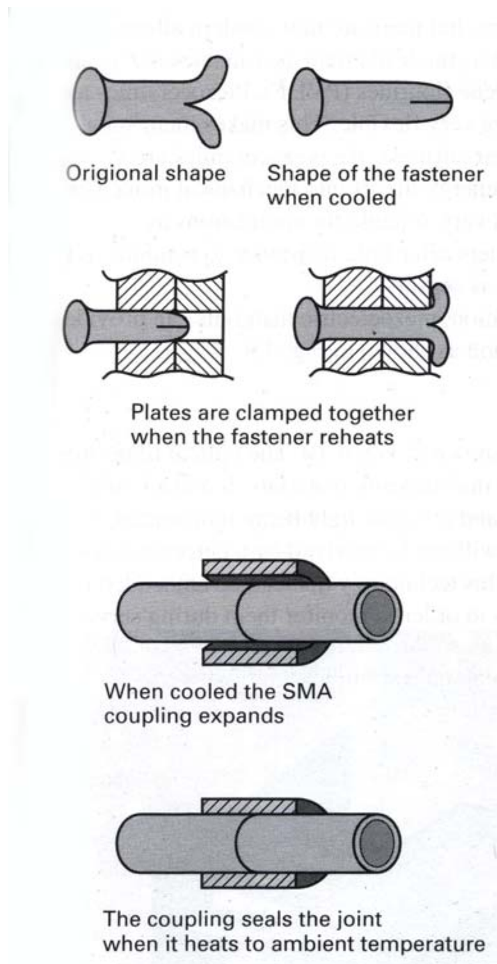
- Energy Star TV and VCRs take 75% less energy than their conventional equivalent when switched off.
- If half of US households replaced their regular TV with one produced by Energy Star then the change would equate to shutting down one whole power plant!
- The Energy Star DVD player uses half the power of conventional DVD players.
- Energy Star monitors emit less heat than conventional monitors, consuming 90% less energy than models without power management systems.

Monotub Industries (www.monotub.com) have also looked to improve their products' efficiency levels and have done affectively with their latest product, the Titan Washing Machine that has a European 'A' rating for wash performance and energy efficiency. The Monotub design has a wider drum than the average washing machine and creates space for 40% more laundry via its removable basket. It saves water by a 'shower power' wash and rinse system and uses a compact heating reservoir to efficiently circulate a volume of hot water through the active jet system. Further related information can be accessed via the Monotub website.



Design for disassembly

This area covers products that are produced with disassembly in mind therefore are easy to repair, upgrade and disassemble at the end of life. An example of this would be a modular computer chassis like those produced currently at ‘Dell Computers’. No tools are needed to disassemble its modular architecture, the covers are simply removed by pushing two release buttons. The product is more economical having easy to use fasteners on its removable individual components. The limited use of screws with little adhesive, leads to easy maintenance and upgrade on the product.



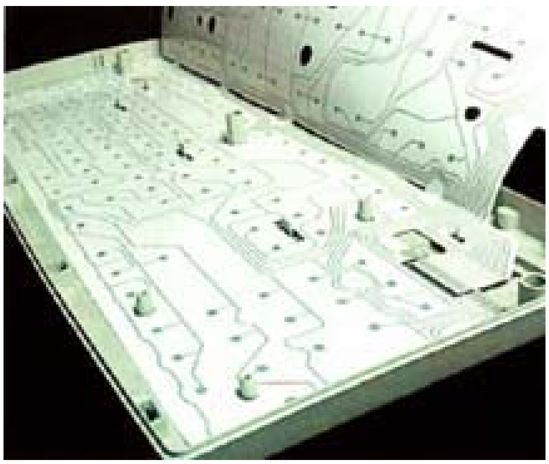
IBM are another leading company in the computer business that are considering and using more sustainable principles by considering disassembly in their products. IBM have stripped their machines of adhesives and now employ ‘Dart’ fasteners to hold foam in place of the less sustainable method. This is not only of benefit to the environment, IBM have also seen a number of benefits from this change in tact. Assembly workers no longer have to deal with toxic fumes from the adhesives, IBM themselves no longer have to store or handle the hazardous materials – saving costs. Above all it improves the products’ disassembly, it is easier to separate components that may be recycled.

