CLEANTEX

Clean and Innovative Textiles Strategy for Circular Economy

MODULE 2
Eco- design for Circular Economy

Unit 2.1
Eco- Design Highlights

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This module will explain the role of design on the sustainability of textile products. It will briefly the role of design in the circular economy, it will present some definitions of EcoDesign, Drivers for EcoDesign, Eco Design and Consumers, EcoDesign and Designers and finally Tools for EcoDesign.

Introduction, definition, aspect that affect and indicators that set an eco- design

Eco-design is a new philosophy that can affect all phases of product development embedding the concept of product sustainability and taking into account green criteria from start to finish.

According to the European Environment Agency, ***"eco-design is the integration of environmental aspects into the product development process, by balancing ecological and economic requirements. Eco-design considers environmental aspects at all stages of the product development process, striving for products which make the lowest possible environmental impact throughout the product life cycle".***

Ecodesign involves designing or redesigning products, services, processes or systems to avoid or repair damage to the environment, society and the economy. The basis of eco- design is the product design process. Due to the changes that happen to the different environments that affect the business world, the social environment, the legal, governmental, technological and the actual environment. The concept of eco-design is the new method of product design, since it is combining all the necessary resources in the multi- faceted filed of product design, manufacturing and supply chain management. This new concept assists to predict, partly, the possible changes in the impacts that the design and manufacturing processes will leave on the environment.

There are several different names that refer to the same concept and factors of eco- design. These names are:

- Sustainable design
- Environmental and conscious design
- Life-cycle and life-cycle engineering design
- Clean design

The complexity of eco- design is mirrored in the multiple questions that need to be answered in order to determine the adequacy of a company's so- called eco- design process. The questions will work as monitors to valorize the industry's and the environment's aspects:

From the side of the industry, it is called to answer:

- Does the tool support the meeting of product requirements?
- Does the tool address environmental product legislation requirements?
- Can the tool be used by company staff, or will external expertise be required?
- Does it reduce the risk of important elements being forgotten?
- Does it fit in well with how products are launched by the company?
- Is the tool user friendly, easy to adopt and implement?
- Does it save time in the overall development process?
- Is it affordable by the company?
- Is it acceptable in terms or environmental responsibility?

In order to produce answers to these questions one must measure the efficiency of the sustainable thinking. Therefore, this is useful to measure the use of resources and their efficiency, the impact of

the economic activities to the environment, while taking into consideration social economic and environmental fields. While it seems that one is trying to measure the unmeasurable there have been researches and regulations produced, according to the legislations of the countries, continents and businesses.

Eco- design in the fashion industry

A big sector that eco- design plays a very important role in, is the fashion industry. The clothing, the accessories, the shoes and the leather industry are already taking into consideration the mentality and are adopting it to their labour and production as a major factor. Hence, new principles are being developed for new business models that will increase the clothing use, for the creation of safe and renewable inputs and for the creation of solutions so that the used clothes are turned into new.

First thing first, is the categorization of the fashion industry. It can be divided into two types, the slow fashion and the fast fashion model. By the names only, it is easy to understand what each model represents. On one hand, fats fashion is following a specific mindset that is recognized by:

- Mass production
- Globalization
- It is depending its activity on the image of the company
- New instead of old (old is commonly referred nowadays to vintage)
- There is a large dependency on the market needs
- There is unawareness surrounding the impact that it has to different environments
- Its cost is based on labour costs and material costs
- The production is of large scale

And on the other hand, slow fashion model's mindset is recognized by:

- Diversity in production (meaning producing unique items)
- It can be of global and local activity
- It is depending its activity on the sense of self
- Instead of aiming to produce new products, it is focusing on making long lasting and well-maintained products
- There is mutual trust between the company and its market
- There is awareness of the environmental impacts
- The pricing is based on transparent and true facts incorporating ecological and social costs
- The production is usually of small and medium scale

With the introduction of eco-design in the fashion industry, there is a third model created, the eco fashion, also referred as sustainable, organic, conscious fashion. This indicates that slow fashion and fast fashion surely, cannot be referred as eco fashion. And this is true. The fact that a production is based on the slow fashion model's mindset, this does not make it sustainable. Ecological fashion takes from the top to the bottom the supply chain system of a company and reorganizes it in this way and on every step, in order to avoid any negative impacts and improve the activities.

