COMPUTER AIDED DESIGN OF EXTRUSION FORMING TOOLS COMPLEX GEOMETRY PROFILES

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The inherent design freedom promoted by the employment of thermoplastic profiles is one of the major reasons for their attractiveness. Theoretically, thermoplastic profiles can be produced with any cross section suited for a specific application. However, despite the low cost of the raw materials involved, the usually employed design methodologies, based on experimental trial-and-error approaches, is highly dependent on the experience of the persons involved and requires high resources consumption. These difficulties are obviously more evident when the desired profile has a complex geometry and there is lack of previous experience with similar geometries, restricting significantly the range of application of these products.

The employment of numerical modeling codes to aid the design of extrusion dies and calibrators (tools required to produce thermoplastic profiles), may diminish the severity of the problem, but is still problematic since it also requires the experience of the designers involved to take the decisions required along the development process.

The above mentioned problems motivated the development of the automatic design concept [1,2]. The main objective of this approach is to transfer the design process control to the computer, in order to enable the automatic search (i.e., without any user intervention) of the optimal tool geometry required for the production of a specific profile. The final goal of this project is to further generalize the concept of automatic design of the extrusion forming tools (dies and calibrators), by extending it to a wider range and more complex profile geometries. This objective requires the improvement of the currently available numerical modeling code to make it able to work with unstructured meshes, which is described in this work. As a final remark, it is important to mention that the proposed developments will allow the fully exploitation of the automatic design concept, constituting a major contribution to the evolution of the knowledge in the field of extrusion die design and, thus, providing conditions for the development of new products demanded by highly specialized applications, minimizing the amount of resources involved.

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