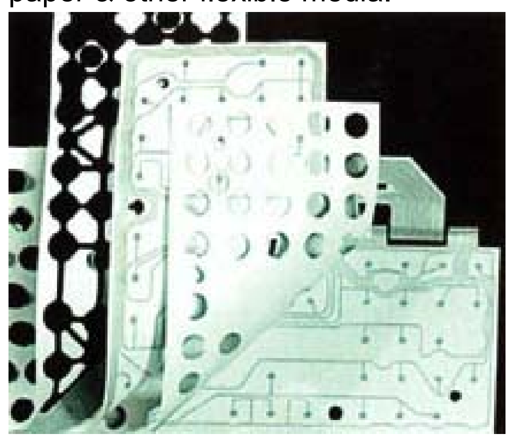
At present most products are disassembled using hand or robotic methods, and sadly neither are a huge consideration in the majority of products on the market. There are a few though for those who do consider it, the disassembly of a material may be improved is ‘Active Disassembly’ using Smart Materials, known as ADSM. The use of ADSM also allows for increased recyclability in consumer products to be integrated alongside the properties needed from the products’ materials to fulfill its function. There are two main areas, Shape Memory Alloys (SMAs) and Shape

Memory Polymers (SMPs) that are being explored by various institutes regarding ADSM, Brunel University are at the forefront. The whole principle behind both sets of materials is that the specific material will change shape under a certain change of temperature specific to that material. The material is basically used as an actuator and various releasable fasteners to aid in disassembly are being investigated. Signs are that these could prove the future for better disassembly and for better products.

Research into new technologies

Dr Blue Ramsey of Brunel Universitiy's Department of Design (www.brunel.ac.uk) is developing research into social and technical issues involved in environmentally sensitive design. This is currently centred around new more sustainable methods for creating printed circuits using offset lithography to form the circulation paper & other flexible media.





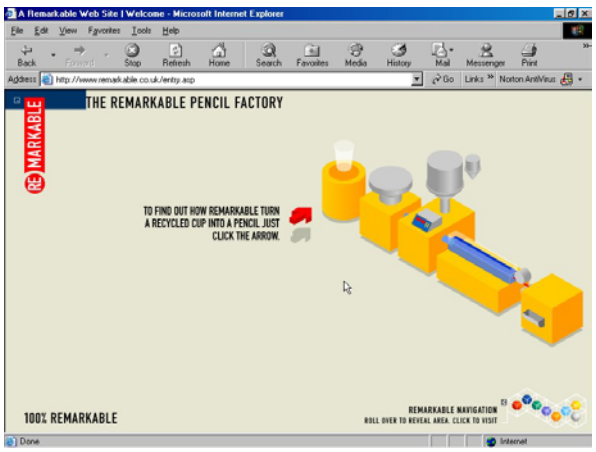
Dr. Ramsey's work is an example of the research and development going on throughout the world seeking more sustainable products and methods for the future.

Innovative redesign

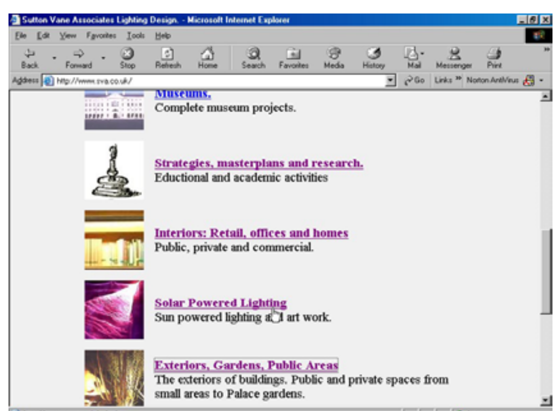
"Extract what's positive from the past and turn it into something sustainable for the future."
Redesign – Sustainability in New British Design, Michael Evamy (The British Council, 001)

As designers we have a responsibility to aim to achieve sustainability by reducing demand for energy and natural resources. The products in this section all have achieved this to some degree and therefore should all be used as inspiration for your future design work in years to come.

