

## Experimental and Finite Element Analysis for Mechanics of Soil-Tool Interaction

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**Abstract :** In this paper a 3-D finite element (FE) investigation of soil-blade interaction is described. The effects of blade's shape and rake angle are examined both numerically and experimentally. The soil is considered as an elastic-plastic granular material with non-associated Drucker-Prager material model. Contact elements with different properties are used to mimic soil-blade sliding and soil-soil cutting phenomena. A separation criterion is presented and a procedure to evaluate the forces acting on the blade is given and discussed in detail. Experimental results were derived from tests using soil bin facility and instruments at the University of Saskatchewan. During motion of the blade, load cells collect data and send them to a computer. The measured forces using load cells had noisy signals which are needed to be filtered. The FE results are compared with experimental results for verification. This technique can be used in blade shape optimization and design of more complicated blade's shape.

**Keywords :** finite element analysis, experimental results, blade force, soil-blade contact modeling

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