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EXAMPLES OF BAG DESIGN FROM WASTE LEATHER PARTS AS MATERIAL WITHIN THE SCOPE OF SUSTAINABILITY

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ABSTRACT

Problems such as ineffective use of limited natural resources, pollution of natural water resources, global warming, pollution of soil and air necessitate the research of renewable, sustainable and usable alternative resources and techniques. Leather is a healthy, long-lasting, timeless material used in clothing, shoes, accessories and lifestyle products. Undesirable environmental wastes emerge due to the fact that leather businesses have liquid, gas and solid wastes, and the excessive use of chemicals and resources such as energy and water while transforming rawhides into leather products. Environmental wastes have increased the effective use of resources and the need for usable alternatives of waste materials in industrial areas in terms of sustainability. In the study in which the qualitative research method was used, an action research was conducted. Within the scope of the study, 8 bags were designed and produced from waste leather pieces. During the planning stage of the designs, the sketches of the bag forms were drawn at first. In the development of the designs, the general forms of the bags, the sizes, types and colors of the leather pieces were taken into consideration, and the patterns for creating the surface were studied. Colored waste Nappa leathers sized between 1.5 mm and 2 mm were used for bags. The tessellation method, one of the zero-waste design techniques, was used to obtain products from leather pieces in the study. The study aimed to contribute to both the environmental and economic aspects of sustainability with bag designs made with waste leather.

Keywords: Design, Sustainability, Leather, Waste Material, Bags.

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SÜRDÜRÜLEBİLİRLİK KAPSAMINDA MALZEME OLARAK ATIK DERİ PARÇALARINDAN ÇANTA TASARIM ÖRNEKLERİ

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ÖZET

Sınırlı doğal kaynakların verimsiz kullanımı, doğal su kaynaklarının kirlenmesi, küresel ısınma, toprak ve havanın kirlenmesi gibi sorunlar yenilenebilir, sürdürülebilir ve kullanılabilir alternatif kaynak ve tekniklerin araştırılmasını zorunlu kılmaktadır. Deri giyim, ayakkabı, aksesuar ve yaşam tarzı ürünlerinde kullanılan sağlıklı, uzun ömürlü, zamansız bir malzemedir. Deri işletmelerinin sıvı, gaz ve katı atıklarının olması, ham derileri deri ürünlerine dönüştürürken kimyasalların ve enerji, su gibi kaynakların aşırı kullanımı nedeniyle istenmeyen çevresel atıklar ortaya çıkmaktadır. Çevresel atıklar, kaynakların etkin kullanımını ve endüstriyel alanlarda sürdürülebilirlik açısından atık malzemelerin kullanılabilir alternatiflerine olan ihtiyacı artırmıştır. Nitel araştırma yönteminin kullanıldığı çalışmada eylem araştırması yapılmıştır. Çalışma kapsamında atık deri parçalarından 8 adet çanta tasarlanmış ve üretilmiştir. Tasarımların planlanması aşamasında öncelikle çanta formlarının eskizleri çizilmiştir. Tasarımların geliştirilmesinde çantaların genel formları, deri parçaların boyutları, türleri ve renkleri dikkate alınmış, yüzey oluşturmak için desenler çalışılmıştır. Çanta yapımında 1,5 mm ile 2 mm arasında değişen renkli atık napa deriler kullanılmıştır. Çalışmada deri parçalardan ürün elde etmek için sıfır atık tasarım tekniklerinden biri olan mozaikleme yöntemi kullanılmıştır. Çalışmada atık deri ile yapılan çanta tasarımları ile sürdürülebilirliğin hem çevresel hem de ekonomik boyutuna katkı sağlanması hedeflenmiştir.

Anahtar Kelimeler: Tasarım, Sürdürülebilirlik, Deri, Atık Malzeme, Çanta.