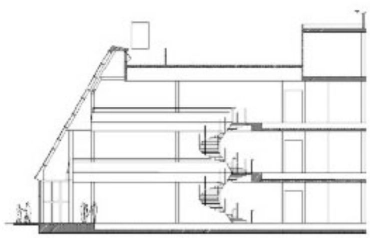
Britain throws away £4billion plastic cups every year, enough to form a loop around the world 12 times! With this in mind Edward Douglas Miller and his company 'Remarkable' (www.remarkable.co.uk) set out to sustain a longer lifespan for the plastic cup in the age of Victor Papenek's so called 'Kleenex Culture'. A products' life does not have to finish as a raw material, Remarkable have proved that it is now practical and profitable to give a second life to many products that would be previously thrown away after a fairly non-efficient life. They took the discarded plastic cup and turned it into a pencil, they now produce over a million. This saves on rubbish in landfill sites and saves trees, Remarkable are even turning car tyres into notepads and mouse-mats, pencil cases and milk cartons into pens! For more information you can check out the Remarkable website at the above address.



In the last few years it has become increasingly necessary to use products or sources available to produce better products in every sense. Sutton Vane Associates (www.sva.co.uk) have produced a unique 'Tsola light' that does not deal in wires and dangerous mains voltage but simply runs from daylight that is collected by its own internal solar cell, which is then converted to electricity. The light automatically switches on at dusk and off again at dawn, by recycling daylight as an artificial light, SVA's product costs nothing to run and more importantly saves energy.

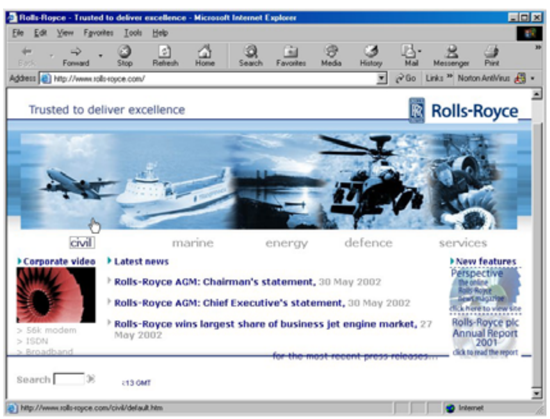


SVA are also working on a development in Sunderland that illustrates how solar power can be integrated into office architecture to take advantage of solar energy in Britain. The idea is based around minimizing heat losses, using the buildings mass to control the temperatures, use natural ventilation, save energy consumption by maximizing natural daylight



and producing energy by using PV in the farcades. Studio E and Akeler's Solar Office includes a South-facing wall that features a photovoltaic integrated farcade. 45,000 cells together produce 73kW, that's enough to run 300 PC's!
Further information on SVA's projects can be found at: www.sva.co.uk

Over 18,000 new airliners will be needed in the next 20 years such is the demand on aircrafts at present. If the majority of those are fitted with Rolls-Royce's Trent engine then the skies will be a lot cleaner and a lot quieter. The



Trent engines are low on emissions, low on noise and low on fuel consumption and so can be seen as the current benchmark for new aircraft to follow. It includes a unique three-shaft design that uses the latest in materials technology, infact the Trent engine goes much further than current and proposed legislation. It's lighter in weight and uses less fuel, it is no surprise that in February of 2001 it had around 30 customers ordering £12billion worth of 1400 Trent engines! It only takes a break through in one field like this to make other companies and their designers to sit up and take notice, perhaps following suit.

