Auminium beams subjected to impact loading
by

Professor Magnus Langseth
SIMLab, NTNU
Norway

e-mail: magnus.langseth@ntnu.no

Abstract: When designing aluminium beams subjected to impact loading the cross-section geometry as well as the material properties are playing a major role. Complex geometries can be made by the extrusion process and proper material properties can be designed by heat treatment. Thus, the interaction between the cross-section geometry, the yield stress and the hardening of the material will have impact on the energy absorption. In this presentation the behaviour of aluminium beams subjected to impact loading is studied with focus on support conditions, cross section geometry, mass of the impactor, and material properties. The force displacement curves and thus the energy absorption is obtained using virtual complementary work or virtual forces. All cross sections are assumed in class 1 or 2 and the energy absorption is limited by material failure on the tension side and local plastic buckling on the compression side. During an impact the transient phase is handled by the mode approximation technique. The effects of welding on the behaviour of a simply supported beam subjected to a point load in the centre is also shown. All methods proposed are gathered in a Plastic Capacity (PLCA) program and validated by using analytical methods from the literature together with numerical simulations.