



Book of Abstracts
TEXTILE SCIENCE RESEARCH CENTRE
OPEN DAY 2019



CIRCULAR ECONOMY CHALLENGE FOR
TEXTILE/CLOTHING/LEATHER/FOOTWEAR SECTOR

Organizer: Textile Science Research Centre (TSRC)
University of Zagreb Faculty of Textile Technology
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CONTENTS

LECTURES

D. Drmač: Circular Economy in the EU – New trends	1
K. N. Simončič: Sustainable Fashion Design - Causes & Opportunities	2
E. Vujasinović, S. Bischof: Eco Design	3
S. Bischof, T. Krička: Design of Advanced Biocomposites	4
H. Boljar: Ecologically Sustainable Footwear	5
A. Falak: SET – Save Energy in Textile SMEs	6
J. Mucko: Wake up your creativity!	7
S. Flinčec Grgac, T. Dekanić, A. Tarbuk: Hospital Protective Textiles	8
S. Ercegović Ražić, J. Akalović: Environmentally Friendly – National Environmental Protection Label	9
T. Pušić: Environmental Profile of Washing Process	10
D. Kodžoman: Qualitative Analysis of Swedish Fashion Brands with Emphasis on Sustainability Concept	11
M. M. Kodrić Kesovia: Method of Analysis and Digitalization of Technical Documentation of Historical Damask Fabrics in Dubrovnik	12

EXHIBITIONS

T. Novak, B. Kožuh: Biomaterial Manufacturing – Change begins with us!	13
K. Laszlo Klemar: Tailored Futures?	14
S. Kutnjak Mravlinčić & students: Footwear Design - student internship in footwear factories	15
A. Pavetić & students: Author's Initials as Patterns on Textile Bags – part II.	16
J. Končić, I. Šabarić & students: Awarded students work on Labtex Company Contest	17
Ž. Knezić & Associations <i>Sunjanka Sunja, Ozana Zagreb, Hajdina Donji Kućan</i> : Textiles are not thrown away	18

Dunja Drmač

Sustainability Officer at EURATEX (European Textile and Clothing Confederation), Brussels

Circular Economy in the EU – New trends

Resource intensity, microplastics, EU restrictions on chemicals are pressing issues for the European textile and clothing sector, coming from the public, media and institutions.

With the new European Commission starting this fall, it is clear that the textile sector is in the focus of policy-makers. Since 2017, EURATEX, as the official voice of the European Textile and Clothing Industry, together with its Members, strives to identify success stories, needs and challenges for companies to prosper in circular economy. In unprecedented collaboration sealed in May 2019 with global fashion and retail actors, EURATEX and the signatories call for a set of new, more effective policy tools while through company evidence, EURATEX shapes up its own EU textile Strategy for a circular economy that truly delivers.

Sustainable fashion design - causes and opportunities

From all processing industries, today the most harmful to the environment is textile and garment industry. The accident in Bangladesh in 2013, where 1123 workers were killed, has led to the finding the new approaches to production based on the circular economy (re-exploitation already used). Thanks to theoretical discussions and creative platforms, which underpinned by sustainable development, the scientific community and the public were stimulated the awareness of adverse consequences of fashion industry. Fashion in the context of sustainability, develops so-called slow fashion production, response to the current aggressive fast fashion. The lecture will give a historical insight into the reasons for initiating the sustainable fashion movement, as well as providing examples of good practice through artistic and fashion production.

