International Joint Conference on Environmental and Light Industry Technologies
18-19 November 2010, Budapest, Hungary
Óbuda University

IMPLEMENTATION OF THE SUSTAINABLE APPROACH IN FASHION DESIGN

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Abstract:

Environmental friendly (green) has become a keyword for the success on the consumer market. The implementation of the sustainable and ethical approach in the fashion design process could be an important aim of the design education. This study shows the role of education in forming designer's approach sustainable and selects some special topics (green labelling, renewable textile raw materials, ethical fashion, etc.) that should be discussed with designer students during their studies.

Keywords: sustainable design, green labelling, ethical fashion, renewable textile fibres

1 GREEN PRODUCTS AND GREEN LABELS

With the increasing consumption per year, issues related to ecology and sustainability become more critical for the entire world. Due to the increasing demand and to the higher profit resulting from the sale of products with environmental benefit, a new trend is gaining ground, green marketing. It can be a very powerful marketing strategy though when it's done properly. The trend results in the change of consumer behaviour and the traditional production processes. The strengthening of consumer awareness supports the protection of the environment buying more green products [1].

A green product may be environmentally friendly in itself or produced and/or packaged in an environmentally friendly way. Green labels could be important tools for decision making when purchasing textiles. But is it true, that a green product really has an environmental benefit? Some companies develop their own labelling systems ("green cotton"), which is faster than setting up industry wide standards but also it may be less transparent.

What are behind these textile labels: eco, bio, social, fair – who is who? Designers, suppliers and customers often have difficulties in giving the right answer. The demand to know more about textile ecology is increasing, more and more events and organizations offer information to topics like green textiles, sustainable textile processing, eco-indexing, traceability and transparency, organic fibre production, and environmental footprinting are worldwide discussed in many forums and conferences. [2] To be worth considering those organized by Ethical Fashion Forum, the RITE Group, or Textile Exchange. Attendees at the Sustainable Textiles Conference hosted by Textile Exchange few weeks ago in New York City included representatives from adidas, Anvil Knitwear, C&A, Disney, Eileen Fisher, Gap, H&M, Lenzing, Nike, Nordstrom, Patagonia, Puma, REI, Target, Walmart, and Williams-Sonoma. In addition to recycling, environmental protection, sustainability and guaranteed social standards, also the theme of plant-based dyeing is a new feature of the debate [3].

The design education could highlight the importance of textile ecology (production, human, performance and disposal ecology). Students should be introduced to the concepts and goals of Life

Cycle Assessment[1] (LCA) to asses impacts associated with all the stages of a process from raw materials through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling. The interpretation of results will help making a more informed decision in eco design.

In the following chapter some examples are given for certified eco-labels, available for textile products. These are some of the most visible of the applications of life-cycle assessments. First to mention is the European environmental label "The Flower". It could be awarded to companies and products that can comply with all the demands from the EU. The eco-label »Blue Angel« has set the standard for eco-friendly products and services selected by an independent jury in line with defined criteria since 1978. The label is an ecological beacon showing the consumer the way to the ecologically superior product and promotes environmentally conscious consumption [4].

Figure 1: Blue Angle labels with specific environmental benefits[4]

For textile designers is useful to be informed on voluntary and obligatory organic textile standards and certification along with eco-textile labelling and the options available for sourcing textiles in a socially responsible manner. Textile products made from natural textile (cotton, wool, silk, etc.) could be distinguished by the label "Naturtextil" [5]. This label (figure 2) of the International Association Natural Textile Industry e.V. (IVN) stands for the highest possible environmental requirements textile products currently can fulfil.

