Viscoplastic deformation of thin-walled tube under dynamic torsion and tension. Part I.

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This presentation shows some preliminary results prepared within the program of joint studies on verification and validation of the known in literature viscoplasticity models: proposed originally by Perzyna and extended by Nowak and Pęcherski to include the contribution of shear banding, by Rusinek and Klepaczko (R-K) as well as by Johnson and Cook (J-C) to describe the behaviour of different steels in a wide range of strain rates, strains and temperatures. Our ultimate goal is to make comparison of the behaviour of mild steel, DH-36 steel and other kinds of high strength steels subjected to the chosen processes with changing loading path. The material behaviour will be predicted with use of the finite element numerical simulations for the mentioned above models. Also the experimental verification of the material reaction in simulated numerically processes is foreseen.

In present study viscoplastic deformation of thin-walled tube under dynamic torsion and subsequent tension is considered. In the first step the DH-36 steel is chosen and Perzyna viscoplasticity model is applied for the numerical simulation of the process with use of finite element program ABAQUS. In the next step mild steel and other kinds of steels will be considered. Also the numerical simulations of the same process, with use of the same specimen and the R-K as well as J-C viscoplasticity models will be performed. The experimental investigations of thin-walled tube subjected to dynamic torsion with subsequent tension are also foreseen.