

Challenges of The Hungarian Textile and Clothing Industry and Textile Education

Lívía KOKAS-PALICSKA

Óbuda University, Rejtő Sándor Faculty of Light Industry and Environmental Protection Engineering,
Institute of Product Design, 1034 Budapest, Doberdó str. 6.
e-mail: kokas.livia@rkk.uni-obuda.hu

***Abstract:** Sustainability and innovation (smart textile) are key drivers for business growth and the success of the textile and fashion industry. This paper presents the current situation and challenges of the Hungarian textile and clothing industry showing several companies as good examples of an innovative way of thinking. There is a demand to bring together the market players along the apparel and textile supply chain to discuss challenges, latest innovation and best available practices on developing sustainable fashion. The implementation of the sustainable approach in the textile and clothing industry could be an important aim of education emphasizing the difference between green marketing, or eco-business and sustainability as a business strategy. Students from the field of textile engineering and fashion design need professional skills in processing technologies and product design, but also adequate information on environment-related problems. Our task is to explain them how to improve the level of functions, to (re)create new products while at the same time to save the environment and to avoid ruining it. This paper aims to highlight our responsibility for the future and shows different ways of managing environmental issues in the textile chain.*

***Keywords:** design education, sustainability, textile innovations, Hungarian textile and clothing sector*

1 The Hungarian Textile and Clothing industry – past and future

In 1989, at the time of the change of the political system in Hungary the textile and clothing industry lost its traditional markets faster than any other sector. Former state companies were wound up, with their places being taken by a plethora of small businesses. In the course of privatization the sector lost a huge amount of capital measured both in terms of means of production and in terms of human resources. The privatized and restructured industry began to consolidate

towards the end of the 1990s, and then started to grow, even if this growth started off only from a very low level. The number of enterprises increased rapidly in the course of the privatisation process until 1997. Since then the situation has been stabilized and the number of companies is even on the increase. State ownership had disappeared by 2000 almost entirely. However, after just a few years import competition began to intensify enormously, a phenomenon that was paralleled by an increasing tendency in the textile trade towards dubious business practices, primarily customs fraud and the avoidance of VAT. Immediately after the turn of the millennium market challenges brought about new forms in quality terms. The global division of labour strengthened, as did the move by manufacturers to relocate their activities to countries operating with lower costs [1].

Current situation of the sector

The sector is largely made up of small- and medium-size enterprises, although they are also attended by a considerable number of sole proprietorships. Besides companies a great many non corporate enterprises operate. These are registered as sole entrepreneurs and usually employ 1-5 people. Their number is decreasing; those of them who are successful become corporate enterprises. The number of registered enterprises approaches 4,500, although it is true to say that the number of functioning businesses is somewhat smaller than this. The sector currently employs around 50,000 people, the vast majority being female labour. There is a strong demand there

- to stop, stabilize and renew the Hungarian textile and clothing industry, with enhanced innovation and through changing the product structure
- to enlarge the number of competitive companies in the sector to save the actual level of employment
- to enhance the prestige of the sector

There are several factors to mention which negatively influence the development of the Hungarian textile and clothing industry:

- globalization - free trade, cheap import
- relative high labour costs
- increase in competition - countries with high productivity levels and low wages
- relocation of production to countries of Asia, Oceania, India and South America
- extremely unfavourable wage relations
- lack of state support
- low capital for the development of own products with high added value

The dramatic shrinkage of former capacities to produce hemp and flax in Hungary results in a danger, that more than 120 years of experience in production and processing will be lost. The knowledge in development of a drug-free industrial hemp plant and the “cottonization” of hemp is still available and could be used for the production of hemp-based green products especially in technical applications. This could contribute to the development of the Southern-Plains region of Hungary and to building cross-border cooperation. 1-2% of the Hungarian corn production (infected or waste for burning) could be used for the production of polylactid acid to produce polylactid fiber (PLA).

The textile sector has become more innovative in the past years, approached new markets and applications for their products. Nowadays about 50 % of textile products are used for technical purposes.

Sub-sectors/technologies/products with potential from an export aspect [1]

- work and protective clothing
- technical textiles
- healthcare textiles
- home and household textiles
- other fashion items
- car carpets

Enterprises involved in the manufacture of technical textile products are relatively large, but mostly SME's with their own R&D strategies, to pursue continuous product development. Businesses active in this sub-sector are proving themselves increasingly successful not only on the Hungarian market, but on the wider European market, too.