Figure 2: The quality hallmark for natural textiles [5]

The Global Organic Textile Standard (GOTS) is recognized as the leading processing standard for textiles made from organic fibres worldwide. To get the GOTS label (figure 3) the standard defines high level environmental criteria along the entire supply chain of organic textiles and requires compliance with social criteria as well. Only textile products that contain a minimum of 70% organic fibres can become certified according to GOTS. All chemical inputs s.a. dyestuffs and auxiliaries used must meet certain environmental and toxicological criteria and also the choice of accessories is limited

[1] LCA is a widely accepted measurement tool for environmental sustainability – a technique for assessing the environmental impacts associated with a product or service, covering all stages in a product's life.

under ecological aspects. A functional waste water treatment plant is mandatory for any wet-processing unit involved and all processors must comply with social minimum criteria. [5]

Figure 3: The Global Organic Textile Standard (GOTS) [5]

The seal of approval "medically tested and tested for toxins" (figure 4) signalizes the final consumer the additional value of guaranteed security for skin-tolerant, hygienically immaculate textiles [6].

Figure 4: Guaranteed skin tolerant - seal of approval for hygienically immaculate textiles [6]

The slogan, "Confidence in Textiles" has become a synonym worldwide for responsible textile production, safety and transparency. It applies to industry and trade along the textile chain just as it does to users and consumers of stylish, functional and colourful textiles. The Öko-Tex® label (figure 5) is now taking on a status similar to that of a brand name. [7]

Figure 5: Öko-Tex® label[7]

”Organic” label is explicitly linked to environmentally friendly agriculture with environmental benefits (not using chemical fertilizers and pesticides), and with benefits in farmers’ health. The label which of “Fairtrade” gives a guarantee about ethical production to consumers with social responsibility. It is primarily a social label and focuses on improving the working and living conditions of smallholder farmers in developing countries. Each sold product with a Fairtrade label includes a guaranteed premium for community projects. Labels for Fairtrade and organic complement each other perfectly. Combining the two is a way of strengthening the position of farming families socially and environmentally as well as supporting their development efforts.

2 SUSTAINABLE FASHION DESIGN

"Green" could be an added value also for fashion designers. Organic and sustainable clothing is a trend for producers and retailers. The rapid growth of organic textiles sales may be due in part to the introduction of organic lines by popular retailers such as Target, Ralph Lauren Home and Bed Bath & Beyond. By responding to consumer demand for organics, these powerhouse players have helped increase attention, awareness and distribution of these products to the market [8]. The ability of fashion and retail to influence and inspire consumer behaviour should not be underestimated. The number of followers of ethical fashion is increasing more and more and this trend will continue for years (May 2007 Vogue).

Education plays an important role in forming designer's approach sustainable. Its task is to explain the dual challenge of designers - to improve the level of functions, to constantly recreate new products while at the same time to save the environment and to avoid disturbing it. Our students from the study field of Product Design and of Light Industry Engineering pick up this approach in different subjects during their 3,5-years- studies. Topics like renewable textile materials, recycling, new environmental-friendly finishing technologies, biomimicry, consumer knowledge and business ethics, etc. are already included in their education program, but more effective would be to concentrate the knowledge about sustainability completing with other related subjects and use it in the design praxis.

The idea of sustainability means often for fashion designers only using more environmentally-friendly materials and methods in clothing production. Designers could be most inventive when it comes to recycling or creating new products from waste e.g. textiles fabrics made from recycled PET plastic bottles or bamboo. Sustainable fashion is not only „green" like t-shirt made from organic cotton, nowadays designers use renewal or recycled material for fashionable clothing, rather than producing "dusty, hippy-looking clothes". But designers should have responsibility for the future not only through responsible choices about materials and processes. The aim is to reduce material and energy consumption, to be cost-effective in the production process and during the usage. Analysing environmental-friendly or renewable textile raw materials it is not always clear if they really have environmental benefits. It is important to analyse the whole textile chain from the fibre production, through the process of weaving, knitting, or non-woven, the kind of finishing and tailoring (process ecology) to problems of usage and recycling. In all this there is dangers for people involved (human ecology). Designers should know that 80% of environmental influences and life cycles costs are determined by the design process. It is important to know what sustainability means: to equally consider environmental aspects, social and economic aspects [9].

3 SOME RAW MATERIALS OF SUSTAINABLE FASHION

Eco-fashion designers prefer to use materials made from renewable materials such as cotton (organic, natural coloured), bamboo, hemp, flax, corn (polylactid) or soyabean, wool (baby alpaca), silk, milk, etc. [10]. In the following chapter eco-friendly characteristics of selected fibres used for eco-design will be discussed.