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1. INTRODUCTION

Rapid population growth in the world leads to unconscious use of natural resources, increased environmental damage and rapid consumption of industrial raw material resources. This leads to increased pollution, instability and the collapse of industrialized societies (Bürdek, 2005, s. 62). The earth has limited raw material resources due to both its geological structure and elemental distribution. The factors that cause the raw material problems in the world can be listed as population growth, industrialization, environmental pollution and global warming. There is a close relationship between living standards and raw material consumption. As the welfare of the societies increases, raw material consumption also increases. In this respect, as the number of countries reaching the industrialization stage increases, world raw material consumption will increase and the reserves will be depleted in a short time. Environmental pollution occurs in the processes of turning raw materials into products. According to Avaner (2019, s: 847), industrial greenhouse gas emissions, known as the primary cause of climate change, change the natural structure of the atmosphere and increase the amount of natural greenhouse gas in the atmosphere. This increase disrupts the balance of solar radiation, and the greenhouse effect causes the earth to warm up more than it should. This warming causes difficulties in accessing food, clean water and raw material resources. According to the Resource Efficiency report by the Center of Excellence in Cleaner Production Technologies, the public and private partnership “Resource Efficiency in Production and Recycling” has been carried out in EU countries, including France, Germany, Italy, Hungary, Spain and England since 2009. Resource efficiency potentials in these countries have been assessed. In the EU countries mentioned in the study, it has been determined that approximately 40% of the operating costs are raw materials, and approximately 50% of this is energy and water costs. Based on natural raw material resources, energy and labour intensity, the textile, ready-made clothing and leather products industries are among the sectors that are both responsible and most affected in terms of rapid production and consumption (http 1).

Irresponsible consumption of resources and production of waste of quality and amount that may cause environmental problems are among the factors that disrupt the ecological balance and negatively affect environmental health and the sustainability of natural resources (Palabıyık, 1998, s. 46). The biggest factors increase deterioration of natural resources in recent years are climate changes and the increase in global warming and the unconscious use of resources. In this case, it has created the need to turn to sustainable alternatives in terms of production and consumption in the field of fashion and textile (Hailu, 2021, s. 377). To ensure sustainability, it is necessary to protect the environment

we have to ensure sustainable development. In order to ensure sustainable development, wastes have a great importance. Waste material should not only be seen as polluting the environment, but it is also a very good source of recycling (Valentin et. al, 2014, s. 158). Sustainability aims to be continuous by driving innovation, increasing business success and leading to a better quality of life. In this case, it increases competition by engaging in new searches in economic, social and environmental fields, and connects the business and customers (Ashton, 2018, s. 2). Also, sustainability is an approach that is sensitive to the environment and respectful to natural resources, together with ecological designs. Sustainability also consists of products designed with recyclable, biodegradable materials that aim to obtain the raw material from the region where they are located, thus planning to eliminate the damage to the environment due to possible air pollution during transportation (Güneş and Demiraslan, 2020, s. 81).

As a material, leather has always taken its place in the fashion sector as raw material and product because it is not harmful to human health, has a long expected life, creates style in terms of color, design and texture with fashion trends. Leather has the feature of breathing as well as being durable and flexible. Leather is widely used in the production of shoes, bags, clothes, upholstery and various other products. The leather industry has a unique feature due to the unique texture of the leather which is the raw material of the sector, and its ability to sustain this texture up to the consumer. However, the leather industry causes a large amount of waste in different forms such as solid, liquid and gas in the tannery and leather product manufacturing processes (Özgünay et al., 2007, s. 1899; Kanagaraj et al., 2015, s. 2).

Today, the concept of sustainability has gained importance in the leather sector, as in other industrial sectors. Leather is the most produced and waste material in the world (Pringle et al., 2016, s. 545). Various chemicals are used to transform and process rawhides into commercially valuable leather. The chrome tanning method is the most widely used and 90% of the world leather production uses this method due to its ease of use and the roughness of the leather skin (Bacardit et al., 2015, s. 197). However, chrome contains chemicals and is very harmful to the environment, so the use of chrome is a controversial issue. It is difficult to biodegrade leathers made with the chromizing-tannery system, which is a serious threat to the environment. The mismanagement of these wastes causes serious pollution problems and disrupts the ecological balance (Greenwell et al., 2016, s. 314). The European Green Deal (European Commission, 2019) has put forward the Circular Economy Action Plan, where good competition can be achieved and living in a greener and cleaner Europe. According to this plan, it aims to contribute to the economy, environment and raw material resources by transforming wastes into products within

their life cycle. For this reason, ways to add leather waste which are an important pollutant to production must be found (Arbizu et al., 2021, s. 2). Despite the great economic value and importance of the leather industry, it causes great harm to the environment. In addition to leather wastes from production, leather products cause solid accumulation after use (Dhayalan et al., 2007, s. 762). Leather waste is 400 tons worldwide only from the shoe industry. When leather waste is disposed of in the environment, it takes more than 60 years to degrade. By developing a vegetable tanning method to reduce the environmental impact of chromium pollution in the leather tannery, the degradation time of leather waste is shortened (Ariram and Madhan, 2017, s. 2). Leather waste is divided into various classes within itself. These are: 1- Wastes from tanneries 2- manufacturing phase; finished leathers are cut into shoes, clothing, furniture, etc. wastes remaining at this stage 3- products returned from the sale of leather products, wastes from damaged products 4- waste leathers generated when the consumer no longer needs the leather product used (Pringle et al., 2016, s. 545). Waste management is directly related to the economic, social and political situation of the countries. Example: It is easier to recycle waste products in high-income, industrialized countries. When waste is managed correctly, the need for natural resources and the damage to the environment are reduced (Alemu et al., 2021, s. 2788).