2 Sustainable approach - a challenge for the market players of the textile and clothing sector

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. But sustainability means more than using environmentally-friendly materials, it is a strategy to save the environment, to reduce material and energy consumption, to be cost-effective in the production process and during the usage, equally considering

environmental, social and economic aspects. It need a holistic approach, in which environmental, economic and social aspects are equal.

There are three ways of managing the sustainable approach in the fashion sector:

- Product design and fabric/raw material selection (choosing more eco-friendly products and processes, (re-) design, re-examining markets, reusing waste and making well-designed and efficiently manufactured products)
- selecting retailers (choosing suppliers with a credible certificate, environmental policy)
- informing the consumer (seminars, consumer organisations)

There is a need for opening a dialogue between the brands and retailers and their supply chains to broaden integration of sustainability as a business strategy. The demand to know more about textile ecology is increasing, more and more events and organizations (Ethical Fashion Forum, the RITE Group, Textile Exchange, Made By, etc.) offer information on topics like green textiles, sustainable textile processing, eco-indexing, traceability and transparency, organic fibre production, and environmental footprint are discussed worldwide at many forums and conferences. A number of seminars are offered to provide an open and neutral ground to discuss most burning environmental issues, latest innovations, challenges, and the best practices on developing sustainable fashion production. [2].

2.1 Raw materials for eco-fashion

Designers for eco-fashion prefer to use natural fibers or recycled materials. Even conscious consumers think that eco-textiles equals to fabrics made from cotton, silk or wool. Cotton as the largest natural fiber in the global fiber, textile and apparel economy represents now roughly 80 % of all natural fibers consumed. The natural fibers complex generates hundreds of billions of dollars of revenue annually in the global economy, and results in hundreds of millions of jobs. But it is important to point out, that regular cotton plants need a large land-use, high quantities of pesticides and fertilizers, and a high water consumption and there are also some ethical issues regarding genetically modified types. Even regular wool has a high climate impact, and involves doubtful animal welfare practices (mulesing Merino sheep). Results of Life Cycle Assessments of environmental impacts of fiber production show that nowadays there are much more fibers on the market, which could be used for eco-fashion, than natural or organics. Fibres based on renewable primary products using eco-friendly production processes, or ones made of various forms of plant biomass or recycled material should not be ignored by designers for eco-fashion.

2.2 Eco-labels

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. Over the past ten years, the development of various eco-labelling schemes has raised the profile of environmental issues within the textile and clothing supply chain. Several national and international eco-labelling schemes are in use worldwide causing increasing confusion on the marketplace. Selected eco-labels (Figure 1) for textiles were discussed by Author in another paper [3]



Figure 1 „Green” labels as marketing tools

Comparison of social and environmental requirements of organic farming and fair trade shows how effective these labels can be used for going sustainable (Table 1).

Table 1 Social and environmental requirements[4]

	environment	biodiversity	animal welfare	human rights	labour condition	trade relation
fair trade	++	++	NR	++	+++	+++
organic	+++	+++	+++	++	++	-

+++ Included to a high extent, ++ Included to a moderate extent, + Included to a limited extent,

- Not included, NR Not relevant

To encourage innovation in the textile and clothing sector, whilst allowing fibre users and consumers to benefit more readily from new and innovative products a lot of compromises are needed. EU institutions agreed in April 2011 to simplify the textile regulation allowing consumers to gain more information about textile products. The Council and the EP agreed that the Commission should carry out an in-depth study over further requirements of mandatory labelling, this could include handling instructions, the unification of sizes, the indication of the country of origin and allergic substances, electronic labelling and other technologies [5].

3 Innovation – as a key driver for being sustainable

The ever changing market forces the industry to respond very quickly. Consequently processes and technology change from one season to the other. New investments can be made only if they are in the focus of further development. Innovations may include new production technologies to reduce the labour requirement of garment completion and the development of novel ‘smart’ functions.

The most favoured innovation focuses on product development (functional and smart products) and on environmental friendly, cost effective process technologies. Innovation on the field of raw materials (nanofibers, functional fibers), knitting, weaving and nonwoven technology (space fabrics, tissue engineering), in finishing (digital printing, coating, nanotechnology, plasma treatment, etc.) are key drivers for the future of this branch. Producing innovative textiles could be a guarantee for success.

