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Editorial

Numerical and Experimental Advances in Innovative Manufacturing Processes

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1. Introduction

The severe competition in an international market pushes manufacturing companies to continuously improve current processes in the quest to minimize errors, reduce waste and speed up the entire idea-to-product cycle, while maintaining low costs. In addition, product development times are shorter and sometimes highly customized according to clients' needs, therefore demanding great adaptivity from manufacturing plants.

In this sense, besides improving current manufacturing techniques, it is imperative to search for new manufacturing techniques emphasizing an increase in the accuracy and quality of manufactured products, along with a reduction in production costs. Particularly within the scope of the various forms of processing metallic materials, these techniques must encompass additive, subtractive, joining or shape-changing techniques that have become the drivers for numerous new research lines.

Numerical and experimental methods have continuously improved to provide a better analysis and understanding of several of these innovative manufacturing processes, studying their advantages and drawbacks compared to more classical methods.

This publication encloses a set of contributions on topics that include studies ranging from laser forming to casting, and from grinding to tube drawing.

2. Contributions

The aforementioned topics could be addressed in several published manuscripts. Grain refinement, which may confer greater formability for a wide range of metallic materials due to twist extrusion, was numerically analysed by Joudaki et al. [1] and Yalcinkaya et al. [2]. Improved PCBN (Polycrystalline Cubic Boron Nitride) tools for milling operations were discussed and experimented on by Wang et al. [3], giving an important contribution to the field of the machining of hard materials. In [4], phenomenological anisotropic yield functions, which are still the most cost-effective way to predict the elasto-plastic behaviour of complex anisotropic metallic sheets, were revisited in the context of hydrodynamic deep drawing. Returning to cutting and machining related techniques, innovative insights into the grinding process were studied experimentally and numerically, respectively, in references [5,6]. Hahn and Tekkaya [7] addressed both the numerics and experiments regarding the use of Vaporizing Foil Actuators (VFA) as an innovative and extremely fast sheet-metal forming methodology. Laser forming technology received attention from Safari et al. in the works [8] and [9], the former as a state-of-art review in the field. The hydroforming process for the manufacture of complex shapes, such as metallic bellows, was performed by Safari et al. [10]. A low-pressure die cast of aluminum automotive wheels was modelled and validated by Ou et al. [11], while Jardin et al. [12] employed additive manufacturing and 42CrMo4 steel in a very disruptive investigation. Finally, Al-Hamdany [13] revisited the tube drawing process, which included anisotropy and die-tilting for eccentricity.

In this sense, a wide range of materials, processes and investigation methodologies were researched in this Special Issue.

3. Acknowledgments

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