Eco-design

1980s are considered as beginning of the ECO era in textiles. Naturally coloured cotton and organically-grown cotton were released on the market, formaldehyde-based cross-linking agents were replaced by citric acid, natural dye become IN, while microwave and plasma treatments turn out to be 21st century most promising technology. Efforts have been done to set up concepts and technological solutions that can conserve or save resources and prevent environmental pollution. So, two fields of action were identified: production process and product, or so-called “clean” production and eco-design. Cleaner production led to the efficient production technologies and reduced the consumption of resources, thus lowering the production cost. On the contrary, product eco-design has proven to be more challenging. Its (potential) environmental and economic impacts or advantages go beyond demands of the manufacturers. The first milestone was set in 1992, when IDSA - the American Association of Industrial Designers - published a catalogue of 12 eco-design facts that were formulated as guidance for resource reduction and recycling opportunities for industrial design and redesign. Introduction of an eco-labels (e.g. EU Ecolabel), integration into the ISO standard and EC Directive on eco-design followed. Although today, in the field of sustainable development and circular economy many similar terms such as design for environment, green design or sustainable design are used. Nevertheless, eco-design has remained synonym for design that takes into account the impact of product on the environment throughout its entire life cycle. Eco-design aims to reduce environmental impact and seeks, at the same time, to improve the aesthetic and functional aspects of the product. It also includes the consideration of social and ethical needs while product contributes to social and economic well-being, and can be produced from renewable raw materials. Therefore, it is no wonder, that one of the pioneers of eco-design said that today's designers have very difficult task, so as moral and ethical obligation to be responsible for the design and its impacts!

Sandra Bischof & Tajana Krička*

University of Zagreb Faculty of Textile Technology

*University of Zagreb Faculty of Agronomy

Design of Advanced Biocomposites

Design of Advanced Biocomposites from Energy Sustainable Sources (BIOCOMPOSITES) is a project to design and produce advanced biocomposite materials of enhanced properties with wide application potential characterised with total assumption of raw materials through the production of biofuels based on the development and application of new technological solutions.

Developed innovative products and technologies will be transferred into the scientific and business sectors, respecting the principles of resource efficiency and circular economy.

Combining design with advanced technologies and advanced materials project activities will have direct impact on development of automotive, agriculture and energy sectors and indirect impact on textile/clothing/leather/footwear (TCLF), construction and wood sectors. Projects final and longterm goal is to help to increase competitiveness of involved sectors, so as their GDP.

Hrvoje Boljar

MIRET, Duga Resa

Ecologically sustainable footwear

Working in the high-end fashion footwear industry for 10 years, we have worked with some of the best and some of the worst brands in the world. We had an opportunity not many people get to have — to see the industry from the inside. We have experienced a sobering moment and a realization of the environmental impact of the industry. We felt obligated to solve this issue. 20 billion pairs of shoes are produced every year. That's enough to circle the Earth with 300 lines of shoes, every year. MIRET is one of the global pioneers in the area for ecologically sustainable footwear and one of the first for offer a radical change.

SET – Save Energy in Textiles

SET, Save Energy in Textile SMEs, is a collaborative project launched to enable the European textile SMEs to improve their energy efficiency and achieve tangible and countable economic and resource-efficiency benefits.

More information on SET can be found in the official website www.euratex.eu/set.

The SET project is a part of Energy Made-to-Measure information campaign running until 2016 to empower over 300 textile & clothing companies, notably SMEs, to become more energy efficient. A major outcome of the SET project is the SET Scheme, a tool designed for textile companies to autonomously assess their energy consumption and performances in the production process, ultimately to improve their energy efficiency.

The SET Scheme is made up of 3 elements, a guide document (this file); a stand-alone software (SET Tool) for self-assessment with a user friendly interface; and an on-line part (SET Web) for advanced benchmarking and comparison of the performances across years.

Waking Creativity

The ESF-funded project "Waking Creativity", based on means of promoting Social Entrepreneurship, is intended to encourage the establishment of a social enterprise in order to handle textile recycling:

- through hygienic treatment of the collected textile before the final division,
- by making items of new usable value from non-wearable textile,
- by separating textile for secondary raw materials.

