ECO-FRIENDLY APPROACH IN FURNITURE DESIGN

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Key words

Eco-friendly, Furniture, Recycle materials, Ecologic

Abstract

The importance of eco-friendly design productions have increased their worth in the world where natural sources are limited but human needs are unlimited. Obviously, with the improvement of industrial production, not only the furniture design affected, but also the environmental problems became more serious. In developed countries and in our country, the studies that support eco-friendly furniture design view have supported the products like those in both production and design process. The choice of material for furniture design is an important issue so that during the post process of the design, the chosen material is preferred as the most harmless one for the environment. The reason behind choosing ecological material is not to harm nature and human health. Therefore, natural and recyclable materials are used. This study aims to observe the furniture design that is being developed with ecological design view so that significant views and movements related to environment problems and design have been researched. The results show that, the furniture designs, which are made with ecological materials, have opened a new design approach for new material search and experimental designs.

1. INTRODUCTION

In furniture designing, environmental problems are mentioned under the title of ecological design. Ecological design is also known as ‘sustainable, eco-design, green design or eco-friendly design’. (Yeang, 2010: 23) The meaning of the term which is called ‘sustainability’ means not being harmful to the environment and can be used for a long time period. When we look for other definitions, it is told as ‘economic, meeting the environmental and social needs without giving harm to next generations’ life conditions. (wikipedia, ecodesign) Eco design is decreasing the environmental effects during the life cycle, material design and better material design. Tuna Özçuhadar has described ecological design at his research report in this way: eco-design or design for environment adds its product and service designs systematically to life cycle approach, eco design is a design action which connects the new suggestions that can be accepted by socially and culturally and they should be technically possible for environmental needs. (Özçuhadar, 2011: 16).

The concept of sustainability was firstly used at Bruntland report which was published by World Environment and Development Commission in 1987; according to this report ‘sustainability concept was defined as both meeting today’s and next generations’ needs without making concessions. (Filik A, 2004: 13) At designing area, this approach aims to be purified by population of the World which is increasing constantly and fast, the lack of natural sources, global warming, environmental pollution and the target is to leave a clean, healthy area for next generations. In the concept of sustainability, raw stuff is the first principle of
using the water and energy economically. In our times, because of the increasing environmental problems, designers have started doing works in this way. Notably, in architecture, industrial material design has been effective at inferior design, furniture and urbanism. According to Ken Yeang, ecological design or eco-design is simply expressed as integrating our environment and life styles with ecological design principles and strategies; designing all the forms in biosphere in harmony which fit natural environment perfectly. (Yeang,K.2006:06) In our century, there is an instant change in technology, economics and communication areas. The importance of environment-friendly furniture design view is becoming more significant in our world where natural sources are limited and human needs are unlimited.

In fact, industrial and technological improvements are a cause for consuming natural sources. For this reason, in developed countries, views for environment-friendly furniture designing is generally accepted. Because of the economical and technological improvements, manufacturing has become higher so that the negative effects of industrial producing are being tried to decrease. The increasing world population that ends up with limited natural sources has made recyclable and the least harmful technologies used obligatory. To solve this problem, designers and producers have looked for a solution and at producing stages; some certain sanctions have become compulsory. The environmental problems at designing have become a designing principle. Rather than being functional, material search has become more valuable. The aim of this study is to see the contributions of criteria such material, shape, function, colour, fabric to the furniture design by examining the historical growth of environment-friendly design process. The significant views and movements in this area and environment-design relationship in history related to environment-friendly design have been analysed.

**Sustainable Design Concept**

Sustainable design shows the social, environmental, economical values of design product in product designing area, on the basis of sustainability concept. However, to make this happen; the choice of material, piece and all design, the production improving stage and producing technology must have a sustainable system. William Mc Donogh Hannover described sustainable design at his declaration ‘Planet Rights’: As a part of nature’s developing part, sustainable design is being sensitive to the environment and understanding responsible explanation and makes it actual. (McDonogh,2000:1). Jason McLennan who wrote Sustainable Design’s Philosophy describes it in this way: ‘While decreasing the negative effects to the minimum or wiping them out, sustainable design is a philosophy that carries the environment quality to the highest.’ (McLennan,2004:24) A design must obey some criteria if it wants to be accepted as sustainable. Tuna Ozcuhadar has listed them in his studies, which he did at European Union projects.
Table 1: Eco-design principles (Özçuhadar T. (2014))