3.1 Chances for sustainable development of textile and clothing industry

A lot of efforts have been made worldwide to develop new environmental friendly processes in the textile chain. Experts in the UK recommend [6] that for products in which raw material production dominates, in addition to measures to extend product life, alternative processes or materials should be pursued. A switch from conventional to organic cotton growing would eliminate most toxic releases, at the cost of price rises. For products in which production dominates impacts, process efficiency should be pursued and the impact will be reduced by extending the life of the product or by re-using materials by some form of recycling.

Sustainable alternatives:

- Use of organic fibers, recycled and eco-fibres based on eco-friendly production processes, etc.
- Use of new polymers: biomaterials / biopolymers, (reactive) hotmelts, laminates
- (nano)additives
- New finishes and coatings (metallized materials, super hydrophobicity, bioactive finishes, enzymatic processes, (atmospheric) treatments using cold plasma, liquid CO₂, EB and UV, ultrasonic techniques, electrochemical dyeing)

- Lowering the environmental damages of wet processes – through modification, optimisation reducing consumption of dyestuff, chemicals, water and energy
- Process optimisation (Are all this process steps and auxiliaries in these quantities necessary?)
- Fast multi-step treatments
- Advanced textile wastewater treatment (use of algae as the bioremediation agent, heterogeneous complex, radiation, etc.)
- Reducing the amount of toxins and environmentally harmful contents in chemicals for dyeing, printing and finishing (alternative chemical products)
- Optimizing processes for laundries of hospitals and for dry-cleaning
- Saving energy in mechanical processes in apparel industry (energy-efficient lighting)
- New technologies for the modification of the surface (plasma treatment)
- Implementing the sustainable approach in product development, in service and education.

The main effects of surface treatment using plasma is cleaning, the increase of microroughness (anti-pilling finishing of wool) and the hydrophilic surfaces. Fields of application are in desizing, functionalizing, and design of surface properties of textiles. Plasma treated textiles could be extremely dust- and dirt-repellent and hence should also be repellent to bacteria and fungi. It is successfully used for shrink-resist treatment of wool with a simultaneously positive effect on dyeing and printing.

Innovation such as self cleaning fabrics with super hydrophobe surface (lotus effect), the active climate control in cloth using Phase Change Materials (PCM), shape memory alloys or polymers for thermal insulation, the functional fabrics protecting against heat, firer, radiation or mechanical stress and smart textiles with incorporated microelectronic devises for application in health care, emergency or sport open new perspectives and niche markets.

Technology innovations such as 3D knitting and weaving may lead to economically viable production, with some consumer benefits from increased responsiveness. However, this will only have environmental benefits if associated with material recycling.

Comparisons in the energy consumption of clothes in the production and the use phase have shown that the use phase of clothing (washing, ironing, drying, etc.) needs by far the highest amount of energy, and causes the largest portion of CO₂ emissions [7]. Using innovative production techniques, wash temperatures of

cotton products can be reduced and tumble drying avoided. Novel treatments may provide resistance to odours so reducing the total number of washes or allow faster drying with less ironing. Technological innovation may lead to new means to freshen clothes without washing, efficient sorting of used clothing, new fibre recycling technologies and new low temperature detergents.

3.2 Research and developments in the Hungarian textile and clothing sector

Research activities related to the sustainability of the textile and clothing industry are being carried out at different knowledge centres in Hungary: at the Institute of Isotopes and at the Institute of Materials and Environmental Chemistry of the Hungarian Academy of Science, at BAY-ATI, Institute for Materials Science and Technology, and BAY-NANO, Institute for Nanotechnology, at the Department of Polymer Engineering and at the Faculty of Chemical and Bioengineering of Budapest University of Technology and Economics, at Rejtő Sándor Faculty of Light Industry and Environmental Protection Engineering of Obuda University, further at INNOVATEX Textile Engineering and Testing Institute Co., and at Nanovo Ltd., etc.

Two textile clusters were built in the past years in different regions of Hungary, the Pannon Textile Cluster (PanTex) and the South Great Plain Regional Cluster with the aim to help ensure the more efficient and profitable work of textile industry and service development specialists and enterprises.

PanTex (www.pantex.hu) was established in 2005, with the aim to help ensure the more efficient and profitable work of textile industry and service development specialists and enterprises in the West Transdanubian Region. The cluster offers his more than 37 members services in market research, trend tracking, career guidance, information service, interest representation, formation of a common website, project generation, benchmarking club, support for innovation, development activities, assistance in structuring supplier partner relations, partner meetings, assistance in participation at exhibitions and fairs, organization of business meetings, publishing of joint professional publications, arranging logistics activities, etc.