Also, preparations for work in future social entrepreneurship include:

- Social entrepreneurship educations
- Sales skills training
- Educations on the hygienic processing of textiles
- Creative workshops oriented towards making textile objects of new use value
- Researching economic component of textile recycling; product placement of such hygienically processed textiles, newly made items and purchase of secondary raw materials
- Researching social component, regarding the need of people housed in foster families and single-family homes and their willingness to participate in textile recycling workshops.
- Creating a business plan
- Establishment of business cooperative / association.

Regardless of the currently poorly resolved textile disposal in Croatia, this draft business plan indicates a certain measure of sustainability that could be achieved through social entrepreneurship with the planned activity, but with the additional investment of local government and additional funding from another project. Local municipalities expressed their readiness for financial support in order to establish social entrepreneurship, but the launching of the SOE was postponed in order to fully complete needed prerequisites such as team recruitment that could contribute to the achievement of the set goal.

The application of a simple textile disposal model, similar to Poland or some other EU country, can also be organized in the Republic of Croatia using the logistics of Red Cross companies, but this requires support at all social levels.

Hospital Protective Textiles

The project Hospital protective textiles UIP-2017-05-8780 funded by the Croatian Science Foundation established the interdisciplinary research group that systematically explores the possibilities of manufacturing textiles with reduced generation of textile dust and multifunctional protective properties. A fabric of cotton (CO) and cotton / polyester (CO / PES) yarn was produced to investigate the impact of yarn construction, ties and fabric on the generation of textile dust before and after the washing cycles. Develop and define the conditions of the cationizing and antimicrobial finishing with quaternary ammonium compounds, inclusion complexes β -cyclodextrin - essential oils and chitosan in order to achieve stability on multiple cycles of maintenance with the aim of a minimum of chemical and mechanical damage, which contributes to a smaller release textile dust. Sorption of baths with antimicrobial agents on fabrics is investigated by defining interfacial properties (DSA30S) and in situ monitoring of the effect of heat on physicochemical changes (FTIR-ATR GG), with the aim of accurately defining the process parameters to achieve durable crosslinking. Changes in CO and CO / PES fabrics during and after processing and multiple maintenance cycles are investigated at the crystalline, physicochemical and morphological levels and interfacial analysis using FE-SEM, TGA, FTIR, XRD, MCC, GS-MS, EKA, SFE, CA, MMT, WRV, and UV-VIS spectrophotometry. The newly developed fabrics are tested for toxicity, and will be in accordance with the results obtained suggest their targeted application in a hospital environment with proposed formulation of detergents and methods for their maintenance. Finding and implementing new ideas will be directed towards entrepreneurship in order to stimulate economic growth and further research in the framework of new project applications.

„Environmentally Friendly“ – National Environmental Protection Label

The Environmental "Environmentally Friendly" is a voluntary instrument of environmental protection, which covers products, which are compared with similar products have less negative impact on the environment in the entire life cycle. It provides consumers a complete, credible and scientifically based information on the impact of products on the environment. It belongs to Type I environmental labels and declarations in line with the definition of the international standard for classification of environmental labels EN ISO 14024:2018 (HRN EN ISO 14024:2018 Environmental labels and declarations -- Type I environmental labelling -- Principles and procedures). The appearance of the label prescribed by the Regulations on the Environmental Label "Environmentally Friendly" (NN 91/2016), fig.1.



Graphically display of label - „Environmentally Friendly“

This Ordinance shall regulate the procedure and method of awarding the Environmental Label "Environmentally Friendly", content standards, and a description of the process of development and the way the audit criteria, conditions for use and subtraction sign appearance characters as well as the composition and operation of the advisory expert committee.

