

Effects of Co2 Laser Cutting Technique on Bending Properties of Cotton and Cotton Blended Fabrics

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Abstract:

Laser technology is one of the most important modern technologies in the field of industry, which makes it a fertile area for study and research because of the advantages it offers that serve the environment and industry. The utilization of lasers in the textile industry has opened new possibilities for fashion and textile design, including laser cutting. Despite the significant potential of laser technology in textile and fashion design. However, this technology has been not exploited due to the various problems faced by designers, manufacturers, and consumers of this industry. These include the lack of guaranteed and controlled durability for some fabrics, the need to optimize laser technique parameters, and the limited understanding of the design process and application of laser technology.

The objective of this research is study cutting laser technology using carbon dioxide laser (Co2) and its variables (power & speed) and investigate the effect of laser cutting variables on different materials of fabrics (100% cotton, 99% cotton /1%lycra, 98% cotton /2%lycra, 74% Cotton/25% Polyester/1% Lycra and 78% cotton/21% Polyester/1% Lycra) to improve the quality and performance of the final product in the cutting process, through determine the optimum parameters to serve the clothing and textile industry to achieve sustainability concept. The impacts of these parameters selected on bending properties and color change on these fabrics were investigated.

This research includes the following: Executing a design suitable for laser cut process using Adobe Illustrator program, on 6 different types of research fabrics. Implement the cutting laser process at variables power (40, 50, 70 &90 watt) and speed (50,100,120 &150mm/s) which was determined based on the laser process and type of fabric used. The quality of the fabrics was verified at the optimum parameters of laser ray by measuring color change, and bending test (FAST-2).

The results of the present study can be summarized as follows: Through preliminary experiments with the laser cutting process, 100% cotton fabrics were cut at a power of (70 & 50 W) and high speed of (150mm/s) as the optimal variable based on the weight of the sample used. The variable power is (50W) and the speed is (150mm/s), were optimal for cotton/polyester/lycra fabrics. Preliminary experiments proved that there is a strong relationship between the laser variables of power and speed, which led to the emergence of different results for the cutting process on the different research fabrics. The objective evaluation for color change measure achieved an acceptable degree for the research fabrics at the optimal laser beam parameter for each fabric. The stiffness of 100% cotton fabrics and cotton/polyester/lycra fabrics decreased when exposed to laser rays, which leads to fabrics gaining flexibility.

Keywords:

Co2 laser; cutting parameters; textiles; bending property; bending coefficient ;sustainability

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Paper History:

Paper received November 26, 2023, accepted January 28, 2024, appears online March 1, 2024.