

ANALYSIS AND OPTIMIZATION OF FORMABILITY TESTS FOR COMPOSITE SANDWICH METAL-POLYMER MATERIALS

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Abstract: Lightweight design is a main objective, not only to aeronautical industry, but also nowadays to automotive industry, due to the awareness of environmental problems, current and near-future restrictions. This is the context for extensive research to developing and using lightweight materials, such as the combination of metals with polymers, the so-called composite sandwich materials. However, the combination of steel with other materials poses new challenges, due to their new or different behaviour and non-homogeneity of deformation, needing also different approaches to material characterization and formability analysis. One of these challenges is related with traditional and standard sheet metal formability tests, which did perform well for homogeneous materials but show not being adequate for composite materials. This work defines the problems faced with formability tests, such as hole expansion, KWI and Fukui tests, when using composite sandwich metal/polymer materials and identifies the fundamental geometrical and processing variables for each test. A sensitivity analysis is performed for these variables by developing virtual tests and corresponding finite element models, in order to optimize and find the adequate testing procedures for this new kind of non-homogenous materials.