Criteria are defined for each product group that includes the most important product environmental footprint during their life-cycle, from exhaustion of raw materials through production to the waste phase (recovery/ recycling/ disposal). They are awarded for a specific period (up to 5 years). Within the framework of the project *Criteria for environmental label protection Environmentally Friendly for „leather“* (S. Ercegović Ražić i J. Akalović, 2017.) the contracting authority of the Ministry of Environment and Nature, an analysis among Croatian leather manufacturers and leather product, according to the national environmental label *Environmentally Friendly* in Croatia was carried out. It can be concluded that leather manufacturers, leather products and footwear manufacturers are interested in environmental issues and production that would be in harmony with environmental requirements and thus create value added for better placement of their products on the market, but they are also aware of the real problems and circumstances that prevent them. The project defines the primary objectives of the criteria for the award of Environmental protection label for leather, criteria for finished leather, and assessment and verification with detailed requirements for each criterion.

Environmental profile of washing process

Parameters of textile care processes according Sinner cycle include mechanical agitation, chemistry, temperature and time. Modern washing processes are based on environmental guidelines for sustainable development: how to reduce energy consumption, use less harmful chemicals and achieve favorable effects. This concept has recently been realized through low-temperature washing processes (LTWs), which require high-performance detergents and enough mechanical agitation. Novel studies and research results have offered an insight into the impact of various types of textiles on the amount of particles/fragments/fibres that could be released during textile lifetime (use and care, washing especially) in the form of microplastic waste, showing at the same time potential impact of parameters Sinner's washing cycle on the amount of shedded fibrils/fibres in washing.

Duje Kodžman

PhD student at University of Ljubljana

Textile Science Award 2019

Category: Young Scientist

Qualitative analysis of Swedish fashion brands with emphasis on the concept of sustainability

Implementing sustainability in fashion design is a demanding task because it includes several complex challenges, especially when taking into consideration that the mere nature of fashion is based inherently on the continuous process of change and the pressure to become new, or be perceived as new. This paper consists of three chapters: a) Sustainability and its interpretation within fashion industry; b) Scandinavia as a world leader in sustainability; and c) Analysis of sustainable Swedish fashion brands. The fashion industry is Sweden's biggest creative industry, and there is a great confidence in the future growth of this industry. Investment into research around the challenges of sustainability in Sweden led to affirmation of sustainable way of clothing production. This paper analyses 8 Swedish fashion brands (in alphabetical order): Asket, Deadwood, Elvine, Filippa K, H&M, Nudie Jeans, Phi and Soft Goat. Aforementioned clothing companies are transforming their business models and improving their supply chains to reduce overall environmental impacts, improve social conditions in factories, and that is why they stand out. Analysis of their business policy is an evidence of successful utilization of sustainability within fashion industry.

Mateo Miguel Kodrič Kesovia

PhD student at University of Zagreb Faculty of Textile Technology

Textile Science Award 2019

Category Young Scientist

Method of analysis and digitalization of technical documentation of historical damask fabrics in Dubrovnik

The objective of this research is developing analysis method for documenting historical patterned damask fabrics through interdisciplinary approach of modern textile material science. All applicable methods of material analysis must be adapted to be in compliance with the ethical principles of textile conservation profession. The contemporary challenges of attribution and studying historical textiles will be demonstrated. An innovative model of comprehensive digital documentation that would incorporate historical, stylistic and technological analysis of the historical patterned textiles will therefore be created and implemented in the Textile Conservation-Restoration Workshop at University of Dubrovnik, Arts and Restoration Department, for documenting historical damask fabrics preserved within the Dubrovnik region. This documentation form will be the basis for developing a future digital repository of historical damasks that would offer optimal research options and general overview of documented textile heritage; enhance methods of determining authenticity and attribution; show the correlation and distribution of certain historical textile patterns; as well as potentially allow digital reconstructions and reproductions of already damaged historical samples using modern weaving techniques.

EXHIBITION:

Biomaterial manufacturing – change begins with us

Sustainability is a trend today. Is this trend truly an inner human need and if it isn't, how do we make it so? A real and long-term change can only happen if the intent is genuine. How to explain people the concept of sustainable development and circular economy to young, without it being merely a superficial understanding that will not inspire them to act? How to make them not only participants, but instigators of change? The answer is: allow them to think creatively and acknowledge that the change truly starts with them.