<table>
<thead>
<tr>
<th>The use of sustainable sources</th>
<th>The use of recycled materials</th>
<th>Standardizing the items</th>
</tr>
</thead>
<tbody>
<tr>
<td>The minimize the energy at producing stage</td>
<td>Using recyclable materials</td>
<td>Integration of function</td>
</tr>
<tr>
<td>To minimize the energy consumption at using stage</td>
<td>Using materials that have low energy</td>
<td>Environment-friendly surface design</td>
</tr>
<tr>
<td>The have reusable package</td>
<td>Using renewed items</td>
<td>Increasing the performance easily</td>
</tr>
<tr>
<td>Weigh and volume of package optimisation</td>
<td>Variety of materials and decreasing the number of items</td>
<td>To eliminate the users, adding instructions and statements</td>
</tr>
<tr>
<td>Waste recycling-reusing</td>
<td>Decreasing the material input</td>
<td>Easy dissembling – easy disintegrating</td>
</tr>
<tr>
<td>To minimize waste and releasing to the environment</td>
<td>To minimize the process of materials that are being used</td>
<td>Labeling the product – To eliminate the users, adding instructions and statements</td>
</tr>
</tbody>
</table>

2. THE RELATION BETWEEN ENVIRONMENT AND FURNITURE DESIGN

With the relation between environment furniture design concepts, it can be said that during the furniture design and making it, the least harmful designs are included. Environment is a natural area where all alive and lifeless things live. The place where living existences are tied with vital ties, affect and affected is called as habitat or environment. (Atasoy E.2006:21) Another definition contains all determinant climatic and biological factors that affect any organisms or ecological community. (Kışlalioğlu M.1994:8) To meet the needs of increasing population, there have occurred some problems related to the devastation of environment. The pollution, which was caused by the increasing population and production, brought new solutions. Environmental problems are things that affect all alive and lifeless existences negatively, cause constructional harms, destroy the balance in ecosystems and mostly cause by people. Environmental problems not only happen naturally, but also with human beings. After the Industrial Revolution, consuming the natural sources insensibly more than it was needed and the negation that technological growth created gave the environment a harmful ground. Not only urbanization and industrialization which were going to give an answer for increasing population but also waste problem, air, water and soil pollution also created environmental problems.

Environmental problems were firstly taken consideration internationally in Stockholm, at a meeting named ‘Human and Environment’ in 1972. Afterwards, the meeting that was held in 1977 in Tiflis, the strategies against to environmental problems were held. In 1922, Rio Summit; important precautions were decided by focusing on this issue’s worth. The waste, which is left in the nature, is gained to the nature with microorganisms after a while. However, some materials cannot be recycled in a short time so they cause pollution. The materials that take time to be recycled can be sequenced as glass, plastic and aluminium. These problems got the attentions of the designers and they looked for other ways. The increasing problems of today have made the furniture designers search for new seeking. In environmental problems, there have been two different attitudes. The first approach is using
the natural materials and the second one can be seen as using the recyclable materials. Because of not capable of being renewable and limited, wood is the leading material in northern countries. It is observed that the designers do not prefer this approach. Ecology is a system, which consists the relationship of human beings and environment.

Recently, the importance of environment-friendly designs has been noticeable. By hearing this term, it is understood that instead of natural products wasted objects, recyclable ready materials are used for furniture design. As an example; we can show that instead of cutting trees and obtaining wood, we can use environment-friendly materials that seem like wood. In recent years, especially to protect the natural sources of the countries, environment-friendly design issue has gained more importance so that we have tried to analyse the thoughts and views of the leading designers about environment-friendly idea.

