Modelling of Extrusion Welding Conditions for Aluminium Alloys

Lesniak D.[1a], Gromek P.[1b], Madura J.[1c], Zaborowski K.[1d], Leszczynska-Madej B.[1e]

[1]*AGH University of Science and Technology, al. Mickiewicza 30, 30-059 Krakow, Poland*

[a)] Corresponding author: dlesniak@agh.edu.pl
[b)] gromek@agh.edu.pl
[c)] madura@agh.edu.pl
[d)] kzaborow@agh.edu.pl
[e)] bleszcz@agh.edu.pl

Abstract. Extrusion of hollow shapes containing longitudinal welds from easy-to-weld aluminium alloys is realized in industrial practice by using porthole dies. In the work, an original method and a special modified device is presented that simulates conditions occurring in a welding chamber of the porthole dies. The weldability tests were performed for difficult to weld 7xxx alloys and also for low and high-component 6xxx alloys – in a wide range of welding temperatures and pressures. The microstructure and seam welds strength were examined. The fractographic research of welding fractures were also carried out. The welding conditions for hard deformable AlZnMg(Cu) alloys were determined and compared to low and high-component AlMgSi alloys. The parameter describing the ability to welding was defined as the stress necessary for welding to the yield stress ratio (σ_w/σ_{pl}) and was determined for the analysed alloys as a temperature dependent. The obtained welding stress values will be the basis for the porthole die design.