The project „Biomaterial manufacturing – change begins with us“ has originated as an attempt to answer these questions and challenge the students to create the material completely on their own, in their own homes and turn it into a unique design of their own choice while only spending money for a couple of teabags, some sugar and bacterial culture. It should enable them to make a „fabric“ that complies to the philosophy of sustainability; a 100% biodegradable material that can be reintroduced into nature instead of producing more waste. The entire process of developing the material is unpredictable which adds a touch of excitement to the project.

From dark brown to white coffee shades, transparency, suppleness and rustling quality of the new material are the inspiration for the upper part of the dress. The structure of the material enabled the use of classic sewing technique allowing a playful one-shoulder flounce with added round elements and a butterfly accessory to come to life.

Does such a democratic material deserve to be further researched and perfected? Do we consider it worthy of scientific research or is it just a small, insignificant experiment performed by an eco-enthusiast?

Change truly starts within us considering that „we are limited, not by our abilities, but by our vision“ (Khalil Gibran).

Kosjenka Laszlo Klemar, project manager

Technical Museum Nikola Tesla

EXHIBITION:

Tailored Futures?

The participatory cultural-artistic project "Tailored Futures?" realized in partnership of Technical Museum Nikola Tesla and University of Zagreb Faculty of Textile Technology includes a multimedia exhibition, a participatory program (workshops) and a web platform. It is intended for a people of the age of 54+, in particular workers of former Croatian textile industries. Through 5 themes (division of work, automatization, ecology, self-organization, structures of feeling) the project discusses the past, the present and the future of Croatian textile industry. The aforementioned themes are presented at the exhibition through museum exhibits, objects from the former textile factories and artworks that are created on project workshops in interaction and exchange of knowledge between artists and former factory workers. The project workshops were held in the cities that were once the centers of the Croatian textile industry - Split, Sinj, Zadar, Zagreb, Varaždin, Čakovec and Osijek. During the exhibition in the Technical Museum Nikola Tesla in Zagreb, a number of creative workshops about the use of textile waste by recycling, the use of new technologies in the textile industry and the new forms of self-organizing through the DIY (do it yourself) and Open (<http://skrojene-buducnosti.eu>) one can find information about the project and project activities, as well as theoretical texts by prominent authors.

The project is co-funded by European Social Fund.

Mentor: Suzana Kutnjak-Mravlinčić

Students: Marina Kišić, Martina Višnjić, Natalija Varga Mirić, Danica Habulan, Lucija Šarić, Mia Makšan, Romana Cecarko

University of Zagreb Faculty of Textile Technology, Study Unit Varaždin

Collaboration with SMEs : IVANČICA d.d. Ivanec, **MIDAL d.o.o.** Varaždin,
PROIZVODNJA PG d.o.o. Prelog, **LORENZ SHOE GROUP d.o.o.** Varaždin,
MEISO d.d. Goričan, **JELEN PROFESIONAL d.o.o.** Čakovec

EXHIBITION:

Footwear Design - student internship in footwear factories

Exhibition of the third year bachelor students of professional study Shoe design shows a range of footwear prototypes of different types and purposes, made within the course Shoe design and during the professional internship in the following footwear factories; Ivancica d.d., Midal d.o.o., Proizvodnja PG d.o.o., Lorenc Shoe Group d.o o., Meiso d.d. and Jelen Professional d.o.o. Developed footwear prototypes are made of leather, which is still main resource in footwear. Leather comes as a side product of food industry, closing the loop of the circular economy cycle. The refined skins used by these factories are certified according to the requirements of the footwear industry. In search of new, innovative or simply different ideas students have investigated the selected incentives and designed different types of footwear using available materials and existing molds with associated soles or heels. In the design process, special attention was paid to combining upper parts from multiple components to reduce the material consumption, leading to reduced waste when tailoring a significant segment of the production phase. The results are functional and wearable prototypes of ergonomically shaped footwear, made from eco-friendly materials, unrelated to current fashion trends with the potential to last longer, which is also a trend in sustainable fashion.