There are two methods of controlling the damage to the environment in animal hide production. The first is to prevent pollution and the second is to control pollution. There is "clean production" in preventing pollution and it prevents pollution (Valentin et al., 2014, s. 161). There is a close relationship between sustainable development and environmental protection. In addition, waste management has an important place in the concept of sustainability. Because waste does not only represent pollution but also a source of raw materials (Valentin et al., 2014, s. 158). When the waste leathers generated in the leather production process are converted correctly, it will be of great benefit to the environment and the economy. Environmental benefits by recycling, it will eliminate the polluting polymer materials in the waste leather and offer a livable place for humanity. The economic benefits are environmental resources have to be consumed in the leather production process and the waste of resources is reduced by using the waste leather by recycling (He et al., 2018, s. 78). It is to ensure the appropriate recycling of the waste leather provides energy savings and brings economic growth. In addition, recycling done correctly helps sustainable development planning. Recycling also has social benefits. It will support both the development and brand image of the leather producers, which aims to be environmentally friendly by recycling waste leather (He et al., 2018, s. 78; Pringle et al., 2016, s. 545).

Design as a problem solving process; it is an important gain that enables the emergence of new ideas, increases the quality of work with innovation and offers better living conditions (Ashton, 2018, s. 2). The first step of this announced itself under the name of “Green Design”. Since the 1960s of public hazards, such as resource depletion, environmental pollution and ecological damage has led to the emergence of Green Design (Yuan and Tang, 2021, s. 1). Green Design involves careful use of natural resources. In order to achieve this, it is necessary to reduce the consumption of disposable products and unnecessary packaging and to combat waste products. Green design also covers reuse of products and recycling of materials. In addition, it encourages the use of eco-label certified products (Martirani et al. 2006, s. 3).

Resource efficiency, United Nations Environment Program (UNEP), in order for natural resources to be accepted as sustainable production, the dimension of a product from production to consumption, which is called the life cycle of the product, must be reduced (Niemann et al., 2008, s. 150). The reuse of post-industrial waste in design contributes to green design and sustainability. Thus, they undertake a social responsibility duty by displaying a sensitive and conscious approach to the idea of protecting the environment and the use of natural resources (Gürler et. al, 2018, s. 142).

The study aims to evaluate the waste leather pieces that occur during the saddlery and garment leather production stage. The study aims to provide environmental and economic sustainability by producing bag designs in various models using waste leather pieces and additional materials. The study was carried out in two stages within the scope of the qualitative research method and the action research model was used. Action research includes studies in which researchers are involved in the practice process to understand and solve the problems, arisen in that course of time. Action research is a flexible and process-oriented approach (Yıldırım and Şimşek, 2008, s. 78). As the first stage of the study, a literature review was made, and the data obtained were transferred within the framework of the research. The second stage of the study is the practice stage, covering the bag production period. New designs were created with leather pieces from textile industry production waste. During the planning stage of the designs, the sketches of the bag forms were drawn at first. In the development of the designs, the general forms of the bags, the sizes, types and colors of the leather pieces were taken into consideration, and the patterns for creating the surface were studied. The study aimed to contribute to both the environmental and economic aspects of sustainability with bag designs made with waste leather pieces. The bag was chosen within the scope of the research because it is the most preferred and added value product among clothing accessories. In addition, the applications are built on the bag, as its surface is large and therefore it allows the use

of more waste leather in the design.

When the studies on the redesign of leather waste are examined, it is seen that there are mostly studies in the sector that include the products of fashion brand enterprises. In the study of Imre (2021), in which the shoe industry was examined in terms of production processes and waste, shoe samples made with recycling by the Nike brand were examined.



Picture 1: Nike Recycled Material “Trash Talk” Basketball Shoe, (İmre, 2021, s.58).

Most of the studies carried out are based on recycling examples in the sector, especially by brand businesses. Practical studies in which wastes are turned into granules and used in the design as well as without professional recycling are very few. Recycling a manufactured product is very costly. Therefore, it is important to reuse the waste parts as they are in the design.

