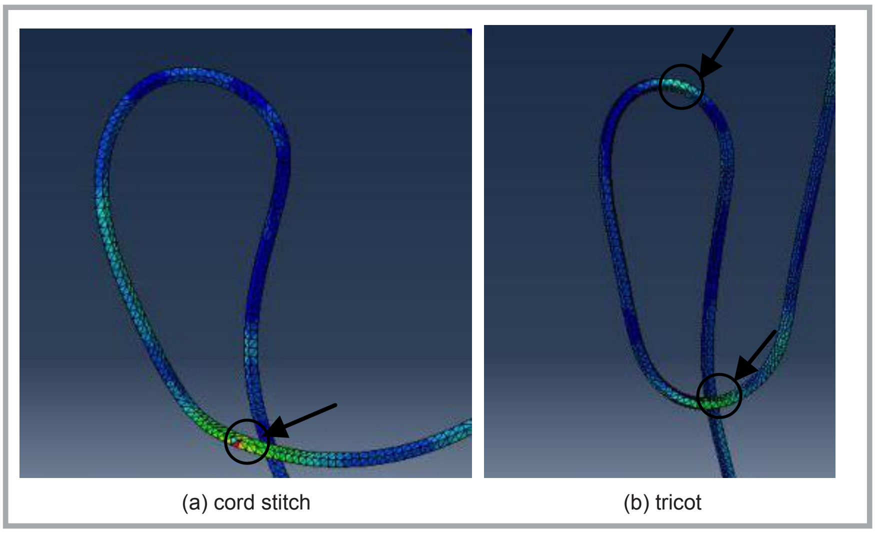

Figure 14. *Stress distribution in fabric.*

Stress distribution

The single loop was shown to find the stress distribution, given in ***Figure 14***, and the red and yellow areas displayed in the circle were the stress concentration areas. It was observed that the maximum stress was mainly located in the area of yarn contact, where significant loop curvature and yarn slippage happened during loading.

By examining the highly stressed areas, the failure regions were well predicted by FEM. The analysis showed that the areas of yarn contact were the most critical regions, with high stress concentration, generated by the compound forces of bending, compressing and abrading.

Conslusions

In this study, a geometry model of warp-knitted fabric was simulated by TexGen software, and then the model was outputted to ABAQUS. The uni-axial tension of the warp-knitted fabric was analysed by FEM. The results showed that FEM was feasible for warp-knitted fabric with a complex structure to predict its mechanical properties.

- Some databases on the geometry model describing the unit cell of warp-knitted fabric were obtained and inputted to TexGen software to simulate the 3-D geometry of the loop. And the geometryl model was outputted from TexGen and then inputted to ABAQUS. Then a finite element model of uni-axial tension of the warp-knitted fabric was established by definition of the material, mesh, loading, interface friction, and so on, in ABAQUS.
- The results of experiments and finite element analysis of uni-axial tension were studied. In the numerical analysis of warp-knitted fabric in the tensile process using FEM, the transfer of yarns between loops and yarn elongation when at different fabric elongations were simulated. The simulation was in good agreement with the experimental tensile process. Also the same trend of the tensile force was found in experiment and finite element analysis. It was also observed that the maximum stress was mainly located in the area of yarn contact, where significant loop curvature and yarn slippage happened during loading.

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