Mentor: Andrea Pavetić

Students: Katarina Budiša, Petra Crnogorac, Dora Filipaj, Josipa Hančar, Stela Iličić, Mihaela Juraković, Rahela Bargh, Karla Krpan, Nikolina Krstičević, Iva Malogorski, Vedrana Peček, Hela Perišić, Anđela Šimunov

Associates: Martinia Ira Glogar (digital printing) & Đurđica Kocijančić (sewing)

University of Zagreb Faculty of Textile Technology

EXHIBITION

Author's initials as patterns on textile bags – part II.

The task for the students was to design and realize a quality, functional, aesthetic, ecologically friendly and inexpensive textile product that can be used by different consumers for a long period of time and for different purposes. A textile bag was selected as the product which will be produced, and an initial was selected as the pattern which will be printed on the bag. The chosen shape of the bag is very simple - it's a A3 rectangle with wide and long handles. The bag is made of thicker unbleached, non-dyed cotton fabric. Because of the chosen shape and textile material, the bag is easy to produce and maintain, high-quality, functional, durable, inexpensive, eco-friendly and suitable for everyday use. Initials - letters that are designed to stand out, were selected as the patterns which will be printed on the bags because they give to consumers ability to choose the bag with the initial that suits them best, symbolically and visually. Each student designed several letters of the English alphabet. During this creative process students showed their creativity, individuality and originality. The initials were printed on the bags using the digital printing technique. As a final result of this process was created a textile product that, by its characteristics, fits into the principles of the circular economy. Exhibited works, created within the course of Creativity in textiles IVA in the academic year 2018/2019 at the University of Zagreb Faculty of Textile Technology, show us how successfully students have solved the given task.

Jasminka Končić & Irena Šabarić

University of Zagreb Faculty of Textile Technology
Labtex d.o.o.

EXHIBITION

Awarded students work on Labtex Company Contest

Design contest by Labtex d.o.o. for the students of the University of Zagreb Faculty of Textile Technology, entitled DESIGN AND MAKING OF CONCEPTUAL SOLUTION OF WOMEN'S MEDICAL WORKWEAR included the following evaluation criteria:

- conceptual design of women's medical workwear/design of four women's medical workwear garments (working coat, short blouse, tunic and trouser)
- sketch concept of each garment (drawing project)
- material color proposal for garment
- a technical sketch of each garment.

Awarded students are:

1. Ana Marija Guša
2. Marija Pavličević
3. Dominik Brandibur

Students work will be presented as part of the exhibition.

Mentor: Željko Knezić

University of Zagreb Faculty of Textile Technology, Center of Creative Weaving

Collaboration with TSRC & Associations:

Sunjanka Sunja, OZANA Zagreb, Hajdina Donji Kućan

EXHIBITION

Textiles are not thrown away

In the tradition of the citizens of the Republic of Croatia every textile item has a special attention. Once the garment is not wearable anymore, it is used as the weft in weaving blankets, bed mats, covers for seats or benches. Despite tendencies of the consumer society to replace old items immediately with the new ones, and throw the old ones - the traditional weaving and use of already used textile items to create new useful items is still nurtured among the small part of the population. The benefits are manifold: creation of a new unique product, reducing the amount of waste, while participants have the opportunity to show their creativity in which they feel useful, and contribute to the preservation of tradition.

Organizing Committee:

Sandra Bischof, president

Tanja Pušić, vice-president

Anita Tarbuk

Tihana Dekanić

Slavenka Petrak

Ana Sutlović

Ivan Beritić

The implementation team:

Lea Botteri

Branka Brkić

Ivana Čorak

Martinia Ira Glogar

Rajna Malinar

Nikolina Mamlić

Kristina Šimić

Ksenija Višić

Anja Ludaš

Mateja Mataković

Karmela Wolff