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Editorial

Tube and Sheet Metal Forming Processes and Applications

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1. Introduction

In the late 1960s, pioneer works by Keeler [1] and Goodwin [2] established the initial procedures for characterizing metal sheet formability based on the use of circle grid analysis (CGA) techniques, allowing for the determination of the in-plane strains on the surface of sheet metal formed parts. Later, in the early 1980s, Embury and Duncan [3] introduced what they called 'formability maps', currently known as forming limit diagrams (FLDs) [4], allowing for the plotting of the values of the critical strains at the onset of failure, along with the strain distribution attained at the forming process of a certain industrial part or component. These research works allowed the creation of the current framework for the analysis of sheet metal forming, also extensible to tube forming.

On the other hand, the current manufacturing industry focuses on the production of light-weight components with better mechanical properties, always fulfilling the increasingly more strict environmental requirements. These challenges have resulted in the requirement for the development of manufacturing processes in general, including, evidently, those devoted in particular to the development of thin-walled metallic shapes, as is the case with tubular and sheet metal parts and devices.

Thus, this Special Issue is devoted to research work in the field of sheet metal forming, tube forming, and their applications, including both experimental and numerical approaches and using a variety of scientific and technological tools, such as the above-mentioned FLDs, analysis on formability and failure, strain analysis based on circle grids or digital image correlation (DIC), and finite element analysis (FEA), among others.

The contributions presented in this Special Issue are discussed in the following section, and were originally invited to deal with recent studies in the field of tube and sheet metal forming processes and their main applications within different high-tech industries, such as the aerospace, automotive and medical sectors, among others.

2. Contributions

These topics were addressed in several high-quality scientific papers within this Special Issue. In what follows, the contents of the published manuscripts are briefly summarized.

Some of these contributions focused on material plastic behavior, as is the case in the work by Fang et al. [5], focusing on the direct assessment of the R-value in sheet metal based on the use of multicamera DIC systems, or the analysis of strain-hardening viscoplastic wide sheets submitted to bending under tension by Alexandrov and Lyamina [6]. Additionally, in this regard, the paper by Shahzamanian et al. [7] presented a numerical study of the influence of superimposed hydrostatic pressure on the damage mechanism by shear in sheet metal forming through the use of the shear modified GTN model to understand the effect of pressure on the shear damage mechanism.

Incremental sheet forming (ISF) was another topic of relevance in this Special Issue, dealt with in the work by Bautista-Monsalve et al. [8] through a novel machine-learning-based procedure for determining the surface finish quality of parts obtained by heat-assisted

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SPIF. Additionally, the work by Suntaxi et al. [9] dealt with ISF, although in this case, concerning the multistage SPIF of thin-walled tubes from a numerical perspective. Other papers analyzing tube forming were carried out by Standley and Knezevic [10] dealing with the manufacturing of ultrafine metallic tubular structures by accumulative extrusion bonding, or the paper by Kishimoto et al. [11] which analyzed the deformation behavior causing the excessive thinning of micro metal tubes in hollow sinking.

Other contributions were dedicated to technological applications, such as the medical field in the case of Palumbo et al. [12], proposing an approach for the manufacture of cranial prostheses in sheet metal forming, the use of additive manufacturing by Tondini et al. [13] for the manufacturing of polymer tools for use in sheet metal forming, or the work by Hoffmann et al. [14] studying the reduction in warping in kinematic L-profile bending using local heating.

This compilation of research works has generously contributed to the success of this very interesting and high-quality Special Issue of *Metals*, devoted to "Tube and Sheet Metal Forming Processes and Applications".

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