

Fracture toughness: a key property to address cracking-related problems in the sheet metal industry

The sheet metal industry is constantly facing new challenges to satisfy the more and more demanding requirements of sectors like the automotive. Safety and lightweight have become the main design criteria for carmakers, which imply the manufacturing of high-performance and lightweight components with higher strength materials and more complex geometries.

These high-strength materials often exhibit limited local ductility, which reduces their formability and increases their cracking susceptibility. Cracking-related problems like edge cracking in cold forming or crack formation under impact loading are increasingly frequent events that can certainly limit the applicability of some high-strength alloys. Such fracture behaviour cannot be predicted by traditional testing approaches and, therefore, alternative characterization methods have become necessary.

In this sense, fracture toughness has shown to be one of the most suited properties to predict the cracking performance of high-strength steels and aluminium alloys and it is posed as a key parameter for the design and implementation of new high-performance sheet materials. Nevertheless, fracture toughness measurements are not widespread in the industry and, consequently, there is still a lack of knowledge in this field. This talk presents some guidelines on how fracture toughness can be applied throughout the different phases of the sheet metal industry value chain, from the material design to the serial production of components. The objective is to highlight the benefits of including fracture toughness measurements in routine testing campaigns for a more efficient use of high-strength metal sheets.