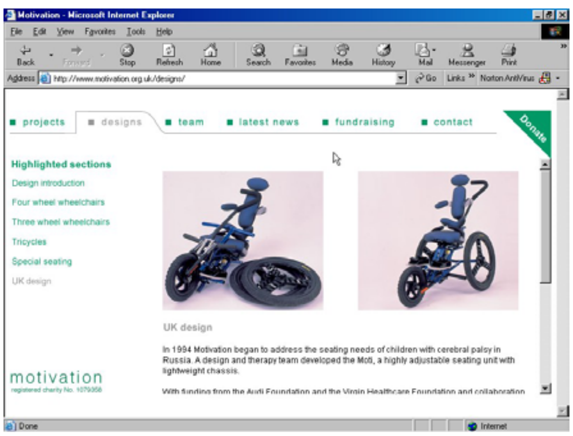
More information on the 1400 Trent engine and Rolls-Royces' latest strides forward in more sustainable transport can be found at: www.rolls-royce.com

Baltic - The Centre for Contemporary Art in Gateshead can be seen as yet another example of where a previous design, in this case an old 1950s industrial building, has been given another life.

Opening in 2002, the former Baltic Flour Mill, used for grain storage, occupied an unused prime spot on the south bank of the Tyne River. £46m has been spent regenerating its use and is now one of the largest temporary art spaces in Europe. The Baltic will not hold a permanent collection but instead will house invited artists' collections in a constantly changing medium. The reopening of the Baltic will see not only job opportunities created on the social side, but also energy consumption will be kept to a minimum with its own energy centre that will convert its own natural gases into heating and electricity for the building. More information on this can be found on either:

www.balticmill.com or via www.gateshead-quays.com

Transportation visions



Sustainable design does by no means just apply to within this country there are thousands of products like these being produced that affect people worldwide. In Western Europe the life expectancy for a paraplegic is about normal, but in developing countries where they are less advantaged it can be only 2 to 3 years. The Motivation Charitable Trust (www.motivation.org.uk) is aiming to extend their life and the quality of it, they are seeking an improvement through the Mekong Wheelchair. It's can be a locally produced product that offers suffers a greater freedom in their life however long. More than 800 mahogany framed 3 wheeler Mekong Wheel Chairs are now produced in a number of developing countries such as Cambodia, Sri Lanka and Bangladesh.

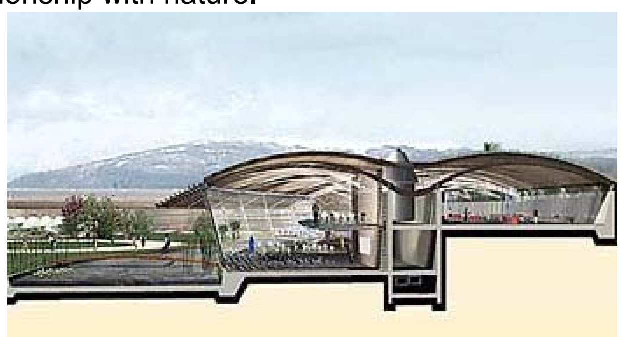
The 'Rocky Mountain Institute' (RMI) (www.rmi.org) are aiming follow up their environmental policies on forestry by improving public transport in the area and helping communities discover alternatives. RMI and Green Development services are promoting less mobility hungry societies with an emphasis on more transit friendly communities and real estate. When this isn't possible and a car is at present a necessary solution, RMI are developing the 'Hyper Car', a radically cleaner and more efficient form of transport into those methods currently used. RMI have been refining and promoting the 'Hyper Car' since 1991, with the aim of decreasing the need for imported fuel supplies, increasing energy security in nationally and locally based resources. The concept would offer an ultra-light construction, better performance, affordability, safety, hybrid-electric drive and most importantly a huge improvement in fuel economy. The proposed use of fuel cells that run on tanks of compressed gaseous hydrogen fuel would virtually eliminate pollutants. The RMI website (www.rmi.org) gives more information on the car and how they are promoting the product in the USA and in developing companies of whom they hope will develop the car to leapfrog current less sustainable car users.