3. ECO-FRIENDLY FURNITURE DESIGN PROCESS

First attempts for eco-design occurred at the end of 1980s in the USA and Europe. At the beginning of 1990s, the first sample project attempt in the Netherlands became the most serious one in different eight sectors (furniture, automotive, packaging etc.) and that experience became a model for the following ones. In 1994, Deft Technology University investigating programme DFS (design for sustainability) declared their first eco design manual named ‘Promise’ with the Netherlands and other partners. It was a source for the meetings of some countries that were held in Costa Rica, Spain, Colombia, Norway, and Belgium. (Özçuhadar, 2011:15)

Even if ecological approach seems to us as a new trend, it has been observed that designers had done some works about it. From 1960s to today, the designs, which got the environmental problems concrete in their furniture design events, have been more attractive. Environmentally sensitive art ideas in the beginning affected ecological design. The formulized phrase of Marcel Ducamp ‘Everything is an artwork.’ was effective. Naturally, this kind of saying showed that every material could be used for designing. Therefore, the materials that haven’t been used so far for designing have been started for using. The approach of Duchamp supports the environmentalist approaches. Related to this issue, Benjamin Baldwin’s design ‘ Tractor sitting chair’ in 1953 and Mezzadro and Sella which were seat designs and produced until 1983 can be shown as examples. The main causes of environmental problems are duplicate productions, production systems and the choice of materials. In other words, most of the products are made by not substitutable natural sources. Designer, as a person who creates a product or a definer, leads the negative and harmful sides of the product in the producing stage.

For that reason, he should be the one who determines which material to use and where and how to use it. At the beginning of 1960s, because of being more important, industrial design products caused more expensive, useless and leaded social status which were followed by new problems. New styles made every new product thrown away and it set a new trend. Furniture became an ordinary object rather than an expensive one or inherited thing. This approach is being severely criticized by environmentalists. Today’s designers try to solve environmental problems in their designs while serving to lots of areas. Furniture design forced the world to use new materials that can meet the needs of increasing population in 19th
century. Furniture design started looking for new materials and improving its producing skills after passing to industrial production. Firstly, wooden furniture is seen as the first material. Additionally, plywood, shiver plague, fibre plague, aluminium were the materials which were given answer to industrial production because of being cheap and easy for duplicate production. After that, wood and aluminium were avoided being used unnecessarily. In 1960s, increasing environmental problems made designing look for new ways. The experimental works of designers get the attention about that subject. It was a big step for designers to look for original searches in environmental designing. In our time, environment-friendly design got importance thanks to industrial improvements and environmentalist approaches. Increasing in world population got the nature damaged. Especially in developed countries, because of political awareness, producing and consuming is more conscious. After having those developments, architects gave up traditional value judgements and started giving worth to environment-friendly design.

**The historical process of eco-friendly design**

In 1950 and 1960s, Gunnard Anderson’s designs got the attention. In this designing type, industrial waste use conscious is seen. Especially, newspaper and coop table were used with extraordinary materials such as dust aluminium and fibreglass mixture. With the use of paper, Anderson created a new chair design that Welttstein strengthened the only structure. Andersen’s this extraordinary design got people’s attention but it wasn’t very useful. The materials that were used revealed that paper materials were going to make a progress in industrial production.

![Figure 1: Gunnar Aagaard Andersen, Chair, 1952(Charlotte &Peter Fiell, 1000 Chairs, Taschen, Italy,2002)](image)

The material, which was a combination of paper paste with PLA (biologically ripped plastic), wasn’t very durable for thin crossing, weight and stretching, humid or heat. Peter Murdock contributed radically to ecological production by Using cardboard in furniture design. Despite being supported by extra additives, this design was firstly designed for children because of being weak to carry. Paper not only makes the material use economical, but also it’s an effective tool for designers to create new shapes. However, as these models are not capable of carrying after a certain weight and being disposable can be shown as downsides. Thanks to enriching paper material content and capable of answering industrial production in terms of the facilities at cutting, bending; it was considered by designers again.
Ghery was really inspired by Murdoch’s foldable, spotted and disposable chair, designed for children and named as Spooty. Ghery created a chair and an armchair by sticking the layers of paper as it has a low capacity of carrying. To ensure durability and stretching construction, he made the cardboard layers opposite to one another by curling. Those laminated cardboard construction products have found their places in our world. In our day, sofas or chair, which were made of cardboard, have become a daily object. Robert Welttstein designed furniture by shaping the cardboard layers with curling. By increasing the section of the paper, the ability of carrying got higher. This model had the shape of one material that consisted of thick cardboard layers. Ghrey’s this cheap, recyclable and foldable model is both cheap for producing and buying. On the other hand, this laminate material can be shaped as straight or curved.