In the study conducted by Karaoğlu (2021), designer examples made using leather and knitting are included, and especially the vest design in which leather pieces are combined with knitting is presented. In the study where suede leather was used, emphasis was placed on sustainability.



Picture 2: Leather Pieces and Knit Combination Cloth (Karaoğlu, 2021, s.29).

In the study conducted by Özdemir (2023) on recycling examples in handicrafts, fifty-two handicraft products in which were used many waste materials included.



Picture 3: *Painting From Pieces of Leather, Ensar Akdoğan (Özdemir, 2023, s.23).*

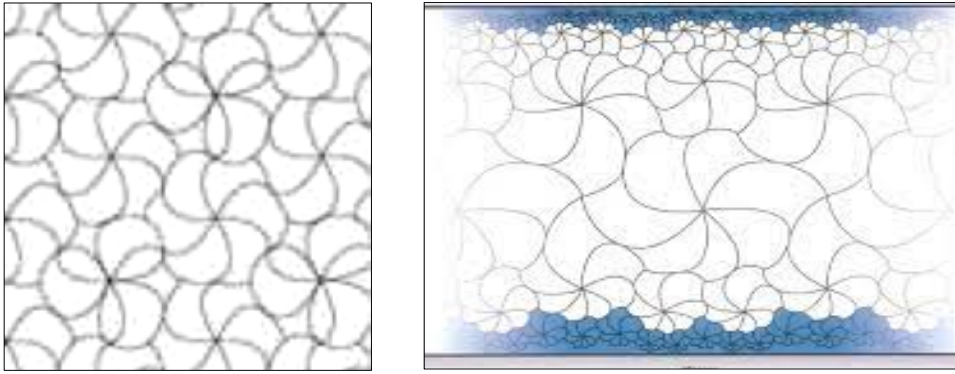
In the study conducted by Bayramoğlu (2019) on the transformation of wastes into products with high added value in the leather industry, accessory designs were made from waste leather pieces (Picture 4). In the related research, four necklace and earring design examples are presented, emphasizing the sustainability of leather waste.



Picture 4: *Examples of Accessories from Waste Leather (Bayramoğlu, 2019, s. 49-52).*

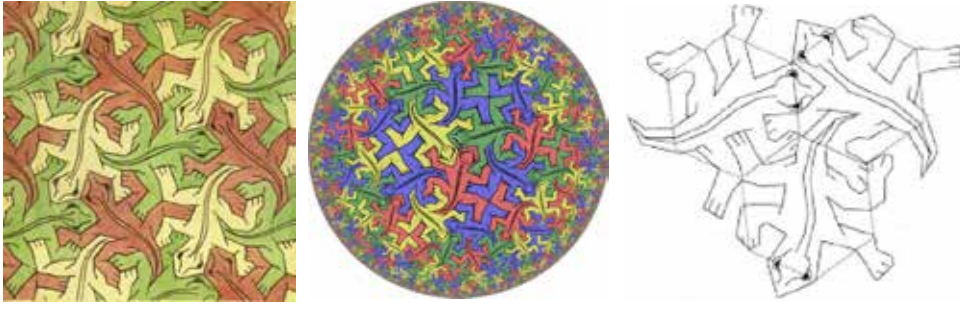
In this study, various bag models were produced by using waste leather pieces that are planned to be discarded while making saddlery and clothing products in the leather industry. Thus, waste leather was utilized to ensure sustainability and fashionable and useful new design bags were created. The bag designs were planned by Yasemin Koparan and the production process was completed with the atelier team Meryem Bozburun, Melike Genç, Havane Adalı, Nuray Çiçek, Zeynep Taş, Abdussamed Avcı, Tuba Özbek.

The zero-waste method, which emerged as a part of sustainability, was used in the studies. The purpose of zero-waste design is to eliminate the generation of waste or to minimize the amount of waste during the design and production stages (McQuillan, 2011; s. 90, Niinimäki, 2013, s. 18). It aims to produce within the “zero waste, zero loss” principle. One of the most important and pioneering works in zero-waste design belongs to McQuillan. McQuillan (2011) developed four approaches to zero-waste fashion design: tessellation, jigsaw puzzle, embedded jigsaw puzzle, and multiple fabric methods. Because of the explanations, the tessellation method (Picture 5), one of the zero-waste design techniques, was used to obtain products from leather pieces in the study. The tessellation method creates geometric shapes and patterns that repeat by fitting perfectly together, with no gaps between them (McQuillan, 2011, s. 91).



Picture 5: Holly McQuillan First Mosaic Design (McQuillan, 2011, s. 91).