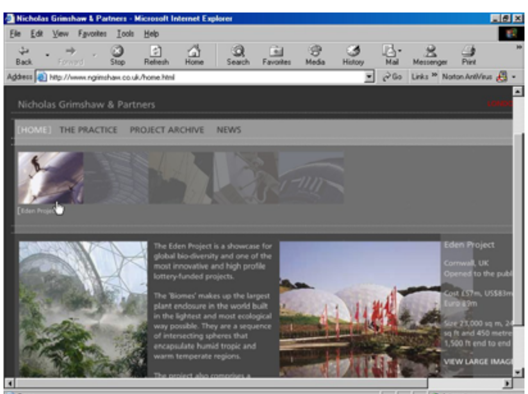
Many institutes and companies are pledging to improve their environmental policies. Leading US-based catalogue company, Norm Thompson, is looking at ways to improve their service using sustainable methods. The have pledged a commitment to sustainability that includes eliminating PVC from their product lines by 2006 due to its impact on the environment in use and disposal, they plan to phase in organic cotton and also develop recyclable and biodegradable packaging. The firsts signs of progress in this area are its inserts that are printed with non-toxic soy-based ink and produced on recycled paper.

Sustainable projects (www.edenproject.com and www.ngrimshaw.co.uk)

In March 2001 the world's largest greenhouse opened its doors, the Eden project. It says so much for the principles of sustainability, enhancing understanding of interaction between people, plants and resources. The showcase is situated in an old clay quarry in Cornwall and contains 80,000 of the world's plants in its outstanding structural domed shaped segments. The structure skin of the project is fabricated from hexagonal geodesic panels, glazed with transparent ETFE foil pillows – each weighing 1% of its glass equivalent and requiring a mere fraction of the energy during manufacture. The structure lends itself to the environment, needing no rock-blasts for its construction and giving its viewers a breath-taking impact to symbolize their relationship with nature.

Following the successes of the Eden Project 'Nicholas Grimshaw and Partners' have been approached to create Ecolandia in Yvedon-le-Bains, a Switzerland-based vision linking its people, the latest technology and the environment. Within these three areas entertainment, education, commerce and nature will overlap to create 30,000 square metres of informed sustainability. At the centre are illustrations of four different ecological systems of the planet each making up an 'Eco-dream' area.

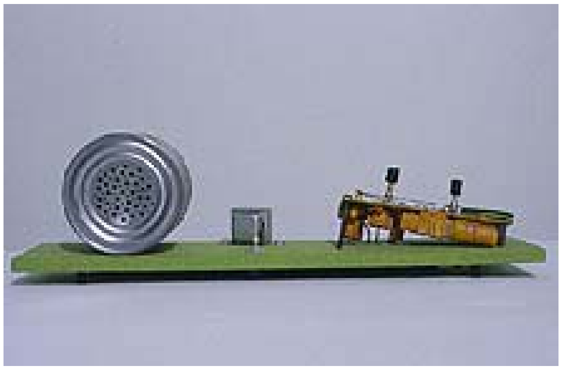




The building is semi-transparent to allow light to seep in and the outer layer of the building includes, photovoltaic solar panels. 'Nicholas Grimshaw & Partners' hope to echo the beauty of its surrounding and outer structure of the proposed architecture with a deeper inner beauty of the promotion of sustainability. The project is due to open in the year 2006.