Other views and movements
Post modernism idea showed its effect on furniture design that occurred as a result of being opposite to modernism in 1970-1980s. Post modernist views revived the historical tendencies and it contributed to create new shapes by inspiring from the past. In this model Kitsch approach designs are extremely effective.

In all behaviour and tendency, every kind of form, factor and shape richness is noticed. On the other hand, after plastic materials’ harms occurred, furniture designers searched for new ways. They used both waste and recyclable materials and waste plastic mixture. Ron Arad’s
design, which is an old car seat and rusted pipe, is interesting. In 1980s, ‘We use everything done today. Production belongs to today, not the next generations.’ said Ettore Sotsass. In our time, this saying loses its worth or it is commented in other ways. The reason is, extreme, useless and only shape supporting approaches lose their validity. Because of its harms and hard to recycle, plastic material use is being tried to be better today. For instance, we can show the model of Gaetano Pesce that was made with waste polyurethane resin with different intensity structure by hand or mold in 1963. The aim of Pesce was to create furniture model that was both industrial and hand-made. In 1980s, environment friendly approach and cultural improvements reflected on the style technically. Art became expressionist and figurative after its conceptual stage in 1960s. Not only in advertising or marketing, but also in individual’s life this design played and important role. Designing has become a game on the media and exhibitions. Designs which are small, one-piece, combination of styles with unusual materials called as New Design.

Elisabeth Garaustlea and Mattia Bonetti show their furniture designs that they reflect ethnical and primitive art view. Ethnical and primitive art view has affected today’s designers. The reason behind this is they can easily supply the materials and forms in their environment. On the other hand, as ethnical and primitive furniture examples are related to the local culture, they are easily adopted. You can see the effect of ethnical and primitive culture below:

![Image of a furniture design]

Figure 4. Jane Atfield, Rcp2, 1992 (Charlotte & Peter Fiell, 1000 Chairs, Taschen, Italy, 2002)

**Primitive design movements**

The model of Elisabeth Garaustlea and Mattia Bonetti whose name is ‘Prince Imperial’ was prepared with raffia and it is a construction of wood and metal. The leather worn on the construction is extremely suitable for primitive art features.

![Image of a primitive design]

Figure 5. Elisabeth Garaustlea & Mattia Bonetti, Prince Imperial, 1985 (Charlotte & Peter Fiell, 1000 Chairs, Taschen, Italy, 2002)
Ready made movements

New movements in which existing materials are used are called as Ready-made and they aim to make furniture from ready objects. The target is using the materials that have been produced in different numbers. This kind of movements aim is to create an alternative to existing furniture design. With Marcel Bruer and Andy Wharol’s leadership, in this movement any object can be used as a sitting object. Ron Arad’s waste car seat and rusty, bended, metal piped seat is one of the leading examples of those.

Also we can show Mark Maden’s armchair design that was made of hard wooden materials’ waste and cut with curved forms. However, this model should be considered not as a comfortable one for having a gap on the surface and lines. As we have spoken so far, the environment friendly approach has happened after trying new materials. For this reason, with new materials new shape opportunities have been looked for. Lots of artists use different materials while expressing their thoughts. This approach differentiates the known artists from the attractive ones. At environment friendly approach, different materials make raw stuff use less.

Harmful materials in the use of furniture

Adhesive and surface operation materials are harmful to human health and it’s a reality. Besides ergonomic approaches, there are also precautions for not catching fire to protect human health and negative results. However, those productions’ effects and harms haven’t been defined yet. The adhesives, varnishes or paintings in furniture designing contain chemicals and their toxics are not known. (Aksakal N., Vaizoglu S., Güler Ç. 2005:1,erişim tarihi:22.06.2015). At a study that was held by Songul Vaizoglu and Cagatay Guler in Ankara, they have discovered that in rural and urban kitchens formalhedit was highly used. These materials cause people to have allergy, runny nose, sore throat and headache.