Escher tessellation technique was created as combinations of unit elements comprising geometric shapes. Escher commented about the regular division of a plane as follows: “A plane assumed to be limitless in all directions can be covered or divided by similar geometric shapes placed next to one another without gaps, and these can continue indefinitely as long as there exist certain rules” (An and Jang, 2023, s. 5). The best-known example of the use of mathematics in the arts (Picture 6) is M.C. Escher’s works (Gagern and Richter-Gebert, 2009, s. 25).

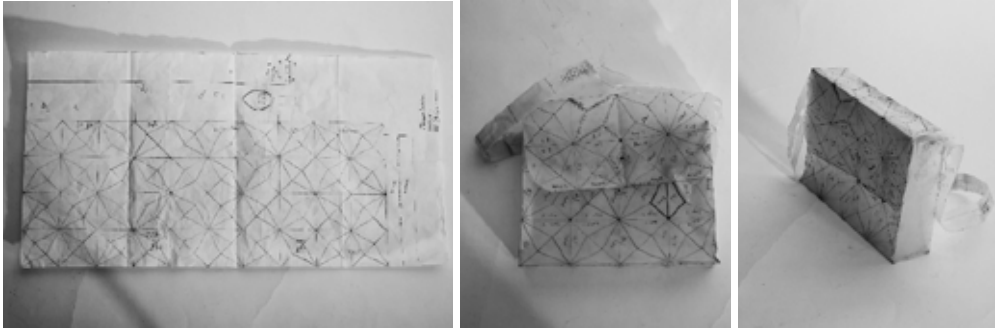


Picture 6: M. C. Escher in 1939 *Famous Lizards Drawn by Tessellation Method and Lizards Reaching for the Circle Limit* (Gagern and Richter-Gebert, 2009, s. 25, 26).

Colored waste Nappa leathers sized between 1.5 mm and 2 mm were used for bags in the research. Nappa leather is obtained by tanning lamb, sheep, goat, calf and cow leathers, usually with chromium salts. These leathers have smooth or granular grain and they are thin, soft, flexible and durable in various colors (Özdemir and Kayabaşı, 2007, s. 80). It is more water-resistant than other types of leather. It is generally used in shoes, bags and the textile industry.

2. SUSTAINABLE BAG DESIGNS

In this part of the research, bag designs and features obtained by using waste leather are included. Taking into account the structure, material and technical characteristics of the waste pieces, leather surface studies were carried out with the least waste.

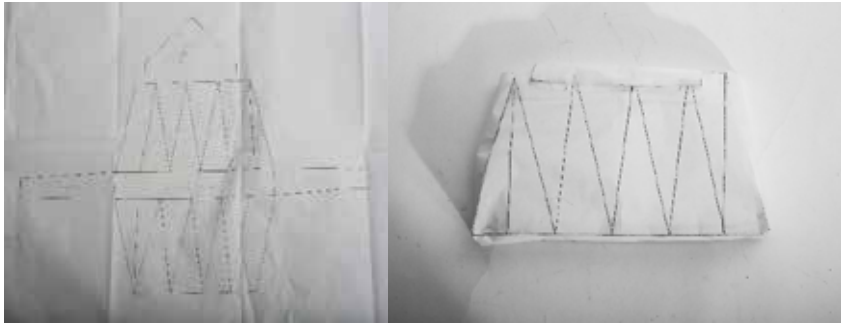


Picture 7: *Design Sketch of Bags from Waste Leather* (Yasemin Koparan Personal Archive, 2021).



Picture 8: *Production of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

In the produced bag (picture 8), as a requirement of the tessellation technique, geometric lozenges and triangular patterns were included on the surface. Geometric forms are intertwined without leaving any spaces. Appropriate colors were brought together, and the leather pieces cut in geometrical forms were placed on adhesive interlining. The edges were pierced with leather piercing tools. Leather pieces were stitched with waxed thread by using the cross needle method, one of the leather stitching methods. The loop stitch method was used for the edges. Closed staples were used in the middle of the patterns as decoration. The bag was designed as one piece except for the expendables. Chain and leather pieces were used as the handle.



Picture 9: *Design Sketch of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

The bag model was created on sketch paper (Picture 7). In the designed bag model, the pattern design was drawn by using the tessellation method, one of the zero-waste methods. A three-dimensional view was given during the design process. Since the purpose is to create less waste, a square flap bag model was preferred by avoiding curved forms.