This is a talk of trillions of dollars, and this is proved by the numbers of the fashion industry of today:

- Industry's worth values at 1.3 trillion USD
- Holds an amount of 300 million people employed

- Uses more than 60% of textiles for clothing
- Clothing use has declined

For starters, anyone in the fashion industry, producers/ manufacturers and consumers can make the difference by small but important steps. Reuse, recycling, upcycling and remanufacturing are main variables that will affect and change in the longtime the cycle of the products.

Eco- design in product development

Let's start with the presentation of the typical standard product development where we can find 5 phases.

Idea Generation

In this first phase, the company is searching for ideas for a new product. These ideas can come from customers, competitors, newspapers, journals, employees, suppliers etc. This is a crucial phase since all next phases and processes are built on this. Usually small businesses have not equal access to R&D, meaning technical research for the development of a new product.

Screening

The ideas that have been generated from the first phase need to be filtered out so that only the viable ones are kept and further developed. In this phase the company collects opinions from stakeholders such as customers, employees, and maybe other companies. The aim is to avoid costly unfeasible ideas. Other factors such as competition, legislation and technology changes may also affect the company's decisions. At the end of this second phase only a few ideas will remain.

Concept Development

In this third phase the company has to estimate the potential costs, revenues and profits related to the product. It also "conducts a SWOT analysis to identify the Strengths, Weaknesses, Opportunities and Threats existing in the market". The aim is to identify the products's target group and consequently its niche.

Product Development

This phase consists of the design and manufacture of the product that starts with the manufacture of the prototype and its testing. Based on the results of the testing the company decides whether or not to proceed with a large-scale production.

Commercialization and Rollout

In this last phase the company launches the promotion campaign for the new product as well as the new product, based on the results of the market research that has been conducted in previous phases.

According to UNCTAD (United Nations Conference on Trade and Development), UNEP and the Ellen MacArthur Foundation,

- Some 93 billion cubic metres of water - enough to meet the needs of five million people - is used by the fashion industry annually,
- Around half a million tons of microfibre, which is the equivalent of 3 million barrels of oil, is now being dumped into the ocean every year.
- Around 20 % of wastewater worldwide comes from fabric dyeing and treatment.
- Of the total fiber input used for clothing, 87 % is incinerated or disposed of in a landfill.
- As for carbon emissions, the industry is responsible for more than all international flights and maritime shipping combined.

If demographic and lifestyle patterns continue as they are now, global consumption of apparel will rise from 62 million metric tons in 2019 to 102 million tons in 10 years.

The key points of a product's lifecycle that need to be taken into account during the product development are:

- Design - does the design ensure that the product meets its purpose in the most energy and resource efficient way? Can the product be repaired, remanufactured, disassembled or recycled easily? Does the design make use of the most efficient materials and enable the user to be as efficient as possible in using the product?
- Raw materials - can fewer raw materials be used to get a satisfactory result? Are raw materials recycled or recyclable? Are raw materials used with the least environmental impact? Is there compliance with regulations on hazardous materials?.
- Manufacture - can the manufacturing be more energy efficient? How can waste and packaging be reduced? Are there other ways to get the same manufacturing results but be more efficient?
- Retail - is the packaging as efficient as possible? Could less packaging be used? Can transport costs be reduced by shortening supply chains or the distance the products need to travel? Could the way in which the goods are displayed be improved, and can waste be reduced through better supply chain management? Is there communication to the customers on how to choose the most environmental products?
- Use - can the product be made in such a way that it lasts longer, either by better component use or designing with easy repair in mind? How can customers be guided to use the same products for longer?
- End of life - can the product or service be reused, remanufactured or recycled? If not, can the amount that needs to go to landfill be reduced?
- Legal - are the legal responsibilities, if any, met?

Besides the environmental impact, social impact considerations can also be taken into account as the effects on workers and local communities where the raw materials come from, where the goods are produced and where they end up after being used?

Success factors

For a successful implementation of eco-design the following parameters should be considered.

Involving stakeholders from an early stage and encouraging participation so that all can understand and decide on changes relating to the eco-design process before their implementation

Favoring group work: to facilitate change in all stakeholders by getting them to evolve in a “collective” form (integration into the group),

Involving people through participative training, research and application rather than transmitting of theoretical information

Promoting exchanges: opting for bi-directional communication and an interactive approach which is not limited to top-down communication and training,

Assuring an environment of confidence, promoting the involvement and commitment of the Management by developing and conveying a specific vision, which helps being firm about the objective determined but flexible about the actions required to achieve this objective.