Also formalhedit without colour and toxic gas used in glues, PCP (pentaklorofenol) and Linfan (HCF-Gamma) that is used in solvent, painting, varnish and diluents carry carcinogenic materials. Polyurethane and polystyrene, which are used while producing foam in plastic furniture spreads chloro-fluorocarbon gases and it, gives harm to ozone layer which protects from Sun’s harmful radioactive rays. Respirable fibres in fibreglass, polyester and solvers show toxic effect so they affect human health badly. (Karslı H.2008:83). International Cancer Research Institution (IARC) has ordered the materials that are used in furniture producing (Aksakal N., Vaizoglu S., Güler Ç.2005). Especially in western countries, in children and adult furniture those materials cannot be used. In our country, some precautions have been taken.
Table 2: Harmful materials in the use of furniture

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Harmful Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formalhedit</td>
<td>Alumina trihydratemagnesium hydroxide, Calcium ve zinc molibdat,</td>
</tr>
<tr>
<td>Adhesives</td>
<td>Zinc borate, Organic phosphonates Phosphonate esters,</td>
</tr>
<tr>
<td>Fibre resin used in MDF.</td>
<td>Ammonium polyphosphate, Phosphonic acid, Tricresol phosphate,</td>
</tr>
<tr>
<td>Fire polibroms (PBDE)</td>
<td>Phosphonic acid, Tetrakis hydroxy methylphosphinium chloride,</td>
</tr>
<tr>
<td>Decabromodiphenyl oxide</td>
<td>Choric paraffins, Organphosphates,</td>
</tr>
<tr>
<td>Polibromo difenil esters (PBDE)</td>
<td>Antimon trioxide</td>
</tr>
<tr>
<td>Hexabromocyclodecane</td>
<td>Ammonium pentoxide, Sodium antimonat,</td>
</tr>
</tbody>
</table>

4. ENVIRONMENT- FRIENDLY FORTUNE DESIGN APPROACH

Choice of material comes first before function and shape while designing environment-friendly designs. The most important issue about the material choice is being least harmful to the nature, using less energy and choosing useful materials. It is an essential thing while choosing the material and producing. In furniture design, there are two tendencies. First one is using the material while second one is using recyclable material or waste, ready-made objects. Wooden materials should be used just like they are and their natural beauty needs to be reflected. However, materials such as wood should grow fast and they should be taken from trees that can be recycled easily.

- Furniture design with natural materials

![Figure 6](www.onecohome.co.uk)

Figure 6. Blox table, Richard Whawell (www.onecohome.co.uk),

- Furniture design with recycled materials

5. CONCLUSIONS

No matter how it is thought as a new perspective, designers before have considered environment friendly material design. Therefore, in terms of environment friendly; making the features better and using the sources economical had a great impact. The designs that are created by original works or unusual ways have supported our environment positively so; using recyclable materials will give us more positive results. In environment friendly designs, the aim is obvious. Using less energy, less material and less harmful to environment are the
main targets. Compared to furniture design history, it’s meaning for today and past are hard to express. However, the designers had the sense about this issue and they created samples. For design history, classical things that are valid for every era, alternatives, and unusual, primitive or attractive designs have all contributed to environment friendly design.

In furniture design, being functional and aesthetic were worthy. In fact, it was a synonym for utility, high quality and available cost. In today’s world, mostly individual designs are noticeable. For this reason, art, industry and technology are integrated and ideas have stepped forward. In the recent years, environment friendly design gained significance. This study supports the environment friendly approach that is made with industrial waste, unusual forms, ready-made and recyclable designs. In our country where environment friendly destruction happens, we can come to this conclusion: our designers need to take the precautions for using environment friendly materials and they need to be encouraged.

References
Baldwin(2001): 1000 Chair, Taschen, Londra
Charlotte & Fiell P.(2002): 1000 Chairs, Taschen, İtaly,
Duchamp, Marcel:Eczacibaşı Sanat Ansiklopedisi (2001):Yem Kitabevi, İstanbul,
Filik A(2004): Ekolojik tasarım ve Türkiye'deki ekolojik tasarım ve uygulama örneklerinin incelenmesi,Doç.Dr.Seda TÖNÜK, YTÜ, Fen Bilimleri Enstitüsü
Karslı H.Umut,(2008) :'Mobilya Tasarımında Ekolojik Yaklaşım', Tasarım Dergisi, 181.sayı:
www.cevresorunlari.com
www.turkishfurniture.org/TR/Yonlendir.asp


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