New elasto-plastic model dependent on the third invariant: LS-Dyna implementation and industrial application

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Abstract: In this contribution, an elasto-plastic model has been proposed based on a yield surface dependent on the third invariant of deviatoric stress tensor, in order to describe the mechanical behavior of wide range of ductile materials. The first part, theoretical aspects are discussed and a mathematical formulation is suggested upon isotropic and kinematic hardening, and associative plasticity. In the second part, a numerical integration algorithm is proposed and implemented in LS-Dyna finite elements commercial software. At the end, conventional tests are carried out, in order to demonstrate the robustness of the proposed model. Furthermore, an industrial application is taken and numerical simulations are performed to demonstrate the advantage of the new formulation.

Key words: third invariant effect, LS-Dyna implementation, isotropic and kinematic hardening.