The South Great Plain Regional Textile Industry Cluster (<http://www.eurotex.eu/klaszter.html>), founded in 2001 focusing on the knitting industry, have established their own supplier network, jointly operate a machinery service, coordinate orders in order to distribute capacity, operate a pattern design studio and put forward joint offers of products manufactured by the member enterprises. The cluster places great emphasis on product development. Their latest development is, for example, the application of nanotechnology in order to give their products an antibacterial element [8].

Besides the above mentioned in this chapter selected (by Author) examples are presented for developments of last year realised in the Hungarian textile and clothing industry.

3.2.1 National Technology Platform for the Renewal of the Hungarian Textile and Clothing Industry (TEXPLAT)

The project was sponsored by the National Office for Research and Technology and coordinated by the Hungarian Society of Textile Technology and Science (TMTE). The aim of the project was to renew the Hungarian textile and clothing industry through the transformation of their product structure, as well as to determine the main directions of R&D&I activities accordingly for the next decade. Besides uniting enterprises, TEXPLAT has a central role in the renewal of the product structure of the Hungarian textile and clothing industry, maintaining outside contacts of the industry as well as boosting the self-esteem and prestige of the sector.

The platform focused on two milestone-like tasks in 2009-10 (in the first two years of its operation):

- to draw up a roadmap and a mission for the Hungarian textile and clothing industry as well as compile its Strategic Research and Innovation Plan.
- to work out the Implementation Plan, based on the strategy.

An important task of the Platform is to involve the most competitive enterprises of the Hungarian textile and clothing industry – as many of them as possible, including SMEs too – in the activity of the Platform and to help them effectuate the results of their innovations in the form of marketable products and services. [8]

3.2.2 Anti-bacterial fabrics using nanotechnology

The Hungarian state-owned textile company, Szefo has jointly collaborated with Szeged University of Sciences to develop an anti-bacterial fabric by incorporating nano silver technology. The patented process and the anti-bacterial outer-wear fabric will be utilized in orders executed for Italy's Dama, its main exporting partner. Joining the Enterprise Europe Network, the 51-employee small company, Eurotex Ltd, making knitwear for Italian designer Emidio Tucci among others, adapted also nanotechnology based finishing to produce jumpers lined with Russian-made nanosilver [5].

Nanosilver has antibacterial substances designed to keep clothes fresher for longer. Since nanosilver-reinforced clothes prevent the wearer from sweating into the material, they require less frequent washing than other alternatives.

3.2.3 New plant for the production of innovative nonwoven products

The automotive industry has become one of the most important industrial sector for Hungarian textile companies. The well-known German company, J.H. Ziegler GmbH is investing nearly 7 million EUR in a new production building and in the most modern, largest and most versatile production systems for nonwovens in Bábolna. The company opened his first plant in Hungary in 2006. It has been producing nonwovens primarily for the furniture industry, but it will now be able to supply the automotive sector with a far greater proportion of acoustic absorbers and other nonwoven components directly from Bábolna/Hungary. In 2010, Ziegler achieved a turnover of around 30 million EUR, which represents a 40% increase compared to 2009. Just over half of the total turnover came from the automotive industry and its sub suppliers [5].

Background of the investments are:

- good productivity of the workforce,
- excellent logistics location (close to the city of Győr)
- continued growth of the local automotive industry

3.2.4 Increase of capacities to produce innovative active wear

Manifattura Italiana Tessuti Indemagiabili Spa (M.I.T.I.), an Italy-based manufacturer of high-quality fabrics, is setting up a plant in Hungary with innovative production facilities. The company has refurbished a textile plant in Szentgotthárd (western Hungary), where it proposes to increase its concentrated staff strength from 40 to 100 employees by adding other 60 employees. It invested over €2 million for the refurbishment of the 4,000-square-metre production capacity to furnish it with high-tech weaving machinery. Cheap availability of labour in Hungary was the primary reason for this shift. M.I.T.I. is to set on board in Hungary, a new development scheme which apart from enhancing the capacity will also expand its range of products. Over the past 78 years, M.I.T.I. has produced several different kinds of knitted fabrics. Also during the past decades its activities have concentrated on high-performance stretch fabrics for active wear. With its 200 employees its main focus is on the western European market [5].