Obstacles

The implementation of the eco-design approach results in changes in the practices of those concerned, due mainly to:

- the consideration of new parameters,
- the use of new tools and/or methods,

- the potential implementation of a new organization…

The human factor plays a prominent role in these modifications, as the project can generate fear and difficulties for the employees (skills to be acquired, loss of existing skills, difficulties in reviewing themselves or looking forward, etc.)

Other possible obstacles are:

- Potential increase in product cost
- Increased development time, human and financial investments and therefore associated costs
- Changes in company policy or regulation, which can lead to evolving specifications
- Insufficient knowledge of the environment

The eco-design approach has an impact on many product characteristics. These include:

Fewer materials. This protects resources and reduces emissions.

Easy to recycle. Using materials that are easily identified, reused or recycled.

Use of bio-materials. Using a single type of material or a biodegradable material is best, whether natural or a derivative.

Long-lasting. The product should be long-lasting, its useful life being maximised

Multipurpose, reusable and recyclable. Products should have multiple uses, be suitable for reuse, and be manufactured with recyclable materials.

Lowering emissions. Products should be of a suitable size to save material and fuel consumption during transport to reduce CO2 emissions.

Innovative. Technological innovations can optimise product efficiency and sustainability.

Green message. Sustainable design spreads the idea of sustainability with messages intrinsic to the product itself.

“Product designers who aim to develop products with lower environmental impact need tools that include information, guidance and examples.

There are many different tools that integrate environmental criteria that can be used to support product development.

The design tools can be divided into two types: quantitative and qualitative. The first require large amounts of information and time for their use. Unlike qualitative which are simpler, require less information and time, which allows an easier integration in the internal product development. The latter are more suitable for designers despite having a larger margin of error

The main quantitative tool is the Life Cycle Assessment (LCA), a tool to assess the environmental aspects and impacts associated with a product from cradle to grave, through a specific methodology. For the use of LCA there are several integrated software, supported by databases of materials and production processes.

The quantitative tools are more difficult, they need specific knowledge and are time consuming. To overpass these limitations and in order for the tools to fit different contexts simpler versions of a qualitative nature have been developed. Despite, allowing the incorporation of various environmental criteria, as more summarized they become the less reliable they are.

There are also eco- design tools that go beyond the strict environment scope and incorporate sustainability, economic and social criteria. These tools are based on methodologies used in eco-design, extending its scope. An example of a quantitative tool here is the S-LCA (Life cycle assessment – social) and examples of qualitative such tools are the MSDP (Method for sustainable product development) and the SDO Toolkit (Sustainable Design Orienting Toolkit)”.

Eco-design in opening new channels to sustainability

Textiles (apparel and fabrics) have been identified by the European as one of the priority product within its circular economy initiatives that can contribute to the achievement of both EU and global goals. “The European Green Deal, the Circular Economy Action Plan (CEAP) and the Industrial Strategy identified textiles as a priority sector in which the EU can pave the way towards a carbon neutral, circular economy, and announced an EU Strategy on textiles. The action can contribute to many of the UN Sustainable Development Goals (SDGs), including Goal 6: Clean water and Sanitation, Goal 7: Affordable and Clean Energy, Goal 12: Responsible Consumption and Production, and Goal 13: Climate Action” (Eionet Report - ETC/WMGE 2019/7).

This report largely depends on documents produced by the EC related to the Textile sector in order to highlight the importance that EC is placing for the sustainability of the sector and the corresponding references are given at the end.

It is to be noted that there are many organisations and NGOs that aim at encouraging the use of sustainable practices and they also promote the role of design in the circular economy mode of operation, such as the Ellen Macarthur foundation, the Circular Fashion Summit, EURATEX, etc. A short search in the Web will present many such initiatives.

The product and its design are central in the transition to a circular mode of operation. Decision made during the design stage are easy to be evaluated and alternatives can be assessed. If a product is on the manufacturing stage, then changes are difficult and expensive to be done. The same applies for the environmental footprint. The design stage it is a relatively low-cost activity, but it determines 70-80% of all product characteristics, including its product-related environmental impacts. Previous EU Ecodesign product policies were towards electric and electronic appliances (for example, refrigerators, washing machines and dishwashers), but now the Commission has committed to expand the Ecodesign approach to a wider range of products, including textiles.

Designing products in a smarter way can extent their useful lives and achieve reuse, repair, redistribution, remanufacture and refurbishment. These aspects are not taken into account when designing a product and mostly issues related to waste are considered.