Changing design perspectives

Sustainability is not all about new technologies and the latest equipment it can simply mean making the most out of what's around us. Sustainable design



can be seen as a new way of thinking, a design that involves changing people's perspective on how design should be created and developing it to a more sustainable way of thinking. Stuart Walker seems to be leading the way in this area, concluding in a recent journal that "it's important to get the ideas out there for people to see, and criticize and react to." If you can get people to react to products, concepts and ideas then at least they're taking notice. Stuart Walker has spent the last few years developing various prototypes of chairs, lamps, radios, jewellery, phones and other goods with 3 important principles in mind.

- Economic priorities of business
- Environmental responsibility and minimizing the impact
- Social responsibility

Walker's products aim to reduce a reliance on capital, energy intensive tools, use readily available localized materials and production methods. Using local materials, labour and skills would go some way to achieve this. His products include chairs from local wood, lamps from twigs with bottles for lampshades and case-less phones which components are simply attached to plywood.

So what are the benefits of localizing production?
It adds a culture and richness to our products, illustrating bigger concerns. It reduces transportation and packaging costs, promotes a cyclic use of materials, creates local opportunities for repair and maintenance, and gives a culture or society an identity. Stuart Walker does not state that all products should be made in this way, he just indicates that we as designers are perhaps to quick to go down already mapped out avenues without finding better routes for ourselves.

Sustainable development does not aim, at present, to make everything totally sustainable in the short-term only to educate and develop designers for a more sustainable and improved future in the long-term.

Electrolux Industrial Design and Cranfield University are working together and developing innovative designs to try to change peoples' perspectives and views on Eco-design. They have developed the Eco-kitchen which is aimed to improve the users efficiency in the kitchen at the same time taking into account environmental issues through creative design concepts.

The kitchen is said to be the area of any house that is used the most and therefore has the largest environmental impact, designers have a part to play in promoting less materialistic concepts when it comes to kitchen products. The Eco-kitchen project aims to achieve this responsibility through innovative design.

The Datawall design shown on the left acts as the brain of the kitchen giving information on levels of use of kitchen products, various menus, food inventories and even a link to the supermarket!

The Smart Sink below aims to minimize water use by using a smart tap that can be set at spray or at mist. There are two levels, one showing consumption and the other showing the amount of water in the sink, it also has a grey water purifier. All of the Smart Sink's features are designed with improving the products' sustainability in mind.

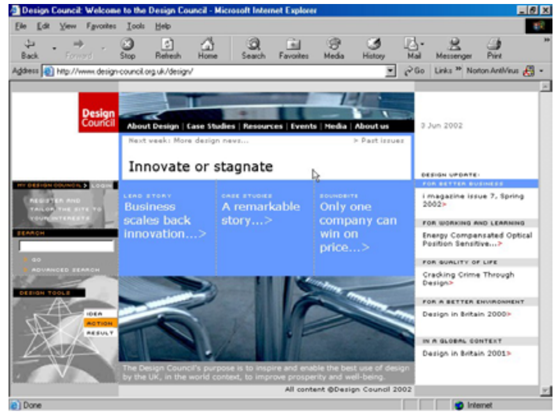
Lastly the Chest freezer is shown below, it's a simple change that makes so much difference. By stacking up the food that's stored in the freezer it not only allows and promotes the sorting of waste it also reduces the energy waste of conventional freezers, the idea being that conventional freezer allows a 'fall-out' system of energy when opened.

Further useful resources

The following websites should be used as useful resources as initiatives that promote the awareness of sustainable design gathered from Michael Evamy's excellent 'Redesign' book.

Millennium Products
www.design-council.org.uk

Exercised its power and influence in the design world by celebrating the most innovative designs towards the end of the millennium, rewarding sustainability and highlighting company methods to aspire to.



Design Sense
www.designmuseum.org

Continually recognises sustainability in design and architecture by an annual award at the museum.

The Centre for Sustainable Design
www.cfsd.org.uk

Suppliers of Ecodesign tools and techniques to companies, holding around 30 conferences promoting the area, highlights innovation, quality and leading work in design.