ANALYSIS OF THE SITUATION WITH TEXTILE WASTE

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Introduction

Textile industry is one of the oldest, most important and most complicated production industries. World production of textile fibers has been growing steadily over the past few decades. In 1975, approximately 24 million tons of textile fibers were produced, 10.6 million tons of which were chemical fibers, while in 2010 the production of textile fibers increased 3 times (76 million tons, approximately 49.6 of which were chemical fibers). In the period of 2010-2020, the production of chemical textile fibers was steadily increasing and a total of 108.3 million tons of textile fibers were produced (Figure 1) [1, 2].

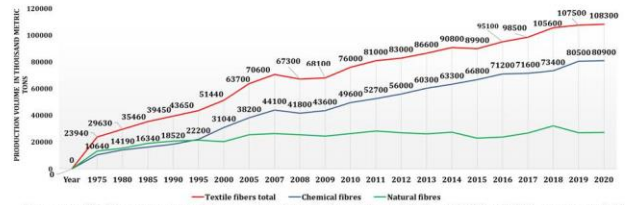

Figure 1. *World production of chemical and textile fibers from 1975 to 2020 (in 1,000 metric tons) [2]*

As it can be seen from the data in 2020 (Figure 1), the amount of synthetic fibers is significantly higher and amounts to 80 million tons while the production of natural fibers is about 3 times lower and amounts to 27.4 million tons [3]. Increased demand and consumption of fiber is a result of global population growth and rising living standards. Textile fiber production and consumption are projected to continue to grow, and global fiber production is expected to reach 156 million tones by 2030. The European region as a whole remains one of the world's leading manufacturers of textiles and clothing [4, 5, 6].

The situation with textile waste in Europe

Textile waste is a significant problem, as 2 to 15 kilograms of waste per person are generated annually in Europe. In 2021, the total population of the European Union was approximately 447 million [7]. The constant increase in the number of inhabitants means higher consumption of textiles, and consequently larger quantities of textile waste.

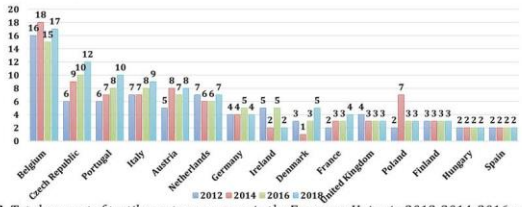

Figure 2. *Total amount of textile waste per person in the European Union in 2012, 2014, 2016 and 2018, by country [9]*

According to the data on waste generation in the countries of the European Union (EU), Italy is on the first place in the generation of textile waste (in 2016 the total amount of textile waste was close to 466 thousand tons). After Italy, Germany, France and the United Kingdom are among the largest producers of textile waste in the EU, each with over 200 thousand tons of landfilled textile waste [8]. But if we take into account the number of inhabitants, then Belgium has the largest amount of textile waste per capita with 17 kilograms per person in 2018 year. The largest increase in the amount of generated textile waste was observed in Kosovo from 4 to 16 kg per person. In the Republic of North Macedonia and Serbia the amount of generated textile waste in 2018 is 2 kg per person [9].

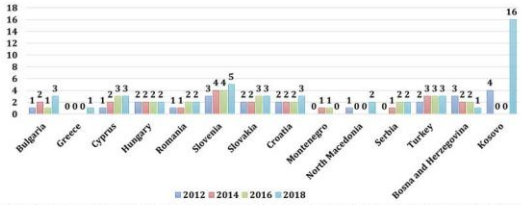

Figure 3. *Total amount of textile waste per person in other country in Europe in 2012, 2014, 2016 and 2018 year [9]*

The data clearly show that the largest producers of textile waste in Europe are Belgium, Czech Republic, Portugal, Italy, Austria and Netherlands. Only 20% of clothing waste is collected globally for reuse or recycling. The remaining 80% is deposited or incinerated, resulting in a large loss of energy and raw materials [10].

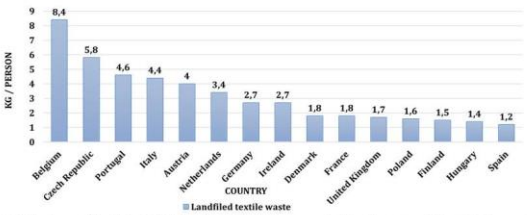

Figure 4. *Total quantity of landfilled textile waste per person in the European Union (EU) countries, in 2016 [10]*

According to the data on waste generation in the countries in European Union (EU) (Figure 5), Belgium has the highest percentage of textile waste utilization per person in 2016, with an average of 1.5 kg. In Italy and Portugal, on the other hand, the amount of reusable textiles was 0.8 kilograms [11].

