MODELLING OF WIRE DRAWING IN OPENFOAM

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Bekaert is a world market and technology leader in steel wire transformation. Two main types of mechanical processes are used to influence the properties of steel such as strength, ductility, fatigue, and shape: wire drawing and wire rolling. This paper focuses on wire drawing.

During a typical wire drawing process, a steel wire is pulled through a conical die to reduce its diameter. The plastic deformation influences the mechanical properties of the wire, depending on the die geometry and wire diameter reduction amongst other parameters [1]. This paper investigates the influences of die angle and reduction on the residual stresses of the wire. In addition, the cooling of the die is also modelled via coupling the multi-region heat transfer solver with the nonlinear solid mechanics solver [2].

Figure 1 below presents an example of simulated equivalent stress distribution in the wire and die during a drawing process.

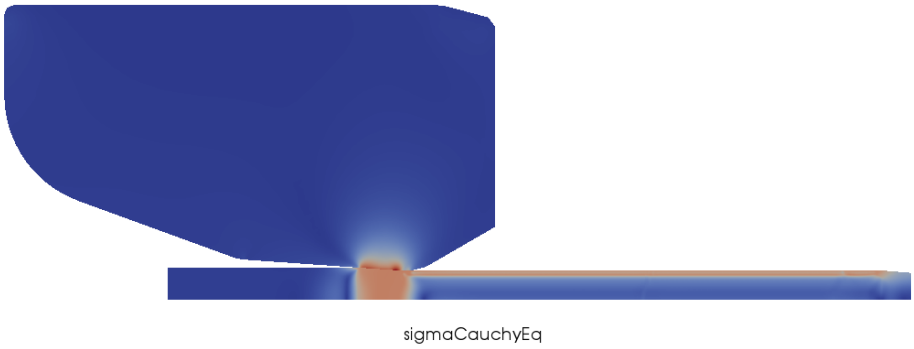

Figure 1: Equivalent stresses in the wire and die

References

[1] Roger N. Wright, Wire Technology: Process Engineering and Metallurgy, 1st ed. Butterworth-Heinemann, November 17, 2010.

[2] P Cardiff, Z Tukovic, A Karac, A Ivankovic, Nonlinear Solid Mechanics in OpenFOAM, 9th OpenFOAM Workshop, University of Zagreb, Croatia, 2014