SUMMARY

With various products within the apparel market, denim products share one of the foremost essential market segments. In the denim manufacturing process, various treatment methods, such as sanding, brushing, stone washing, sand-washing, snow washing and stone washing with enzymes and bleaching are used_to achieve the desired result and worn-out effect to denim products. Laser fading method has several advantages over the traditional physical and chemical processes used to finish denim fabrics. The advantages of laser fading over other conventional technologies include no chemicals, no water consumption, and being environmentally friendly.

In this master's thesis, the impact of laser fading on physico-mechanical properties and the fibre morphology of denim fabrics**.** To fulfil the aim of the master thesis, several tests were performed on the fabrics and results were compared with the raw denim fabric results to conclude how the laser fading affects the physico-mechanical properties and morphology of the fabrics.

The thesis analysed the results of four denim fabrics. Four-component fabrics were chosen because multicomponent fabrics have better mechanical properties and are stronger than single components. The first four-component fabric (composition: cotton, modal, polyester, elastane) was selected according to the experimental results of a previous study. After laser fading with different parameters, the morphology of the yarns and fibres of the given fabric was analysed, as well as the visual change between the laser-faded denim and the raw denim. Accordingly, two optimal laser parameters were chosen according to the results of the previous steps. Then 3 different four-component denim fabrics (fabrics 2, 3 and 4) were chosen to understand if previously selected laser parameters could be universal for other types of four-component denim fabrics.

The thesis aimed to determine the effect of laser fading on the morphology and mechanical properties of four-component denim fabrics. The mass per unit area results indicated that the weight of materials decreased after laser engraving due to the increased laser treatment parameters of power and speed. The analysis showed that denim fabrics that faded at higher power have lower mechanical properties and more significant fibre damage. Although all four fabrics had a similar composition, the tear strength test of fabrics 2 and 3 failed in the warp direction; both fabrics were satin-weaved, which may have been why the test pieces were much weaker in terms of cost. After the laser fading, the air permeability of the denim fabrics decreased. As a result of the laser treatment, the fibres absorb thermal energy, causing the fibre to swell and expand, forming pores on the fibre

surface. The effect of laser treatment also depends on the structure of the denim fabric. However, fabric 1 gave better results in selected parameters, but fabrics 3, and 4 still exceeded the minimum requirements. Although laser treatment damages the fibre and reduces the resistance to mechanical properties, it is much more environmentally friendly than chemical treatments and does not pollute the environment.