Determination of the transverse stress in a combined tensile—shear test.

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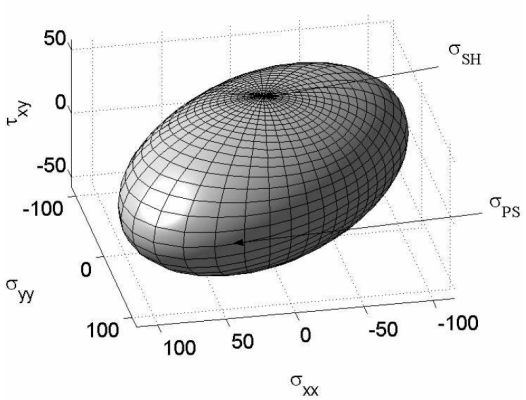
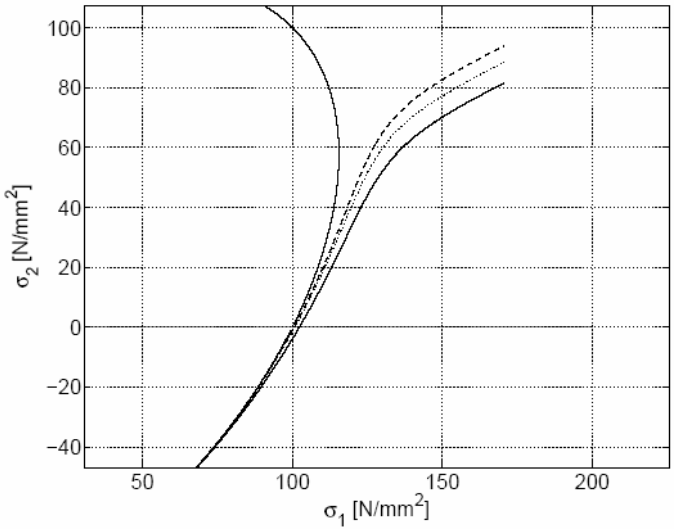
In this thesis the possibilities to determine the complete stress state on the biaxial tester are investigated. The test equipment can load a specimen of sheet material on every arbitrary combination of shear and tensile. This research is done because the possibilities of this test equipment that are intuitively available, are not used.



The Von Mises yield surface in plane stress.

The specimen used in the biaxial tester has a large width-to-height ratio, which results in a transverse stress in the specimen during loading. The forces in tensile and shear direction are easily measured and the stresses in shear and tensile direction are simply calculated. The full description, however, can not be determined because the transverse stress is unknown. This is a result of the constraint, imposed by the large width-to-height ratio. The strains are directly measured on the surface. By imposing the principle of normality, the
tangent of the yield surface is known and the transverse stress can be calculated. The algorithm works for both isotropic hardening and ideal plastic material behaviour. This method is incremental and therefore suitable for experimental work.



Results of tests where the yield surface can is traced with the algorithm.

To test the algorithm, different simulations are performed. These are performed in DiekA, the inhouse code from the University of Twente, for a relatively smooth yield locus and a strongly curved yield locus. Proved is that the concept works. The results however depend heavily on the strain increments during the test. Tensile strain increments of $2 \cdot 10^{-6}$ give results that are within 1 % error of the `exact' solution. Larger increments result in a larger deviation.

The algorithm is not yet usable on the biaxial test facility. The required accuracy for the algorithm are yet too high for the biaxial test facility to satisfy.