3.1 Organic cotton

Often gives suppliers for a hand-picked cotton, that it is a high quality organic product. It is not true, because organic products can be produced only on so called eco-farm. Certified organic cotton is grown without the use of pesticides and harvested without the use of defoliants. It is produced in a strict controlled way (according EU regulation 2092/91, of the USA National Organic Program, the Indian National Program for Organic Production or the Japanese Agricultural Standard [10]. There are different independent institutions that certify organic cotton: KRAV, IMO, and CUC (former SKAL) [11]. Several year ago the Turkish certification company ETKO has been licensed to certify the

Organic Exchange OE 100 standard (this is a voluntary standard for fibre from the US non-profit organisation Organic Exchange).

The fact that no chemicals are used for organic cotton production allows to assume that they are exceptionally safe and wholesome. Objectively, their differences versus other current products are hardly identifiable, yet subjectively a good many consumers believe that organic products are of exceptional quality which justifies their higher price. Similar judgements apply to many products endowed with the emotional quality: there is quite a number of consumers who are willing to pay more for such products.

Natural Cotton Colour

Natural coloured cotton clothing use a naturally coloured seed, eliminating the need for chemical dyes. This special cotton has natural pigments, the products made from natural coloured cotton has the soft shades of beige, green and brown [12]. By emitting dyeing or printing and all the chemical finishing process, discharged water waste can be significantly decreased, reducing the overall environmental load.

3.2 Sustainable man made cellulosic fibres

There are different man-made fibres derived from natural plants (viscose, lyocell, etc.). Often is "bamboo" used for eco-designed cloth or socks. The truth is, that this products really are made from a kind of regenerative cellulose fibre (made of 5-year bamboo plants), which uses environmentally toxic chemicals in the production process that emits hazardous pollutants into the air. Only products made from *mechanically processed* bamboo plant (like hemp or flax) can be called bamboo.

As a quick-growth plant, the bamboo does not require irrigation, fertilization, and medicine scattering during its growth, and is resistant to drought and water logging. Apart from the intrinsic characteristics of bamboo including anti-bacteria, anti-ultraviolet, excellent penetrability and coolness, bamboo fibre has also the functions of moisture absorption and desorption, thus it is called breathable fibre. It is featured by biological degradation, soft handle, good drapability, easy and beautiful coloration.

Lyocell (e.g. TENCEL® produced by Lenzing Fibres Inc.), a »solvent spun« fibre derived from cellulose has gained favourable acceptance within the mainstream fashion industry and also in the eco-fashion industry as being a natural fibre that has a flattering drape and is soft, luxurious, breathable, naturally wrinkle-resistant, and environmentally sustainable. To produce it a special organic solvent (amine oxide) is used to dissolve the cellulose and set the fibre after spinning. The process is clean, because 98% of the solvent is typically recovered and re-used.

Also Lenpur® by Filati Maclodio will be promoted as totally natural thanks to the production method, even if all these fibres fall in the artificial fibre industrial product sector. It has an extremely soft weave, high absorbance and release of humidity, thermo-regulator, transpiration-promoting, anti-odour and absorbent characteristics. It has a unique tactile feel, similar to that of cashmere.

But could a textile be made from cellulosic man-made fibre "green"? Since it is made from renewable material, this fabric is biodegradable. As during the fibre production there is little waste product, so this process is relatively eco-friendly. While production of these fibres is generally eco-friendly and environmentally sustainable, the fibre spinning uses a substantial amount of energy, and uses a solvent of petrol chemical origin, and the transformation of lyocell fibres into fabric and garments can use many of the same harsh, and even toxic, chemicals and processes used in conventional garments.

