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## USING A RENEWABLE ENERGY RESOURCES IN THE CLOTHING INDUSTRY

### Purpose

*The clothing industry is one of the most affected branches of the economy in crisis conditions such as the global Covid-19. If the production of textiles took place in the existing conditions, many companies would stop because the labor costs are high. From the processing of raw materials, through the production of textiles, all the way to the production of clothing, the greatest chance to return to real trends is the energy transition, technological transfer and adjustment of workers. The aim of this paper is to point out the possibilities that would keep the textile industry in line with global trends in the use of renewable energy sources.*

**Keywords:** clothing industry, renewable energy sources, transition of energy, transfer of technology, human adaptation.

### Main scientific results

Renewable energy sources (RES) are resources that enable the rapid transformation of wind, solar, geothermal, biomass and waste energy into useful energy. In order to use one RES in production, it is necessary to make an analysis of costs, investments and profitability, as well as comparability with another energy source, which is renewable and with which it is possible to achieve higher results. Comparisons are possible not only in reducing costs, but also in air, water and soil pollution, impacts on other industries and nature. The main goal is to consider different approaches that combine technology transfer in the clothing industry. It is especially important what will happen to the labor force that was engaged in the process of raw material preparation, production, processing, design creation, color dosing, temperature, drying or ironing if the source of energy supply changes.

Various materials that are resistant to water, fire, dust are used in clothing, but with textiles that have renewable properties that are built into nano-material, it can be a good incentive for faster technology transfer and training of workers in the field of renewable materials. If the type of fiber, the method of fabric production and the finishing processes change, the final properties (texture, appearance, weight, strength, shine, flexibility) of the product will also change. It is estimated that energy costs account for 5 - 17% of total production costs.

The volume of water annually consumed varies between 90.000 m<sup>3</sup> and 800.000 m<sup>3</sup> and depends by operations, substrate and machine use [1]. Eco-efficiency concept translates the simple idea of "creating more with less" by: (i) reducing materials intensity; (ii) minimizing energy intensity in both products and services; (iii) reducing the quantity and the dispersion of toxic substances and decreasing the level of toxicity of such substances; (iv) promoting recycling and the use of renewable energy; (v) extending the durability of products, and; (vi) increasing service intensity [2]. Some areas in the textile factory must have a well-maintained standard temperature and humidity, for which HVAC systems are used. Many textile plants do not require HVAC systems (wet processing plant), except for air ventilation. Several textile factories in India have installed turbo fans on their roofs and reported electricity savings of 23-91 MWh per year [3].

The use of solar energy is recognized in textile drying, finalizing, bleaching and gathering, grating, winding and cutting. In addition to not polluting the environment, solar energy is easily converted into heat or electricity, is invested once in the system, easily integrated with other sources and reduces costs. Integration with solar energy is most sustainable with low-temperature hot water in wet textile processing. Many industries use textile waste after production, such as the carpet industry which has waste incineration plants. In technology transfer, special attention must be paid to the adaptation and training of the workforce on machines or in the treatment of materials used by some of the RES.

### Conclusion

Energy significantly participates in the costs of the clothing industry, so efforts are being made in energy efficiency and the transition of energy from fossil fuels to RES. By installing solar, wind or geothermal energy, savings are achieved not only in the treatment of raw materials, drying or painting, but also in the need to heat production halls. Prerequisites for the use of RES in the textile industry are the existence of awareness of reducing energy costs, the existence of available RES, the existence of awareness of the benefits of reducing pollution using RES, acceptance of energy transition, social support, and technological solutions. The use of RES in processing plants, designing products that can be renewed all the way to fashion creations, puts RES in an important place in the textile industry that can participate in the recovery of this important industry.

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