Picture 10: *Production of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

In the bag model in picture 10, a wide-bottomed and narrowed-top model with a flap was preferred for the form of the bag. The back, front, flap and expendables were worked as separate parts. Triangle cut waste leather pieces of different colors were placed on the adhesive interlining to form a composition. The edges were pierced with leather piercing tools. Leather pieces were stitched with waxed thread by using the diagonal stitching method, one of the leather stitching methods. The flap and expendables of the bag were made of one piece of leather. The loop stitch method was used for the flap edges. Metal accessories are preferred on the handle and flap.



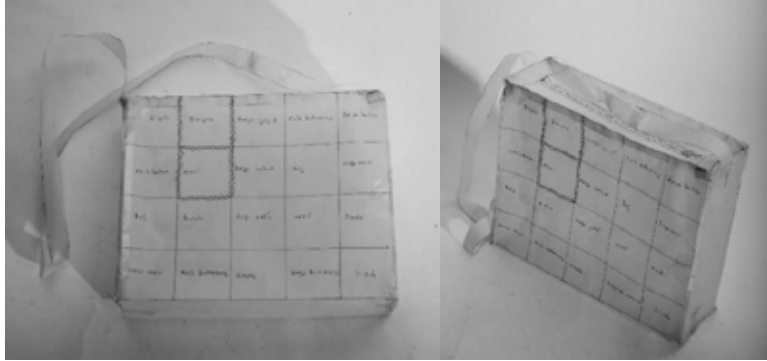
Picture 11: *Design Sketch of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

The bag model was created on sketch paper (Picture 11). In the designed bag model, the pattern design was drawn by using the tessellation method, one of the zero-waste methods.



Picture 12: *Production of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

In the bag model in picture 12, rectangular cut waste leather pieces were used on the surface. Geometric rectangular pieces were used on the flap of the bag, which was in a rectangular form. The back, front, flap and expendables were worked as separate pieces. Rectangular leather pieces of different colors were brought together and placed on the adhesive interlining. The edges were pierced with leather piercing tools. Leather pieces were stitched with waxed thread by using the diagonal stitching method, one of the leather stitching methods. The cross-needle method was used for stitching the edges, and the loop stitch method was used for stitching the flap. The expendables were made from one piece of leather. The handle was made entirely from leather.



Picture 13: *Design Sketch of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

The bag model was created on sketch paper (Picture 13). In the designed bag model, the pattern design was drawn by using the tessellation method, one of the zero-waste methods.



Picture 14: *Production of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

In picture 14, on the surface of the bag, square-cut waste leather pieces were used. The bag was designed in a square form without a flap and a zipper was used for closing. The back, front, flap and expendables were worked as separate pieces. Square leather pieces of different colors were brought together and placed on the adhesive interlining. The edges were pierced with leather piercing tools. Leather pieces were stitched with waxed thread by using the double-cross needle method, one of the leather stitching methods. Colored wooden beads were used on the front surface of the bag while assembling. Metal and leather are used in the handle part. Leather binding was passed between the metals.



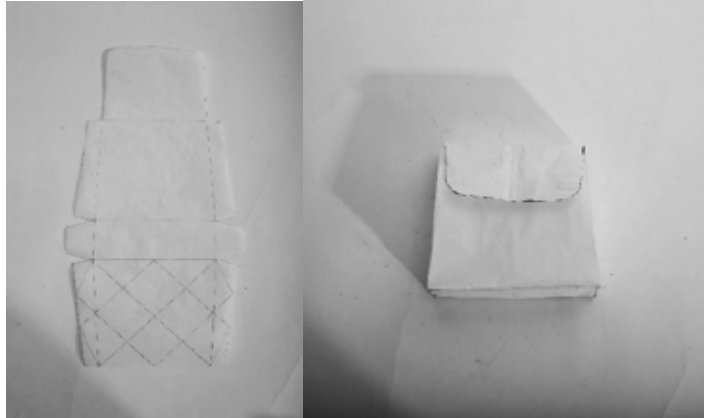
Picture 15: *Design Sketch of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

The bag model was created on sketch paper (Picture 15). In the designed bag model, the pattern design was drawn by using the tessellation method, one of the zero-waste methods.



Picture 16: *Production of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

In picture 16, a square, wide-bottomed and narrowed-top model with a flap was preferred for the form of the bag. The back, front, flap and expendables were worked as separate parts. The flap and expendables were made of one piece of leather. The matching colors of the waste leather pieces were brought together and placed on the adhesive interlining. The edges were pierced with leather piercing tools. Leather pieces were stitched with waxed thread by using the cross needle method, one of the leather stitching methods. Metal and leather were used in the handle part.