Currently the textile sector follows the linear mode of operation, where large amounts of nonrenewable resources are extracted to produce textile products that are often used for only a short period, especially the clothes, and then the materials are landfilled or incinerated. Increasing circularity requires insight into the current drivers of product design, form and function as well as emerging trends that may change these. These changes are nor general and applicable to all sectors, and there is not a solution that fits all cases.

The current textile system is extremely wasteful and polluting. Currently circular business models for the textiles are directed towards the sustainable production of natural and synthetic fibres, and safe additives and process chemicals. It is also essential that textile value chains are transparent and traceable to guarantee clean and safe material cycles.

However, it is the design stage that is crucial for achieving durable textiles which can be made for longer use, repair, recycling and at the same time estimating the resources, the energy footprint and the use of harmful chemicals.

Product design determines to a large extent the longevity, reparability, recyclability, proportion of recycled and renewable material in the product, and its suitability for refurbishment or remanufacture. Product design therefore determines the circularity potential of a product.

Ecodesign requires interdisciplinarity between designers, chemists, material developers, etc. and education, both during professional education and in life-long-learning programmes for industry professionals.

A designer’s education curriculum must have a strong sustainability focus in order to motivate them

and change their design culture.

A designer must have appropriate education and experience in sustainable material choices and proposed designs must be as possible timeless, durable and easy to repair.

Designers must also have incentives or a mandate within their organizations in order to design for circularity and management support must be active because they To assure effective implementation, it is important that the same mind shift takes place at the top management level, at which financial and strategic decisions are taken

A designer should

- evaluate the manufacturing process in terms of energy and water use
- avoid the use of toxic chemicals which makes the end product safe for the user.
- Consider the use/ maintenance of a textile product as it causes environmental problems. A designer has to estimate the washing instructions: the washing frequency and the use of efficient but environmental harmless washing agent. These all depend upon suitable material decisions.
- avoid the use of unnecessary packaging. The use of cheap, throwaway containers, for example, might damage the ozone layer.
- Many products can produce negative consequences after their useful product life is over. Ecodesign considers environmental aspects at all stages of the product development process, striving for products which make lowest possible environmental impact throughout the product life cycle.

The task for Ecodesign can be assisted by the introduction of Guidelines that assist the designer in the decision making process and public authorities can play an important role in steering industry towards sustainable design and production processes

The list of Guide lines cannot be exhaustive but some indicatives are mentioned bellow

The EU Ecodesign Directive, its focus is on energy efficiency and in particular on energy-consuming products. Little attention has been given so far to material choices and circularity aspects which is the focal point of Ecodesign for textiles.

In July 2019, the Ellen MacArthur Foundation’s Make Fashion Circular Initiative published a set of Jeans Redesign Guidelines.

BOX 4.3 Jeans Redesign Guidelines

The Jeans Redesign Guidelines (Ellen MacArthur Foundation, 2019) set out minimum requirements to ensure jeans last longer, can easily be recycled and are made in a way that is better for the environment and the health of garment workers. Health, safety and improvement of working conditions in global textile manufacturing are prerequisites. Beyond this, the Guidelines provide minimum requirements for jeans on durability, material health, recyclability and traceability.

Durability
- jeans should withstand a minimum of 30 home laundries, while still meeting the minimum quality requirements of the brands;
- garments should include labels with clear information on product maintenance.

Material health
- jeans should be produced using cellulose fibres from regenerative, organic or transitional farming methods;
- jeans should be free of hazardous chemicals and conventional electroplating. Stone finishing, potassium permanganate (PP) and sandblasting are prohibited.

Recyclability
- jeans should be made with a minimum of 98% cellulose fibres by weight;
- metal rivets should be designed out, or reduced to a minimum;
- any additional material added to the jeans should be easy to disassemble.

Traceability
- information that confirms each element of the Guidelines' requirements has been met should be made easily available;
- organisations that meet the requirements will be granted permission to use the Jeans Redesign logo on jeans produced in line with the Guidelines;
- Jeans Redesign logo use will be reassessed annually based on compliance with reporting requirements.

Ecodesign is one of the action towards the complete sustainable and circular system for textiles.
It is an imitative and it cannot be treated isolated although it can produce some success stories.
The transformation of the current textile system to a sustainable and circular one, requires a more systemic change.
A circular system requires strong supporting policy measures at all stages of the value chain, new education and behavioural change, new business models, innovative production methods

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