Numerical prediction of force and energy consumption in roll forming processes

Eneko Saenz de Argandoña[1, a)], Joseba Mendiguren[1, b)], Lander Galdos[1, c)]

[1]*Department of Mechanical and Industrial Production, Mondragon Unibertsitatea, Loramendi 4, Mondragon 20500, Gipuzkoa, Spain*

[a)]*esaenzdeargan@ mondragon.edu*
[b)]*jmendiguren@mondragon.edu*
[c)]*lgaldos@mondragon.edu*

Abstract. The roll forming process is a very interesting process for the production of profile shaped parts because of its high production rate, low investment and efficient use of the material. The process is based on the progressive deformation of an initial flat sheet until getting the final desired profile. This progressive deformation is achieved making the sheet going through a set of stands where two opposite rolls force the sheet to get the desired shape.

The design of the roll forming facilities is mainly based on the identification of the necessary stands for the correct production of the profiles. This correct identification relies in the definition of the roll forming process flower that describes the evolution of the profile shape. Once this evolution is identified, next key step is the identification of the roll forming forces as well as the identification of the energy necessary to make the material go through the rolls.

Current solutions when defining the roll forming facilities are based on numerical simulations. This solution is currently offering good results in terms of stand number identification as well as the definition of the geometry of each stand. However, in terms of force and energy prediction, most of the roll forming facilities designers still rely in their experience since no accurate results are achieved when using numerical simulations.

At the present work, a servo drive roll forming facility has been developed and fully monitored. The energy consumption, the closing force and the deformation at each stand are monitored. In parallel, a numerical model has been developed and the key parameters in terms of force and power consumption prediction have been identified. Finally the capacity of the numerical model to predict the forces and the energy consumption of the process are shown.