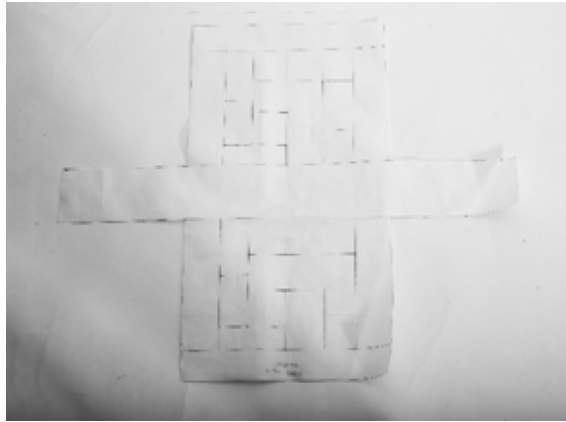
Picture 17: *Design Sketch of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

The bag model was created on sketch paper (Picture 17). The back and cover part of the bag was used as a whole piece of leather. On the front and bellows parts, the pattern design was made using the tessellation method, one of the zero-waste methods. With the waste leather pieces on hand.



Picture 18: *Production of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

In the picture 18 a rectangular and lidded model was preferred in the form of a bag. Metal clips were used to close the bag. The waste leather pieces in colors cut in rectangular forms were placed on the adhesive interlining to form a shaped form. The edges were pierced with a punch tool. The double cross technique, one of the leather joining methods, was used. Pieces of leather were joined together with waxed rope. The wrapping technique was applied at the base of the bag and the single cross needle technique was applied on the edges. The cover edge was covered with leather bias. On the handle part, a piece of leather and a metal chain were used.



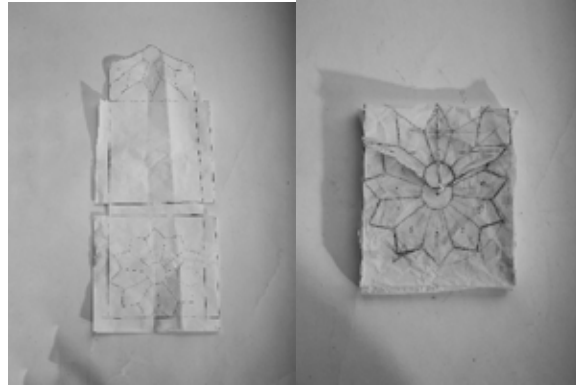
Picture 19: *Design Sketch of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

The bag model was created on sketch paper (Picture 19). In the designed bag model, the pattern design was drawn by using the tessellation method, one of the zero-waste methods.



Picture 20: *Production of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

In picture 20, the bag created in a square form is without a lid. Zipper is used to close the bag. On the front and back of the bag model, waste leather pieces of different sizes were used in rectangular forms. Front, rear, and bellows were worked as separate parts. One size of waste leather was used in the bellows and zipper section. The edges were pierced with a punch tool. Pieces of leather in the bag were joined to each other using waxed rope with the double cross needle technique. A short waste leather handle was used in the bag. Herringbone decoration was made with waxed ropes in different colors on the handle.



Picture 21: *Design Sketch of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

The bag model was created on sketch paper (Picture 21). In the designed bag model, the pattern design was drawn by using the tessellation method, one of the zero-waste methods.



Picture 22: *Production of Bags from Waste Leather (Yasemin Koparan Personal Archive, 2021).*

The bag in picture 22 was designed in rectangular form and as a closed model. The back of the bag was made of a single piece of leather. The cover, front and bellows of the bag were created with the waste leather pieces on hand. Considering the existing piece waste on hand, a flower motif appearance was created from yellow leather pieces. The bellows is added according to the amount of waste parts. The edges were pierced with a punch tool. Using the double cross technique, which is one of the leather joining methods, piece of leather was joined together with waxed rope. A long handle was preferred in the bag in regard to be suitable for cross use. The edges of the handles were wrapped obliquely with waxed rope.

CONCLUSION

In recent years, consumers and enterprises have begun to attach importance to the raw material and material content of the products, ethical values in production, production conditions, and natural requirements. Especially after the pandemic, people have tended to prefer sustainable and environmental products more in order to protect nature. Leather as a material has always taken its place in the production sector as raw materials and semi-finished products, as it has a long lifespan and creates a style in terms of colour, design and texture. In this context, leather is widely used in the textile arts for centuries, the production of shoes, accessories, bags, clothes, upholstery and various other lifestyle products.