3.3 Polylactid fibres (PLA)

PLA as polymer is known generically as “polyester” , but is typically made using lactic acid from fermenting various sources of natural sugars. These sugars can come from annually renewable agricultural crops such as corn or sugar beets. As a melt-spinnable fibre with a vegetable source, PLA has many of the advantages of both synthetic and natural fibres. It is compostable, is less environmentally costly than polymers that are recyclable, because there is a limit to the number of recycling iterations that can occur before the material loses its usefulness. It is even less environmentally costly than other biodegradable thermoplastics, since the entire mass of PLA can eventually be re-converted into new PLA, whereas many other biodegradable thermoplastics incorporate at least some material derived from fossil fuels. Although PLA is not a perfectly sustainable polymer, since some energy must be irretrievably used in its polymerization and in converting the polymer into fibres and fabrics, it offers superior sustainability and lower environmental impact than any other non-cellulosic synthetic fibre, and possibly even superior to some natural fibres. PLA fibre, Ingeo™ (NaturalWorks LLL) not only lowers the carbon footprint of products and components, but it also offers exceptional performance capabilities: it can have the look and feel of natural fibres with a comparable performance to traditional synthetics [13,14].

3.4 Milk protein fibre

The new generation of milk fibre is a man-made fibre made of milk casein. Milk fibre adopts continues graft copolymerization techniques. To make milk protein fibre, milk is first dewatered and skimmed, then by means of a new bio-engineering technique, the protein spinning fluid suitable for a wet spinning process is manufactured, then finally the new high-grade textile fibre is made. The producing process has no effect on the environment and there is no toxic component (formaldehyde) in the product, so milk fibre can be considered as a „green product”. It is superior in strength and has far better qualities than many other man-made fibres. It contains seventeen amino-acids and natural anti-bacterial rate is above eighty percent and has a long-term emission of negative ions. It is thus beneficial for air quality, it stimulates blood circulation, is a natural antibacterial agent, and is sterile. It is resistant to fungus, insects and aging. Yarns from milk fibres can be blended with other fabrics like cotton, silk, and cashmere to give it different characteristics. They are particularly suited for contact with the skin in clothing, underwear, and bedding. Fabrics made from milk fibre are easy care, light weight, soft, keeping tender hand-touch [15].

Figure 6: Fabrics made from milk protein fibre (produced by Filati Maclodio SpA.) [15]

3.5 Soybean protein fibre (SPF)

Soybean fibre is made from soybean cake after oiling, by bioengineering synthesizing from the distilled spherical protein. The production started in the 30’s but without big market success. In 1998, a new soybean fibre was invented, characterized by good affinity with skin, soft handle and excellent penetrability, and especially demonstrates obvious advantages in knitting garments. With the functions and effects of bacterial inhibition, far infrared, negative ions and resistance to ultraviolet, it is a super material to fabricate top-grade knitting underwear and household textiles [16].

Table 1: Advantages of soybean protein fibre[16]

advantages	**characteristics**
"Cashmere feel"	soft, smooth, light,
Dry and comfort	the moisture absorption is similar to that of cotton fibre, but its ventilation is more superior to that of cotton.
Luxuriant appearance	silky luster with perfect drape and elegant
Good colour fastness against sunshine and perspiration	Compared with silk products, the problem of freshness of colour and stability of dying is solved.
Anti-ultraviolet property	superior to cotton fibre, much more superior than viscose and silk
Good mechanical property	Breaking strength of the single fibre is over 3.0 cNdtex, which is higher than that of wool, cotton and silk and only lower than that of polyester fibre of high intension
Function of Health	possesses many amino acids
Skin Evaporation	Its amino acid can activate the collagen protein in the skin, resist tickling and evaporate the skin.

Biopolymers trumped the other plastics for biodegradability, low toxicity, and use of renewable resources. It is interesting to know, that although they are more eco-friendly material, but farming and energy-intense chemical processing means they are dirtier to produce than petroleum-derived plastic, according to a study in Environmental Science & Technology[17].