4 THE CHALLENGE OF TEXTIL AND DESIGN EDUCATION AT RKK

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. An important task of our textile design

education is to show the basics of eco-design - how principles of ecological, ethical and social aspects could be combined during the design process.

As a teacher of textile and marketing and as researcher I would like to contribute to the changes of our design education highlighting the importance of our responsibility for the future. Students need professional clothing design skills, but also adequate information on the actual problems of sustainability in the textile and fashion industry. It is important to explain them the disadvantages of global business - it causes tremendous environmental problems due to the long transit ways, etc. -, and to point out the social and ethical responsibility (the trend of over-consumption of clothes creating “fashion victims”), the poor working conditions in sweatshops and, among others, the principles of fair-trade. Increased emphasis on durability as a component of fashion would support a move towards reduced material flow. The sector could have its material flow without economic loss if consumers pay a higher price for a product that lasts twice as long.

Our education has encouraged several activities in the last years related to the topic sustainability and eco-design. A successful initiative for advertising eco-design was the competition for schools organised at RKK in the past years. Interesting design concepts for recycling and reuse were sent from 11 Hungarian high schools to the exhibition in 2010 at RKK (Figure 2) [9].



Figure 2 “Waste couture” by Dobos Emese, Green design competition for high school students at RKK [9]

The protection of the environment was one of the most important topics at the summer university programs “European Digital Print Media” (<http://rkk.bmf.hu/edmm>). The international project was organised three times at “Rejto Sandor” Faculty of Light Industry and Environmental Engineering (RKK) at Obuda University with the financial support of the European LLP/Erasmus program. Innovative digital printing technologies were used to form designer approach responsible for the future. At the final exhibition of the 3-week programs students presented the importance of sustainability in different ways (Figure 3).



Figure 3 A student's works using digital printing techniques [10]

Our designer students and teachers participate yearly at the international workshop “Metal Inspirations” sponsored by the American company U. S. Steel in Kosice. The workshop 2011 was organised by the Department of Design at the Faculty of Arts, Technical University in Kosice together with the steel company and the Vocational School for Metallurgy in Kosice-Saca with the slogan among others „We support a safe and healthy environment” to inspirit eco-design and re-design. At the end of the workshop the most innovative design products of our students and teachers (Figure 4) were exhibited in the Technical Museum of Slovakia [11]



Figure 4 Design work of participants of Institute of Product Design, Obuda University at the international design workshop »Metall Inspiration«[11]

Our students from the study field of Product Design Engineering (BSc) and of Light Industry Engineering (BSc) specialised in textile and fashion pick up a sustainable approach in different subjects during their 3.5-year studies. Besides regular subjects other initiatives could be also mentioned, where this approach was integrated. The tasks of our higher education and the textile/apparel industry in training future textile experts and product designers are:

- to implement innovative and sustainable approaches adapting suitable methods for innovation management

- to use successful alternative teaching methods and trainings for eco-design in life-long-learning process
- to strengthen the cooperation among designers, product developers and production companies for creating competitive eco-fashion products
- to enhance the dissemination of information resulted from LCAs and other evaluation methods of environmental footprints of textiles
- to collect information about the best available practises decreasing the environmental impacts of textile processing and supply chain to disseminate them among the market players of the sector
- to cooperate with the members of the supply chain to build a platform between educators, industry experts and supplier/retailers on environmental issues

Summary

Sustainability and innovation are challenges and the right business strategy for textile and clothing companies to grow up and be competitive in the future. It needs innovative thinking to reduce consumption and waste, the use of toxic materials, to increase energy efficiency, to encourage reuse and recycling, and the development and use of renewable energy sources. There is a difference between “green fashion” using renewable material like cotton or 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 have an 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. Textile and design education plays an important role in the dissemination of information resulting from LCAs and other evaluation methods of environmental footprints of textiles. Although there are some good initiatives in design education at RKK, it would be important to work on adequate concepts, strategies and tools to teach sustainable fashion 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.

The new established platform named TEXPLAT aims to renew the Hungarian textile and clothing industry through the transformation of their product structure as well as to determine the main directions of R&D&I activity accordingly for the next decade. There are a number of examples for textile innovation which lead to sustainable developments – some of these are researched in several Hungarian knowledge centres or adapted by Hungarian companies. Decision makers have a

high responsibility to support the implementation of such innovation and to strengthen the sustainable approach encouraging discussion with educators, designers, industry experts and supplier/retailers.

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