Despite the great economic value and importance of the leather industry, it causes huge

harm to the environment due to the chemicals used in layering. Leather products cause the accumulation of solid matter after their use, as well as the leather wastes from production. The mismanagement of these wastes causes serious pollution problems and disrupts the ecological balance. In the textile and ready-made clothing industry, synthetic leathers called artificial leather are used, apart from genuine leather. However, petroleum-based chemicals such as polyvinyl chloride (PVC) or polyurethane are also used in the production of artificial leather. Artificial leather, especially used in the clothing industry, is very harmful to human health and the environment. For this reason, insufficient recycling of such materials causes environmental pollution. Since it is not possible to prevent the production and use of these and similar materials, consideration should be given to the evaluation of wastes. Since leather has a long lifespan, it is necessary to focus on the wastes generated in production. These reasons necessitate a more efficient use of raw material resources. All these negative effects have made it necessary to develop innovative materials, products, methods and designs by making use of environmentally friendly resources.

In the manufacturing industry, models are cut using patterns for saddlery and clothing. Thus, the remaining pieces are thrown away as waste material. Leather wastes do not disappear and dissolve in nature for many years. Therefore, especially in the leather industry, sustainability and recycling are very important in terms of waste management in the new generation business approach.

In this study, original bag designs were created from leather pieces, which are leather industry waste, and transformed into products with low cost but high added value. Products made from waste leather pieces are appropriate for mass production in the leather industry. Usable and producible examples are presented as bag models created by recycling waste and having low cost, design aesthetics and originality. It is aimed to contribute to sustainability by raising awareness with the results obtained. While designing the bags, the mosaic technique, which is one of the zero waste molding methods, was used. In accordance with the chosen zero waste technique, generally triangular, square and rectangular geometric shapes were used in the designs. Sketches were made on parchment at first in order to create a surface from waste pieces in the designs. In addition to the use of waste leather pieces, attention was paid to include the existing waste leather pieces in the designs with the least waste. Waste leather pieces were evaluated with cutting little or no cutting as possible. In terms of colour, the most compatible ones of the waste leathers at hand are brought together in the designs. In the production phase, mostly diagonal wrapping and double cross wrapping stitching techniques were used as joining and decoration.

In this study, it was concluded that the structural properties, sizes and colours of the waste leathers affect the bag designs and they are very important in terms of surface and form creation. It has been seen that all kinds of waste leather can be used in terms of design and have design value, and that waste leathers can be shaped within the framework of design infinity in accordance with their types and sizes.

The waste of leather, which has a long life as a material, must be evaluated unconditionally both after production and after the user. Design includes processes that can achieve quite different and unique results within the scope of human mind and his/her abilities. In this context, leather waste can turn into many different design products and models depending on the visions of designers. In terms of the durability of the leather and the use of waste leather in terms of design, the most suitable design product was considered to be the bag.

Especially in the new world order, where natural resources are depleted and there are difficulties in raw materials, awareness has been tried to be created in the study in terms of the sustainability of animal skin. When the literature on the subject is examined, it is observed that the studies on leather have gained momentum in the last 20 years, but it is observed that the researches are still limited in number. Day by day, the traditional natural fiber and leather raw material resources are decreasing and cannot adequately respond to consumption, every research to be done in this field is of great value. In the leather sector, it is necessary to prevent waste generation at the first stage or to reduce the amount of waste resulting from production as much as possible. In cases where wastes cannot be prevented or reduced in production, design methods for obtaining recycling or reusable products should be researched so that the wastes can be re-evaluated.

The designs created are prototypes and are presented with technical features that can be applied and produced by non-professional people. It is expected that it will set an example for those who want to produce with small parts that can be obtained free of charge, especially from leather producing businesses. In terms of businesses, the features of the presented bag designs have been developed with machinery and equipment and have been designed in a usable structure.

In the study, examples are given for transforming them into design products with high commercialization potential with a completely zero waste logic without the need for much technical knowledge in the fields of textile and handicrafts. It was emphasized that redesigns can be obtained from post-production wastes of surface materials, especially in terms of leather or textile. In this context, it has been revealed that new designs should be made from waste materials, especially due to the problems experienced in

the world regarding raw materials. Contrary to fast production and consumption, slow consumption should be adopted. Awareness studies should be carried out on the need for manufacturers and consumers to respect design products. In order to reveal their products, designers must be create nature-friendly and ecological products based on the concept of sustainable design. Within the scope of sustainability, efforts should be increased to contribute to the circular economy in our country by upcycling regardless of the type of waste.

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