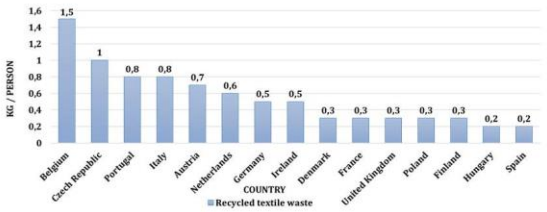

Figure 5. *Total quantity of recycled textile waste per person in the European Union (EU) countries in 2016 [11]*

Possibilities and chalanges

The increasing quantities of textile waste, the pressure and energy in the processes of its disposal or incineration, performed properly or not, impose the need to introduce sustainable ways of textile waste management. Sustainable ways of textile waste management will contribute to reduced waste generation, ie. more efficient use of raw materials and reuse of flows of production materials, reduction of disposal costs, which inevitably imposes the need to raise environmental awareness of waste generators. Restoring the flow of textile waste involves reusing products in their original form, common practice for clothing and recycling waste, and transforming it into a new product. Recycling technologies are generally divided into primary, secondary, tertiary and quaternary. Primary approaches involve recycling the product in its original form. Secondary recycling involves the processing of polymer products into new products that have lower physical, mechanical, and chemical properties. Tertiary recycling involves processes such as pyrolysis and hydrolysis, which convert polymer waste into basic chemicals or fuels. Quaternary recycling refers to the incineration of textile waste and the use of generated heat. All of the above approaches are used to recycle textile waste.

The dominant way to deal with textile waste is landfilling. There are several disadvantages associated with this practice: first, landfills covers useful areas of land and requires payment of adequate fees, and second is leading to environmental pollution due to increased amounts of waste. Also, landfilling of textile waste creates material and energy losses.

Because textiles are almost 100% recyclable, nothing in the textile and garment industry should go to waste. In reality, the recycling rate of textile waste is not very high.

A common reason for this is the underdeveloped public awareness of consumers to participate in the recycling process as well as economic conditions. While legislation can easily upset the balance in favor of recycling, this coercive move can only have the opposite effect in terms of environmental protection. Given the heterogeneity of textile waste, the development of more energy efficient and less expensive recycling technologies requires cooperation with the textile and garment industry, legislation, adequate resources, labor and time. The efforts of the textile recycling industry are aimed at recycling and reducing both types of waste: pre-consumer and post-consumer waste.

Conclusion

The constant increase in the number of inhabitants means higher consumption of textiles, and consequently larger quantities of textile waste. Textile waste is a significant problem, as 2 to 15 kilograms of waste per person are generated annually in Europe. Sustainable ways of textile waste management will contribute to reduced waste generation, ie. more efficient use of raw materials and reuse of flows of production materials, reduction of disposal costs, which inevitably imposes the need to raise environmental awareness of waste generators. Textile recycling and reuse are more sustainable than incineration and landfilling.

The textile recycling industry is a combination of different activities and numerous constituents (users and arbitrators of the textile recycling system) that operate within a socio-cultural system that influences the attitudes and behavior of citizens. Without an internal connection of the constituents the system does not work at full potential and may even cease to exist. The global economy, international trade laws, technological and engineering advances, cultural development, competitive conditions and infrastructure (including waste availability options) are also important factors.

Reference

[1] Engelhardt A. (2005). Fiber Production Hits All-Time High, International Fiber Journal.

[2] Fernández, L. (2021). Production volume of textile fibers worldwide 1975-2020. (https://www.statista.com/statistics/263154/worldwide-production-volume-of-textile-fibers-since-1975/).

[3] Fernández, L. (2021). Textile fiber market share worldwide 2020, by type .(https://www.statista.com/statistics/1250812/global-fiber-production-share-type/).

[4] European Textiles and Fashion: Facts & Figures. (2016). (https://www.euractiv.com/section/innovation-industry/infographic/european-textiles-and-fashion-facts-figures/).

[5] Jordeva, S., Tomovska, E., Zhezhova, S., Golomeova, S., and Dimitrijeva, V. (2020). Textile waste management practices. Contemporary trends and innovations in the textile industry CT&ITI 2020. ISSN 677(082) / 687.1(082).

[6] Maksimov, S., Jordeva, S., Zhezhova, S., Mojsov, K., and Janevski, A. (2022). Methodology for determining the quantity of textile waste from the cutting process. Tekstilna industrija. pp. 29-36. ISSN 0040-2389.

[7] O'Neill, A. (2022). Total population of the European Union (EU) 2021. (https://www.statista.com/statistics/253372/total-population-of-the-european-union-eu/).

[8] Smith, P. (2022). Total textile waste in the European Union (EU) 2016, by country.

(https://www.statista.com/statistics/1090540/textile-waste-generated-in-the-european-union/).

[9] Generation of waste by waste category, hazardousness and NACE Rev. 2 activity. (https://ec.europa.eu/eurostat/databrowser/view/ENV_WASGEN__custom_2523861/default/table?lang=en).

[10] Lawrence K. Wang, Mu-Hao Sung Wang, (2021) Handbook of Environmental Engineering, Springer.

[11] Smith, P. (2022). Total recycled textile waste per person in the European Union (EU) 2016, by country. (https://www.statista.com/statistics/1090702/recycled-textile-waste-in-the-european-union-per-person/).