3.6 Recycling polyester fibre

Fortrel®, EcoSpun® (Wellman Fibres Inc.), Eco-Intelligent® (Victor Innovatex Inc.) or RePET® (Libolon Inc.) are registered trademarks for "recycled polyester". The recycling of PET-bottles is meanwhile an industrial standard process. It does not need any more the virgin PTA (terephthalic acid) which is made from petroleum as its raw materials, so it saves more than 50% of energy and CO_2 emissions due to curtailing many process of manufacturing the petrochemical material [18].

These "recycled polyester" fibres are very soft to the touch and can also be blended with other fibres for enhanced qualities. It is used mostly for vests, jackets, pants, blanket throws and accessories, but also used in carpets, home furnishings and fibrefill.

Recycling polyester fibre could be more eco-friendly when the dyeing process is eliminated through injecting pigments directly into the polymers during the spinning process. This guarantees reducing energy use, greenhouse gases emissions, and water and chemical consumption. Environmentally friendly sewing thread made from recycled PET bottles are also on the market (made by Coats), it is available in a range of counts, sizes and colours, primarily for use in apparel.

4 ETHICAL FASHION

An important task of design education could be the implementation of the ethical approach in the design process.

After finishing their education many designers start to work for multinational companies, either as an outside consultant or as an in-house employee. They could get a job to develop a new green fashion, more cost effectively as in the past. How could the principles of ecological sustainability and social aspects be combined during the design process?

Could textile chain be economically sustainable? In the global businesses, raw materials come from one part of the world (particularly from developing countries), manufacturing happens in another place, and final sales are made somewhere else – meanwhile all these products are transported through many thousand kilometres causing high environmental pollution. The global production could affect economic imbalances, can lead to impact labour conditions, human rights, and environmental practices. Should production on textile be allowed in countries like, Bangladesh?

Design education should even involve the question of social responsibility and fair trade. It is important to explain, that fashion is ethical, when the design, material and producing process used for their products are sustainable; not causing damage to the environment and the society. It is the way to contribute to the betterment of all and to ensure abundance, diversity, and health to the future generations. Ethical companies work under fair condition and pay fair tariffs for their workers.

To fair working condition belongs the principle of supply chain responsibility, fair labour standards, multi-stakeholder verification, transparency, a process-approach to implementation, involvement of stakeholders in producing countries. In many countries, ecological principles are being written into law, general reference information is available to designers and producers from a number of sources, including several professional associations (Fairwear Foundation, Fair Trade, Rat für nachhaltige Entwicklung, Internationale Verband der Naturtextilwirtschaft e.V., Ethical Fashion Forum, etc.). In many companies there are department for Corporate Social Responsibility (CSR) to examine human rights of workers, working hours, wages and freedom of association, etc. It happened very often, that staff were not paid adequately for overtime.

The Fairwear Code of Labour Practices e.g. is based on internationally recognized standards which have been set through tripartite negotiation. The core of this code is made up from eight labour standards [19] derived from Conventions of The International Labour Organization (ILO) and the UN's Declaration on Human Rights:

1. Employment is freely chosen.
2. Freedom of association and the right to collective bargaining.
3. Safe and healthy working condition.
4. No exploitation of child labour
5. There is no discrimination in employment
6. No excessive working hours
7. Payment of a living wage
8. Legally binding employment relationship.

5 SUMMARY

Sustainability is a challenge for designers. It needs innovative thinking to reduce consumption and waste, reduce the use of toxic materials, encourage reuse and recycling, increase energy efficiency, and encourage the development and use of renewable energy sources. Education should distinguish between "green" fashion using "renewable" material like bamboo, and the practice of reducing or eliminating environmental impacts of fashion design keeping in mind social and economic issues. Designers need life cycle thinking to understand how the developed fashion products impact on the environment, they need to learn how to use an effective tool (Life Cycle Assessment) to quantify and balance the impacts of fashion design products.

Education should lighten "green" textile labels, trade marks in explaining what are behind these, which institutions are there for control, testing and certifying. Teachers should to be encouraged to discuss with their students how fashion could be "ethical ". It would be important to work on adequate concepts, strategies and tools to teach sustainable fashion. The aim is to improve the environmental performance of fashion products throughout their life-cycle by systematic integration of environmental aspects at the earliest stage of their design.

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